TENDER DOCUMENT

NIT No. - DLI/CON/720/643

FOR

Tender for Tender for “Design, Supply, Erection, Testing and commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis”

VOLUME- II

SCC, GENERAL SPECIFICATIONS, TECHNICAL SPECIFICATIONS, TENDER DRAWINGS.

ENGINEERING PROJECTS (INDIA) LIMITED

(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7, Institutional Area, Lodhi Road, New Delhi-110003
TEL NO: 011-24361666  FAX NO. 011- 24363426
SPECIAL CONDITIONS OF CONTRACT (SCC)

NIT NO. DLI/CON/720/643

1.0 (i) The following Special Conditions of Contract (SCC) shall be read in conjunction with General Purchase Conditions (EPI) & General Conditions of Contract (EPI). If there are any provisions in these Special Conditions of Contract, which are at variance with the provisions of General Purchase Conditions (EPI) and General Conditions of Contract (EPI) the provisions in these Special Conditions of Contract (SCC) shall take precedence.

(ii) The terms and conditions shall be as per the terms and conditions given in Tender documents of COMFED (1 to 410 sheets) as applicable. If there are any provisions in these Special Conditions of Contract, which are at variance with the provisions of GCC given in Tender documents of COMFED (1 to 410 sheets) the provisions in these Special Conditions of Contract (SCC) shall take precedence.

(iii) The General Conditions of Contract (COMFED) shall be read in conjunction with EPI General Conditions of Contract (GCC). whenever there is a conflict with EPI GCC the General Condition of Contract (COMFED) shall prevail.

2.0 SCOPE OF WORK INCLUDED IN THE CONTRACT

The brief scope of work included in this tender shall include (but not limited to) Design, Engineering, manufacture, shop fabrication, assembly, testing & inspection at manufacturer’s works, packing, dispatch, transportation, delivery to site, Loading & Unloading, required fabrication & assembly at site, Installation, Testing & Commissioning, completion of facilities, performance guarantee testing, final painting and handing over to SMU/COMFED complete in all respect up to satisfaction of SMU/COMFED for Design, Supply, Erection, Testing and commissioning of 5.00 LLPD Automated Dairy Plant at Dehri On Sone, Bihar on Turn Key basis.

Site Visit: The Civil construction work has been done at project site and adequate space in each section is planned for DAIRY Milk Processing Plant equipment as per the client’s requirement. Bidder must visit the site and see the area and provision kept in milk processing plant building for installation of Dairy Plant processing equipment in the existing building. Bidder to submit the site visit Report along with the tender. Any minor alteration/modifications if required shall be looked into during installation & commissioning of equipment.

3.0 QUALIFICATION OF TENDERERS

To be eligible for this tender the bidders should fulfill the requirements as mentioned in the e-Notice Inviting Tender (NIT). The Tenderers are required to fulfill all the eligibility criteria as stipulated in NIT and elsewhere in the Tender documents. The price bid of tenderers who fulfill the eligibility criteria as per evaluation of EPI shall only be opened. The decision of EPI in this regard shall be final & binding on the tenderers.
4.0 **DISQUALIFICATION**

In addition to clause no. 14 of Instructions to Tenderers (Suppliers), the tenderers may note that they are liable to be disqualified and not considered for the opening of Price Bid if;

a) Representation in the forms, statements and attachments submitted in the pre-qualification document are proved to be incorrect, false and misleading.

b) They have record of poor performance during the past 10 years such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor, inordinate delay in completion, consistent history of litigation/arbitration awarded against the contractor or any of its constituents or financial failures due to bankruptcy etc. in their ongoing/past projects.

c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.

d) If the tenderers attempt to influence any member of the selection committee.

5.0 EPI reserves its right to take appropriate action including disqualification of tenderer(s) as may be deemed fit and proper by EPI at any time without giving any notice to the contractor in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the Tenderers.

6.0 EPI reserves the right to independently verify the performance of the bidder from the Existing owners/users/owners’ Consultants. In case any installation of the manufacturer is found to be performing unsatisfactorily, EPI reserves the right to reject the tender and price bid of such bidder shall not be opened, even if the bidder is meeting the technical and other qualifying requirements.

In such circumstances the bidder shall have no claim on EPI of whatsoever nature.

7.0 **PAYMENT TERMS**

For design & supply of component equipments:-

a) 30% (thirty percent) of the total supply value without taxes & duties shall be paid in advance against Bank Guaranty of the equivalent amount issued by any nationalized/scheduled banks.

b) **On receipts of goods at site** :-

60% of the supply value including taxes and duties, freight, insurance, P & F, unloading etc if any against detailed break up cost as furnished by bidder and accepted by EPI, shall be released by EPI on safe receipt of the goods at site/destinations within 30 days after inspection and approval of SMU, Ara Dairy/EPI on being satisfied with their specification & conditions etc.

c) **On final acceptance:**

The balance 10% of the supply value of goods supplied shall be paid on continuous satisfactory running of the complete plant for one month on completion of the other ordered services by the SMU,Ara/COMFED/EPI within scope of this purchase Order.
For payment of Installation, Testing & Commissioning component:-

a) **On progress of Work:-** 80% of the total value for installation & commissioning part of the PO, shall be paid on prorata basis on actual completion of installation/erection and after due inspection and approved by the SMU Ara Dairy/COMFED/EPI against detailed break up.

b) **On final commissioning of work:-** 10% of the total value/price for installation & commissioning and after due inspection and approval by the SMU, Ara Dairy/COMFED/EPI against detailed break up cost.

c) **On final acceptance:**

The balance 10% of the installation & commissioning shall be on the continuous satisfactory running of the complete plant for one month, on completion of other ordered work/services by SMU, Ara/COMFED/EPI within the scope of Purchase order.

### 8.0 PRICE BASIS:

Prices are FOR site, Dehri- On- Sone, District-Rohtas Bihar.

Quoted prices of the following items shall also include the cost of items indicated against its respective head in BOQ.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Sl. No. of BOQ</th>
<th>Price to be included also for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raw Milk Silos</td>
<td>3.</td>
<td>One set of Auto Sampler suitable for communication with Lab PC for measurement of % Fat, % SNF, PH and Temperature.</td>
</tr>
<tr>
<td>2</td>
<td>Tetrapak Raw Milk Chilling Unit P 30000</td>
<td>4</td>
<td>Duo type in line strainer, MOC of Equipment – SS 304.</td>
</tr>
<tr>
<td>3</td>
<td>SMP Reconstitution Mixer I200 5 KLPH</td>
<td>10</td>
<td>Soft water heater module, MOC of Equipment – SS 304.</td>
</tr>
<tr>
<td>5</td>
<td>Past Water Storage Tank 15000L</td>
<td>37</td>
<td>Suitable monoblock Pump Set and pipe Fittings.</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Items</td>
<td>Sl. No. of BOQ</td>
<td>Price to be included also for:</td>
</tr>
<tr>
<td>--------</td>
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<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Interconnecting Pipes B/w Tanks and Modules suitable</td>
<td>48</td>
<td>Required pneumatic Valves</td>
</tr>
<tr>
<td>7</td>
<td>Interconnecting Pipes B/w Tanks to Modules and Vice Versa for Tanker CIP System suitable</td>
<td>49</td>
<td>Required pneumatic Valves</td>
</tr>
<tr>
<td>8</td>
<td>SS 304 Dump Tank for Leaky Pouch</td>
<td>57</td>
<td>Suitable capacity Pump &amp; Duplex Filter, MOC SS 304 and one extra HMST of Capacity- 2 KL for storing leaky milk in SS 304 MOC</td>
</tr>
<tr>
<td>9</td>
<td>Double Head Pouch Packing Machine with Coding 5000 PPH</td>
<td>63</td>
<td>Suitable Capacity Voltage Stabilizer</td>
</tr>
</tbody>
</table>
| 10     | Utility Piping Material for Drops from header suitable               | 66            | • Condensate Transfer Pump – 5 KLPH : 4 sets  
• SS Condensate Collection Tank MOC-SS316 insulated and claded with SS, 100 Ltr cap- 2nos.  
• SS Condensate Collection Tank MOC-SS316 insulated and claded with SS and with Level Sensors, 5000 Ltr cap - 1 no. |
| 11     | Automation Hardware and Software                                      | 71            | • Automation Hardware covers all required computers, printers, Furniture and Fixtures of Control Room including Air Conditioners and other requirements suitable for 5.0 LLPD Dairy Plant  
• Automation Software to cover all requirements of 5.0 LLPD Automated Dairy Plant |
| 12     | Process Installation Material – SS Pipes, Fittings and Support Material | 78            | Pneumatic Valves, MS SS Support Material all complete suitable for 5.0 LLPD Automated Dairy Plant                                                                                                                        |

Prices charged by vendor for goods to be delivered and services to be performed under the agreement executed shall not vary from the prices quoted and subsequently negotiated.

9.0 **Packing & Forwarding:**  
Included in above price.
10.0 Taxes & Duties

The following shall be also read with clause no 13 of GCC:

1. The bidder/Contractor must be registered with GST and should have valid GSTIN number.

2. The bidder/contractor must submit as an compliances of GST Act, the invoices in GST compliant format failing which the GST amount shall be recovered/ adjusted by EPI without any prior notice from the next invoices or available dues with EPI.

3. The bidders/contractors are requested to update/upload the GST/Taxes data periodically so as to avail ITC credit by EPI failing which it shall be recovered/ adjusted by EPI without any prior notice from the next invoices or available dues with EPI.

4. Rates to be quoted in this tender all inclusive with all taxes and duties etc. including GST.

5. Bidder while quoting the rates in the tender must also consider the ITC credit applicable for the works, if any.

6. In case of any reduction in rate of GST or other taxes in future or the project getting exemption status prior to the last date of bid submission or afterwards, the subcontractor shall pass on the benefit to EPIL immediately, failing which EPIL shall have right to recover the differential amount from the amounts due to the subcontractor. Further, in case of any increase in rate of GST or other taxes in future or the project losing exemption status prior to last date of bid submission or afterwards, the said increase of taxes shall be paid/reimbursed to the subcontractor, subject to the condition that the reimburses the said increased taxes to EPIL.

11.0 Unloading, Transportation & inspection

After unloading shall be arranged by vendor as per the clause 12 of the General Conditions of the Contract for plant work and Clause 11 of the special terms & conditions of the contract of the tender document duly accepted.

Required road permit (if any) will be provided by Managing Director, Shahabad Milk Union (SMU) /EPI.

Bills to be made in the name of :

Engineering Projects (India) Limited

Payment to be made by:
Engineering Projects (India) Limited
Consignee Name & address:

"Shahabad Dugdh Utpadak Shahkari Sangh Ltd, Rohtas Dairy Project, Industrial Area, Behind B M P -2 Camp, Dehri-On-Son, Rohtas, Bihar-821307" and follow dispatch instruction to be given by EPI.

The Plant shall be established at Dehri-On-Sone about 20KMs from Sasaram the District town of Rohtas District and about 6 kms from Dehri On Sone Rly. Station

12.0 Specifications of works: As per Tender Documents of COMFED for main plant works enclosed with schedule of makes of various equipments.

Supervision of works: The day to day supervision of works (Supply, installation & commissioning part of the equipment) shall be done by SMU, ARA, Dairy/EPI, However managers Engg/ Engineers of COMFED HQ will also inspect works time to time as and when needed. The nodal officer of SMU/COMFED will inspect all equipment in line with the specifications and forward report for payment etc.

13.0 Inspection & Tests ( for Supply , instllation & Commissioning ) The SMU Ara Dairy/EPI or its representative shall have right to inspect and /or test the Goods to confirm their conformity to the specification as per clause 8.0 of the GCC(COMFED) on page 78 and Clause 5.0 of the special conditions of Contract (COMFED) at page 104 of the tender document. (COMFED).

14.0 Insurance: The goods supplied under PO shall be fully insured by vendor in Indian Rupees as per the Clause 11 of the GCC(COMFED) and relevant Clause of the SCC of the tender document.

15.0 Performance Security: Vendor will submit the performance security to the purchaser in the amount of (Ten) 10% of the total supply value of the plant work within 30 days after the receipt of this purchase order or along with acceptance of this order under Clause 7.0 of the GCC(COMFED) at page 77 & SCC (Comfed) under Clauses 4(4.1 & 4.2) of the tender document.

The performance Security shall be in the following forms:-

a. A bank guarantee , issued by a Nationalised Indian Bank/scheduled bank.

b. Or Demand Draft in favor of EPI..........................

c. Such bank guarantees shall be valid till the expiry of the warranty period and will be liable to be extended as per direction of EPI without. Any proof of damage or breach of contract. (Finance to Check)

The performance security will be discharged by the purchaser and returned to the supplier not later than 30 days following the date of completion of the supplier's performance obligations, including any warranty obligations.

16.0 Warranty/Guarantee The supplier shall provide the MD,SMU,Ara Dairy/COMFED/EPI the warranty/Guarantee under clause 15 of the General Conditions of Contract ,GCC(COMFED) on page No. 83 of tender document.
17.0 Force Majeure & Termination in Consequence of Force Majeure
This term is applicable as per Clause 25 of the GCC (COMFED) of the tender document.

18.0 Delays in the supplier’s performance
Delivery of goods & performance of services shall be made by the supplier in accordance with the time schedule specified by the purchaser under Clause 22 of the GCC(COMFED)of the tender document at page no.85.

19.0 Liquidated Damages: Liquidated damages subject to clause 23.1 of GCC(COMFED) subject to clause 24 , if the supplier fails to deliver any or all the goods or perform the service within the time period(s) specified in the contract , the Purchaser shall , without prejudice to its other remedies under the contract , deduct from the contract prices , as liquidated damages , a sum equivalent to :
   a) deduct 0.5% (Half percent) of the full supply/commissioning value of work for delay of every completed week of (seven) 7 days including holidays and ignoring incomplete week.
   b) The total amount so deducted shall not exceed 10% (Ten) of the total supply value. Once maximum is reached EP may consider termination of the order in consultation with MD, SMU Ara/COMFED. Any incremental taxes & duties & levis on account of delay in performance of the contract by the supplier shall be to supplier’s account.

However, the payment of liquidated damages shall not in any way relieve the contractor from any of its obligations to complete the facilities or from any other obligations and liabilities of the contractor under the contract.

20.0 Approvals:
Under Clause 13 on page 119 the tender document (COMFED) vendor will obtain the necessary approvals of the factory Inspector, Boiler Inspector, Electrical Inspector, Weights & Measures Inspector, Explosive Inspector and any other state and local authorities as may be required and the cost of obtaining such approvals shall be included in the total project cost. All the necessary details, drawings, submission of application and performa will be furnished by the supplier to the purchaser for verification/signature. The necessary application duly filled-in, together with the prescribed fees shall be submitted to the appropriate authorities by the supplier on behalf of the purchaser. However, all the actual statutory prescribed fees paid by the supplier shall be reimbursed by the purchaser upon production of receipt/vouchers.

21.0 Acceptance of Award of Order—would override and nullify any condition made by the supplier in their tender/offer papers if those are inconsistent with the conditions incorporated in order and other terms and conditions in tender papers issued by EPI. The workmorder is issued in the limit of the tender document alone and thus it can not be constructed in manner so as to render any of the provisions of tender document/agreement redundant.

22.0 The Other terms & conditions –As per GCC of tender document (COMFED).
23.0 VARIATION IN TAXES, DUTIES, LEVIES AND IMPOSITION OF NEW TAXES ETC.

Any new taxes introduce by Central Govt / State Govt or variation in taxes is payable to contractor subject to reimbursement of same from client. If client has not reimbursed any new taxes and variation in taxes contractor does not have any claim on this and are not payable. Contractors are requested to submit the proof of deposit of taxes claimed failing which it shall not be reimbursed.

24.0 COMPLETION PERIOD

The work shall be completed in 10 Months as mentioned in the NIT.

25.0 The bidder shall comply with legal orders & directions of law of local bodies. The bidder shall give to the Municipality, Police, Local Bodies and concerned Governmental authorities all necessary notices relating to work that may be required under the law and obtain all requisite licenses / permissions. Nothing extra shall be paid by EPI on this account.

26.0 INSPECTIONS & PERMITS

The bidder shall obtain all necessary permits from local bodies, provincial or central authorities and shall make arrangement for inspection and tests etc. as required at his own cost.

27.0 LICENCES

The bidder shall arrange for obtaining the license for the operation and approval of drawings for the equipment etc. as required from the local Government/authorities at his own cost & nothing extra shall be payable.

28.0 The work shall be carried out in accordance with the drawings approved by the SMU, Ara/COMFED. Before the commencement of any item of work, the bidder shall correlate all the relevant drawings/documents/specification issued for the work and satisfy himself that the information available there from is complete and unambiguous. The discrepancy, if any, shall be brought to the notice of Engineer-In-Charge before the execution of work. The bidder alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and/or incomplete information. Nothing extra shall be paid on this account.

29.0 The bidder shall give performance tests of the entire installation(s) as per specifications and drawings before the work is finally accepted and nothing extra whatsoever shall be payable to the bidder for these performance tests.

30.0 Bill of Quantities given in price bid shall be read in conjunction with NIT, Instructions to Tenderers (Suppliers), General Purchase conditions, Technical specifications, Drawings, Schedules, Tender Documents-Comfed, Addendum etc..

31.0 After completion of installation, testing and commissioning of all the equipment as per tender specifications, the bidder shall, however, provide proper training to the Owner’s employees/representatives for maintenance and operation of the equipment without any additional cost.
32.0 The bidder has to arrange for inspection of equipment and shall submit internal inspection certificate/document and nothing extra shall be paid.

33.0 Care shall be taken in handling of material to avoid damage. Any damages made to the equipment during transit shall be made good by the bidder.

34.0 TEST CERTIFICATE

All manufacturer’s certificates of test showing that the materials have been tested in accordance with the requirements of the relevant standard specification and the copy of the test certificate as well as standard shall be supplied free of cost to EPI for onward submission to SMU,Ara/COMFED.

35.0 INITIAL INSPECTION AT MANUFACTURER’S WORK:

The bidder shall furnish such facilities as will be necessary for inspection of the material before dispatch at his or his associate’s works and also for witnessing such tests as per technical specifications, as are done at the works if so required by SMU,Ara/COMFED/EPI. The bidder shall give minimum two week notice regarding the dates proposed for inspections. The Tenderer shall submit list of test on components of equipment, which shall be carried out at manufacturer’s premises.

36.0 INSPECTION DURING INSTALLATION AND FINAL INSPECTION:

The EPI or its representatives shall have the right to inspect and/or test the Goods to confirm their conformity to the specification as per the clause 8.0 of THE GCC (COMFED) and 5.0 of the SCC of the Contract of the tender document. The bidder shall arrange for checking and testing the installation as per technical specifications. All instruments and materials required for testing shall be the responsibility of the contractor. The final inspection of the installation and testing of equipment may be carried out by SMU,Ara/COMFED/EPI. The taking over of equipment after trial run shall be subject to removal of defects, if any, pointed out during the inspection.

37.0 SITE ENGINEER (For Installation, Testing & Commissioning):

37.1 Adequate no. of Experienced Engineers and supervisors to be posted during installation, testing and commissioning.

37.2 Successful bidder to depute their engineers for checking of arrangement of various foundations, levels, pockets etc. of civil construction.

38.0 It will be the sole responsibility of bidder to obtain all statutory approvals and completion clearance from the all relevant statutory bodies and for all other services as included in the scope of contract etc. from the concerned department as required within the stipulated time frame. Liaison work on behalf of EPI with the local bodies will also have to be done by the bidder. Nothing extra shall be payable to bidder on this account. No claim whatsoever in this regard shall be entertained.

39.0 Competent personnel shall be deployed by the successful bidder for jobs requiring special skills.
40.0 In the event of slackness, delay, bad-workmanship and any other default on part of the Party, EPI shall cancel the order and carry out the same at the risk and cost of the Party.

41.0 PARTY confirms that they have read, understood, have copies of the “Tender Documents” and have visited the site. Their offer is based on the ‘Tender Documents’ and caters to all the works, requirements etc. thereof.

42.0 All men, materials, machinery, tools and plants, infra-structure, resources etc., as required for execution of works shall be provided and arranged by PARTY for their portion of work. The amount / rate quoted in their offer by PARTY to EPI includes all charges, all direct and indirect cost of works, materials, labour, plant & equipment, all taxes, duties, levies, royalties, GST etc., all transportation charges including for cartage of issue material, electricity and water charges and for all expenses, such as labour camp, bank guarantee charges, insurance charges, EPF/CPF/ Statutory contributions and other expenses whatsoever, incurred on execution, completion and maintenance of the works as per ‘Tender Documents’ and their own overheads and profit etc. PARTY shall comply with all the requirements laid down as per ‘Tender Documents’ and shall un-conditionally abide by its offer quoted at pre-award stage for execution of works as per terms, conditions, specifications, drawings, documents etc. given in the ‘Tender Documents’ for the completion, handing over, maintenance period etc. for the project.

43.0 The PARTY shall take insurance cover at its own cost towards Workman Compensation Act for its own workers, employees and for the Plant & Equipment deployed by the PARTY at the project site and shall furnish documentary proof of the same to EPI failing which no payments shall be released to the PARTY against work done. The PARTY shall assist EPI in follow-up with insurance company in case of any claim related to PARTY’s scope of work. EPI is not liable to pay any claim of the PARTY if it is not paid by insurance company due to any reasons whatsoever. The insurance cover for the complete project shall be arranged by EPI at its own cost.

44.0 Earnest Money Deposit submitted by PARTY along with their offer as security to un-conditionally abide by its offer shall be kept valid for a period of 150 days from the last date of submission of offer. The EMD is liable to be forfeited if the PARTY revokes / withdraws its offer during its validity or extended validity period of offer. In case of revocation / withdrawal of offer by PARTY after issuance of Pre-award tie-up letter and during its validity or non-start of work within stipulated time and non-submission of performance security / any other security etc. if required to be submitted by the PARTY to EPI after award of work, EPI shall have the option to forfeit the EMD and get the work executed at the risk & cost of the PARTY. The decision of EPI in this regard shall be final & binding on PARTY.

45.0 In the event of award of works, PARTY shall submit to EPI, Bank Guarantees from a Nationalized / Scheduled Bank towards advance, performance, retention money, security deposit etc. as required by EPI / Client / Local Authorities as per conditions of the ‘Tender Documents’ (in the prescribed proforma of EPI) in favour of EPI, for PARTY’s portion of work. In case any initial cash deposits are to be made to the Client, the same shall be made by EPI and PARTY in proportion to their respective value of the contract.
46.0 In case PARTY is awarded the works and fails to execute the same as per agreed schedule of progress of work and as per specified quality and / or lags behind in activities required for timely completion of works, as determined by EPI / Client, then EPI shall give 15 days written notice to PARTY to achieve the specified quality and / or to deploy adequate resources to the satisfaction of EPI, for timely completion of works. Upon expiry of the notice period, if PARTY fails to achieve specified quality and / or fails to take action for timely completion of works, then EPI shall have option to withdraw the remaining work partly or in full from PARTY and get the same executed at the risk and cost of the PARTY from alternative agency / agencies besides encashment of the guarantees submitted by the PARTY to EPI. The decision of EPI in this regard shall be final and binding on the PARTY.

47.0 The PARTY shall post adequate competent engineers and supervisory staff at site for day-to-day execution and supervision of its works etc. during the entire duration of the contract including maintenance / defect liability period. The minimum number and level of engineers, supervisors and other personnel to be deployed by the PARTY should be as directed by EPI. In case the PARTY fails to deploy adequate number of personnel at site / office, EPI after giving seven days notice shall engage the required personnel solely at the risk and cost of the PARTY and debit the cost of the same to the account of PARTY. EPI shall exercise overall management, monitoring and coordination of project. EPI shall not post any staff during maintenance / defect liability period for which the PARTY shall make suitable arrangement to the satisfaction of SMU,Ara/COMFED/EPI.

48.0 The PARTY shall be responsible for timely completion of the works within the contractual completion period. In case the project execution is delayed beyond the contractual scheduled completion period due to reasons attributable to the PARTY. Total Liquidated Damages / Compensation for delay, if any, imposed / deducted from EPI’s bills by SMU,Ara/COMFED , the party shall be liable to pay liquidated damages and same shall be recovered from PARTY’s bills or other dues. The decision of EPI in this regard shall be final & binding on the party.

49.0 The PARTY to confirm that it holds EPF Code number, GST registration number, PAN (Permanent Account Number of Income Tax) etc. and shall be responsible for depositing EPF subscription and contribution for labour and staff employed by it on the works and other taxes, duties and dues etc. as per statutory requirements and documentary evidence of same shall be provided to EPI. The PARTY shall also be responsible for labour welfare and for arranging labour and other licenses / permits /clearances etc. for the project at their own cost. In case EPI has to take labour license or and other licenses, all expenditure towards the same shall also be borne by the PARTY. The PARTY shall comply with all the requirements as per labour laws /acts. All the records in this regard shall be maintained by PARTY as per statutory requirements and rules and shall be produced by the PARTY on demand if required.

50.0 The PARTY shall be responsible for obtaining all approvals from Client with regard to quality of materials & workmanship and measurements etc. for their portion of work. All such approvals shall be in the name and title of EPI. The PARTY shall be responsible for reconciliation of issue material with Client, if any. Any shortfall in issue materials shall be made good / recovered from PARTY as per terms of EPI’s contract with the Client.

51.0 The PARTY will not correspond directly with client and all the correspondence in matters regarding bills, claims, interpretation of the specifications, conditions and all matters related to the contract with Client, Client’s Consultants, all other
agencies including Government and Statutory bodies etc. shall be done through EPI only. PARTY shall prepare and submit expeditiously all bills, claims, details, clarifications, documents, information, etc. as required by EPI / Client for proper execution and successful completion of the works.

52.0 In case of non-approval of PARTY’s association for the project by the Client due to any reasons, the PARTY shall have no claim on EPI.

53.0 Income tax shall be deducted as per income tax act as applicable.

54.0 The PARTY shall plan and execute its scope of work in such a manner that the other works, connected with the works of the PARTY, but not included in PARTY’s scope of work, do not get affected / delayed.

55.0 The PARTY shall deploy sufficient plant & equipment of the required capacity and in good working condition for completion of the works in stipulated time with required quality. The equipment should either be owned by the PARTY or hired / leased. The deployment of equipment by PARTY shall be as decided by EPI and the same shall not be less than the minimum deployment stipulated by the Client, if any, for execution of works and as per schedule agreed with EPI. The PARTY shall make arrangement for regular maintenance including preventive and breakdown maintenance and maintain stock of essential spares at site / near to site so as to ensure minimum breakdown time of equipment. The equipment once brought to site shall not be allowed to be removed without the consent of EPI. In case the PARTY fails to deploy sufficient equipment to the satisfaction of EPI or in case of prolonged breakdown of equipment, EPI at its sole discretion shall arrange the required equipment and debit all the related costs including ten percent overheads of EPI and shall recover the same from the due payments of PARTY, including from its bank guarantees available with EPI.

56.0 PARTY shall ensure compliance with all Central, State and Local laws, Rules, Regulations etc. as applicable or may be applicable during the course of execution, maintenance etc. of the works and shall indemnify EPI against any claim or damages whatsoever on such accounts. The PARTY shall keep EPI indemnified at all times against infringement of any Patent or Intellectual property rights as set forth in below mentioned paragraph.

PARTY will pay costs and damages finally awarded in any suit against EPI to the extent based on a finding that the design or construction of any WORK or Products as furnished, where furnished, infringe any patent, utility model, copyright, or trademark granted or registered in the country of PARTY’s shipping destination, provided that, EPI: (i) promptly informs PARTY of the alleged infringement in writing; (ii) provides PARTY the exclusive right to defend and settle the suit, at PARTY’s expense; and, (iii) provides all reasonable information and assistance requested for the defence. PARTY shall have no liability for any infringement that is based upon or arises out of: (a) compliance with EPI’s instructions, specifications or designs; (b) use of WORK or Products in a EPI or third-party process; or, (c) combinations with other equipment, software or materials not supplied by PARTY. The foregoing states the sole and exclusive obligations of PARTY for intellectual property infringement, whether mentioned herein or in any other document including GCC and GPC of EPI.
57.0 EPI is an ISO 9001, ISO 14001 and OHSAS 18001 : 2007 certified company. the conditions of the ISO as applicable should be followed by the PARTY for implementation & maintaining the established procedures of EPI for this purpose.

58.0 The work executed by PARTY shall be subject to audit and quality control checks from Quality Control Division & Technical Audit of EPI, client, Inspecting Agency of the Client and chief Technical Examiner of Central Vigilance commission, Govt. of India. In the eventuality of any defect / sub-standard works as brought out in the report or noticed otherwise at any time during execution, maintenance period etc., the same shall be made good by the PARTY without any cost to EPI. In case PARTY fails to rectify the defect / sub-standard work within the time period stipulated by EPI, EPI shall get it rectified at the risk and cost of PARTY and shall recover the amount from the dues of the PARTY.

59.0 CONCILIATION AND ARBITRATION

General Conditions of Contract (GCC) Sub Clause no.76.1 and 76.3 of Arbitration Clause no.76.0 are amended as given below. Sub Clause no.76.2 will remain the same.

76.0 ARBITRATION

76.1 Before resorting to arbitration as per the clause given below, the parties if they so agree may explore the possibility of conciliation as per the provisions of Part III of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015. When such conciliation has failed, the parties shall adopt the following procedure for arbitration:

i) Except where otherwise provided for in the contract, any disputes and differences relating to the meaning of the Specifications, Design, Drawing and Instructions herein before mentioned and as to the quality of workmanship or materials used in the work or as to any other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the Contract, Designs, Drawings, Specifications, Estimates, Instructions, or these conditions or otherwise concerning the works of the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the Sole Arbitrator appointed by the Chairman & Managing Director (CMD) of Engineering Projects (India) Limited (EPI) or any other person discharging the functions of CMD of EPI. The person approached for appointment as Arbitrator shall disclose in writing circumstances, in terms of Sub-Section (1) of Section (12) of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 as follows:

a) such as the existence either direct or indirect, of any past or present relationship with or interest in any of the parties or in relation to the subject matter in dispute, whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to his independence or impartiality; and
b) Which are likely to affect his ability to devote sufficient time to the arbitration and in particular his ability to complete the entire arbitration within a period of Twelve months. The Arbitrator shall be appointed within 30 days of the receipt of letter of invocation of arbitration duly satisfying the requirements of this clause.

ii) if the arbitrator so appointed resigns or is unable or unwilling to act due to any reason whatsoever, or dies, the Chairman & Managing Director aforesaid or in his absence the person discharging the duties of the CMD of EPI may appoint a new arbitrator in accordance with these terms and conditions of the contract, to act in his place and the new arbitrator so appointed may proceed from the stage at which it was left by his predecessor.

iii) It is a term of the contract that the party invoking the arbitration shall specify the dispute/ differences or questions to be referred to the Arbitrator under this clause together with the amounts claimed in respect of each dispute.

iv) The Arbitrator may proceed with the arbitration ex-parte, if either party, in spite of a notice from the arbitrator, fails to take part in the proceedings.

v) The work under the contract shall continue as directed by the Engineer-In-Charge, during the arbitration proceedings.

vi) Unless otherwise agreed, the venue of arbitration proceedings shall be at the venue given in the ‘Memorandum’ to the ‘Form of Tender’.

vii) The award of the Arbitrator shall be final, conclusive and binding on both the parties.

viii) Subject to the aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 or any statutory modifications or re-enactment thereof and the Rules made thereunder and for the time being in force shall apply to the arbitration proceedings and Arbitrator shall publish his Award accordingly.

76.3 JURISDICTION:

The courts in Delhi/New Delhi alone will have jurisdiction to deal with matters arising from the contract.

60.0 SUSPENSION OF WORKS:

The Clause No. 77 of GCC shall be replaced as under:

(a) The Contractor shall, on receipt of the order in writing of the Engineer-In-Charge, suspend the progress of the works or any part thereof for such time and in such manner, as the Engineer-In-Charge may consider necessary for any of the following reasons:

i) On account of any default on part of the Contractor, or
ii) For proper execution of the works or part thereof for reason other than the
default of the Contractor, or

iii) For safety of the works or part thereof.

The Contractor shall, during such suspension, properly protect and secure the
works to the extent necessary and carry out the instructions given in that behalf by
the Engineer-In-Charge.

(b) If the suspension is ordered for reasons (ii) and (iii) in sub-para (a) above, the
Contractor shall be entitled to an extension of the time equal to the period of every
such suspension plus 25%. No adjustment of contract price will be allowed for
reasons of such suspension.

(c) In the event of the Contractor treating the suspension as an abandonment of the
contract by EPI, he shall have no claim to payment of any compensation on
account of any profit or advantage which he may have derived from the execution
of the work in full but which he could not derive in consequence of the
abandonment.

(d) The Contractor shall resume work in all earnestness after suspension has been
lifted by EPI.

(e) Free suspension of work shall be limited to maximum aggregate period of 60 days.
In case suspension of work exceeds 60 days, cost of suspension will be charged by
the contractor per mutual agreement.

61.0 Mobilization Advance: No Mobilization advance shall be paid and hence clause no.
8 of GCC shall stand deleted.

62.0 The clause no 35.0 of GCC shall stands deleted: No Secured advance shall be paid to
the contractor.

63.0 Retention Money: GCC Clause No.10 stands deleted as already in payment terms
SCC Clause No.7 we are withholding 20% of Payments.

64.0 FURNISHED OFFICE ACCOMMODATION & MOBILITY AND COMMUNICATION
TO BE PROVIDED BY THE CONTRACTOR TO EPI: EPIL GCC Clause No. 28.3 is
DELETED.

65.0 Clause no.16 of Escalation / Price Variation of GCC stands modified as under:
No claim on account of any Price Variation / Escalation on whatsoever ground shall be
entertained at any stage of works. All rates as per Bill of Quantities (BOQ)/ Price-Bid
quoted by Contractor shall be firm including all taxes, GST and duties and fixed for
entire contract period as well as extended period for completion of the works. No
escalation/price variation clause shall be applicable on this contract.
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GENERAL SPECIFICATION

1.0 PROJECT SYNOPSIS

Dairy Plant-Dehri-On-Sone is an esteemed project of Shahabad Dugdh Utpadak Sahkari Sangh Limited/COMFED has been awarded to EPI for implementation on turnkey basis.

Dairy plant site is located at Dehri-On-Sone in Rohtas District of the state of Bihar in the eastern region of India. The site lies between 24.87° North latitude and 84.18° East latitude. The nearest convenient railhead is Dehri-On-Sone which is about 5 km from work site.

The distance from State Capital Patna to Dehri-On-Sone is about 150 km. It is well connected by the rail and road network. The nearest national highways are NH 9 & NH 139.

2.0 General Rules and Regulations

All plant units with respect to their location, layout, general arrangement and design of equipment, structural design, etc. shall be safe to the personnel and conform to the relevant statutory requirements issued by Bihar Government and the Government of India but not limited to the following as applicable.

- Bihar State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbid of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts
- Any applicable statutory compliances/rules by local administrative authorities

Pollution control measures shall be provided considering the latest norms and international standards. These should satisfy the stipulations of Central Pollution Control Board and Department of Environment and the Forest, Government of India.

2.1.1 Standard

Unit of Measurement
All dimensions & weights shall be given in metric system.

Language
All drawings, documents etc. shall be in English language.
2.2 **Safety**

2.2.1 **Safety Regulations**
The Vendor shall comply with the, relevant Safety Rules and Regulations but not limited to the following as applicable.

- Bihar State Factory Rules/Acts
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- State and mobile Pressure Vessels Codes (Unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts
- Any applicable statutory compliances/rules by local administrative authorities

Strict attention shall be paid to all statutory regulations and safety rules for prevention of accidents.

The safety posters/regulations for prevention of accidents shall be displayed by the vendor at appropriate places. Notices and warning signs shall be displayed for all sources of dangers.

When the work is carried out at night or in the obscure day light, adequate arrangements for flood lighting in the working area shall be made by the vendor at his own cost.

All handling/transport and the rigging equipment including lifting tools and tackles shall be arranged and checked at regular intervals and kept in good and safe working condition by vendor.

The vendor must take sufficient care in moving his construction plant and equipment from one place to another, so that those do not cause any damage to the property of the Purchaser or obstruct construction activities of other Vendors.

The vendor shall depute a full time safety engineer who will exclusively look after all the jobs pertaining to safety at site and keep close liaison with COMFED/EPI. He will be responsible for maintaining safe working conditions at site, promoting safety consciousness among the workmen and reporting to concerned authorities in case of accident/dangerous occurrences.

2.2.2 **Safety while Working with Explosives**

Explosives shall not be used on the work site by the vendor without the written permission of the Purchaser and that too only in the manner and to the extent to which it has been prescribed.
Explosives shall be stored in special premises approved by Purchaser and at the cost of the Vendor who shall be liable for all damages, loss or injury to any person or property and shall be responsible for complying with all statutory obligations in these respects.

2.2.3 **Safety Appliances**

The vendor shall provide the safety appliances conforming to the relevant Indian standards to all their workmen and supervisors engaged by them as well as by the sub-contractors.

The vendor shall ensure that all the workmen and supervisors, are using the safety appliances regularly during work at site.

Any form of compensation in lieu of safety appliances shall not be permitted. Any violation in safety provisions of failure to maintain safe working conditions will lead to serious penalty on the Contractor and finally may lead to termination on the Contract.

The workmen of the Vendor deployed for construction and erection in hazardous areas shall be provided with personnel protective safety appliances of special nature suitable for hazardous working conditions.

2.2.4 **Safety during Construction/Execution**

The vendor shall be responsible for the safety of his workmen and employees. The vendor shall ensure that safety practices are followed so as to prevent personal injury to his workmen and also to other persons working/passing by in that area.

The vendor shall ensure that in case of any accidents, the same are reported without delay to the Purchaser/Statutory Authorities as per Rules. In case of any injury/accident the Vendor shall bear all the expenditure for medical treatment and shall pay the compensation in case of permanent disability or death.

The vendor shall ensure that all personnel employed do not stray into others areas. Any injury caused due to this shall be the sole responsibility of the Contractor.

The vendor shall ensure that skilled labours required for specific works have necessary trade certificates and adequate experience of the job. This is likely to be checked by the Purchaser. The concerned operator, mechanics, electricians, fitters, riggers, etc. must be fully conversant with the hazards associated in operation/maintenance of their relevant equipment.

2.2.5 **Safer Working Platforms**

- Vendor shall use strong and secured planks and boards of the right sizes.
- These planks shall be painted at the edges brightly to warn the workers for any misuse (usually zebra paint)
- Vendor shall make sure that scaffolds are erected by the trained scaffolders.
- Supervisors must inspect scaffolds once every week.
2.2.6 **Falling Objects and Debris**

- No loose materials which can fall down should be kept on the working platforms.
- Overhead shelters should be provided to minimize damage from tailing objects.
- Strong nets to be provided to catch these objects or debris.
- Nets must envelop all sides of the building.

2.2.7 **Personal Safety Equipment**

- Workers must wear approved safety helmets and shoes.
- For those working in high places safety belts shall be provided.
- The safety belts must be attached to strong anchorage points.

2.2.8 **Operating Construction Machine**

- Vendors shall make sure that those operating the construction machinery are well trained for their jobs.
- The keys of such machinery shall be kept with the authorized persons.
- The keys shall be removed after use of the machine.

2.2.9 **Safer Electrical Installations**

- Vendor shall use approved types of electrical sockets and plugs.
- Proper insulators for all electrical wiring shall be provided.
- Wiring should not be allowed to lie on the floor or on the ground.

2.2.10 **Safety in Designing of Equipment**

All machinery and equipment must be equipped with safety devices. The safety provisions shall conform to the recognized standards, safety codes and statues.

All safety measures as required to be adopted as per statutory regulations and the safety rules of the plant shall be strictly followed by the Vendor during the execution of the Contract.

2.3 **Drawing and Documents Requirement**

*Vendor to submit list of project drawings indicating category – For approval/For information. In addition to these drawings, any other drawing of equipment/system, if required by SMU,Ara/reference.*

2.3.1 **Drawing**

The drafting standards adopted in preparation of drawing shall be such that good clean and legible print of the drawing can be obtained.

For preparation of original drawing guidelines contained in Indian Standard specification IS: 10164-1985 (preparation of engineering drawing and diagrams) shall be followed.
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<td>A1</td>
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However, Vendor’s standard drawings are exempted from the above limitations. It is desirable to keep the same size of all drawings for ease of filing, reference and record keeping.

All drawings shall be oriented to match the plant layout drawings and shall have a key plan identifying the plant area to which they apply.

There shall sufficient reference notes and cross-references on the drawings to permit identification of all related drawing and documents, which are required for proper understanding.

When a drawing is revised by the vendor/Sub - Contractor, every change made shall be identified on the drawing by placing the revision number in a small triangle so as to be easily recognizable. In addition, a record of revisions along with the co-ordinates showing the location of revisions shall be indicated at the left hand bottom corner of the drawings as per standard practice. In case of revision of drawing, for which different number is allotted, the new drawing shall clearly indicate the number of the drawing which it supersedes.

Approval of drawings from the statutory authorities such as the Indian Boiler Inspectorate, Inspectorate of Explosives, Electrical Inspector, etc. is the responsibility of the Vendor/Sub-Contractor.

The Title block of the drawing shall be enclosed as Annexure I.

2.3.2 Approval of Drawings

Approval of Vendor’s drawings means that these will be checked for conformity with applicable specifications and general conformity with the engineering requirement for the areas covered in the scope of work. It is understood that approval by SMU,Ara/Comfed/EPI does not include checking for drafting and other errors but only reviews of basic concepts and general principles involved.

The Vendor shall be responsible for any discrepancy, errors and omissions in the drawings have been approved by the SMU,Ara/Comfed/ their Consultant. The Vendor shall bear all extra cost due to alterations necessitated by reasons of any discrepancies, errors or omissions in the drawings and particulars supplied by the Vendor.

Approval of Vendor’s drawing shall not relieve the vendor of his responsibility to comply with the intent of the contract; manufacture/fabrication or procurement prior to approval of drawings shall be at the vendor’s risk.
If the drawing is “Approved” then one print shall be returned back to the Vendor duly stamped “Approved”.

If the drawing is “Not approved” or “Approved as Noted”, then one stamped print with appropriate comments shall be returned back to the Vendor for incorporation of comments and re-submission of revised drawings for approval sets within 7 days. After approval of drawings the Vendor shall submit 5 sets of approved drawings to the EPI. The Vendor shall incorporate the following note on the drawing before “Approved by SMU,Ara/COMFED vide letter no………….dtd…”

After approval, any change in the drawings is done, must be brought into the notice of SMU,Ara/COMFED/EP before making changes.

All reference and information category drawings shall be submitted in 5 sets to EPI...

In case any discrepancy is observed on these drawing, same shall be informed to the Vendor by marking the comments on the drawings. The Vendor shall resubmit these drawings in 5 sets to the EPI after incorporating the comments.

After receipt of drawings stamped “Approved/For Reference Only” the Vendor shall submit 10 sets of drawings to the EPI. The Vendor shall incorporate the following note on the tracing before taking additional prints for submission to the EPI.

Vendor to submit 10 sets (hard copy) and 1 set of soft copy of all Ås built Copy’drawings/documents along with the final bill.
**GENERAL SCOPE OF WORK**

(A) The broad scope of work of vendor shall be as per the following:

1. Design, engineering, manufacture, inspection, shop & primary coat of painting, supply of automated Dairy (milk processing) Plant as required for complete & trouble free operation in an integrated manner.
2. Submission of system/equipment drawings for approval/ reference, operating software, erection drawings/ documents in requisite copies, for approval/for reference of SMU,Ar/A/COMFED/EPI.
3. Submission of operation and maintenance manuals in soft editable format, as built drawings etc.
4. Receipt of material, loading / unloading, inspection after unloading, storage, insurance, watch & ward, complete erection, testing, commissioning of integrated system, demonstration of performance guarantees and handing over to SMU ,Ar/A/COMFED,
5. Arranging all the equipment, facilities required for erection, testing and commissioning of the equipment, All consumables required during erection, testing and commissioning of equipment
6. All interconnecting piping, pipe supports, cables, cable trays, support system required for the system.
7. Distribution of utilities with necessary valves as required for the system. points (At one location utility services shall be provided by purchaser) .
8. Power supply feeder from PCC shall be provided up to electrical room, further distribution shall be in vendor's scope.
9. Complete earthing system of equipment
10. Complete Instrumentation and Automation system. Control room furniture, control desk etc.
11. All type of platform, supports for maintenance of equipment.
12. Construction power shall be made available at site on lump-sum chargeable basis @ 0.5% of contract value.
13. All statutory approvals as required.
14. Fire Detection System in the control room shall be provided by successful bidder as per the requirement, FDA system shall have communication port with the main fire alarm system.
15. Deputation of representatives to site for erection, testing and commissioning. A team of experienced engineers & Supervisors lead by team manager shall be deployed by successful bidder during ETC.
16. Applying final finish coat of paint as per approved procedure & shades before handing over.
17. Supply of all commissioning spares. A list of such commissioning spares & insurance spares shall be indicated separately.
18. Progress reporting as per agreed formats, providing documentary evidence of purchase orders on sub vendors with addresses of contact persons, attending progress review / engineering review meetings at COMFED office Patna/SMU,Ar.
19. Arrangement of all erection equipment as required.
20. Training of plant operation and maintenance personnel
21. Attending review meeting with SMU,Ara/COMFED/ their consultant/EPI
22. Receiving delivery of items at site, their proper storage, and handling at site, watch and ward services etc.
23. For detailed scope of work and design parameters on various sub-systems & facilities, technical specs given in the volume-2B of tender document shall be referred to.
24. **Site Visit:** As Civil construction work has been done at project site and adequate space in each section is planned for DAIRY Milk Processing Plant equipment as per the client’s requirement. Bidder must visit the site and see the area and provision kept in milk processing plant building for installation of Dairy Plant processing equipment (BOQ Enclosed in technical part-Vol.-2B.) in the existing building. Any minor alteration/modifications, if required, shall be looked into during installation of equipment. Bidder shall submit the site visit Report with the bid.

(B) Complete set of NIT documents of COMFED (410 sheets) is enclosed with the tender to have the overall idea of the project. Bidder scope shall be limited to work for Dairy (milk processing) plant of the project.

(C) Drawings Documents to be submitted by successful bidder:
   i. Process and Instrumentation Drawing
   ii. Equipment layout Drawing
   iii. Flow Chart drawing of Process System
   iv. GA Drawings & Specification of Equipments
   v. Equipment/ Machines Foundation Details
   vi. Automation system Configuration
   vii. Automation System BOQ
   viii. Automation System Furniture Layout with BOM
   ix. Control Room Fire Detection System
   x. Piping Specification & Piping Schedule
   xi. Cable Specification & Cable Schedule
   xii. Cable Trench Layout
   xiii. Cable Routing Layout
   xiv. Cable Termination
   xv. Drainage System Layout
   xvi. Electrical System Drawings
   xvii. Electrical Single Line Diagram
   xviii. MCC Panel GA & BOQ
   xix. Load & Total Power Consumption Details
   xx. Requirement of Utilities for Dairy Plant (Steam, Water, Air, etc)
   xxi. Any other drawings/documents required for the project as per Supplier recommendation
   xxii. Any other drawings/documents required for the project as per Client (SMU,Ara/COMFED) requirement
   xxiii. Project execution Plan and Bar chart.
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<td>Equipment Specifications &amp; Approved Make</td>
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Technical Specifications
Plant Works

SCOPE OF WORK AND BASIS OF DESIGN

The dairy plant shall be designed, supplied installed and Commissioned by the bidder. The major area covered under the scope of work shall be reception, process, packaging (toned & standard milk), product, CIP and allied works with utilities including process/services piping systems, power / control cable network, earthing network, safety devices, instruments etc. as per requirement for the dairy plant for smooth operation & maintenance of the system.

The brief of processing requirement and equipment details are mentioned hereunder.

1.1 RAW MILK RECEPTION (30,000 LPH X 2 UNITS)

The Raw chilled milk having temperature of 10 deg. C shall be received at Dairy dock in tankers (8000L-9000L). Around 45 tankers shall arrive in a day.

Milk received in tankers shall be weighed in the electronic weighbridge and the operator shall manually enter relevant tanker details in the weighbridge PC and the weighment shall be taken automatically.

Milk sample shall be taken manually from the tanker and the details of the sample shall be fed to testing system for measurement of necessary parameters of Fat, SNF, pH and temperature. Based on the acceptable parameters and actual results the consignment shall be accepted or rejected.

Tanker shall be connected manually to the unloading line. Each tanker shall be emptied out in 25-30-minute duration.

The milk reception rate through tanker is assumed as 20,000 LPH average and 30,000 LPH maximum. The total milk received in a day shall be 5, 00,000 liters maximum. The average fat and SNF percentage in the raw milk shall be 4.0% and 8.6% respectively.

The tankers reception bay shall receive two tankers at a time. There shall be two independent raw milk reception lines through which the milk shall be emptied out from the tankers simultaneously and milk shall be transferred to any one of the raw milk silos (3 x 100 KL) through 30KLPHP Chillers.

Reception bay- It shall also have point for bulk milk dispatch through road milk tankers.
1.2 **MILK PROCESSING PLANT (20,000 LPH X 2 UNITS)**

The raw milk at 4 degrees centigrade shall be drawn from any of the raw milk silos to the balance tank of the any of the two milk pasteurization plants for pasteurization & separation.

The capacity of the pasteurization plant & Separator shall be 20,000 LPH each. The dairy plant shall be designed to run either both the pasteurizers simultaneously or one at a time. The milk separator shall be self-cleaning auto flush. The pasteurized skimmed/formulated/standardized milk shall be stored in the processed silos (3 x 100KL & 2 x 20KL).

To enable SNF addition for manufacturing of different varieties of milk (viz. Standard/toned/double toned), a reconstitution system comprising of funnel & venture unit, tanks (un-insulated), pump, duplex filter, chiller etc. shall be provided. This high SNF pasteurizer. Skim Milk powder bags shall be manually cut opened and dumped in the hopper of funnel & venture.

The skimmed milk / formulated / standardized milk shall be sent to the different sections as follows:

a) Powder plant for SMP / WMP/ Dairy Whitener manufacturing. In case of the WMP production the milk feed shall be at 3% fat. The plant shall be designed for separation and mixing of raw & skimmed milk to get the milk at 3% fat quality. The formulated milk shall have 8.5% total solid for SMP production and shall have 12% total solid for WMP production.

b) Liquid milk packaging section for packing through pouch filling machine.

The transfer milk to powder plant and any one of the other section should be made possible simultaneously.

1.3 **CREAM PROCESSING PLANT (3000 LPH X 2 UNIT)**

The cream shall be collected in each cream intermediate tanks (1000L) from either of the cream separators and shall be pasteurized in the cream pasteurization plant. The dairy plant shall be designed to run either both the pasteurizers simultaneously or one at a time.

The capacity of each cream pasteurization plant shall be 3000 LPH. The total cream produced in a day shall be 48755 kg. (4,00,000 4.9% x 99%/40%).

The cream after pasteurization shall be stored in three numbers of the cream storage tanks each is having 20,000 Litres capacity.
1.4 BUTTER SECTION

The cream, after ripening, shall be pumped from cream storage tanks at the rate of 3200 kg/hr to the CBMM. Cream pump located in the process hall shall be operated based on the level in the common float balance tank of the CBMMs. The butter shall be manufactured through Continuous Butter Making machines (CBMM). The plant shall have two numbers of CBMM and each is having capacity of 800kg/hr. This section shall be provided with PV station (HMI) station for process interactions.

The butter produced from CBMM shall be pouched in bulk packing of 15Kg or taken to the ghee section. The butter shall be taken in either hoppers of butter packing machine or will be transferred directly to the BMV (Butter melting Vat) through a (lobe /screw) pump.

Necessary arrangements for efficient conveying of butter through pipelines shall have to be taken care of by the suppliers. The bulk packs/cartoons shall be stored in butter deep freeze.

The butter milk shall be collected, chilled and sent to Raw Milk Silo for recovery of milk solids.

1.5 GHEE SECTION

The dairy shall be equipped with required ghee manufacturing facilities for production of 5,000kg/day in batch processes. The butter from butter making machine shall be taken to ghee section through butter trolley fitted with auger and butter pump. Butter from deep freeze shall be transported in butter trolleys and transferred manually to butter melting vat. Molten butter shall be pumped to pre stratification tank and subsequently to ghee boilers.

Ghee made in the ghee boiler shall be transferred to ghee settling tank through balance tank and pump. After settling, the ghee shall be clarified, cooled and stored in the ghee storage tanks.

Ghee made in the ghee boiler shall be settled in ghee settling tank. After settling, the ghee shall be clarified and stored in the ghee storage tanks. The stored ghee shall be taken to retail / bulk ghee filling. Entire Ghee manufacturing section shall be through manual control in form of SSRCP push button stations.

A provision for Fat recovery system i.e collection of wash water from ghee boilers & serum from pre-stratification tank shall be provided to avert through piping. The liquid shall be treated with cooling water separate fat manually.

1.6 LIQUID MILK PACKAGING SECTION

It is planned that initially 30,000 L of standard/ toned/double toned milk shall be packed in to 500 ml/ 1000 ml poly pouches by three nos mechanical type pouch filling machines.
The processed milk stored in pasteurized milk silos shall be transferred to any one of the HMST (2 Nos. X 10KL) at packing section (Mezzanine). Milk from the HMST(s) shall be taken to any/all of the pouch-filling machine (3Nos mechanical type 500PPH) by gravity. At a time only one variety of milk shall be packed.

For milk crate management, empty crates shall be received at crate reception dock from the trucks and manually fed to the in feed conveyor of the crate washer (capacity 800 CPH) in an inverted position. The cleaned crates from the crate washer shall be automatically inverted to the correct position and conveyed to the crate store area on conveyors. Washed crate shall be stacked in the crate store. Crate stacks shall be provided to pouch machines manually. A power driven chain conveyor shall be provided in front of pouch filling machine to carry filled crates to the could store through hatch door. Crates shall move from the conveyor in to the cold store over roller conveyor.

Provision for wastes/leakage milk collection should be made with connection from packaging machine trays. The leakage milk collection vat (200L) with strainer is to be provided with transfer pump to transfer the milk to rinse milk tank at process hall.

### 1.7 CLEANING-IN-PLACE (CIP)

#### 1.7.1 General

There shall be two automatic CIP systems. While CIP system I shall have two circuits, CIP 2 will have 3 circuits of operation. All circuits of each CIP system as well as both the CIP system shall be possible to operate simultaneously and independently, with its own set of CIP tanks, PHE, filters, pumps, valves and fittings etc. The CIP systems shall clean all the milk handling equipment storage tanks and pipe line network including milk transfer line from processed milk silo up to milk storage tanks of packing section. The CIP systems shall be operated, controlled and monitored from central control room. The details of the ongoing CIP programme shall be displayed in central control room.

Necessary controls and instrument viz. level sensor, conductivity probes, temperature sensors, transmitters shall be provided to achieve the required CIP operations.

The system shall be totally secured against mixing of the cleaning solutions with the products in case of malfunctioning in the system or power failure.

The system shall be fully automatic and pre-programmed with facilities with the products in case of malfunctioning in the system or power failure.

The system shall be fully automatic and pre-programmed with facilities of selecting and modifying the cleaning sequence and duration from the main control room.

#### 1.7.2 Bulk Storage: 15,000 Liters x 2 Nos. (One each for Acid & Lye)

Acid and lye shall be received in bulk in road tankers and shall be unloaded in to bulk storage tanks. There shall be chemical unloading pump suitable, for the acid and lye
application, for unloading of acid and lye. The unloading pump capacity shall not be less than 10,000 LPH at suitable head. Two numbers of bulk storage tanks (one for acid and one for lye) having capacity of 15,000 Litres each shall be provided. The unloading pumps shall be inter-locked with the high-level of the Acid / Lye tanks for stopping the pumps once pre-determined level is reached.

The tank shall be provided with high level and low-level indicator –cum- alarm system. High-level switch provided in the storage tank shall trip the respective pump for pumping of the solution to that tank. Vapour outlet from each bulk storage tank shall be provided with water seal arrangement. The tank shall be provided with mechanical type level indicator.

The acid and lye solution from the bulk storage tank shall be transferred to the respective tanks meant for Tanker CIP, Dairy Process Plant CIP, APS plant and Powder Plant CIP. The acid & lye transfer pump shall be installed near the bulk storage tanks area and shall be of capacity 1 KLPH (MIN) at suitable head. The tanker unloading pumps shall also be used for concentrated chemical transfer to buffer tanks installed at powder plant & APs plant. These pumps shall also be interlocked with respective buffer tanks.

The pump for acid & lye solution transfer shall be of SS316L in construction for all the parts coming in contact with the concentrated solution. The bidder shall also supply the unloading hoses for acid and lye.

1.7.3 **Tanker CIP: Two Circuits**

There shall be two separate sets of tanks one for Process CIP and another for Tanker CIP. Tanker CIP shall have two circuits with each circuit dedicated for one tanker CIP bay.

The plant shall be provided with 3000 Litres of acid, lye and hot water tanks and 4000 litres of recuperation tanks. The tanks shall be provided with conductivity meter for feeding of desired quantity of acid / lye solution from the respective concentrate storage tanks.

Two CIP forward pumps and two numbers of CIP return pumps shall be provided with suitable flow rate and head. The contact parts of the pumps shall be AISI 316. Pump shall be centrifugal type with open impeller and sanitary design complete with motor and base frame.

CIP programme shall ensure that the line connection for the tankers is made and the man way is open before starting the CIP operation. Dummy cover with two spray ball arrangement shall be provided for each tanker openings for proper cleaning.

Suitable tanker hoses shall be provided for collection of CIP solution from the outlet of the tankers.
SS folding type platform with SS railing on RCC walk way for tanker ma way (4 nos) approach shall be provided.

1.7.4 **Dairy Plant Process CIP: Three circuits**

The plant shall be provided with 5000 Litres of acid, lye, hot water tanks and 8000 litres of recuperation tank. The tanks shall be provided with conductivity meter for feeding of desired quantity of acid / lye solution from the respective concentrate storage tanks.

Three CIP forward pumps and require numbers of CIP return pumps shall be provided with suitable flow rate and head. The contact parts of the pumps shall be AISI 316. Pump shall be centrifugal type with open impeller and sanitary design complete with motor and base frame. The number of routes in each circuit shall be decided by the bidder based on the system offered.

1.7.4.1 **Cleaning Programme**

The CIP system shall generally comprise the following sequence.

- Water pre rinse
- Hot detergent circulation
- Hot/Cold water rinse • Hot acid circulation
- Hot/Cold water rinse
- Hot water sterilization
- Mains soft water rinse

By passing of any operation after detergent circulation from the above sequence of programme shall be made possible.

At the end of detergent and acid cleaning, the solution shall be recovered with the help of sensors provided in the return line and substandard solution shall be automatically diverted to drain.

Intermediate rinse shall be with plain hot/ cold water and this shall be recovered and reused after acid circulation.

The alkaline/ Acidic traces shall be removed with the help of cold/ hot water. Hot water rinse shall ensure satisfactory cleaning of he lines and equipment. Final rinse water shall be recovered in the recuperation tank.

Concentration of detergent and acid shall be maintained with the help of an automatic dosing system equipped with necessary conductivity probes. Chemical dosing shall not be carried out during the CIP in progress. Dosing shall be done in between successive cleaning cycles based on the strength of the solution measured by the conductivity meters installed on the recirculation lines. Duration of the recirculation of the solution shall be carried out such that the homogeneous strength of the solution is obtained.

The completion of CIP of every circuit shall be signaled with an audiovisual alarm.
The temperature and concentration of cleaning solution shall be continuously monitored and corrected automatically. In case of noncompliance of any of the parameters, the sequence shall remain suspended for such time and resume to "NORMAL' when corrected.

The route for CIP circulation shall be pre-programmed. The solution spray shall be only through spray balls. CIP solution shall be returned back to CIP tanks through self-priming CIP return pumps in each routes.

If the programme execution stops at particular step due to power failure of fault, then commencement of programme execution, after rectification, should be from the same step where the programme was terminated.

Sequence of operation and detergent acid consumption shall be automatically recorded in the process computer and shall be recalled on the screen on demand.

1.7.4.2 **RINSE MILK RECOVERY SYSTEM**

A time controlled water purge (quantity of water equivalent to the holding capacity of milk pipe and milk processing equipment) shall be given to push the milk from the pipe line and equipment to the rinse milk storage tank.

The rinse milk recovery tank shall be used to collect the pre rinse milk up to a pre determined concentration / dilution (pre-programmed) from various milk pipelines, equipment and storage tanks over the day. Once the SNF concentration level goes below the preset level, the conductivity sensor mounted over the CIP return line will sense it and automatically divert the rinse water to drain.

1.8 **AIR HANDLING SYSTEM**

There shall be two numbers non-lubricated reciprocating compressor of suitable capacity (1 working + 1 standby) for the generation of moisture free instrument air. The compressors shall have advanced control system for capacity control and for performance monitoring. Suitable refrigerated air dryer and filters for achieving the quality of air suitable for the instrumentation, air receiver with drain shall be included in the scope of work.

Air distribution piping up to all the utilities shall also be included in the scope of work. Necessary arrangements shall be made for taking feed & control for automation interface.

**The bidder shall indicate the pressure and quantity of dehumidified air required in the plant.**

1.9 **WATER HANDLING SYSTEM**

Water handling system shall meet the entire raw and soft water requirement. Raw water shall be mainly used for floor cleaning and general purpose and soft water shall be used for the entire dairy plant processing and cleaning.
The Purchaser shall make raw water and the soft water UG sump at water treatment building. Further distribution of raw / soft water from the sump through hydro flow system / softener up to various buildings & utilities shall be included in the scope of the work including necessary M.C.C. income for this shall be taken from process MCC.

Hydro flow system for raw water shall comprise of 2 nos of vertical inline multistage SS pumps of (1w+1s) and pressure tanks with necessary valves, pressure transmitter, gauges and controls etc.

Hydro flow system for soft water shall comprise of 3 nos of vertical inline multistage SS pumps of (2w+1s) and pressure tanks with necessary valves, pressure transmitter, gauges and controls etc.

Pumps shall be interlocked with respective pressure transmitter and controls and level probes in the UG sump. Measurement and recording of raw water, soft water and chilled water shall be provided. The same shall be made accessible at the central control room.

Requirement of soft water for powder plant (20 hours of operation) may be assumed as 120 cum/ day with peak load as 20 cum/hr. Requirement of soft water for refrigeration plant may assumed as 6.0 cum/hr (20 hours of operation).

1.10 **CONDENSATE RECOVERY SYSTEM**

The system shall consists of facilities for receiving condensate by gravity from the various process equipment to condensate recovery tank/ tanks tank and pumping back to the feed water tank at boiler house.

Two different circuits one for process and CIP section and another one for product section shall be connected to a common condensate recovery tank of 5000 Litres. There shall be two numbers of condensate return pump (1 W+1S) interlocked with the levels sensors of the condensate collection tank.

1.11 **FUEL HANDLING SYSTEM**

Fuel handling system shall consist of 2 numbers each 50 KL Furnace oil storage tanks, day tank of boiler house with set of unloading cum supply pumps, unloading hose, valves, instruments, mass flow meter & controls, piping, electrical heat tracer, insulation & cladding etc as per statutory requirement including necessary approvals.

Pumping and distribution from unloading point of FO yard up to day tank located in boiler house is included in the scope of bidder.

Pumping and distribution from unloading point of FO yard up to day tank located ink powder plant is included in the scope of bidder. (Supply installation of powder plant day tank shall be
carried out by powder plant contractor including level sensors) Interlocking of this level with the FO pump is included in the scope of bidder.

Interlocking the levels of day tanks with starters of respective FO pumps shall be included in the scope of bidder.

**1.12 ELECTRICALS**

Electrical distribution system shall be suitable to operate, control, and maintain all the parameters required for receiving the milk through tankers, chilling, storing, milk pasteurization, separation, processed milk storage, processed milk packaging and transfer to Powder Plant, cream pasteurization, storage, transfer to butter making machines, butter bulk packing, butter melting, butter oil transfer, ghee making, ghee settling, ghee clarifier, storage and packing, granulations etc. complete as specified in the process requirement for milk, milk packaging & milk product manufacturing.

Required number of Motor Control Centers and ancillary panels with complete switchgears as per the requirement of the equipment shall be provided for effective and safe operation of the processing plant.

Required quantity of armored cable, control cable, Instrument cable, GI perforated cable trays, GI drop conduit pipes, SS drop conduits pipe in process section, plate type earth pit, earthing network, earthing conductors, load break Isolators, PB station near motors for emergency isolation, rubber mats for panels etc. shall also be provided.

The sizes of power cables for different capacity of loads / Motor rating shall be as indicated in cable selection charts. All the power & control cables shall be laid through GI perforated trays SS shrouds for all pumps & motors shall be provided. Supply & placement of rubber mats of proper size as per Electrical Inspectorate rules shall be provided.

The electrical LT distribution system specification is detailed below.

**1.12.1 Electric Motors**

All electric motors shall be energy efficient motors and shall comply with the following:

a) All poly phase motors of 0.375 kW or more shall have a minimum acceptable nominal full load motor efficiency not less than shown in Table below or as per the IS 12615 – 2004 Eff 1 for energy efficient motors.

Table for Minimum Acceptable Motor Efficiencies

<table>
<thead>
<tr>
<th>Motor Size (KW)</th>
<th>2 Pole</th>
<th>4 Ple</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.(1.5 hp)</td>
<td>82.2</td>
<td>83.8</td>
</tr>
<tr>
<td>Power (HP)</td>
<td>Efficiency</td>
<td>Power Factor</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>1.5 (2 hp)</td>
<td>84.1</td>
<td>85</td>
</tr>
<tr>
<td>2.2 (3 Ph)</td>
<td>85.6</td>
<td>86.4</td>
</tr>
<tr>
<td>3 (4 Ph)</td>
<td>86.7</td>
<td>87.4</td>
</tr>
<tr>
<td>4 (5.5 Ph)</td>
<td>87.6</td>
<td>88.3</td>
</tr>
<tr>
<td>5.5 (7.5 Ph)</td>
<td>88.5</td>
<td>89.2</td>
</tr>
<tr>
<td>7.5 (10 Ph)</td>
<td>89.5</td>
<td>90.1</td>
</tr>
<tr>
<td>11.0 (15 Ph)</td>
<td>90.6</td>
<td>91</td>
</tr>
<tr>
<td>15.0 (20 Ph)</td>
<td>91.3</td>
<td>91.8</td>
</tr>
<tr>
<td>18.5 (25 Ph)</td>
<td>91.8</td>
<td>92.2</td>
</tr>
<tr>
<td>22.0 (30 Ph)</td>
<td>92.2</td>
<td>92.6</td>
</tr>
<tr>
<td>30 (40 Ph)</td>
<td>92.9</td>
<td>93.2</td>
</tr>
<tr>
<td>37 (50 Ph)</td>
<td>93.3</td>
<td>93.6</td>
</tr>
<tr>
<td>45 (60 Ph)</td>
<td>93.7</td>
<td>93.9</td>
</tr>
<tr>
<td>55.0 (75 Ph)</td>
<td>94</td>
<td>94.2</td>
</tr>
<tr>
<td>75 (100 Ph)</td>
<td>94.6</td>
<td>94.7</td>
</tr>
</tbody>
</table>

(b) Motor nameplate shall list the nominal full-load motor efficiencies and the full-load power factor.

c) Certificates shall be obtained and kept on record indicating the motor efficiency. Whenever a motor is rewound, appropriate measures shall be taken so that the core characteristics of the motor is not lost due to thermal and mechanical stress during removal of damaged parts. After rewinding, a new efficiency test shall be performed and a similar record shall be maintained.

1.12.2 **MOTOR CONTROL CENTER (MCC)**

The MCC shall be suitable for indoor installation with provision for expansion (20% spare feeders). The motor control center shall be completely dust & vermin proof conforming to IP 44 standard. The MCC shall be fabricated, as per detailed specification. The bus bar rating of each MCC shall be capable of carrying 1.25 times of full load current of all the feeders of respective MCC. For calculating full load current, the connected load of MCC shall be considered.

The Incomer of each MCC shall have 4 poles EDO (motorized & draw out type), ACB of suitable rating with built in Microprocessor based protective device with all accessories. Also the Incomer shall have 3-phase 4-wire energy meter with necessary Indications, Voltmeter, and Ammeter with selector switches and CTs and phase Indication lamps.
Each MCC shall be provided with two incomers (one for each section) and a bus coupler. The entire load connected to the MCC shall be divided in such a way that 50% of total connected load (operating & standby) is on each incomer. In case of any breakdown in any incomer of the MCC, it should be possible to transfer the entire load on other incomer of the MCC. Thus the rating of each incomer and bus coupler should be rated for taking care of entire connected load to that MCC.

For Incomer of the panel, the rating of the switchgear shall be 1.25 times of rated full load current of connected load of the panel. The incoming and outgoing feeders from the MCCs in the electrical control room shall have all the feeders entry & exit from the bottom. However, cables from feeders going to plant equipment shall be laid in cable trays along with the wall and ceiling in the rest of the plant building.

The MCCs would receive, control & distribute electrical power at 440 V, 50 HZ. AC to all electrical loads to be connected ink reception, process, CIP & Product section including air compressors.

Additional 20 % spare feeders for future load of different ratings shall be provided in each MCC. One no of 100 A TPN SDF unit for welding point shall be provided. The welding receptacle shall be provided at appropriate locations in each section (e.g., Process, APS, Milk Packaging etc) of the plat.

In addition to the required number of outgoing feeders of individual MCC, one number feeder of suitable rating / type for shunt capacitors (All PP type) for motors of 50 HP or more rating shall be provided on panel or near motor terminal. In such cases the switchgear size shall be designed considering the shunt capacitors. Auto ON / OFF of capacitors arrangement based on ON / OFF of the motors shall be provided.

All outgoing feeders shall have isolation facilities switch dis-connecter fuse units, contactors, thermal / magnetic overload protection & necessary operating controls.

The bidder shall provide power cables of suitable rating and no. of runs from PCC to each MCC in the electrical room.

Minimum Qty- 4 Nos (Tanker Reception & CIP system, Milk Processing & Reconstitution, Butter & Ghee Making, Milk Packaging)

1.13 AUTOMATION

1.0 DESIGN OBJECTIVE

The entire Control & Automation system (C&A) shall be designed, supplied and commissioned to enable the operator to operate the dairy plant in a safe, efficient and reliable manner, without exceeding plant operational limits and ensuring the overall performance guarantee conditions.

The C&A System shall be designed utilizing state-of-the-art technology to ensure:
High degree of System availability and and reliability. Extensive Diagnostic capability to pinpoint failure areas.

Low downtime and high meantime between failures System flexibility and modular expansion capability.

Safety of the main equipment, system and operating personnel.

Open connectivity using OPC (Client Server architecture) Hot swappable system modules.

Communication of all field instruments with DCs shall be through Field Bus only. Instruments shall be of Smart type.

2.0 GENERAL DESCRIPTION

The integrated control system proposed for the new Dairy plant shall be fully automatic, which will have the better features of both PLC and DCS system.

All the operations from weighment, milk reception, milk processing and storage, cream processing and cream storage, cream transfer to butter section, rinse milk recovery system and CIP operations shall be automated and be controlled from control system.

The automatic control shall include starting operation, operation during process, shut down and CIP.

All the data referring to raw materials, products and utilities shall be made available for transfer to the main MIS server.

The automation system should be capable of operating continuously in the ambient temperature experienced in the plant. The system should be able to record and report all the production parameters.

The automation system should be also capable of interfacing with Powder plant, milk packaging only the Utility sections like Refrigeration, Boiler etc. The Bidder shall consider necessary hardware for interfacing the different sections mentioned above with the main automated systems.

All the independent automation systems (other than main or central DCS automation system) shall have communication port suitable for the main automation system all these systems shall be seamlessly connected to the main system. There shall be no hardware handshake signals with the main DCS systems. All the systems must communicate digitally to have better information exchange.

The central automation system shall be located in the control room of Dairy and shall directly control milk reception and Dairy plant operations. This shall include the overall process management and monitoring (PMMS) for data logging and management of the entire dairy plant.
HMI (Human Machine Interface) panel shall be provided for monitoring and controlling of milk reception activity and shall be connected to the main control network for interfacing with the main system.

The system shall also receive data for inventory control from all other PC’s connected on same Network, these PC’s are located at the product dispatch, stores, weigh bridge, laboratory and services. All the operators will manually enter the data at all these Pc’s and MIS reports are to be generated. Energy meters of all MCCs and PCC should be able to communicate with central automation system for data transfer.

Service section except air compressor (for instrument air generation) shall be controlled at their local control panels but log events and important data shall be transmitted from each section to the central system through keyboard. However, the system shall include the measurement and monitoring of services and utilities operating parameters and consumption data for all services in the Dairy complex.

All required instruments for generation of MIS reports shall also be considered.

Reception and storage of chemicals and butter & Ghee sections shall be controlled locally.

The system shall be able to offer redundancy at all levels to provide a high level of fault tolerance. Operator stations, servers, the plant bus, controllers, field networks and I/O modules shall be made redundant as per requirement.

The automation system shall be expandable for eventual inclusion of all data and controls required for the dairy expansion up to 10.0 LLPD.

Automation of various sections shall be designed as given below.

2.0  **RAW MILK RECEPTION**

2.1 Milk mass measurement shall be determined by weighbridge system and also cross checked by electronic mass flow meters system installed in each reception lines. There are two electronic weighing platforms wherein the data is generated by digitizers which are connected to one common computer. The system shall be flexible such that the gross weight (in) and tare weight (out) can be taken from any of the weigh scale.

2.2 Milk tankers shall be driven after weighment at weighbridge and collection of milk samples at the reception lab directly to any free reception bay. There shall be touch screen type PV stations in each for tanker reception bay. The process is operated in following steps.

2.2.1 The weighbridge operator will enter tanker registration no., which will be treated as Tanker ID and related data as per the DC received, in weighbridge computer. The weight data will be received on PC through communication with Weighbridge supplier’s digitizers, from any of the weigh scales. However, provision shall be kept for entering the weight data in case of failure of communication with digitizers.
2.2.2 The laboratory person shall take samples from the tanker for analysis. All the tankers, for which data is entered and saved by the weighbridge operator, shall be displayed on laboratory PC after pressing ‘Get data from server’. When any of these tankers is selected, all relevant data like incoming Fat, SNF, weight etc. appears on screen. The milk-scan machine that measures Fat, SNF shall be connected to this laboratory PC. The results are displayed automatically on PC after each sample is tested. Appropriate data can be selected from screen or it can be entered under respective. Tanker ID. The acceptance or rejection of the milk is done immediately as the analysis is over. The tanker can be received from any of the two reception bays after the quality control department confirms to the system that the milk is of acceptable quality. Override of the reject system shall be done by the manager’s pass ward.

2.2.3 The tanker bay operator connects the house to the tanker and Enables the line on which the unloading is to be done by switching on the lockable button installed on respective PV station. He enters Taker ID (last four digits of registration no.) in the PV station. If the lab analysis is over and the data is entered in the PC, tanker accepted is visible on PV station else it shows rejected and tanker ID resets. If the milk accepted, the tanker bay operator sends request for tanker unloading to control room. This request pops-up the tanker reception menu on OS.

2.2.4 After checking the various interlocks and acquiring the data from reception and lab, reception process shall be started and continued as per the requirement of control philosophy.

2.2.5 After the unloading is over, the tanker shall go to record tare weight data on weighbridge. This completes the tanker reception process and transaction in MIS system. Net weight is logged in the MIS through weighbridge data, additionally flow meters give continuous data on SCADA screen.

2.2.6 If the tanker reception point is not reused within a preset time, the line shall be flushed automatically or blow milk through to the chillers to prevent milk spoilage in the reception lines. Potable water purge points shall be provided in the milk transfer line from each unloading station to minimize the milk solids losses. These purges shall also be operated prior to the commencement of CIP of milk lines on a preset time delay basis from the automation system.

2.2.7 Tanker CIP operations. After unloading is over, the tanker shall be moved to the CIP position, and the dummy man way cover and spray head shall be lowered by electric hoist and placed over tanker’s man way. Full tanker CIP shall be carried out, and milk solids shall be recovered to milk recovery system. Bidders are required to state their Proposed CIP programme for road milk tankers.

2.2.8 All vessels in a group shall be pre-selectable for filling and emptying operations. When the first selected vessel to full, the second selected vessel commences filling. When the first selected vessel is emptied, the second selected vessel commences emptying. It
shall be possible to transfer milk from one silo to any other silo within a group, and to empty any silo to a road milk tanker in case of emergency.

2.2.9 There should be possibility of loading the milk in the one silo from two reception lines.

3.0 **PROCESSING**

3.1 There shall be two parallel lines on which milk processing (i.e. milk pasteurization and cream separation) can be done at 20 KLPH flow rate.

3.2 The system shall prompt the operator to commence pasteurizing after the necessary conditions are checked and requirements are met with. Pasteurizing can be commenced at any time, but the prompt shall be logged as an event. The automation system shall start all the processing equipment.

3.3 Pasteurization parameters shall be fully controllable from the automation system. Temperatures shall be logged for each stage of process and service sections, and trend charts retained by the system.

3.4 The sterilization of pasteurizer shall be done before starting the milk processing. The sterilization process has to be planned by the CCR operator in such a way that it starts before milk processing and continues to run till milk processing is started. This is to ensure proper sterilization of pasteurizers and also to reduce the diversion time during cold start conditions.

3.5 The milk pasteurizers shall be fitted with differential temperature sensors between hot water and milk sections to detect plate fouling. Pasteurizers shall close down and -short clean- at pre- selected intervals (about 4 to 6 hours) or when the differential temperature sensor indicates the need to clean. Full CIP cleaning shall be selected by the operator only at the end of the days run.

3.6 If high level is reached in the selected processed milk silo, the loading automatically switches over to next preferred processed milk silo, if selected before starting the process. Similarly, if high level is reached in the selected cream tank, cream loading will switchover to second tank. However, if any silo or tank is selected in second preference, the same is not available in any other process and show in use status. If second preference is not given for silo or cream tan, sequence shall be terminated at the high level of selected silo or cream tank with flashing of relevant alarm and resetting the selections.

3.7 Each line shall have a cream separator, which has to be started approximately 15 minutes before starting the milk processing sequence.

3.8 Each separator PLC shall give data to main DCS to show the status of separator. Similarly, DCS gives data for controlling the separator. This communication may be done through Profit Bus communication network and not in form of digital and analogue Input / Outputs or otherwise, depending upon the software of cream Separator supplier.
3.9 Self-cleaning separators shall be provided with timer based cleaning cycles. Separator manual cleaning shall be taken up when solid losses through de-sledging operation becomes excessive.

3.10 The system shall maintain a continuous log of tank and silo contents, all operating parameters, and the status (emptying/filling etc) of the vessel and also the type of product, and temperature. The system shall be capable of an instantaneous inventory check of all vessels in the plant. Agitator operation shall be automatically selected by the system.

3.11 At completion of emptying a vessel the system shall flash display indicating the readiness for cleaning in OS and prompt the operator to commence CIP cleaning. The time of this working shall be logged. No vessel shall be reused without CIP cleaning unless otherwise cleared by the managers override.

3.12 The system shall be provided with online standardizes which can be controlled to any desired fat content in the pasteurized, standardized or skim milk

3.13 Pasteurization, storage & transfer operation of cream shall be carried out from main control room. The system shall prompt the operator to commence pasteurizing after the necessary conditions are checked and requirements are met with.

3.14 The control system provided in the processing section shall control all milk transfer to the Milk Pouch Packaging section, Powder plant, UHT/APS plant and CIP of the milk transfer line. At completion of milk transfer, the system shall receive a signal to stop milk transfer, and the processing system shall stop milk flow and purge the line with water.

3.15 The Powder plant system shall indicate when CIP cleaning of the milk transfer line may be commenced, and accordingly the processing system will control CIP cleaning of the milk transfer.

3.16 A separate menu shall be created in the main control station programme to control the separator and to display and monitor various alarms and status.

4.0 SERVICES

4.1.1 None of the services shall be controlled from this automation system. Each services section shall have local control loops and local control panels. The services shall, however, send data to the processing system for data logging, monitoring, and analysis. This shall include pressures, temperatures, flow rate, voltage, current, kW etc., from the services plant, and from each section of the process plant.

4.1.2 There would be separate control rooms in the refrigeration plant & Boiler plant. The refrigeration plant & Boiler plant automation systems shall also send production data for monitoring, analysis and report generation.

4.1.3 Controlling and monitoring of air compressor meant for instrumentation air shall be carried out from the OS.
5.0 **SCOPE OF SUPPLY**

5.1 The scope of work shall cover design, project engineering, control philosophy, software development, manufacture, assembly, shop testing, packing, transportation to site, unloading at site, storage, erection, site testing & pre-commissioning, commissioning, initial & successful operation and performance testing of the entire control & instrumentation package of the dairy plant on turn-key basis.

5.1.1 The bidder shall develop application software including data base graphics, mimics, logs and report format generation etc.

5.1.2 The bidder shall develop suitable management Information software.

5.1.3 The bidder shall provide necessary training for Operators, systems engineers and maintenance engineers.

5.1.4 The bidder shall provide necessary manuals and documents, including submission of I/O List, loop diagram, logic diagram, specification / data sheets and other necessary drawings in printed and electronic medium for approval of Purchaser in multiple sets.

5.1.5 The Bidder shall supply necessary hardware and software for the automation as per requirement and control philosophy proposed. Bidder shall submit the detailed automation system configuration without deviating the basic configuration and the functional requirement.

5.2 **AUTOMATION SYSTEM**

Microprocessor based Distributed Control System (DCS) shall be used for centralized operation of the plant.

The DCS system offered shall have open architecture and shall use common engineering tool for operator station, automation system, communication system, engineering system and I/O. Sub systems are integrated together with standard & proven networks with fully optimized & standard open protocols. All the components shall use single database. Scalability: The offered system should be suitable for future expansion. Comprehensive self-diagnostic features shall be provided to facilitate easy fault location and detection of failure without individually checking each module. On-line testing facility of control system while the unit is in operation, shall be provided with suitable indication for easy identification of faulty module.

The process / final control element interface section shall comprise of various signal interface cards suitable for digital communication with intelligent / smart field devices, distributed I/O stations, local control panel, intelligent actuator/sensor, frequency drives and standard Motor Control System.

Sensors will be checked for open and short circuit conditions. Failure of sensor/transmitter shall not lead to malfunction of the corresponding control system.
5.3 **SEEVER**

Quantity: 1 No.

Server will store all the relevant information from the DCS and all networked computers connected and shall generate the MIS reports. Necessary RDBMS software either ORACLE or SQL Server ad D2K or Visual Basis as front end shall be considered for data storage and MIS reports generation.

5.4 **HUMAN MACHINE INTERFACE (HMI) OPERATOR STATION PC**

Quantity: 2 Nos.

Each monitoring / control terminal shall be fully capable of addressing any plant data thus, will function as a single window for operation and monitoring. Each terminal shall be independent with its support hardware including adequate local memory for resident database to reduce data traffic through the highways. The resident data will be continuously updated at all terminals. 22” wide screen colour TFT LCD panels of resolution 1680 X 1050 @ 60 Hz shall be connected to HMT PCs. The H:MI software shall support Multi Screen Technology and PC’s shall consist of Key Board, mouse, and graphic and report Printers and necessary hardware & software.

All the Personnel Computers other than OS PCs shall have 19” color TFT – LCD display panels of resolution 1280 X 1024 @ 60 Hz. All the PCs shall have latest configuration (with Core 2 Duo 2.0 GHz or higher Processor) at the time of ordering.

5.5 **WIGHBRIDGE PC**

Quantity: 1 No.

Weighbridge shall be connected to this PC via. RS232C port and will read the weights from the load cell transmitter and will freeze the value into the corresponding fields. Necessary driver software will be developed for communication between weighbridge transmitter and the computer. System shall generate the weighment slip in a specified format, which forms the basis of payments. If there is failure in weighbridge communication the operator can manually enter data declared value or weighbridge local display. Only after tanker entry is completed the data will be transferred to file server, before going to unloading bay weighbridge operator will give unloading slip for tanker driver with a unique number generated by system. The driver after unloading must get final printout indicating the milk quantity unloaded along with the process parameters.

5.6 **RECEPTION LABORATORY PC**

Quantity: 1 No.

Reception Lab PC will be located in Reception Laboratory and will be connected on same network. Two instruments (Milko-Scan and Acidometer) are connected to this PC.
via. RS232C port for analysis of Milk. Necessary driver software have to be developed for connectivity of these instruments via. RS232C port. Manual data entry of various test results is also possible in case communication fails between computer and instruments.

Once operator inputs the value and gives analysis command for the particular product code, values read from instruments are compared with the limit setting. This record will then be saved along with the warning if any. The remarks will appear in the report. Only after test results are completed, the data will OK the Sample. OK will appear against the remark column; else warning will be given. Remarks given by manager shall be transferred to file server.

5.7 **BUTTER & GHEE DISPATCH PC**

Quantity: 1 No.

Dispatch PC will be located in dispatch doc and will be connected on same network. This will be manual data entry terminal. All the dispatch report and schedules will be generated here.

5.8 **STORES PC**

Quantity: 1 No.

Stores PC will be manual data entry terminal located in stores room and will be on same Network. Terminal will be used for stores items inventory purpose and report generation.

5.9 **MAIN LABORATORY PC**

Quantity: 1 No.

Main Lab PC will be located in Main Lab and will be connected on same network. Two instruments (Milko Scan and Acidometer) are connected to this PC via. RS232C port for analysis of Milk. Necessary driver software is to be developed for connectivity of these instruments via. RS232C port. Manual data entry of various test results is also possible in case communication fails between computer and instruments. This PC shall be used to generate analytical information of the Milk and Powder in all storage tank in the Plant. All these data shall be transferred to file server for report generation.

5.10 **LIQUID MILK PACKAGING DESPATCH PC**

Quantity: 1 No.

Liquid Milk packaging & dispatch PC will be located in milk dispatch office and will be connected on same network. This will be manual data entry terminal. All the dispatch report and schedules will be generated here.

5.11 **UTILITIES PC**

Quantity: 1 No.
This PC shall be located in central control room and shall be used to view information related to HT / Power, Refrigeration, Boiler etc by picking up them from respective automation system.

5.12 **ADMINISTRATION BLOCK PC**

Quantity: 2 No.

These PCs shall be located in Administration block (one at GM Room / Conference room and one at MIS server room). This shall be used to view information related to process. Administration PC shall be able to see all the screens of process, plant information data like ON/Off status of different sections, critical parameters of process of different sections without any rights to control. Graphics depicting process information along with data (read only) and MIS data shall be made available on Administration PC.

5.13 **PRINTERS**

- Laser Jet B/W suitable for A4 - 1 No.
- LaserJet Colour suitable for a4- I No.
- Dot Matrix 132 column- 5 Nos. (lab, weigh bridge, stores, dispatch, milk packaging)

5.14 **NETWORK HARWARE**

- Fiber Optic Cable - 1 Lot
- UTP/ STP Cables- 1 Lot
- Switches – As required.

5.15 **SYSTEM SOFTWARE**

The system software will preferably be based on open architecture and shall support minimum 32 bit processing platform. For network TCP/IP or ISO- OSI model will be in use. It shall be latest object oriented software, which result in fully scales of software shall be used. The system shall support Client Server Architecture with Fiber optics as a backbone.

5.16 **MIS SOFTWARE**

This shall be based on REBMS software. Following minimum reports are envisaged from the system. Necessary forms to be developed on the network PC’s for entering the data. All the reports shall be developed after the discussion with the customer, however following minimum reports are to be considered for development.

- Weighbridge reports.
- Milk analysis report
- Milk Reception report.
- Milk Transfer report.
- Utility consumption report.
- CIP log report.
• Milk production report
• Milk Packaging & Dispatch report
• Steam generation & consumption
• Refrigeration generation & consumption report.
• Solid Loss report to ETP.
• Power consumption (section wise)
• Water consumption
• CIP chemicals consumption.
• Maintenance Report.
• Lab reports.
• Inventory report of the plant.
• Packing material inventory, wastage and consumption report.
• Stores Materials Inventory Report.

Requirement of maintenance of pneumatic valves, cleaning of PHE, separator & other equipment shall be indicated with alarm in the report with time and date. The detailed maintenance report shall be developed based on the customer requirement during the detail engineering.

5.17 **CONTROL DESK / CABINET**

The design of all console / panels / cabinets and layout shall be based on human engineering considerations, fully keeping in view the convenience of operation and maintenance personnel. Operator’s Consoles shall be free-standing type. All keyboards and other cursor control devices will be mounted on the horizontal part of the console. The monitors will be mounted on the raised part of the console.

All system modules, power supply components as required for completeness of the systems shall be housed in System cabinets. The cabinets shall be totally enclosed free-standing type equipped with full height front and rear doors. Cabinets shall be designed for front access to system modules and rear access to wiring. The cabinets shall be, in general, designed for bottom entry of cables and shall have non-welded construction only.

Constructional Features: Modular steel internal Structure. Wood /metal work surface Powder coated MS structure Under Counter Keyboard trays Slide out CPU shelves Footrest.

Telephone mounting shelves
Binder storage
Under counter pencil trays
Printer table
Revolving Chairs (with back tilting arrangement) one for Each PC

6.0 **CONTROL PHILOSOPHY**

1.0 **Reception:**
1.1 The system shall check following interlocks at various stages before the control room operator can start reception sequence by pressing start button from menu. The silo selection button shall be available only if all the conditions given below are satisfied for a particular silo. For easy understanding, the silo status (i.e. manhole open/high level or silo in use) shall be displayed in the menu instead of the button.

1) Signal is available from Manhole proximity
2) High level is not present
3) Tanker reception from any reception bay to the silo is not ON
4) End flush from tanker bay to silo is not ON.
5) CIP of selected raw milk silo is not ON
6) Dispatch to tanker from selected raw milk silo is not ON.
7) Dispatch to pasteurizer from selected raw milk silo is not ON
8) Silo to Silo transfer from/ to selected raw milk silo is not ON
9) Rinse milk, butter milk transfer to the silo is not ON
10) Recover line to the silo is not ON
11) End flush from cream storage tank to the silo is not ON

After silo selection is done, Go Ahead button shall be available only if following conditions are satisfied.

1) System Enable switch is ON.
2) Request for tanker unloading is available from respective reception bay.
3) Lab acceptance is available to unload the tanker or the MIS bypass is available from respective menu (MIS bypass can be done managerial pass work in case of failure of MIS or PC)
4) CIP of tanker reception line is not ON.
5) The reception sequence is in Auto mode.
6) Signal is not available from proximity of CIP /End flush line. (To ensure that the hose is not connected to CIP /End flush line in tanker reception bay)

1.2 The control room operator shall enter following in to Tanker reception Menu.

- Silo number in which the milk is to be received
- Initial Flushing required or not and Initial Flush time if flushing required
- Go ahead signal.
- Start the reception (This is optional as the start /stop is done by the reception bay operator)

1.3 The system gives following indication on respective PV station as well as PB station.

- Ready to start
- TR bay operator can do the sequence start /stop, from respective PB station or the control room operator can do the same from menu. The TR bay operator checks for hose connection etc. and starts the unloading process by pressing Start button on PB station.
1.4 First of all the system opens chilled water valve in reception chiller and checks for chilled water flow OK signal i.e. Flow switch signal and chilled water valve open feedback, both should be available. At the same time it opens milk inlet valve to the start stop unit.

1.5 If the flow OK signal is available sequence immediately goes to the next step. But if the signal is not available in 20 sec., sequence gets terminated and following alarm message is flashed on OS and PVS. @ CHILLED WATER NOT AVAILABLE IN RECEPTION CHILLER

1.6 If flow switch signal is available, open-air release valve, check for signal from level switch in the de-aeration tank. The air release valve remains open for 5 seconds after the signal is available from level switch. This is to avoid any air lock in reception pump during start-up. If the signal is not available from level switch after 30 sec., no further steps are executed, sequence gets terminated and following alarm is displayed on OS and PVS @ TR BAY: AIR LOCK / TANKER VALVE NOT OPEN /HOSE NOT CONNECTED.

1.7 System Starts unloading pump, and Checks for following feedbacks Pump On feedback and Valve close feedback

If OFF feedback from the valve or start feedback from the motor is not available in present time, system display AIR PELEASE VALVE OPEN or fail to start for the motor on OS & PVS and terminate the sequence.

Following description is with selection of tanker reception bay 1 and silo 1. Only valve number and motor number changers with different bay selection and silo selection, process remains same. As per design, any raw milk silo can be loaded from any bay.

1.8 If initial flush is selected and Initial Flush time is not zero, Open flushing valve in raw milk silo valve cluster, Wait till Initial flush time set by the operator is elapsed Close flush valve.

1.9 If Initial Flush time is elapsed OR initial flush is not selected OR Initial Flush time is zero, system checks if close feedback is available from flushing valve, Close F/b is available then, Ready to start indication is OFF Running indication on TR panel is ON, Open silo-loading valves.

1.10 If OFF feedback is not available from flushing valve in present time, system displays on OS & PVS @ TR BAY: FLUSHING VALVE OPEN

Terminate the sequence (If this valve is not closed properly, milk may get drained.)

-STEADY STATE –

1.11 System checks for following terminating conditions, at various stages, after start button is pressed from menu.
1) More than one silos are selected from menu or none of the silos are selected.
2) Start-stop unit Level low during initial start-up for 30 seconds (indicates air lock in system, tanker outlet valve not opened or hose not connected to tanker)
3) Start-stop unit Level low after start-up, steady state condition (switch signal goes OFF), which means the milk is over either in the tanker or in a compartment
4) Stop signal from CCR or from TR bay
5) Chilled water OK signal is not available continuously for 20 seconds
6) Hose not connected to tanker (flushing/CIP proximity signal is available) during start-up phase.
7) High level in selected silo
8) Alarm for any of the valves or pumps during or after start-up System terminates the sequence immediately, gives respective alarm on OS and the sequence goes in to complete /finished state.

1.12 Once the sequence reaches Complete /finished status, following indications are flashed on PV and PB stations.
Running indication is OFF
Finished indication is ON
The finished indication remains ON for 30 seconds, after which, the sequence can be restarted as described above. After the unloading is over, the tanker goes to record Tare weight data on weighbridge. This completed the tanker reception process and one transaction in MIS system. Net weight is logged in the MIS through weighbridge data: additionally, flow meters give continuous data in RS Vies.

Note: The line Enable lockable selector switch is given to prevent any unauthorized access to the PV station. If the same is kept in OFF condition, the reception process will not reach ready to start status.

The Stop push-button placed on PB stations can be used as an emergency stop button to terminate the process in case of emergency. The process can be restarted again as the steps described above.

2.0 Processing:

2.1 Following controls shall be possible to be made from the OS

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Separator On</td>
</tr>
<tr>
<td>2) Separator OFF</td>
</tr>
<tr>
<td>3) Product On</td>
</tr>
<tr>
<td>4) Product OFF</td>
</tr>
<tr>
<td>5) CIP On</td>
</tr>
<tr>
<td>6) Standardization ON/OFF</td>
</tr>
<tr>
<td>7) Circulation / Failure</td>
</tr>
<tr>
<td>8) Clarification</td>
</tr>
<tr>
<td>9) Perform Overflow / Total dislodging</td>
</tr>
</tbody>
</table>
10) Perform partial dislodging  
11) Reset alarms  
12) Feedback product pump  
13) Milk Set point

Messages from Separator PLC

Function
1) Separator On/OFF  
2) Separator Standstill  
3) Product Start-up  
4) Ready for Operation  
5) Separator Emergency Stop  
6) Separator Slow down  
7) Partial dislodging  
8) Total Dislodging  
9) Separator product  
10) Separator CIP  
11) Separator Overflow  
12) Milk Standardization ON/OFF  
13) Product Pump  
14) Failure separator start-up  
15) Failure speed drop  
16) Failure Deseeding  
17) Failure operating Water  
18) Failure control Air  
19) Failure speed max  
20) Failure Analogue Input speed  
21) Failure Analogue Input Current  
22) Bowl Speed  
23) Motor Current  
24) Milk-Fat actual value  
25) Actual valve feed inlet

2.2 The system shall check following interlocks at various stages before the control room operator can start milk-processing sequence by pressing start button from menu.

2.3 The silo/tank selection buttons shall be available only if all the conditions given below are satisfied for a particular silo/tank. For easy understanding, the silo status (i.e. manhole open/high level or silo in use) is displayed in the menu in place of the button.

Raw milk silo button visibility conditions

1) Tanker reception from any reception bay to the silo is not ON  
2) End flush from tanker bay to silo is not ON  
3) CIP of raw milk silo is not ON  
4) Dispatch to tanker from raw milk silo is not On  
5) Dispatch to pasteurizer from raw milk silo is not ON  
6) Silo to Silo transfer from/ to raw milk silo is not ON
7) Butter Milk transfer to the silo is not ON
8) Rinse milk transfer to the silo is not ON
9) Cream transfer to the silo is not ON
10) End flush from cream storage tank to the silo is not ON
11) Low level is not there is raw milk silo
12) Silo is not selected In other milk process

**Processed milk silo button visibility conditions**

13) High level is not there in processed milk silo
14) Manhole should be cosed of processed milk silo
15) CIP of processed milk silo is not ON
16) Dispatch to tanker /powder plant from processed milk silo is not ON
17) Milk process to processed milk silo is not ON
18) Silo to Silo transfer from/ to processed milk silo is not ON

**Cream tank button visibility conditions**

19) High level is not there in selected cream tank
20) CIP is not On in selected cream tank

**Start button visibility conditions**

2.4 The CCR operator selects following parameters from milk Processing menu.

2.5 Raw milk silo selection 1, 2, or3)
   Processed milk silo selection (4, 5, or 6)
   Processed milk silo second preference (4, 5, or 6)
   Process milk tank for packaging (1 or 2)
   Process milk tank for packaging second preference (1 or 2)
   Cream tank selection (1,2 or 3)
   Cream tank second preference (1, 2 or 3)
   Initial Flush in milk line required or not
   Milk Initial flush time if Initial flush selected
   Initial Flush in cream line required or not
   Cream Initial flush time if Initial flush selected
   Pasteurization temperature set point Separator mil
   Temperature set point Milk diversion set point
   Chilled milk outlet temp. Limit
   Speed selection of balance tank pump
   Speed selection of booster pump
   Start the process

**Note:**

1. Selection of same cream tank is possible in all the milk process lines.
2. The sequence will terminate if chilled milk outlet temperature goes above the set point.
3. Balance tank pump seed is automatically controlled at the set point based on the flow signal received from milk flow meter.
4. Booster pump speed change is not required normal.

2.5 Following example is with selection of raw milk silo-1 and processed milk silo-4. The process remains same for the selection of any raw milk silo and any processed milk silo, only loading unloading valve number changes.

When start button is pressed, system starts following
- Start PID loop for milk heater
- Start PID loop for separator milk heater
- Start hot water pump
- If the feedback of hot water pump is available
- Open chilled water valve
- Check for the signal from flow switch

If the signal is available, sequence goes to next step immediately. If not available in 20 Sec., sequence gets terminated and following alarm is flashed on OS.

@MILK PROCESSING: CHILLED WATER NOT AVAILABLE IN PASTEURIZER-1 (or 2 as selected)

1. Open raw milk silo unloading valves.

The system always keeps track of milk balance tank level so that the milk does not overflow from the balance tank and at the same time adequate milk supply to the process is maintained. Following steps are executed during start-up as well as after steady state.

If low level signal is available from level controller, Open valve, Start pump.

If high-level signal is available from level controller, Close Valve, Stop pump,

If feedback is available from valve Start pasteurizer pumps, at the speed selected in the men. Open cream line valve.

2. If feedbacks are available from pumps and valve steps a and b are simultaneously started.

a. If Milk Initial Flush is selected and Initial Flush time is not zero

Open valve

After the set time is elapsed, close valve, wherein pasteurizer diversion time is excluded.
If OFF feedback is not available in preset time, system displays on OS @ MILK PROCESSING; MILK FLUSHING VALVE OPEN

Terminate the sequence.

b. If Cream Initial Flush is selected and Initial Flush time is not zero.

Open valve.

If valve fall to open, alarm for respective valve on OS and terminate the sequence

After the set time is elapsed, close valve pasteurizer diversion time is excluded.

If OFF feedback is not available in preset time, system displays on OS

@MILK PROCESSING: CREAM FLUSHING VALVE OPEN

Terminate the sequence.

3. Step a and b are executed parallel. If cream flushing time is less, step b is executed before.

a. If Milk initial flushing is not selected or Initial flush time is zero or Initial flush time is elapsed. Open silo loading valves,

b. If Cream initial flushing is not selected or Initial flush time is zero or Initial flush time is elapsed.

Open cream tank loading valves,

System checks for the feedbacks of following valves, if available, reach to steady state.

If Homogenization is required, it has to be started from a separate menu. Clicking the homogenizer graphic pops-up start/stop menu. Homogenizer can be started and stopped any time during process, as there is a bypass route that always remains open. When started, homogenizer takes the milk from the line, as it is a positive pump.

-STEADY STATE-

4. System checks for following signals as terminating conditions,

1) Low level in selected raw milk silo and time delay of 240 Sec. is elapsed (as the low level probe is be installed slightly higher than the bottom of the silo, some amount of milk will remain there even if the instrument doesn't sense it. If unloading is On, certain time delay has to be given by the system before stopping the sequence to remove this milk.)

2) High level in second preferred processed milk silo

3) Chilled milk outlet temperature above set valve

4) High level in second preferred cream tank
5) Chilled water is not available for 20 Sec.
6) Alarm from any of the valve or pump started during sequence.
7) Product pump signal is not available from separator
8) Stop signal from milk processing menu.

Note: If second preference is not given for silo or cream tank, sequence will be terminated at the high level of selected silo or cream tank.

In case any of above signal is available, relevant alarm is flashed and the sequence is terminated, all the selections are reset.

There are three PID loops in this sequence. Brief description about the functioning of these loops is given below.

1.6.1 Main milk beater loop (in cascade control): - Milk is not heated directly by steam but, water is heated by steam in the PHE (pasteurizer) and subsequently it is used to heat-up the milk to the pasteurization temperature. The hot milk temperature value (process variable) is checked after holding, the hot water temperature is also measured after heating for control purpose. The final control element is PID valve in the steam line. The temperature set point is given in milk processing menu. Actual milk temperature is compared with milk heating set point given in process menu. The output generated by this first loop is used as the set point for second loop. The second loop process value is hot water temperature after getting heated by steam. The difference is compared and the steam PID is operated accordingly. Before starting the loop, it has to be ensured manually that hot water balance tank is completely filled with water. Any lapse in ensuring the same may result in to improper pasteurization or leakage in steam heating side of pasteurizer due to continuous steam injection.

When the milk processing sequence and PID loops are put in to manual mode, the PID valve can be operated directly by giving output from 0-100%

1.7 Separator milk heater loop: The inlet milk temperature to the separator should be between 45-55 deg. C in order to get best standardization. As per the PHE design, the temperature of milk going to separator remains between 50-55deg C, therefore this loop is not activated normally. The final control element of this loop is a three- way valve, which is placed in the hot water line after main milk heater. This three-way valve remains fully open in the main heater side. But when the milk temperature reduces from set valve (54deg C app.), this valve opens and allows hot water flow in separator milk heater side until eventually the set point is reached.

1.8 Balance tank pump speed control: The process value is taken from separator flow meter installed after balance tank. The speed set point is given from milk processing menu. The final control element is balance tank pump. Based on comparison of set point and actual flow, the frequency of balance tank is changed which intern changes. The speed of pump and maintains flow. During milk processing, sterilization and recovery the speed set point is taken from menu whereas during CIP the pump is run at maximum speed.
1.9 Booster pump speed control: From the milk processing menu, the speed of pump can be changed from 0 to 100% by changing the frequency from 0 to 50Hz. Normally the speed is kept 100% in all process and CIP.

One more important aspect of milk processing sequence is that it diverts the milk back for reheating if the heated milk temperature goes below milk diversion set point entered in process menu. The diversion valve opens and diverts the milk to balance tank the valve closes and allows the milk into forward path only when actual temperature reaches diversion set point value plus the one °C.

Note: The philosophy given above is for general guidance. The requirement for cream pasteurizer lines are also to be considered similar to that of milk processing lines with necessary checks and controls.

7.0 TECHNICAL REQUIREMENTS

1.0 General

All equipment, system and accessories furnished shall be from latest proven product range of established / reputed manufacturers and shall conform to applicable national and international standards.

The design of various control systems and related equipment shall adhere to the principle of failsafe operation implying that loss of signal, loss of power supply or failure of any component will not lead to hazardous conditions, while at the same time, prevent occurrence of false and unrelated trips.

All the instruments should be suitable for digital communication with proven Field bus technology.

1.1 Climatic Condition

The instruments / control system shall be suitable for environmental conditions that are normally encountered in utilities in India. All equipment / system / sub-system etc. shall be fully tropicalized.

Ambient Temp. 55 deg C
Relative humidity 95% at < 55 deg C

1.2 System Power Supply Condition

For applications requiring AC power, 240 V AC, 50 Hz uninterrupted power supply shall be made available by supplier from UPS complete with voltage and frequency regulators.

The 10 KVA True Online UPS should be considered for DCS power supply. On total failure of the incoming A.C. supply to the plant, sufficient battery back-up has been
envisaged to allow all control and instrumentation equipment to operate for at least 30 minutes to allow safe shutdown of the plant.

24 V DC power supply shall be used wherever applicable for Control System and will be derived from UPS. Any other voltage level required for the system shall be the responsibility of the Bidder along with required hardware.

Control & Instrument (C&I) equipment furnished shall incorporate necessary techniques for protection against electrostatic discharge and radio frequency interface, as per international codes and standards.

Safety earthing and C&I System earthing shall be separate. Safety earth bus shall be connected to main plant earth pit. Separate earth pits shall be provided for system earth bus (electronic earth) Electronic earth shall be cabled directly to the corresponding earth bar.

All instruments shall have clear access for maintenance, removal, lay-down, calibration etc.

All readable instruments shall be clearly visible unassisted.

Access platforms shall be provided for easy access of instruments, valves and actuators. All prefabricated plugged cables, power supply cable for Bidder’s System.

System Cabinet, Marshalling Cabinet and Power Supply Cabinet to fulfill the system requirement

Power Distribution Cabinet for extension of power supply to field instruments

2.0 **Sanitary Pneumatic Seat Valves**

Type: Two way / three way pneumatically operated sanitary valves of mix-proof (safe flow), On-OFF seat valves, flow diversion valves etc. types.

Mix proof valves are with basic external cleaning version

Material: AISI 304

Sealing: Positive

Controls: Electrically or electronically operated integral

The Pneumatic valves shall have the following features to cater to fulfill the above functional requirements:

Housing shall be ball shaped for the ideal flow characteristics to ensure 100% clean ability by CIP. Housing closed by covered by cover plates should not create a sump or dead corners. Housing interconnections shall be by detachable type clamp connection. The seals such as housing seals, stem seals and disc seals shall be flush mounted.
Digital valve petitioners shall be suitable for two-way digital communication based on Field bus technology, this shall ensure real time notification of current and potential valve and instrument problems.

Valves shall have low/ very low susceptibility for the pressure surge. Valve shall have the short leakage outlet to recognize the leakage immediately.

Valve shall have open lantern installed between the actuator and the product area of the valve to assure that leakages occurring at the stem seal shall be immediately visible and also shall act as a protection against overheating of the actuator.

Mix proof valves shall be used wherever the CIP and the process liquids are inter-crossing in the piping system. The CIP of the isolation area is possible and also the leakage shall be easily identified.

3.0 **Field Instruments, Control Valves and Accessories.**

2.6 **General**

Field Instruments shall be suitable for area in which these are located. In general, field instruments shall be weatherproof, dust tight and corrosion resistant with Protection Class IP-65. Field instruments shall be suitably mounted, supported and terminated in local junction boxes.

Die cast aluminum or stainless steel casing shall be used as case material in general.

Dial size for all pressure and temperature gauges shall be 150 mm and any lower size selection specific to the application shall be subject to the Purchasers approval. In general, the minimum accuracy of the instruments shall be as below:

Electronic transmitters: +/- 0.15% of FSD:

Pressure & temperature gauge: +/- 1.0% of FSD; Conductivity analyzer: +/- 0.25% of FSD:

Level gauges: +/- 5.0mm of the reading;

The repeatability of pressure, temperature, level and flow switches shall be +/- 2.0% of FSD.

Temperature stub to be welded on process pipe / vessel and shall match with thermo well process connection and size. Thermo well shall be drilled out of bar stock and the length & construction shall comply with process requirement / relevant standards. Material of construction of thermo well shall be SS 316 suitable for the applications.

The cable inlet at the instruments mounted on the plant will have a female threaded connection for protection pipe with nominal diameter ½" NPTF.
The instruments pneumatic connections will be ¼” NPT female.

All field instruments / equipments shall be provided with stainless steel (SS) tag plates with engraved tag no. and service description. The tag plate shall be secured to the instrument / equipment with SS chain.

2.7 Process transmitters: 1 Lot

All the Process Transmitters shall be based on Field bus technology ad shall support serial, two-way digital communication system. Transmitters shall be provided with local Digital Indicator.

Measuring ranges of transmitters shall be selected in such a way that the rated valve of the measuring variables appears at approx. 50-70% of the span.

The sensing elements and internal parts shall be constructed with AISI 316. In case of stock and corrosive fluid application, diaphragm seal type transmitter with capillary is foreseen.

Transmitters shall generally be installed on Instrument Stands made of 2” SS pipes located at convenient points.

3.3 Process gauges: 1 Lot

Process gauges shall be provided for local indication on all utility lines. Pressure gauge sensing element shall be Bourdon / Bellow / Diaphragm type in general depending upon the process condition. Direct reading Pressure / Differential Pressure gauges shall be used of SS 316 sensing element and AISI 304 movement material.

Local temperature measurement shall be done bi-metal Temperature gauges. Temperature gauges may be direct mounted type (multi-angle) or with SS capillary extension (at least 3 Mtrs) as per the application area.

The sensing element / bulb / capillary etc. shall be of SS 316 for temperature gauges.

3.4 Temperature elements: 1 Lot

All Temperature Sensors Elements shall be of Duplex type with SS 316 sheath and MgO filled. Depending on temperature ranges, Pt-100 Resistance Temperature Detector (RTD) or thermocouple shall be used.

Thermocouple / RTD heads, with chain holder, shall be of the waterproof type, with duplex terminal block, casketed cover and stainless steel chain. Screwed covers shall be use.

3.5 Process switches: 1 Lot

Local switches for pressure, differential pressure, temperature, level etc. shall be blind type and shall be suitable for Field bus communication.
Set points shall be adjustable throughout the range. Switching differential shall be adjustable.

3.6 **Flow Elements:** 1 Lot

Measurement of flow for clean fluids and employing differential pressure principles, flow nozzles or concentric square edge orifice plates shall be provided. All flow element calculation, design and construction shall be based on BS/ASME standard.

Beta ratios (d /D) for flow nozzles and orifices shall not be less than 0.5 and not more than 0.70.

Flow nozzle and flow orifice plates shall be 316 stainless steels. Accuracy of the primary element shall be plus or minus 0.25% or better.

3.7 **Magnetic flow meter:** 1 Lot

Magnetic flow meters shall be true smart type with Field bus output. The flow tube material shall be of AISI 304 with PTFE lining. The electrode material shall be SS 316L depending upon process condition. In general, SMS type process connection may be used for magnetic flow meters.

Accuracy of magnetic flow meter shall be plus or minus 0.5% of flow rate or better.

Local digital flow rate as well as totalize display shall be provided.

Earth ring SS 316 shall be provided for proper grounding of mage flow meter.

3.8 **Mass flow meter:** 1 Lot

The Mass flow meter envisaged shall be Carioles’ straight tube type. The electronics part shall be microprocessor based. The Mass flow meter shall be capable of measuring mass flow rate. Density, temperature, volumetric flow rate and totalized flow.

Mass flow meters shall be true smart type with Field bus output. The flow tube/wetted parts material shall be SS 316 / SS 316L or as per the requirement of process fluid. SMS type process connection may be used for mass flow meters.

Accuracy of Mass flow meter shall be plus or minus 0.2% of flow rate or better. Digital display of mass flow rate, density, temperature, volume flow rate as well as totalized flow shall be provided.

3.9 **Level instrument:** 1 Lot

Flange mounted diaphragm seal type level transmitters shall be used for level measurement on tanks. The wetted parts shall be of SS 316 or suitable material to suit process fluid. The process connection with the tank / vessel shall be 3” flanged.
For clean liquid, water, condensate service etc. (Other than milk applications) normal differential pressure type level transmitters shall be used.

Level gauges shall be of the reflex / transparent / tubular type as per the application area and made of stainless steel and fitted with toughened borosilicate glass. Each gauge shall be fitted with top and bottom- isolating valves with full bore drain valve at the bottom and plugged vent at the top. Flanged connections, rated same as the vessel, shall be use. Gauges shall be arranged so that the visible length is in excess of the maximum operating range.

Displacement / float type instruments and switches shall be mounted in external cages with flanged connections, rating same as the vessel. This type of instrument shall not be used for applications involving viscous, corrosive or flashing liquids. The cage material shall be carbon steel in accordance with vessel material and the float shall be of 316 SS. Drain and vent shall be provided on the cage.

### 3.10 Conductivity analyzer: 1 Lot

The conductivity analyzer may be installed on line or at a distance connected by sampling line. The necessary mounting of analyzer electronic unit shall be taken care suitably. The process connection shall be SMS type.

The conductivity analyzer shall be microprocessor based. The electrode and cell material shall be of SS 316.

Automatic temperature compensation shall be provided with the analyzer.

The meter shall be Field bus compatible.

Special cable for connection between electrode and transmitter

### 3.11 LIST OF MAJOR INSTRUMENT

The following list of instrument is suggestive only the bidder shall provide all the necessary instrument as per the requirement of process and automation.

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Qty</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow meters</td>
<td>Raw water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Soft water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Chilled Water header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Steam header</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td>Mass Flow Meter</td>
<td>Processed milk silo to powder plant UHT</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Plant / Dispatch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cream transfer to butter section</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Tanker reception line- Milk</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Magnetic flow meter milk pasteurizer</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td>Item</td>
<td>Location</td>
<td>Qty</td>
<td>Unit</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td><strong>Flow Meter</strong></td>
<td>Fuel oil flow meter for FO line</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td><strong>Level transmitters</strong></td>
<td>Milk silos</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Bulk lye and acid tanks</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Cream ripening tanks</td>
<td>3</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Pasteurized Vertical Milk Storage Tanks</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>HMST (milk pouch packaging)</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Butter milk tank</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td><strong>Conductivity Sensors</strong></td>
<td>Process CIP Acid and lye tanks</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Tanker CIP Acid and lye tanks</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>Process CIP return lines</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Tanker CIP return lines</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Rinse recovery line</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td><strong>Temperature Indicator</strong></td>
<td>Milk silos</td>
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<td>No</td>
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<tr>
<td></td>
<td>Cream ripening tanks</td>
<td>3</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Past. Water storage Tank</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Past. Vertical Milk Storage tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Past. Hor. Milk Storage tank(packaging)</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>Butter milk storage tank</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Rinse milk storage tank</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Intermediate Milk tank (packaging)</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>BM Vat</td>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee boiler</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee settling tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Ghee storage tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td><strong>Level switch-</strong></td>
<td>CIP tanks (Process and tanker CIP)</td>
<td>18</td>
<td>No</td>
</tr>
<tr>
<td><strong>Float type</strong></td>
<td>Underground water sump</td>
<td>4</td>
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</tr>
<tr>
<td><strong>Level switch-</strong></td>
<td>De aeration tank</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td><strong>Tuning fork type</strong></td>
<td>Milk silos</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Pasteurized Vet Milk Storage Tanks</td>
<td>2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Pasteurized HMST (pouch packaging)</td>
<td>2</td>
<td>No</td>
</tr>
</tbody>
</table>

### 3.0 MAJOR RESPONSIBILITIES OF BIDDER

#### 3.1 Responsibilities of bidder

It is not the intent of these technical specifications to specify completely all details of design and fabrication of any plant/ equipment, nevertheless, the equipment shall confirm in all respects to high standards of engineering design & workmanship and be capable of performing in continuous commercial operation up to agreed performance standards in a manner acceptable to the Purchaser/client.
The Purchaser/client will interpret the meaning of various equipment specification and drawings and shall have the power to reject any material/equipment which in their opinion is not in full accordance to tender specifications.

The successful Bidder shall be responsible to undertake all work involved in implementing the project. This shall include but not limited to design, manufacture, supply installation and commissioning of the entire project component including process equipment, process pipe-work, utilities equipment, services pipe-work, electrical equipment, power cabling instruments and controls, control cabling, pneumatics, and automation. Also all necessary supports, support structures, cable ducts, trenching, conduits etc. required to complete the installation and to meet the Client’s high standards are included. No exclusions of any nature are acceptable, other than those detailed in this Tender document to be in the supply of Client, or in the scope of one of the other Tender Packages.

In particular the Supplier shall be responsible for:

- Developing the process design, complete engineering design manufacture and/or supply of all goods and services and ensuring best performance of individual equipment/system/process plant as a whole. The supplier shall avail the assistance of reputed specialists in their respective fields, wherever required.

- Development of Automation schemes, soft wares, interfaces etc. and their incorporation in the project to the entire satisfaction of the Purchaser/clients.

- Providing Client with technical data, technical literature. Production and service load calculations.

- Arranging for approvals from various statutory authorities on behalf of the client. The statutory fees shall be reimbursed by the client on production of receipts.

- First charge of oil, lubricants and consumables. First charge means that these items shall be replenished until the successful completion of product trials.

- Execution of the project in accordance with the prevailing Indian Standards, Indian Electricity Rules, Indian Boilers Regulations, Indian explosives Act, Indian Factories act, Indian Pollution Act and any other Act which may be relevant to the project and obtaining approvals thereof. Wherever Indian Standards are not available the bidder shall follow international Standards.

- Ensuring satisfactory performance and After Sales service of all items included in the scope.

- Test equipment, test kits, instrumentation & materials required for establishing performance parameters.

- Necessary man-power an tools.
Ancillary services like spares inventory, maintenance schedules, special tools/tackles etc.

Testing, commissioning and operation of the plant during production trials to the satisfaction of the Client. Performance guarantees with regards to the following:

Rates performance of section (s) and complete system 9s)

Product quality standards conforming to the prevailing International Standards

Consumption of utilities section-wise and for the complete system

Training of clients personnel in use of the automation systems, plant operation and control, maintenance and repair of systems and equipment

SELF CLEANING TRI PURPOSE CENTRIFUGE

1.0 Functional requirement: It would be used as a separator / clarifier / standardize for milk at incoming temperature of approximately 45 deg. C to 50 deg C.

2.0 Capacity: Cream Separation: 20,000 LPH and Standardization/ Clarification: 25000 LPH (min)

In case of fat separation by the centrifuge, the % of fat in the skim milk should not be more than 0.1%.

3.0 Sludge Discharge: The centrifuge should have automatic sludge discharge system with automatic control unit equipped with timers and other accessories required for this system. The self-cleaning bowl shall eject the accumulated solids from the sludge holding space of the separator bowl automatically at pre-selected time intervals through sediment ejection port at the bottom of the bowl by means of the hydraulically operated mechanism whilst the bowl is rotating at operating speed. The opening and closing of the sludge ejection port should be done by water, which should be controlled by the automatic control unit.

4.0 Cleaning-in-Place: The machine should be designed for Cleaning-in-Place and it should be possible to incorporate the same in the plant CIP system controlled by Programmable Logic Control. It should be possible to clean the separator with 2% lye and 2% nitric acid solution at about 90 deg C without any adverse effect on the metal or gaskets etc. All parts of the separator in contact with milk as well as outside the bowl, the inside of frame hood and the sludge discharge outlet should be cleaned perfectly without any manual labour.

5.0 Noise Level: The separator should be of such design that the noise level should be less than 80 dB A.

6.0 Drive: The drive for the centrifuge may be just under the centrifuge or mounted vertically by the side of centrifuge on a common frame and integrated together. The drive motor
should be suitable for power connection of 415 V, 50 Hz, 3 phase AC supply should also include a Variable Frequency Drive (FFD) for smoother start and long life of the motor. Transmission of power from the drive to Centrifuge machine shall be either through flat belt or gearbox.

7.0 Accessories:

Cyclone of AISI 304- 1 No.

Lubrication system: Force-feed with gear type oil pump or splash type lubrication system- 1 set.

Controls: Fittings and controls to maintain required degree of standardization-1 set.

Flow Gauge: For continuous measurement of flow of milk and cream- 2 nos.

Pressure Gauge: For continuous measurement of discharge pressure of skim/standardized milk- 1 no.

Oil Pressure Gauge: For continuous measurement of lubricating oil pressure. - 1 no.

Tachometer: For continuous measurement of RPM of disc assembly. - 1 no.

Brake: It should be provided with manual brake for quick slowdown of drum. - 1 no.

Gasket: The gasket should be of food grade rubber. It should be non-toxic, fat resistant and non-absorbent. It should have smooth surface.

Other Accessories: It should include regulating valve for skim milk outlet, shut-off valve for CIP and manual standardizing device. - 1 set.

SS Panel: The separator should be supplied with a SS remote control panel with push buttons and indication lamps for operation. Sludge discharge should be programmable. - 1 no. 8.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost.- 1 set.

Note: Automatic standardization (Stand mat) is not envisaged. There shall be arrangement to fully/partially separate the milk and setting for the same shall be done manually. Suitable provision should be made for incorporating the automatic standardization unit (stand mat) in future.

CONTINUOUS BUTTER MAKING MACHINE

1.0 Functional requirements: Cream having fat content of 40-45% would be fed to the machine for continuous production of white butter at the rate of 800 Kg/Hr. The butter produced by the machine should comply with the latest ISI and Ag mark standards.
2.0 The Churn: The churn should be made from stainless steel conforming to AISI 316. It should comprise of churning vessel, beater, washing device and header. The design should facilitate in place cleaning.

3.0 Drive: The machine should be complete with necessary drive built-in with easily removable cover.

4.0 Accessories

Cooling System: The chilled water-cooling system to maintain the desired temperature of cream during churning and working. - 1 set.

Control Panel: Pre-wired electrical control panel with electrical switch gears, push buttons etc for the entire system. - 1 set.

CIP System: Close circuit CIP arrangement should be provided in the machine. - 1 set.

Float Balance Tank: Stainless steel (AISI 316) float balance tank of 100L capacity for incoming cream complete with float cover & outlet with flanged plug type stainless steel (AISI 316) valve with complete union- 1no.

Balance Tank: Stainless steel (AISI 316) balance tanks 100 litres capacity each for butter milk and butter wash water with covers and outlet with flanged plug type stainless steel (AISI 316) valve with complete union. - 2 no.

Legs: The balance tanks should have suitable stainless steel legs with stainless steel ball feet. The ball feet should have provision for height adjustment of 50 mm. - 4 no each.

Cream Pump: Positive displacement pump of suitable capacity with drive and accessories for cream delivery from float balance tank to the churning vessel. The pump should be provided with variable speed drive arrangement and pressure release valve. - 1 no.

Centrifugal Pump: Suitable capacity pumps, one each for buttermilk and butter wash water. – 2 no.

Shovels: Sand blasted stainless steel (AISI 316) shovels for butter- 2 no.

5.0 Tools Essential special tools should be supplied with the machine without charging any extra cost.

**BUTTER TROLLEY**

1.0 Functional requirements: Butter trolley would be used for transportation of butter from one section to other within the dairy.

2.0 Design requirements
Capacity: 600 Kg.

Dimensions: Overall height (from ground level) and width of the trolley should not exceed 800 mm and 900 mm respectively.

Finish: All welding joints are to be ground smoothly. All stainless steel outer surfaces are to be shot blasted with oxide particles of 10 grits. Butter trolley inner side should be sand blasted with no. B grits particles.

Slope: Generous slope should be provided towards the outlet. Joint Curvatures: All inside corners should have minimum radii of 25 mm.

The Body: The main body should be made from minimum 2 mm thick stainless steel sheet conforming to AISI 316.

2.1 Accessories

Wheels: 200 mm diameter nylon wheels, of which front pair should be swivel type - 2 pairs. Drain Nipple: Stainless steel drain nipple of 51 mm diameter and 75 mm length ending in a stainless steel blank end complete union. -1 no.

BUTTER CARTON TROLLEY

1.0 Functional requirements: It would be used for transporting butter cartons) (24 numbers if butter cartons) within the dairy

2.0 Dimensions: 850 mm length x 6 50 mm breadth x 1250 mm height.

3.0 Body: The body of transporter should be mild steel and the construction should be rugged. The whole body should be spray galvanized after fabrication.

4.0 Wheels: it should have four wheels in which two should be of swivel type.

BULK BUTTER FILLING MACHINE

1.0 FUNCTIONAL REQUIREMENTS

The butter bulk filling machine is required to fill 15 kgs. of butter in hard board cartoons.

3.0 DESIGN REQUIREMENTS

Capacity: 20 Cartons/hr

2.1 Filling Principle: The filling operation should be semi-automatic, i.e the preformed carton will be placed under the filling head. The machine should fill 15 kgs. Of butter and come to halt till the filled carton is removed manually and an empty carton is placed. The filling of the carton should be by volume. The filled carton should be separated from the machine by butter cutting knife.
2.2 The carton will be pre-formed with all the four sides and bottom in closed position.

2.3 Finish: All the SS surfaces coming in contact with butter should be sand blasted.
    All non-product SS surfaces should be finished to 150 grits. All MS surfaces
    should be hot dip galvanized after fabrication.

2.4 Accuracy: The filling accuracy should be plus minus 1% (one percent) by weight.

2.5 All parts coming in contact with butter should be made of AISI 304

3.0 SCOPE OF SUPPLY

3.1 Filling Machine:

3.1.1 The machine should be floor mounted free standing type.

3.1.2 The butter would be fed to SS hopper of machine manually.

3.1.3 The frame for the machine is to be fabricated from mild steel pressed/rolled section or from MS C class pipe.

3.1.4 The filling head should be of screw type with all accessories.

3.1.5 Drive Unit: Drive unit for screw and gear box should be supplied. The motor
    should be suitable for 415 V 3 Phase 50 Hz. AC supply.

3.1.6 Push Button Panel: A suitable SS panel having the push buttons and starters for
    the machine should be supplied and fitted at a suitable location. The panel
    should be complete with push buttons, indication lamps, starter, relays etc. Only
    one point power supply to the panel will be made.

3.1.7 The machine and tables should be completely shrouded with 2mm thick SS sheet conforming to AISI 304.

3.2 A suitable table fabricated from mild steel c class pipe. The frame of the table
    should be hot dip galvanized after fabrication and then shrouded with SS 304
    2mm sheet from all the four sides. The top should be of AISI 304 mm 2 mm SS
    sheet capable of keeping minimum of 3 butter cartons.

4.0 Test

All the welding joints should be tested by DP test

5.0 The supplier should prepare the detailed general assembly drawing showing plan, elevation, end view and cross sectional view of the machine with complete bill of materials. This drawing should be got approved by COMFED before starting fabrication. The bought out items should be clearly indicated with make, model & type.

5.0 The bidder should inform the total electrical load of the machine along with the bid.

GHEE CLARIFIER

1.0 Functional requirements: It would be used for clarification of ghee at the incoming temperature of 50-60 degree C at the rate of 2000 LPH.
2.0 The Centrifuge: All the product conduct contact surfaces of centrifuge such as bowl body, bowl hood, discs, distributor etc. should be made from stainless steel conforming to AISI 304. The separator frame shall be cast iron duly finished with epoxy paint. It should be designed for proper grouting. 1 no.

3.0 Drive: The drive for the centrifuge should be mounted on the centrifuge frame underneath the bowl and integrated together. The bowl spindle shall be connected to the motor shaft through a suitable drive mechanism. -1 no.

3.1 Accessories.

Lubrication System: Force-feed lubrication system with gear type oil pump or splash lubrication shall be provided. – 1 set.

Oil Pressure Gauge: For continuous measurement of lubricating oil pressure. – 1 no.

Tachometer: For continuous measurement of R.P.M. of disc assembly - 1 no. Alternatively pulsation counter shall be provided.

Gasket: The gasket should be of food grade rubber. It should be non-toxic, fat resistant and nonabsorbent. It should have smooth surface.

Painting: All mild steel surfaces are to be painted with a coat of epoxy primer followed by two coats of epoxy paint after through de-rusting.

4.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

GHEE POUCH FILLING MACHINE (Mechanical type with photo cell)

1.0 Design requirements

<table>
<thead>
<tr>
<th>Capacity(Minimum)</th>
<th>Minimum 800 Packs/ Hr of sizes 200 ml. or 500 ml. or 100 ml.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>+ 0.5% for 1000 m.</td>
</tr>
<tr>
<td>Type</td>
<td>The design of the machine should be hygienic. All the functions of the machine shall be controlled using cam timer switches/cam and the machine shall be mechanical cam operated</td>
</tr>
<tr>
<td>Elec. Power</td>
<td>3 Phase, 415 V (+/- 10%), 50 Hz. (+/-2%),4 wire</td>
</tr>
<tr>
<td>MCC</td>
<td>All the ghee contact parts of the machine should be made from stainless steel conforming to AISI 304.</td>
</tr>
</tbody>
</table>
**Finish**

<table>
<thead>
<tr>
<th>Finish</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All stainless steel inner surfaces are to be polished to 150 grits.</td>
<td>The outside surface of the machine shall be circle polished to</td>
</tr>
<tr>
<td></td>
<td>150 grits.</td>
</tr>
</tbody>
</table>

**2.0 Accessories**

**Float Balance tank:** Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the pouch filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS 304 pipe is to be extended down up to the bottom of the machine.

The machine should consist of SS 304 body built on a treated Aluminum chassis. All sub-assemblies are to be mounted on these plates. All tapped holes on chassis shall have helical steel inserts for longevity of chassis.

**Spool bearer Assembly & Film guide:** The heat sealable film roll up to 20 Kgs. shall be mounted on spool bearer at the rear bottom of the machine. The spool bearer assembly should be sliding type to facilitate easy changeover of the film roll. The spool roller bracket assembly shall be made of SS 304 material.

The film layer is then passed through various rollers and subassemblies such as: End of film loosening.

Subsequently, it should be passed over a set of ultra violet tubes for sterilization of the film. The film layer should then form in to a tube.

**Vertical seal:** The film shall be overlapped and sealed into to be by vertical electrode. The jaw should be mechanical cam operated and shall be of water-cooled. The vertical jaw support shall be of SS 304. The vertical electrode winding rod support shall be of Aluminum and necessary slots are to be provided for easy cleaning.

**Downward feed:** Downward movement of the film tube should be controlled by a set of rubber nip roller driven by a motor through a reduction gear unit. The nip roller support shall be of SS 304.

**Injection system:** The product from the float balance tank is passed through injection tube into the film tube. The filled quantity of the product in each pouch is controlled by opening of the valve at the lower end of the injection tube. The flow of product through injection tube in the pouches should be continuous and by gravity. The sealing should take place through the product.

**Horizontal seal:** The horizontal sealing and cutting should take places at the same time by the horizontal electrode mounted on the fixed horizontal jaw. The fixed horizontal jaw is water-cooled. The rear moving jaw shall be mechanical cam operated.
Electrical control panel: The indicating lamps, electrical switches, control relays, solid state variances, digital pouch counter, Hour meter etc. should be mounted in this panel. Only MCB’s are to be used instead of HRC fuses. The machine shall also be equipped with single phase 5 Amps and 15 Amps adaptors. Facility to transfer pouch totalize data to the computer/PLC system shall be provided.

Photo mark Scanner: The machine shall be provided with photocell with all mounting arrangements to control the length the pouch.

Additional features:

Auto operation facility shall stop the machine and audiovisual alarm should be provided if the film roll is exhausted.

Emergency switch to stop the machine shall be provided on front side of the machine. The machine should stop if the front door or back door is open.

The machine should stop automatically for ghee ending

Facility to insert a closed circuit in place cleaning system for the machine shall be provided. The CIP adaptors and hoses are in the scope of supply.

3.0 Date coding device: It shall have 12 characters with each character of 3 mm height and facility to accommodate digits.

4.0 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

5.0 Statutory Requirement: The pouch filling machine shall be duly stamped by the weight and measure department and the test certificate shall be submitted by the supplier.

6.0 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>Capacity of machine Packs/Hr ml &amp; 1000 ml</th>
<th>---------</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 200 ml. 500 ml &amp; 1000 ml</td>
<td></td>
</tr>
<tr>
<td>Leakage % on 200ml, 500 ml and 1000</td>
<td></td>
</tr>
<tr>
<td>Weight &amp; dimensions of the pouch filling machine</td>
<td></td>
</tr>
<tr>
<td>Utility consumption:</td>
<td></td>
</tr>
<tr>
<td>a) Electrical power (KW)</td>
<td></td>
</tr>
<tr>
<td>i) Connected</td>
<td>---------at-Deg. C</td>
</tr>
<tr>
<td>ii) During operation</td>
<td></td>
</tr>
<tr>
<td>b) Cooling water (LPH)</td>
<td></td>
</tr>
</tbody>
</table>
LINED CARTON GHEE FILLING MACHINE

1.0 FUNCTIONAL REQUIREMENT

The filling machine would be used for filling of ghee in lined cartons. Ghee would be delivered to the SS balance tank of packing machine at around 45 degree C. The machine should be suitable for 1000 ml. & 500 ml packs.

2.0 DESIGN REQUIREMENT

2.1 Capacity: 12 packs per minutes (Min.) for 1000 ml.

2.2 Finish: All stainless steel joints are to be ground smooth and finish to150 grit. All stainless steel surfaces are also to be polished to150 grit.

2.3 Operation: The machine should be fully automatic operated from a control panel. The operation of the machine should be

* Carton ejection (pre-formed carton will be used)
* Heat sealing of bottoms of liner
* Coding and closing of carton bottom
* Filling and check weight of product
* Full sealing of liner
* Gluing of top flap of carton and closing of the same.
* Discharge of carton.

All the above operations should be dust free.

2.4 Accuracy

2.4.1 Filling Accuracy:

It should fill the carton with weight accuracy of plus minus 0.5 per cent

2.5 Available Services

Compressed are - at 6 Kg/sq. cm.

Elect. Power - 415 V, 3 Phase, 50 Hz AC supply.

2.7 Material: All product contact parts should be fabricated from AISI 304 stainless steel.

3.0 Accessories:

Balance tank: Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS 304 pipe is to be extended down up to the bottom of the machine.
Carton Release: the machine should have proper carton magazine and release system for ejection of pre formed lined cartons.

Bottom Closer: The machine should first erect the carton and then close the bottom with high pressure heat sealing before discharging to filling unit.

Filling Unit with Check Weighing System. The machine should have the filling unit with check weighing system. The flow of product of required capacity/quantity from the balance tank is suitably controlled to fill the carton.

Sealing Unit: to complete the sealing of liner followed by top closing and sealing of cartons.

Code and Date Printer: The machine should have ink type code and date printer suitable to operate with quick drying type ink.

Instruments and controllers: A SS control panel of IP 55 standard with all necessary instruments and controllers should be supplied and fixed at suitable location on the machine.

CIP: The machine should have facility to insert a close circuit cleaning in place system. It should be suitable for wet cleaning. Safety features: The machine should have in built relevant safety features including no carton no fill and empty carton detection. Drive: The machine should be complete with necessary drive and accessories including control. The necessary arrangement should be there for variable speed and change over to different size of cartons. Counter: Carton counter to count the number of cartons filled by machine with resetting arrangement. Sterilization: A set of sterilizing lamps should be provided for sterilizing the formed cartons immediately prior to filling with product.

Statutory Requirement: The machine shall be duly stamped by the weight and measure department as per requirement and the test certificate shall be submitted by the supplier.

4.0 Tools and Spares: Necessary set of tools and spares suitable for 2 years’ operation should be supplied. The list of spares should be given with the offer.

5.0 Painting: All non SS surfaces are to be degusted, degreased and then coated with two coats of anticorrosive epoxy primer followed by two coats of epoxy paint with Ivory colour.

6.0 Test: DP test for all the welding joints.

7.0 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>Capacity of machine Packs/Hr of sizes 500 ml or 1000 ml.</th>
<th>**********</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 500 ml. 500 ml &amp; 1000 ml.</td>
<td>**********</td>
</tr>
</tbody>
</table>
Leakage % on 500ml, 500 ml and 1000 ml

Weight & dimensions of the machine

Utility consumption:

a) Electrical power (KW)
   i) Connected
   ii) During operation
   b) Compressed Air ..................at ......Kg/sq.cm

WATER SOFTENING PLANT

1.0 Capacity: The throughput of the softener shall be 30 Cum./hr. The softener is of automatic regenerating type with Na Cl (common salt) as regenerating medium.

The entire regeneration sequence such as opening and closing of valves, brine injection, beginning of next regeneration etc. are fully automatic. The sequence of the above activities should be initially by an electricity operated reset timer. At the end of every regeneration, the unit should automatically go in to service. Manual regeneration facility should also be provided.

Changeover from one softener unit to another whenever a water softener unit goes under regeneration should be automatic.

2.0 Design requirement:

Mild steel pressure vessel with inlet and outlet connection, resin charging and withdrawal connection and supports. The vessel shall be internally rubber lined and painted externally with anticorrosive paint.

Brine tank of MS rubber lined construction to store and measure salt for regeneration of the softener complete with brine level indicator.

3.0 Accessories:

* Raw water feed pump 1w+1s -2 no.
* Hydraulically operated brain injector -1 no.
* Initial charge of ion exchange resin for The softener vessel -1 lot
* Hardness test kit - 1 set
* Inlet and outlet pressure gauges - 1 set
* Inlet and outlet sample valve - 1 set
* Water flow meter with totalizer - 1 no.
4.0 Quality of Raw water: Quality of raw water given below is for the guidance. However, actual quality of water shall be analyzed and softener shall be selected accordingly by the bidder.

Odour : Nil
Ph  : 7.8
Total Hardness : 224 ppm.
Total hardness in treated water : less than 5 ppm.

ROAD WEIGH BRIDGE

1.0 Type: Pit less type weigh bridge of static type with electronic sensing and indication.

2.0 Capacity: 60,000 kgs with resolution of 10 kgs. The total weighing system shall conform to internationally adopted OIML recommendations conforming to Weights and Measures Act in India. Accuracy to be minimum +/- 0.025% of full scale.

3.0 Platform: Size 12m x 3 m (Minimum), steel platform, complete with non-skid plate deck, girders etc. Platforms should be provided with horizontal movement constrainers, if required.

4.0 Electronics: The electronics will be configured around a suitable microprocessor and shall have the following INPUTS/OUTPUTs.

4.1 Inputs

The primary inputs shall be from resistive strain gauge type load cells. There shall be a minimum of 4 nos. of load cells.

The sensor inputs shall be up to isolated.

A to D conversion shall be of the dual slope conversion type.

Load cells shall conform to the following requirements.

i. Should be capable of sensing from zero to rated capacity.
ii. Should have built in suppression of interference voltage.
iii. Should be compensated for variations in temperatures.
iv. Should be hermetically sealed, dust, vermin and waterproof. Protection to be minimum IP 67
v. Should be supplied with screened cables and suitable mounts.

4.2 DATE, TARE WEIGHTS, VEHICLE NO/ROUTE NO. ETC. should be fed through the keyboard of the local computer.

4.3 Outputs

These shall be for the following:
a) Balance and balance limit.
b) Test
c) Tare entry
d) Gross weight/Net weight
e) Over-range, under range.

Read Out: using 7 segment LEDs or vacuum fluorescent read outs at least 10 mm high. The read out should not flicker.

Hard Copy: This should be available on a local printer. The printer interface should be RS 232C with baud rate selectable from 300 to 1200 bauds.

The printer should print only after the system has stabilized and hard copy should provide the following information.

1. Date
2. Truck no./Code/route no.
3. Tare weight
4. Gross weight
5. Net weight.

4.4 Interface Rs 232 C and/or MA serial output, baud rate selectable from 300 to 1200 bauds for connection to remote computer.

5.0 Power Supply Unit: For powering the above mentioned circuitry and the load cells. Interference and surge suppressors should be built into the power supply unit (PSU). The system shall be powered from a single phase source of 220V AC +/- 10%, 50 Hz +/- 2%.

6.0 All the electronics involved i.e. the processor, input/output modules, interfaces, keyboard, PSU should be housed in one unit which shall be dust and vermin proof.

The system shall incorporate automatic zero tracking and span drift correction should be built in the system.

7.0 Special Note: The supplier shall arrange for inspection and stamping of the weigh bridge by local weights and measures authorities. The fees for stamping, if any, will be reimbursed to be supplier against documentary proof.

SS TUBES AND SUPPORT PIPES

1.0 Type: TIG welded, annealed and de-scaled tubes shall be manufactured as per the standard ASTM-A270. Outer surface of the tubes should be mirror polished and inner surface should be pickled as per dairy standard.

2.0 Material of construction and thickness:
3.0 All the pipes unless otherwise stated shall conforms to AISI 304. The average wall thickness of tubes should be 1.6 mm up to 50.8 mm diameter and 2.0 mm for diameters 63.5 and above. The wall thickness at any point shall not vary more than 12.5% over and under from the average wall thickness specified. The joviality on the open ends shall be within the permissible limit specified in the ASTM A 270.

4.0 Support pipes shall have wall thickness of 2.6 mm up to 40 NB pipe and 3.2mm for higher size pipes up to 63B

5.0 Testing: All the process tubes shall be hydraulically tested at the manufacturer’s works at 1500 PSI for pipes up to 38.1 mm diameter and 1000 PSI for tubes size 50.8 and above. All the tubes shall bear the heat mark. The supplier is required to furnish the test certificate of the tubes with respect chemical composition, tensile test and mechanical test.

SS FITTINGS

6.0 **Plug Valves**: The plug valve shall be in 2 way or 3-way configuration with SMS end connection as specified. The valve body and plug shall be made out of investment casting using AISI 304 material. The inner side of the valve body and the contact surface of the plug shall be ground smooth and then lapped to get full metal-to-metal contact. The outer visible surface of the valve body and the plug shall be mirror polished. The nozzle port shall be provided with SMS union complete with nut, liner, male part and neoprene food grade rubber gasket. The male part shall be integral part of the valve body casting. The manufacturer is required to test each valve on a hydraulic pressure of 7.5 Kg/cm2.

7.0 **Manual Butterfly Valve**: The butterfly valve shall be of sanitary design and all liquid contacting parts shall conform to AISI 316. The valve sealing gasket shall be EPDM / Nitril rubber material suitable for hot water sterilization temperature of 100 Deg. C and hot acid and lye solution of 2% concentration at 85 Deg. Celsius. The valve shall be provided with SS handle. The valve shall be with plain ends shall be suitable for direct welding on the pipes.

8.0 **Non Return Valve**: The non-return valve shall be of sanitary design and all liquid contacting parts shall confirm to AISI 304. The valve sealing gasket shall be EPDM / Nitril Rubber material suitable for hot water sterilization temperature of 100 Deg. Celsius and hot acid and lye solution of 2% concentration at 85 Deg. Celsius. The non-return valve shall be with plain ends shall be suitable for direct welding on the pipes.

9.0 **Unions**: All the parts unless otherwise specified shall be made out investment casting using AISI 304 material. The union shall be complete with liner, male part, nut and sealing ring (neoprene food grade rubber gasket). The liner and male part should be suitable for expansion joints. All the inside as well as outside surface of the union shall be mirror polished.
10.0 In-line Sight Glass: The in-line sight glass should be complete with SMS unions at both ends having toughened heat resistant glass and protective stainless steel cover. It should have quick replacing arrangement for replacement of glass by flange and bolts. The material of construction shall be AISI 304 unless otherwise specified. All the inside as well as outside metal surfaces shall be mirror polished.

11.0 Crushproof Hose Pipe for Tanker Unloading: The flexible hose shall be crushproof reinforced plastic spiral construction with vulcanized end connection and SS fittings. The hosepipe shall be resistant to CIP cleaning liquid and should withstand a hot water sterilization temperature of 100 Deg. C and hot acid and lye solution of 2% concentration at 85 Deg. C.

12.0 Bend, Tee, Elbow: These fittings shall be made out of AISI 304 unless otherwise specified, process tube, TIG welded, annealed, de-scaled having outer surface mirror polished and inside pickled, manufactured as per ASTM A279. The thickness of the fittings made from the tube section should not be less than 1.6 mm up to 63.5 mm dia and should not be less than 2.0 mm for above 63.5 mm dia. The wall thickness at any point shall not vary more than 12.5% over and under from the average wall thickness specified.

Bends and elbows shall be free from wrinkles. Tee shall have uniform flaring on the branch connection. The joviality on the open ends shall be within the permissible limit specified in the ASTM A270.

MOTOR CONTROL CENTRE (SHEET STEEL)

Functional requirements.

To receive, control and distribute electrical power at 440 V, 50 Hz, AC in sheet steel housing.

1.2 Design Requirement and Scope of Supply

1.2.1 Statutory Requirements:

Motor control center is to be manufactured/ assembled as per the latest ISI Specification, Indian Electricity Rules, including special requirements of concerned State Electricity Inspectorate and the detailed specification mentioned below.

1.2.2 Housing Details:

The switchboard shall be fabricated using pressed and shaped cold rolled steel sections structure of adequate thickness. The sheet steel used for panel shall be min. 14 SWG sheet except that the partition plates and inter-panel barriers may be made of 16 SWG. The switchboard shall consist of free standing front openable panels arranged to form a
continuous line-up of uniform height. Cold rolled sheets shall be used for doors and front covers. Front doors shall be hinged type and bus bars and cable alleys covers shall be bolted type.

1.2.3 Switch Board shall be extensible at both the ends by addition of vertical sections. Ends of the bus bars shall be suitable drilled for this purpose. Panels at Extreme ends shall have openings, which shall be covered with plates screwed to the panel. The switchboard shall be provided with integral base frame. The panel base plate/cable gland plate shall be 2.5 mm thick.

1.2.4 The switchboard shall be totally enclosed, dust, weather and vermin proof. The switchboard shall conform to degree of protection not less than IP 44. Gaskets of durable material shall be provided for doors and other openings. Suitable hooks shall be provided for lifting the boards. These hooks when removed shall not leave any opening in the board.

1.2.5 All bard ware shall be corrosion resistant. All joints and connections shall be made by galvanized zinc passivated or cadmium plated high tensile strength steel bolts, nuts and washers secured against loosening.

1.2.6 The switch board shall be in cubicle design (each feeder components are housed in individual cubicle) suitable for indoor installation. Suitable cable & bus bar alleys shall be depth may be increased suitably to accommodate cables/ buses on back of MCC. All components of the switch board shall generally be approachable from front. However, MCC can be in double front execution also if specifically asked for. The maximum and minimum operating handle/ push button height of any feeder shall not be more than 1900 mm or less than 300 mm with reference to panel bottom. Supporting arrangement for dressing of power and control cables in cable alleys also shall be provided. Maximum shipping Motor length of MCC shall be 2500 mm.

Approximate Size of Cubicles for Starter Feeders

<table>
<thead>
<tr>
<th>Motor</th>
<th>Cubicle for DOL Starter</th>
<th>Cubicle for Star-Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>Up to 10 HP</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>12.5 to 30 HP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 to 60 HP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Rating</td>
<td>Cubicle for SFU</td>
<td>Cubicle for MCCB</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>Height mm</td>
</tr>
<tr>
<td>Up to 63 A</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>100 A to 250 A</td>
<td>400</td>
<td>450</td>
</tr>
<tr>
<td>400 A &amp; Above</td>
<td>400</td>
<td>600</td>
</tr>
</tbody>
</table>

**Minimum depth of cubicle for ACB Feeder shall be 1000 mm**
**Minimum width of cable and bus bar alleys shall be 300 mm**

1.2.7 **Paining :**

All metal surfaces shall be thoroughly cleaned and degreased to remove all scales, rust, grease and dirt. Fabricated structures shall be pickled and treated to remove any trace of acid. The under-surface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the final coat.

After preparation of the under surfaces, the panel shall be spray painted with final two coats of approved shade of powder coating.

The finished panels shall be dried in staving ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run-off paint, etc. All
unpainted steel parts shall be cadmium plated or suitably treated to prevent rust, corrosion, etc.

1.2.8 Nameplates:

Nameplates for all incoming and outgoing feeders shall be provided on doors of each compartment. Nameplates shall be fixed by screws only and not by adhesives. Engraved nameplates shall preferably be of 3- ply (Black-White-Black) acrylic sheets or anodized aluminum. Special danger plates shall be provided as per requirement.

Inside the panicle, stickers should be provided for all components giving identification no. as per detailed wiring diagram.

1.2.9 Bus bar Sizing Connection and Supports:

The bus bars shall be made from high conductivity electrolytic aluminum conforming to grade E91E of IS 5082. The bus bars and supports shall be capable of withstanding the rated and short circuit current stated in the single line diagram/feeder details. Minimum size of power bus bars shall be 200 Amps rating. Maximum current density permissible for Aluminum bus bars shall be 0.8 Amps/ mm2 for bus bar area above 500 mm2 & 1.0 Amp/ for bus bar area below 500 mm2. An earthing bus bar of minimum 150 mm2 section aluminum shall be provided outside panel at bottom throughout the length of the panel. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All doors shall be earthed using flexible copper connections to the fixed frame of the switch board.

1.2.10 The bus bars shall be provided with heat shrinkable PVC insulating sleeves of 1100 V grade. Red, yellow and blue colour shall be used for phase bus bars and black colour shall be used for neutral bus bars. Joints shall be shrouded suitably. Supports for bus bars shall be made of suitable size non-hygroscopic and non-inflammable epoxy compound SMC/DMC blocks and these should be adequate in number so as to avoid any sag in the bus bars.

1.2.11 Minimum clearance between phase to phase shall be 25 mm and that between phase to neutral /earth shall be 20 mm.

1.3 Power Connection:

1.3.1 For power interconnection within the panel board:

Copper conductor PVC insulated cables of adequate cross section shall be used. FOR CURRENT RATING ABOVE 63 AMPS ALUMINIUM BUSBAR STRIPS OF ADEQUATE RATING SHALL BE USED. MINIMUM SIZE OF COPPER CONDUCTOR TO BE USED SHALL BE 4.0 MM2. Cable lugs/ sockets of suitable size and type shall be used for all interconnections.

1.3.2 For all aluminum to copper connection: The copper surface will be silver plated and the aluminum surface will be properly cleaned and supplied with oxide inhibiting grease.
1.3.3 For all outgoing motor feeders, the suitable size terminal blocks shall be provided in
cable alleys and wiring up to these from contactors shall be done by panel supplier. These terminal blocks shall be heavy duty type to withstand high starting currents.

1.3.4 For incoming and outgoing feeders of the MCC, aluminum conductor cable will be used
and hence the panel is to be designed for receiving these and wherever required cable boxes with bus bar extensions for receiving more no. of cables, shall be provided in panel by supplier. Removable gland plates of 12-gauge thickness shall be provided on top/ bottom of panel, for cable entries.

1.3.5 To prevent accidental contacts, all interconnecting cables/bus bars and all terminals also shall be shrouded.

1.3.6 Standard colour code of red, yellow and blue for phases and black for Neutral to be followed for all bus bars/ conductors.

1.4 Auxiliary wiring and Terminals:

1.4.1 Wiring for all controls, protection, metering, signaling etc. inside the switch board shall be done with 1100 volts gray colour PVC insulated FRLS copper conductors. Minimum size of these conductors shall be 1.5 mm², however, cT circuit wiring shall be done with 2.5 mm². Control wiring to components fixed on doors shall be flexible type.

1.4.2 The complete panel would be sub-divided in to different sections by Purchaser and each section shall have its own control circuit with fuse and indication. Terminal block (Minimum 3–ways) for control wiring shall be provided for each outgoing Motor feeder in its cubical. 10% spare terminals shall always be available in each terminal block. Control wiring up to these terminal blocks shall be done by supplier.

1.4.3 All control wiring should be provided with necessary cable sockets/lugs at both ends.

1.4.4 Conductors shall be terminated using compression type lugs. Each termination shall be identified at both the ends by PVC ferrules. The identification termination numbers should match with those on drawings.

1.4.5 Control wiring for motor feeders should be such that the “green” light of motor feeder is “ON” only when control as well as power circuit of feeders is “ON” and it shall have its own fuse.

1.4.6 For all motor starter feeders, provision for control wiring to remove ON/OFF control is to be made. The auxiliary wiring for the same shall be brought up to terminal block in the feeder’s cubicle. 1.5 Switchgears:

1.5.1 Air Circuit Breakers (ACBs)

These shall be electrically operated (motorized), fully draw out type with built-in microprocessor based programmable protection, and suitable for 415 V, 50 Hz supply. Microprocessor based programmable protection unit shall have settings for overload,
short circuit, instantaneous and earth fault currents with time delay and LED indicators to show various conditions such as Power On, Overload, Short-circuit, Instantaneous Earth fault, Percentage load, Self-Diagnostic Test etc. current rating, short circuit current, protection relays etc. shall be as specified in feeder details. Mechanical interlock shall be provided such that it shall not be possible to plug in a closed circuit breaker or to draw out a circuit breaker in closed position. It shall not be possible to operate a circuit breaker unless it is in fully plugged-in, test or fully isolated position. In test position, the breaker shall be tested without energizing the power circuit. The ACB feeder cubical door cannot be opened when ACB is "ON". However, it shall be possible to defeat this interlock for inspection purpose. Trip coil shall work under the following voltage variation conditions:

Closing Coils - 85% to 110% of rated voltage
Trip coils - 50% to 130% of rated voltage.

The circuit breaker shall be provided with mechanically operated emergency tripping device. This device shall be available on the front of the panel.

The circuit breaker position shall be indicated electrically. The following indicating colours shall be used:

BREAKER ‘CLOSE’ - RED
BREAKER ‘OPEN’ - GREEN
BREAKER ‘AUTO TRIP’ - AMBER

Note: The air circuit breaker for incoming feeder shall be of 4 pole construction, unless stated otherwise.

15.2 Molded Case circuit Breakers (MCCB)

MCCBs shall always be provided with separate operating handle mechanism with door interlocking. The MCCBs shall be of triple/ four pole construction (as required in the feeder details) arranged for simultaneous three/four pole manual closing or opening and automatic instantaneous tripping on short circuits. MCCBs shall be provided with adjustable type tripping device with inverse time characteristics for over load protection. All MCCBs are to be provided with operating handles interlocked with cubicle doors.

Closing mechanism shall be quick make, quick break and trip free type. Operating handle shall give a clear “ON” “OFF” & ‘TRIP’ indication. Control voltage for MCCB shall be 240 volts. The ratings shall be as specified in feeder details.

Minimum rated breaking capacities shall be as under:

MCCBs up to 100 Amps - 25 KA
MCCBs 120 to 200 Amps - 35 KA
Above 200 Amps - 50 KA

Note: All feeders having MCCB shall be provided with neutral link complete with isolating link. However, the MCCBs for incoming and non-motor feeders shall be of 4 pole construction, unless stated otherwise.

1.5.3 Switch Disconnect or fuse units: The load break switches shall be heavy duty, air break type suitable for continuous maximum rating with manual quick make / break mechanism. These shall have positive isolation with positive indication of contact separation. They shall have high short circuit making and withstanding capacities. Breaking capacity shall correspond to AC 23A utilization category. Mechanical interlock shall be provided to prevent opening of door in switch ‘closed’ position and prevent closing of switch in door ‘open’ position. However, it should be possible to defeat this arrangement for testing purpose. Live terminals of the switch shall be shrouded.

1.5.4 Fuses: shall be non-deteriorating HRC cartridge link type with operation indicator which will be visible without removing fuses for the service. These shall be complete with molded Phenolic fuse base and cover. Wherever required fuse pullers shall be provided. The fuse base shall be so located in the modules to permit insertion of fuse pullers and removal of fuse links without any problem. One set of fuse puller to cover entire range of fuses used in the panels shall also be provided.

1.5.5 Contactors: The rating of the power contactors shall be as

**Required depending upon the feeder rating indicated in the specifications and as per the table provided in this specification below.**

Contactors coils shall be suitable for 240 volts, 50 Hz. Unless otherwise specified. All contactors shall be supplied with minimum 2 no + 2 NC auxiliary contacts. Additional contacts if required for interlocking etc. shall also be provided. Rating of contactors shall be based on the feeder ratings.

All contactors of motor starters shall be suitable for AC3 duty unless specified otherwise.

1.5.6 Protective Devices:

Bimetal overload relays with inbuilt single phase protection shall be provided for all motor feeders. The relays shall be adjustable and self reset type. Heavy duty starters shall be provided with securable type current transformer operated overload relays only, which shall be suitable for motor starting time of 15.60 seconds. Any other relays, if required for incoming & outgoing feeders shall be specified in the feeder details.
1.5.7 **Timers:**

The timers shall be continuously adjustable and electronic type. Suitable for 240 V, 50 Hz supply. The timers for star Delta automatic starters shall have time delay of 0 to 60 seconds between changeover of contacts.

1.5.8 **Push Buttons (PBs):**

Push Buttons shall be complete with actuator and contact block and shall be generally mounted on doors of the cubicles. Colours shall be as follow:

- Stop/open/emergency - Red
- Start/Close - Green

It should have minimum 1 no.+1NC contacts. Push buttons shall conform to IP-65 protection against dust and **Water ingress**.

1.5.9 **Indication Lamps:**

All outgoing & incoming feeders shall be provided with ON indication lamps. Colours shall be as under:

- Phases - Red, Yellow & Blue
- ON - Red
- OFF - Green
- TRIPPED - Yellow

Indication lamps shall be in the form of cluster of high intensity light emitting diodes (LED) to vive bright indication. These lamps shall be of 22.5 mm dia and having operating voltage of 240 V. AC.

1.5.10 **Current Transformers (CTs):**

CTs shall be cast resin insulated type. Primary and secondary terminals shall be marked indelibly. CTs shall preferably be mounted on stationery parts. These shall be capable of withstanding momentary short circuit and symmetrical short circuit current for 1 second and shall have a minimum rating of 10 VA. Neutral l side of CTs shall be earthed. Protection CTs shall be of low reactance, accuracy class SP” and an accuracy limit factor greater than “10” Instrument CTs shall be of accuracy class “1.0”and accuracy limit factor less than “5.0”. Separate CTs to be provided for protection and metering purpose.

1.5.11 **Measuring Instruments:**

These shall be of square pattern having approximate dimensions 96 mm x, flush mounting type. Necessary auxiliary instruments like CTs, VTs, etc. are also included in the scope of supply. All AC meters shall be of Digital type for displaying three phases reading. Suitable selector switch shall be provided if the digital meter does not have provided for simultaneous display of three phase readings. Voltmeter shall be suitable
for direct line connection. Voltmeters shall be connected through fuses only. Intelligent panel meter shall be provided with incoming feeder for the MCC for the measurement and digital display of multifunctional Electrical Parameters such as voltage, current, active power, reactive power, frequency, power factor, active energy, reactive energy, etc. All motor feeders above 10 HP shall be provided with ammeters shall always be CT operated.

1.6 Special Requirements:

1.6.1 All motor feeders above 10 HP shall have automatic Star Delta Starters and up to 10 HP shall have DOL starters unless specified otherwise.

1.6.2 All motor feeders of rating 15 HP and above shall be provided with ammeters with selector switches.

1.6.3 All motor feeders up to 40 HP shall be provided with MPCB as specified in the feeder details and motor feeders above 40 HP shall be provided with MCCB’s having a minimum breaking capacity as specified in the clause 1.5.2 above.

1.6.4 All the power contactors of Star-Delta starters shall have same current rating.

1.6.5 The following selection table shall be followed for switches & contactors of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>415V motor HP</th>
<th>Contactors Rating AMP.</th>
<th>MCCB Rating Amp.</th>
<th>MCCB Rating Amp.</th>
<th>Type of Starter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UP to 10 HP</td>
<td>16</td>
<td>-</td>
<td>16</td>
<td>DOL</td>
</tr>
<tr>
<td>2</td>
<td>UP to 10 HP</td>
<td>25</td>
<td>-</td>
<td>25</td>
<td>Starter.</td>
</tr>
<tr>
<td>3</td>
<td>20 to 25 HP</td>
<td>32</td>
<td>-</td>
<td>40</td>
<td>-Do-</td>
</tr>
<tr>
<td>4</td>
<td>30 to 35 HP</td>
<td>32</td>
<td>-</td>
<td>50</td>
<td>-Do-</td>
</tr>
<tr>
<td>5</td>
<td>40 to 45 HP</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-Do-</td>
</tr>
<tr>
<td>6</td>
<td>50 to 60 HP</td>
<td>40</td>
<td>100</td>
<td>-</td>
<td>-Do-</td>
</tr>
<tr>
<td>7</td>
<td>50 to 60 HP</td>
<td>70</td>
<td>100</td>
<td>-</td>
<td>-Do-</td>
</tr>
<tr>
<td>8</td>
<td>65 to 70 HP</td>
<td>70</td>
<td>200</td>
<td>-</td>
<td>-Do-</td>
</tr>
<tr>
<td>9</td>
<td>75 to 90 HP</td>
<td>110</td>
<td>200</td>
<td>-</td>
<td>-Do-</td>
</tr>
</tbody>
</table>
For motors of smaller ratings, MPCB with suitable thermal release may also be provided as per the requirement given in the feeder details. The following selection table shall be followed for MPCB & contactors of motor feeders unless otherwise specified:

<table>
<thead>
<tr>
<th>Sl.</th>
<th>415V Motor HP</th>
<th>Contactor Ratings</th>
<th>MPCB RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0.5 to 01</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>02</td>
<td>1.5</td>
<td>16</td>
<td>3.2</td>
</tr>
<tr>
<td>03</td>
<td>02</td>
<td>16</td>
<td>05</td>
</tr>
<tr>
<td>04</td>
<td>03</td>
<td>16</td>
<td>06</td>
</tr>
<tr>
<td>05</td>
<td>05</td>
<td>16</td>
<td>08</td>
</tr>
<tr>
<td>06</td>
<td>7.5</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>07</td>
<td>10</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>08</td>
<td>12.5</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>09</td>
<td>15</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>17.5</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

For capacitors, rating of contactors/switch shall be double of rated current of capacitor.

For incoming feeder of rating higher than 600 Amps., ACB shall be provided unless otherwise stated in the feeder details.

1.6.6 If the outgoing feeder rating is higher than 63 Amp., MCCB shall be provided unless stated otherwise and preferably these shall be located at the lower portion of the panel. These feeders shall also have isolating link for neutral in case 3 pole MCCBs are to be supplied as per the requirement given in feeder details.

1.6.7 Electrical interlocking shall be provided between various feeders as required by the process and specified in feeder details.

1.6.8 If the total operating load on MCC is more than 600 Kw, MCC shall be provided with two incoming feeders with a bus coupler unless specified otherwise. Each incoming feeder shall have independent instrumentation and protection.

1.6.9 Induction motors (above 15H.P) having 3000 RPM shall require higher rating for fuses, contactors and electronic timers due to very high starting current. MCC supplier has to specially check this requirement from Purchaser.
1.6.10 Supplier has to submit GA & power circuit drawing for approval to Purchaser before starting manufacturing of MCC. All the major components of an MCC shall be of same “Make”

1.6.11 The following selection table shall be followed for cables of motors unless otherwise specified.

<table>
<thead>
<tr>
<th>3 phase 415 V</th>
<th>Aluminum Conductor Cable Size-Sq.mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor H.P.</td>
<td>Direct-on-line starter</td>
</tr>
<tr>
<td></td>
<td>Supply Side</td>
</tr>
<tr>
<td>Up to 7.5</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 phase 415 V</th>
<th>Aluminium Conductor Cable Size-Sq.mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor H.P.</td>
<td>Direct-on-line starter</td>
</tr>
<tr>
<td></td>
<td>Supply Side</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>125</td>
<td>-</td>
</tr>
<tr>
<td>150</td>
<td>-</td>
</tr>
</tbody>
</table>
Note: For DOL starter up to 7.5 HP motor 4 sqm. cable should be used.

1.6.12 The following selection table shall be followed for earthing of electrical loads. All earthing shall be made with two runs.

- Control switches/glands – Copper wire 14 SWG
- Motor up to 10 HP – GI wire 8 G.
- Motor above 10 HP up to 125 HP – GI strip 25 x 3 mm
- Motor above 125 HP GI strip 25 x 6mm
- Switch board/ motor control centre- GI Strip 40 x 6mm
- Earthing main in trenches - GI Strip 40 x 6mm
- Cable trays - GI Strip 25 x 3 mm

### ELECTRICAL ITEMS

#### 1.1 MOTOR ISOLATORS (AL. DIE CAST)

1.1 These isolators shall be installed inside the main plant or outside as per the site conditions for isolating the power to the motor. This shall be of metal clad plug & (IP65 protection) type of isolator.

1.2 General Requirement.

1.2.1 The isolator box should be of cast aluminum, dust, vermin and either proof suitable for wall/structural mounting. The enclosure shall be cast out of superior quality Al. Alloy. All the surfaces should be suitably cleaned and the surface must be made smooth. The enclosure should be finally achromatized and coated with epoxy powder by static charge spray method of light grey confirming to shed 631 of IS 5. All external hardware used must be of stainless steel. All the rating surface should be provided with round rubber gasket (min 6mm) in the grove so as to make it effectively dust and vermin roof.

1.2.2 The enclosure box should be of IP 65 class and the minimum size must be 210 x 125 mm. Each isolator must be provided with suitable MCB. Two nos. holes of 3/4 "dia at the bottom for the cable entry must be provided. 30 amps 6-way terminal block is to be provided inside the isolators. All wires/ cables must be terminated using suitable crimping type copper lugs. Two nos. brass screws with washers must be provided on either side of box for earthing.
2.0  CABLE TRAYS

2.1 Functional requirement: Cable trays are used (based on the site condition) for laying the power and control cables inside the plant from PCC to the MCC and wherever required.

2.2 Fabrication: These shall be perforated type, heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS-226 and hot dip galvanized as per IS – 2629/BS-729. Width of cable tray shall be as per the requirement. Height to be minimum 50mm and thickness of plate to be 1.5 mm u to 300mm cable try width. For cable trays having width more than 300mm, height to be 75mm and thickness of plate to be 2.0mm . Cable trays to be supplied to site in standard lengths of 2.5 M. Necessary accessories of cable trays such as coupler side plates for joining cable trays, bends, riser, inside riser, tee etc. must also be factory fabricated. Plain cable tray covers 1.5mm thick to be supplied if specially required. Sample of cable tray to be got approved from COMFED before supply.

2.3 The detailed specifications for various electrical items are provided in the special conditions of contract Electrical installation.

3.0  CABLE CLANDS

These shall be provided at both ends of armoured/unarmored electrical cables. Cable glands shall be manufactured as per performance requirements of BS6121, AMENDED AS ON DATE, WITH BRASS MATERIAL ACCURATELY MACHINED AND NICKEL PLATED. The shall be of heavy duty single compression type for cable conductor sizes above 35 sqmm and weather prof double compression type for cable conductor sizes up to 35 sq.mm. Single compression cable glands will be complete with check nut, gland body, 3nos. metal washers, outer seal rubber ring and compression nut. Double compression glands shall be complete with check nut, gland body, neoprene outer ring, armour clamping cone, armour clamping ring, armour clamping nut, skid washer & outer seal nut.

4.0  CABLE CONNECTORS.

5.1 Cable connectors, lugs/sockets, shall be copper/ Aluminium alloy, suitably tinned, solder less crimping type.

6.0  CABLE INDICATORS.

These shall be self-sticking type and of 2mm thick lead strap for overall cable. PVC identification numbers, ferrule shall be used for each wire.

7.0  CONDUITS.

For lying of cables under floor, GI class ‘A’ pipes shall be used. For laying cable in air whereas cable trays are not being used, MS ‘B’ class pipe shall be used. Size of pipe shall depend upon the overall outer diameter of cable to be drawn through pipe. No pipe
less than 40 mm dia shall be used for this purpose. In dairy process area wherever required SS -304 pipes, 1.6mm thick shall be used.

8.0 LT POWER CABLES

Power cables for use on 415 V system shall be of 1100-volt grade, aluminum conductor, PVC. Insulated, PVC sheathed, armored and overall PVC sheathed, strictly as per IS: 1554 (Part-I) – 1976. The size of cable shall be as specified in cable selection chart. No cable of size less than 4 sq.mm shall be used.

9.0 LT CONTROL CABLES.

Control cables for use on 415 V system shall be of 1100 volts’ grade, copper conductor, PVC insulated, PVC sheathed armored and overall PVC sheeted, strictly as per IS: 1554 (Part-I)– 1976. The minimum conductor diameter shall be 2.5 sq.mm.

SERVICE PIPES, VALVES AND FITTINGS

1.0 The main supply pipe sizes of various utilities shall be designed keeping in view the future expansion/ modifications.

2.0 MATERIALS FOR PIPING

For raw water and soft water, chilled waterlines: Galvanized steel (ERW) IS 1239-3589, 3601, 4736 (medium duty)

2.1 For steam lines and compressed air line: MS “C” class pipes (ERW) IS 1239-3589, 3601, 4736.

<table>
<thead>
<tr>
<th>Service</th>
<th>Size</th>
<th>Specification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP Steam 03</td>
<td>02</td>
<td>16</td>
<td>05</td>
</tr>
</tbody>
</table>

Flanges/counter flanges shall be as per BS tables:
- Table F for HP & LP steam
- Table D for Water.
- Table E for Ear.

4.0 For pipeline sizing following velocities of the fluid shall be considered.

4.1 LP steam : 20m/s.
4.2 Water steam : 3m/s.
4.3 Air : 20m/s.

5.0 Note: The payment shall be paid ON LOT BASIS for all pipes and valves. The cote of accessories like flanges, counter flanges, bolts, nuts, bends, tees, gaskets, clamps, PUF saddle for CW lines, structural supports, anchor fasteners associated civil works etc, are
to be included in the cost of piping. The bidders have to workout the total quantity for each of the services based on the service pipe layout and the respective service schematic and quote their rates accordingly.

4.0 GENERAL TECHNICAL REQUIREMENT FOR PUMP, PHE & TANKS.

1.0 SS milk & CIP Pumps.

Pump impeller and casting shall be of AISI 316 for all process pumps. Prime mover: 3 Phase, 415 V (+10%), 50 Hz (+5%), TEFC squirrel cage AC INDUCTION MOTOR WITH Class “F” insulation of suitable HP as per I: 12615-2004 Eff 1.

2. MATERIALS FOR PIPING

For raw water and soft water, chilled waterlines:

Galvanized steel (ERW) IS 1239-3589, 3601, 4736 (medium duty) Stainless steel (AISI 316) inlet and outlet should end in stainless steel complete SMS union. Quick opening sanitary fittings.

The motor part of the pump should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

All stainless steel surfaces are to be polished to 150 grits.

Pump for CIP return shall be self-priming.

The sealing gaskets must ensure complete sealing and prevent any cross leakage between product and service liquids. Gaskets shall be of sanitary type. It should be of “SNAP-IN/LOC IN” glue-less type made out of EPDM.

The inlets and outlets for chilled water/hot water and product should be provided with complete stainless steel (AISI304) forged type SMS unions.

All weld joints are to be ground smooth and finished to 150 grit. All stainless steel surfaces are to be polished to 150 grits.

Essential special tools should be supplied with each PHE without charging any extra cost. The supplier shall supply minimum 20% of each type of gasket as spares along with the plate pack free of cost for each PHE.

Thermo well and provision for RTD sensors for digital thermometers and temperature transmitter and each inlet and outlet port of each section shall be provided.

The plate diagram should be submitted.
A safety device should be provided in the hot water side of heating section (plate pack) to avoid damage to the heat changer caused by excessive pressure. It should be of sanitary design.

A suitable steam pressure reducing valve, steam control valve with PID controller along with by-pass valves should be supplied with the pasteurization plant so that the steam pressure is limited within 1.5 kg/cm2.

The condensate assembly from the pasteurizer shall end with a CS trainer; float type steam trap and by-pass SS ball valves.

Automatic controls should be provided to insure that the pasteurization temperature is maintained. If the required temperature is not reached, the flow of product should be automatically diverted back to the float balance tank with an audiovisual electric horn. The flow diversion valve shall be of electro pneumatic type. The temperature accuracy should be plus minus 0.50°C.

A name plate of suitable size and its fixing bracket made out of AISI 304 material shall be provided on the front supporting block.

3.0 SS Storage tank

The volume of the tank should be such that after filling it up-to the rated capacity, the level would be 100 mm below the line where cylindrical shall joints the conical tip.

The only metal to metal contact between the inner and outer shells should be at the places where fittings for the tank are provided.

All stainless steel welding joints are to be ground smooth and polished to 150 grits. All stainless steel surfaces shall be left with original mill finished or polished to 150 grits.

The insulation should be applied in staggered joints. All joints should be sealed with bitumen. The bitumen should be applied uniformly on both the surfaces of first and second layers of insulation and on inside surface of third layer of insulation.

Suitable size of man way at appropriate location shall be provided with the storage tanks. Sampling Cock should be provided on the inlet-cum-outlet nozzle pipe and should be in stainless steel (AISI 304) CONSTRUCTION WITH SANITARY DESIGN.

All SS storage tanks shall be provided with high and low level probes and level transmitter. Thermo well of 25mm AISI 304 10 G pipe with ¾”BSP thread shall be provided. The portion of the thermo well, which is in the jacket, should be insulated with rock wool or equivalent and totally shrouded so that hot water or chilled water does not come in contact with the insulating material.

Lifting lug 16mm thick stainless steel (AISI 304) lifting lugs should be provided at tip- 3 nos.
The tank shall be manufactured following good manufacturing practices.

General arrangement of this equipment should be as per the attached reference drawing. A name plate of size 1580 mm x100 mm and its fixing bracket made out of (AISI 304) material shall be provided.

Drive unit for agitator: The driving geared motor for the agitator shall be of suitable capacity with helical gear and minimum service factor of 1:4. The geared motor shall be complete with key in the driven shaft, oil level indicator, oil filling plug, oil breather, drain plug and suitable geared out for the first charge of the geared motor to be provided. The electric motor shall be energy efficient TEFC, squirrel cage induction type with IP55 degree of protection with class “C” insulation, suitable for 415V(+/- 10%) three phase AC supply. Performance of motor in general should confirm to IS: 12615-2004 Eff 1 values. The geared motor should be provided with stainless steel (AISI 304) shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

Safety valve for steam release and pressure gauge on the main steam inlet nozzle should be provided for jacketed vessel.

SS milk storage tanks of 30 KL and above shall be provided with side agitators.

Condensate outlet assembly should be provided with strainer, float type steam trap, sight glass and bypass valve arrangement. It should be provided with suitable flange joint for each removable component for jacketed vessel.

MILK RE-CONSTITUTION SYSTEM: - TERBOBLENDER TYPE
(CRATE WASHER WITH DRIER)

1.0 FUNCTIONAL REQUIREMENTS.
Crate washer should be designed for washing HDPE; pouch crates of 10 liters capacity of ‘Prepac’ Nagema and ISI type.

2.0 DESIGN REQUIREMENTS.
2.1 Capacity: (Minimum) 800 Crates per hour.
(Maximum dimensions of crates L-570, W- 378, H-175)
Configuration: Straight through, single track

2.3 Washing Sequence
2.3.1 Fresh Water Pre-rinse: Pressure hot water first rinse having minimum 3.5 kg/Sq cm discharge head and 55 Deg. C temperature (Return water from the after rinse shall be used). 2.3.2 Pressure hot detergent rinse having minimum 3.5 kg/sq cm discharge head and 70 Deg. C temperatures.
2.3.3 Pressure hot water after having rinse minimum 3.5 kg/sq cm discharge head and 80 Deg. C temperature

2.4 **Available Services.**

2.4.1 Steam: at pressure 3 kg/sq. Cm(G).

2.4.2 Water: Raw/ Soft water at 2.to3 Kg/Sq cm pressure

2.4.3 Air drying at 70 Dg. C. temperature.

2.4.4 Electric power: 3 Phase, 415 V (+10%), 50 Hz (5%) electrical power supply from MCC to terminal box of the crate washer.

2.4.5 Finish: All welding joints are to be ground flush and all stainless steel surfaces are to be polished to 150 grits.

2.4.6 Temperature Control: It should have temperature control of detergent tank and hot water.

2.0 **SCOPE OF SUPPLY**

3.1 Main Enclosure: The main enclosure which houses washing & sterilizing sections should be made from 2mm thick stainless steel sheet conforming to AISI 304. For easy accessibility, it should contain removable stainless steel AISI 304 inspection doors all along the length on both sides. Crates guides should be provided all along the length on both sides of crate washer.

3.2 Under Frame: The complete under frame should be made from SS 304 pipe section. The assembly should have sufficient number of SS 304 legs with the stainless steel ball feet having 50mm vertical adjustment.

3.3 Conveyor chain and drive system: The conveyor chain shall be made of poly acetyl chain link with SS connecting pins. The operation of chain system should ensure proper spacing between the individual crates. The drive motor, transmission drive shaft and idler shaft should have adequate and accessible provision for adjustment and tensioning. The motor for the conveyor shall be 3 Phase, 415 V (+ 10%), 50 Hz (+ 5%), TEFC, squirrel cage ac INDUCTION MOTOR WITH CLASS “Insulation of suitable HP. The drive should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismantleable. It should have provisions for air circulation and entry of electric cable.

3.4 **Washing Stations.**

3.4.1 Washing: The pumping and jetting arrangements should supply sufficient washing liquid to the inside and outside surfaces of the crates.
3.4.2 Filter: A pressure filter should be provided in the liquid (hot detergent) re-circulation line to prevent choking of pump impeller and stainless steel 304 adjustable nozzles. The filters shall be fabricated from AISI 304 SS material.

3.4.3 Sump Tanks (3nos): These tanks should be made from stainless steel conforming to AISI 304 and would be used as feed tanks for various washing liquids. Correct operating levels shall be maintained automatically in tanks with necessary SS 304 float valve assembly.

There should not be any inter mixing between different liquids. Necessary strainers shall be provided in the sump tanks to prevent choking of pump impeller.

3.4.4 Water Heating Arrangements: For hot water, direct steam injection system should be providing using steam water ejector for mixing steam with water. In case of detergent heating, indirect steam heating system using SS 304 coil should be used. The heating coil shall end with a steam trap. Condensate from the heating coil should be discharged in to hot water tank for heat recovery. Temperature of liquids will be maintained by main static controls. Suitable drain points shall be provided to drain the used liquid.

3.4.5 Air Heating Arrangement: Drying of crate s should be done by hot air at drying temperature 70 Deg. C. The hot air dryer consist of an axial fan blowing directly in to two heaters. The blower, air heater and ducting etc. should be provided. The impeller housing of blower and ducting should be from SS 304 whereas coil of air heaters and fins should of copper. The first heater recovers heat from condensate discharged by steam traps The second heater is a steam heater unit to raise the air temperature to 70 Deg. C. All the sections of the dryer are radically accessible through lift out panels.

3.4.6 Jet Nozzles: One lot of adjustable angle type nozzles made of stainless steel conforming to AISI 304 should be provided. The jet nozzles shall be removable type for easy cleaning.

3.4.7 Pumps: (3 Sets).

Suitable capacity centrifugal mono bloc type pump sets having cast iron impeller, cast iron body, and SS shaft having 35 MWC discharge pressure shall be supplied The pump should be provided with flanged type electrical motor with mechanical sealing arrangement. The pump and drive should be integrate together. The motor shall be 3 Phase, 415V (+10%), 50Hz (+5%) TEFC, squirrel cage ac induction motor with Class “F” insulation of suitable HP. Suitable The motor part of the pump should be provided with stainless steel AISI 304 shroud. The shroud should be easily dismountable. It should have provisions for air circulation and entry of electric cable.

3.5 Instrumentation: Suitable connections/thermo well shall be provided on the delivery side of the pumps and on the sump tanks for fixing pressure and temperature gauges. The temperatures and pressures of delivery sides of pumps and sump tanks should be indicated on an instrument panel located on main enclosure. Instrument panel fabricated
from SS 304 with acrylic cover should contain dial type pressure gauges and digital temperature indicator (with automatic selection of measuring points).

3.6.1 Electrical Control Panel.

Main Enclosure: The enclosure and the supporting structure shall be made from Stainless steel sheet conforming to AISI 304. The enclosure shall be made out of 2mm thick SS 304 sheet and shall be moisture, dust and vermin proof. The panel shall be mounted on the top of the crate washer near to the drive end for operator convenience.

3.6.2 Push Buttons and Indicating Lamps: It should contain ON/ OFF push buttons and indicating lamps for all the motors. All indicating lamps shall be LED type and shall contain related inscriptions. The panel should also have an emergency lockable switch to stop total operation of the crate washer in case of emergency.

3.6.7 Wiring: The control panel should be completely pre-wired. The wiring should be done by ISI quality copper cables and should be dressed in accordance with the standard practice.

3.7 Termination points: All distribution piping should be pre-assembled and terminated at a single flange for each service connections.

3.8 SPARES' BOX: The spares box fabricated from GI 20 G: Sheet size 900mm x 400mm height with hinges and lockable arrangement (including Godrej Naval Lock) which consists of following items, shall be supplied along with the crate washer.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item description</th>
<th>Qty</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>100 ML container of FEVICOL ANRO 1 solution to lock conveyor nuts.</td>
<td>1</td>
<td>No.</td>
</tr>
<tr>
<td>2</td>
<td>100 ML container of FEVIBOND adhesive for mounting rubber seals.</td>
<td>2</td>
<td>No.</td>
</tr>
<tr>
<td>3</td>
<td>Window rubbers</td>
<td>5</td>
<td>M</td>
</tr>
<tr>
<td>4</td>
<td>Door rubbers</td>
<td>15</td>
<td>M</td>
</tr>
<tr>
<td>5</td>
<td>Discharge filter gasket</td>
<td>4</td>
<td>No.</td>
</tr>
<tr>
<td>6</td>
<td>Discharge filter nylon bags</td>
<td>25</td>
<td>No.</td>
</tr>
<tr>
<td>7</td>
<td>Conveyor poly-acetyl links and SS linchpins</td>
<td>10</td>
<td>No.</td>
</tr>
<tr>
<td></td>
<td>V-belts</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Detergent nozzles (tips only)</td>
<td>10</td>
<td>No.</td>
</tr>
</tbody>
</table>
3.9 The following information is to be furnished by the bidder:

A) - For pumps

<table>
<thead>
<tr>
<th>Pump details</th>
<th>Unit</th>
<th>Details to be furnished by the bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make of pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model no.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity of pump</td>
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<td></td>
</tr>
<tr>
<td>Head</td>
<td>MWC</td>
<td></td>
</tr>
<tr>
<td>Pump efficiency</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Inlet/outlet size</td>
<td>Mm/mm</td>
<td></td>
</tr>
<tr>
<td>BKW</td>
<td>KW</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>KW</td>
<td></td>
</tr>
<tr>
<td>Motor RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor make</td>
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</tr>
<tr>
<td>Motor efficiency</td>
<td>%</td>
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</tbody>
</table>
FILLED CRATE CONVEYORS

1.0 FUNCTIONAL REQUIREMENT:

The conveyors shall be used to transport empty HDPE crates from the outlet of crate washer to pouch filling machines and HDPE crates filled with milk (in polythene pouches) from the packing table to the milk Cold Store. The filled crates shall be manually loaded on to the conveyor, which is passing below a pouch-crating table.

2.0 Design requirement:

Capacity : 800 Crates per hour (Minimum)

Type : Floor mounted, self standing, chain conveyor with suitable drive. (Minimum dimensions of crates L-570, W-378, H-175)

A specialist manufacturer shall design and fabricate the conveyor. The detailed design and fabrication of the conveyor is the responsibility of the bidder. The conveyor dimensions shall be machine other components of the pouching system such as belt conveyors, pouch crating table, roller conveyor etc. However the Purchaser shall approve the general arrangement drawing for the conveyor.
3.0 SCOPE OF SUPPLY

FRAME

The conveyor shall have stable structure framework fabricated using hot dip galvanized Indian standard square/circular steel sections. The thickness of the galvanization shall be minimum 80 microns and shall be carried out as per IS standard. The conveyor shall be supplied on an adjustable ball foot.

Geared motor (IP55) of suitable rating, complete with sprockets, idlers etc. An SS protection cover shall be provided for the drive, chain etc. the drive shall be of reputed make. CHAIN & TRACK

The chain shall be poly-acetyl moving in a track of suitable material and type.

4.0 ACCESSORIES TO BE SUPPLIED

4.1 Trough for chain dips cleaning:

An SS 304 trough of suitable size to hold the water for the chain dip cleaning with drain valve (Audco make ball valve) shall be provided.

4.2 Lubrication

Suitable lubrication arrangement for the poly-acetyl chain is to be provided. The bidder shall furnish the details.

The cost of all the accessories (4.1 and 4.2) shall be included in the cost of the chain conveyor and nothing extra shall be paid.

MILK POUCH FILLING MACHINE (MECH. TYPE WITH PHOTOCCELL).

1.0 FUNCTIONAL REQUIREMENTS

The milk would be fed by gravity flow to the float operated bane tank of the twin head mechanical type pouch- filling machine. The machine should form pouches of film, fill with milk and seal the same.

3.0 DESIGN REQUIREMENTS.

<table>
<thead>
<tr>
<th>Capacity (Minimum)</th>
<th>Minimum 5000 packs/ Hr of size 200 ml. or 500ml. or 1000 ml.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>+0.5% for 1000ml.</td>
</tr>
<tr>
<td>Elec. Power</td>
<td>3 Phase, 415 V(+/-10%),50 Hz.(+/-2%),4wire.</td>
</tr>
<tr>
<td>Cooling water</td>
<td>3 to kg/sq. cm at less than 20 Deg. C</td>
</tr>
<tr>
<td>Finish</td>
<td>All stainless steel inner surfaces are to be polished to 150 grits.</td>
</tr>
</tbody>
</table>
3.0 SCOPE OF SUPPLYS

3.1 The machine: The double head mechanical type pouch filling machine should automatically form, fill land seal milk in pouches from polyethylene film, continuously supplied from a roll. The design of the machine should be hygienic. All the milk contact parts of the machine should be made from stainless steel conforming to AISI 304. All the functions of the machine shall be controlled using cam timer switches and the machine shall be mechanical cam operated.

3.2 Float Balance tank: Stainless steel AISI 304 float balance tank of capacity at least 50 litres should be provided at the top of the pouch-filling machine. The balance tank shall be provided with mechanical type float valve and an overflow connection ending in a SS 304 sanitary type ball valve. The overflow SS pipe is to be extended down up to the bottom of the machine.

3.3 The machine should consist of SS 304 body built on a treated aluminum chassis. All sub-assemblies are to be mounted on these plates. All tapped holes on chassis shall have helical steel inserts for longevity of chassis.

3.3.1 Spool bearer Assembly & Film guide: The heat sealable film rolls up to 20 kgs shall be mounted on spool bearer at the rear bottom of the machine. The spool bearer assembly should be sliding type to facilitate easy change-over the film roll. The spool roller bracket assembly shall be made of SS 304 material. The film layer is then passed through various rollers and subassemblies such as:

- End of film
- Film loosening
- Film brake etc.

Subsequently, it should be passed over a set of ultra violet tubes for sterilization of the film. The film layer should then form into a tube.

3.3.2 Vertical seal: The film shall be overlapped and sealed into a tube by vertical electrode. The jaw should be mechanical cam operated and shall be of water-cooled. The vertical jaw support hall be or SS 304. The vertical electrode winding rod support shall be of Aluminium and necessary slots are to be provided for easy cleaning.

3.3.3 Downward feed: Downward movement of the film tube should be controlled by a set of rubber nip roller driven by a motor through a reduction gear unit and electromagnetic clutch break system.
3.3.4 Injection system: The product from the float balance tank is passed through injection tube into the film tube. The filled quantity of the product in each pouch is controlled by opening of the valve at the lower end of the injection tube. The flow of product through injection tube in the pouches should be continuous and the sealing should take place through the product.

3.3.5 Horizontal seal: The horizontal sealing and cutting should take place at the same time by the horizontal electrode mounted on the fixed horizontal jaw. The fixed horizontal jaw is water-cooled. The rear moving jaw shall be mechanical cam operated.

3.3.6 Electrical control panel: The indicating lamps, electrical switches, control relays, solid state variacs, digital pouch counter, Hour meter etc. should be mounted in this panel. Only MCB’s are to be used instead of HRC FUSES. The machine shall also be equipped with single phase 5 Amps and 15 Amps adaptors. Facility to transfer pouch totalizer data to the computer/PLC system shall be provided.

3.3.7 Drive System: The machine shall be equipped with dual drive assembly to control the pouch length of individual head separately.

3.3.8 Photo mark Scanner:

The machine shall be provided with photocell on each head with all mounting arrangement to control the length the pouch.

3.3.9 The machine shall also be provided with the following additional features:

- Individual head operation shall be possible. Option of packing 1 litre on one head and ½ litre on another head should be possible at the same time.
- Auto operation facility shall stop the machine and audiovisual alarm should be provided if the film roll is exhausted.
- The machine should stop automatically if any obstacle comes in between horizontal jaws.
- Emergency switch to stop the machine shall be provided on front side of the machine.
- The machine should stop automatically for milk ending and also for the overlap of film.

3.3.10 Facility to insert a closed circuit in place cleaning system for the machine shall be provided. The CIP adaptors and hoses are in the scope of supply.

3.3.11 Date coding device: It shall be heat embossing type, 12 characters with each character if 3mm height and facility to accommodate digits.

3.3.12 Tools: Essential special tools should be supplied with the machine without charging any extra cost.

4.0 Manufacturing Code:

The equipment shall be manufactured following good manufacturing practices.
5.0 Statutory Requirement:

The pouch-filling machine shall be duly stamped by the weight and measure department and the test certificate shall be submitted by the supplier.

6.0 Remarks

6.1 The supplier should furnish along with the offer the following details in absence of which the offer will be treated as incomplete.

<table>
<thead>
<tr>
<th>CAPACITY OF MACHINE</th>
<th>...... PACKS/ Hr of sizes 200 ml. or 500 ml. or 1000 ml.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy of filling at 200ml, 500 ml. and 1000ml.</td>
<td></td>
</tr>
<tr>
<td>Leakage% on 200ml, 500ml and 1000ml pouches.</td>
<td></td>
</tr>
<tr>
<td>Weight &amp; dimension of the pouch filling machine</td>
<td></td>
</tr>
<tr>
<td>Utility consumption</td>
<td></td>
</tr>
<tr>
<td>Electrical power.</td>
<td>Connected ........ KW</td>
</tr>
<tr>
<td></td>
<td>During operation .... KW</td>
</tr>
<tr>
<td>Cooling water</td>
<td>.... LPH at .... Deg. C.</td>
</tr>
</tbody>
</table>

STEAM & WATER MIXING BATTERY

1.0 FUNCTIONAL REQUIREMENTS

It would be used for generating hot water for washing dairy floor and other uses.

2.0 DESIGN REQUIREMENTS.

2.1 Operating Principle: Principle of operation should be direct injection of steam in to water.

3.0 SCOPE OF SUPPLY

3.1 STEAM Valve: ½” three pieces ball valve with SS working stainless steel working parts – 1 no.

3.2 Water valve: ½” three pieces ball valve for water – 1 no.
3.3 Non return valve: ½” non return valves on both steam and water lines, - 2 no.
3.4 Steam Mixing Chamber: It should be made of chromium plated gun metal - 01 no.
3.5 Out Let: 1/2” Tapered outlet for connecting rubber hose. It should be made of chromium plated gun metal.
3.6 Bracket: It would be used for hanging rubber hose and should be made of chromium plated mild steel – 01 no.
3.7 Clamp: Serrated strip type metallic hoe clamps for each battery should be supplied - 2 no. each.
3.8 Hose Pipe: A rubber hose pipe of diameter ½" should be supplied loose with each battery. It should be suitable for use of hot water and steam – 10 m. Each.
3.9 Spray Gun: A suitable water spray gun should be provided at the end of the hose.

**MILK POUCH CRATE TROLLEY**

<table>
<thead>
<tr>
<th>functional requirement</th>
<th>It would be used to transport milk filled crates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Requirement</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>One stack of 6 to 10 crates</td>
</tr>
<tr>
<td>Operation</td>
<td>The crate trolley is to be driven manually.</td>
</tr>
<tr>
<td>Scope of supply</td>
<td>The trolley should be made from milk steel. The complete trolley should be galvanized after fabrication. The wheels should be of rubber with mild steel (galvanized). The rubber should be adoration free and suitable to work under load. The dia of the wheel should be 250 mm.</td>
</tr>
</tbody>
</table>

**TECHNICAL SPECIFICATION AND SCOPE OF SUPPLY OF MILK STORAGE SILO**

CAPACITY: 100 KL

**SCOPE OF SUPPLY**

Supply of 100 KL Vertical Milk Storage Silo with Side entry agitator.
FUNCTIONAL REQUIREMENT

The milk silo would be used to store chilled raw / pasteurized milk at 4 °C temperature and shall be installed outside.

DESIGN REQUIREMENTS

Capacity: 100,000 Liters.

The volume of the tank shall be such that after filling it up to the rated capacity, the level would be 100 mm below the line where cylindrical shell joins the conical top.

Constructional Features:

The tank shall be vertical, double walled, Insulated and welded construction of sanitary design. The vessel shall be made of SS conforming to AISI 304.

Slope:

The bottom of the silo shall have 1:15 slope towards inlet cum outlet for free and complete drainage of liquid.

Metal Contact:

The only metal-to-metal contact between the inner and outer shells shall be at the places where fittings for the tank are provided. At the places where mild steel stiffeners are provided, insulated padding shall be fixed between the inner stainless steel shell and stiffeners.

Finish:

<table>
<thead>
<tr>
<th>Internal Surface</th>
<th>Original 2B Mill Finish / 150 Grit Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Surface</td>
<td>Original 2B Mill Finish with all burs removed.</td>
</tr>
<tr>
<td>Weld-joint</td>
<td>Ground smooth &amp; finished to 150 Grits.</td>
</tr>
<tr>
<td>MS Stiffener</td>
<td>Two coats of epoxy primer after proper de-rusting.</td>
</tr>
</tbody>
</table>

Joint Curvatures:

The radius of all welded and permanent attachment joints shall be at least 6 mm. where the conical top and flat bottom join the cylindrical shell and radii shall not be less than 25 mm.

Installation:

It shall be suitable for outside installation. Accessories mounted on top shall be weather proof.
**SCOPE OF SUPPLY:**

**Inner cylindrical body:**

The inner shell & conical top shall be fabricated from 3mm thick stainless steel conforming to AISI 304. The inner flat bottom shall be fabricated from 4mm thick stainless steel conforming to AISI 304.

**Outer cylindrical body:**

The outer shell & conical top shall be fabricated from 2mm and 3mm thick stainless steel respectively conforming to AISI 304.

**Insulation:**

The entire inner shell (including alcove portion), conical top and flat bottom shall be insulated as follows:

Inside of Outer shell & Outside of Inner shell shall be coated with two coats of Black Bituminous Paint:

1st layer- 15 mm thick Polyurethane having density 30-35 Kg/m3 each longitudinally.

2nd layer - 50 mm thick Expanded Polystyrene foam having density of 16- 20 Kg/m3 applied radially in staggered joint with CPRX compound Sealing.

3rd layer - 50 mm thick Expanded Polystyrene foam having density of 16- 20 Kg/m3 applied longitudinally in staggered joint with CPRX compound Sealing.

4th layer – 42 SWG (0.1mm thick) Aluminum foil shall be covered over the insulation on shell. This is for the Moisture control.

Suitable stiffeners shall be providing as per approved design. All the cladding joints shall be welded in design.

**5.0 Accessories**

**Alcove:**

The alcove arrangement shall be of size 1800 mm X 1500 mm and projecting 900 mm from the silo with bottom plate. The alcove shall accommodate thermometer pocket, level transmitter, inlet cum outlet, low level switch, sampling cock and man-way. The Alcove shall be provided in welding construction.

**Inlet cum Outlet:**

100mm diameter cup type inlet cum outlet with manual operated butterfly type valve (size 76.1mm) stainless steel (AISI 304) flanged valve ending in complete stainless steel union.
Air Vent:

Stainless steel (AISI 304) 450 mm dia. Standard design air vent to prevent formation of particle vacuum during CIP and pressure during filling.

Man-way:

Stainless steel (AISI 304) side elliptical man-way of 405mm x 550mm diameter and located at the bottom of the silo and provided with air tight hinged insulated stainless steel (AISI 304) door with tightening and locking device. The man-way door gasket shall be neoprene or nitrile rubber of food grade quality.

Light Glass:

Stainless steel (AISI 304) light glass assembly shall be provided with toughened glass and stainless steel lamp shade for mounting 24V, 100 watt bulb. The lamp holder shall be made from brass.

Side Agitator:

Side mounted mechanical agitator with 3 blade propeller type impeller having sweep dia. of ~300mm. Agitator shall provide with 7.5HP @ 6 or 8 Pole motor of BBL / ABB Make, single dry mechanical seal of Burgmann Make & Bearing Housing. The agitation system to ensure uniform mixing & agitation of the milk. The agitator shaft shall be made of SS rod. The motor shall be provided with SS weather proof cover for protection. 1 Set

Level Indication:

Sanitary type liquid level indicator and transmitter shall be provided. All the milk contact parts shall be of SS 304 material. The liquid level indicator shall be diaphragm type. Suitable level indicators shall be provided to indicate the leveling the silo. It shall work on 24 V DC, two wire type. It shall be duly calibrated and shall have an accuracy of ± 0.25%. 1 No.

Spray Ball:

Removable stainless steel (AISI 304) cleaning device located at the apex of the conical tope to provide for flooding of liquid over the complete interior surface during CIP. The spray ball shall be of 100mm dia. stationary type with holes 180 deg. This shall be connected to 51mm dia. SS pipe and with stainless steel SMS union at the outer end connection with blind end. 1 No.

Sampling Cock:

Sampling cock shall be provided on the Inlet, cum Outlet and will be stainless steel constructions of sanitary design. 1 No.

Level Probe and socket:
High level, Medium Level (Agi. Cutt off Sensor) and Low level probe with provision shall be provided of E & H make.

**Thermo well:**

200 mm long stainless steel (AISI 304) inclined pocket suitable for monitoring stem type dial thermometer / temperature sensor shall be suitably located in the alcove. It shall have 21mm BSP male threads. Thermometer / PT 100 (Temperature sensor) of radix make shall be provided. The temperature indicator shall be housed in SS control panel.

**Drain Hole:**

The outer shell shall be provided with one or more drain holes at the lowest point. Any aperture in the shell shall be designed so as to prevent ingress moisture.

**Lifting Lug:**

Stainless steel (AISI 304) lifting lugs shall be provided at top. 4 Nos.

**Anchor Points:**

Anchor points, pipes and socket shall be provided on top of the tank so that safety railing and platform shall be welded to them after installation.

**Sight Glass:**

Stainless steel (AISI 304) sight glass assembly shall be provided with toughened glass. It shall be provided in such a way that one can easily read from the lowest level up to the highest level marks.

**Railing:**

The necessary railing of 900mm height in SS 304 shall be provided with the help of 38.1mm & 25.4mm OD tube which is 1.6mm thick. The toe guard of 150mm x 2mm thick in SS 304 shall also be provided. The railing pipe shall be supplied loose and shall be assembled / welded at the site as per the requirement.

**Sand blasted Level Marking:**

It shall be calibrated at 500Ltrs. Interval provided on the inner shall at opposite side of sight glass.

**Paintings:**

All the mild steel stiffeners used in the construction of the silo shall be painted with two coats of epoxy primer after thorough de-rusting.

**Control Panel:**
SS 304, 2mm thick control panel shall be provided comprising with Level indicator, Temperature indicator, Cyclic timer & soft starter for agitator, Push buttons, On/off buttons, Alarm & internal wiring of panel.

**TESTS**

The following tests shall be conduct by supplier at their works.

Dye penetration test for weld joints. Water fill-up test of inner vessel for water tightness before insulation. Final inspection prior to dispatch including agitator trial needs to be provided. When manway is closed and covered tightened without gasket then the gap at any place between the man-way neck and cover shall not exceed 0.5mm.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Qty.</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydrostatic type Level Transmitter of DN 65 DRD flange</td>
<td>1</td>
<td>E &amp; H</td>
</tr>
<tr>
<td>2</td>
<td>Level Indicator, suitable for level transmitter.</td>
<td>1</td>
<td>West</td>
</tr>
<tr>
<td>3</td>
<td>Tuning fork type High, Medium (Agi. Cutt off sensor) &amp; Low Level Switches.</td>
<td>3</td>
<td>E &amp; H</td>
</tr>
<tr>
<td>4</td>
<td>Temperature Sensor – PT 100, 12” Long ½” BSP end conn., Range : 0 to 150 deg. C</td>
<td>1</td>
<td>Radix</td>
</tr>
<tr>
<td>5</td>
<td>Temperature indicator</td>
<td>1</td>
<td>Radix</td>
</tr>
<tr>
<td>6</td>
<td>Control panel</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Milk Pasteurization Plant with all accessories**

Capacity : 20 KLPH

Make : Tetra Pak / APV / GEA only

Function: This shall be used for pasteurization of fresh as well as reconstituted milk and subsequently chilling it.

Design Parameters:

- Temperature Programme : 12-45/55-60/65-80-4 Deg. C
- Raw milk feed temperature : 12 Deg. C
- Holding time for pasteurization. : 20 Sec.
- Finished milk discharge temp. : 4 Deg. C
- Heat regeneration : 93%
- Chilled water feed temp. : 1.5 Deg. C
- Chilled water flow rate : 3 times the milk flow Rate.
Required water and compressed air to be made available. Bidder to specify complete technical data of the pasteurizer.

Finish: All welding joints shall be ground smoothly. All stainless steel surfaces are to be polished to 150 grits.

Scope of Supply:

Heat Exchanger - Plate Pack

**Plates:** The plates shall be made from stainless steel conforming to AISI 316 and shall be of sanitary design. All the milk contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

**Gaskets:** The sealing gaskets shall ensure complete sealing and prevent any cross-leakage between product and service liquids. Gaskets shall be of sanitary type (SNAP IN TYPE)/Loc-in-type. These shall be continuously bonded to the heat transfer surface. Gasket shall be made of nontoxic, fat resistant, nonabsorbent and should be smooth surface materials.

The gaskets material shall be of food grade rubber and shall withstand a water sterilization temperature of 100 degree C and 2% caustic solution at 80 degree C. Gasket material shall be non-toxic, fat resistant, non-absorbent and shall have smooth surface.

**Holding section:** It shall be designed for continuous holding of the product for at least the minimum specified holding time at the pasteurization temperature. The tubes shall be made of SS 304. The holding section shall be tubular type on supporting stand.

**Supporting frame:** The supporting frame for the plate pack shall be of a self-supporting design made of stainless steel (AISI 304) cladded mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/cm2.

**Accessories:**

**Inlets/Outlets:** The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions.

**Thermo-wells:** Stainless steel (AISI 304) pockets for thermometer/sensors on all the inlets and outlets of products and services. Each pocket shall be complete with a stainless steel (AISI 304) guard for mounting glass thermometers/PT 100 sensors.

**Ball feet:** The frame shall be provided with adjustable stainless steel ball feet with provision for height adjustment of 50mm.
Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Float Balance tank: The suitable capacity of balance tank shall be fabricated from 2 mm thick stainless sheet conforming to AISI 304. The tank shall be provided with cover, sanitary type SS 304 float valve with no foam milk inlet, outlet, return milk inlet, inlet for water, over flow, high & low level probes, and adjustable stainless steel ball feet. The float valve should be designed to withstand inlet pressure of 3 Kg/cm².

Milk pump: The pasteurizer stainless steel feed pump shall be of sanitary design as per dairy standard. Its capacity shall be 50% higher than that of the capacity of pasteurizers. The pump shall generate head of 30 MWC. The TEFC drive squirrel case motor shall be fitted with stainless steel shroud with louvers for air-cooling and suitable arrangement for cable connection. All other specifications shall be same as mentioned anywhere else for the centrifugal pump.

A suitable capacity Booster Pump in order to maintain the positive pressure on the pasteurized milk side.

Flow controller: Stainless steel flow control device is required to automatically maintain the required flow rate under varying pressure conditions. The flow controller shall be of a sanitary design and shall be suitable for the continuous run against the increased resistance due to milk scale formation.

Duplex Filter: Duplex filter in standard design made from 2 mm thick SS plate shall be provided for hot milk filtration prior to centrifugal separation.

Heating Device: Final stage of heating shall be done with steam heated water. The hot water generation system shall be through a hot water PHE. The heating section shall be complete with PHE, hot water pump, necessary inter connecting pipes & fittings. The hot water pump shall be industrial type of Grundfoss make.

Ball Feet for floor mounted equipments: All the floor mounted equipments shall have ball feet with provision for height adjustment of 50 mm.

Instrumentation and control panel:

Automatic controls shall be provided to ensure pasteurization temperature of product. If the required temperature of product is not reached, the flow of product shall be automatically diverted to the float balance tank with an audible alarm. The flow diversion valve shall be of pneumatic type.

The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip PID controller for temperature of
pasteurized product with display of set temperature and actual product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

Six-point strip chart recorder shall be provided.

Audio alarm with hooter and acknowledge and reset push button.

Auto manual selection switches and forced forward flow provision i/p convertor for steam control valve operation and electrically operated solenoid valve for air supply to flow diversion valve.

Air pressure regulator cum moisture separator with isolating valve cum air filter to ensure proper air supply to the i/p convertor and solenoid valves.

**INCOMING ON/OFF SWITCH FOR CONTROL SUPPLY.**

Ten sets of `on` and `off` push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various modules. (Two numbers spare push buttons are included) indication lamp for showing the Position of Flow Diversion Valve (Forward/Diverted Mode)

**PIPES AND FITTINGS (SS 304): All Inter Connecting Pipes With Necessary Fittings For Product As Well As Service Shall Be Supplied Within The Specified Battery Limits And Exclusions.**

**PRODUCT:** The Supply Shall Include All the Necessary Ss 304 Pipes And Fittings From Float Balance Tank To The Finished Pasteurized Product Outlet As Required Interconnecting The Above Equipment.

**HOT WATER:** The Supply Shall Also Include Necessary Ss 304 Pipes and Fittings For Pumping Hot Water To The Heating Section Of The Pasteuriser And Return To The Hot Water Set.

**TOOLS:** Essential special tools shall be provided along with 20% spares gasket and 2 nos. each type of plate.

**Milk chiller**

Capacity: 30 KLPH

Make: Tetra pak / GEA / APV Only

Function: The single section plate heat exchanger shall be used for chilling raw /whole milk with chilled water.

Design Requirements:

<table>
<thead>
<tr>
<th>Component</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk feed temperature</td>
<td>35 degree C</td>
</tr>
<tr>
<td>Milk discharge temperature</td>
<td>4 degree C</td>
</tr>
</tbody>
</table>
Chilled water feed temperature - 1.5-degree C
Maximum permissible chilled water flow rate - 3 times the milk flow rate
Maximum pressure drop on Milk Side - 1.0 Kg/Sq mm

Finish: All welding joints shall be ground smoothly. All stainless steel surfaces shall be polished to 150 grits.

**Scope of Supply:**

**Plate Pack:**

**Plates:** The plates shall be made from stainless steel conforming AISI 316 and shall be of sanitary design. All milk contact and exterior, surfaces shall be easily accessible or readily removable for cleaning and inspection.

**Gaskets:** The sealing gaskets shall ensure complete sealing and prevent any cross leakage between product and service liquids. Gaskets shall be of sanitary type (SNAP IN TYPE) or Loc-in-type of good quality nitrile rubber. It shall be continuously bonded to the heat transfer surface.

The gasket material shall be of food grade rubber and shall withstand a water sterilization temperature of 100 degree C and 2% caustic solution at 80 degree C. Gasket material shall be nontoxic, fat resistant, nonabsorbent and shall have smooth surface.

**Supporting frame:** The supporting frame for the plate pack shall be of a self-supporting design made of MS cladded with AISI 304 SS sheet with a manually operated tightening device. The tie rods shall be of SS 304 with pipe sleeve of AISI-304 to protect the rod.

The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg./cm sq.

**Inlets/Outlets:** The inlets and outlets for chilled water and product shall be provided with complete stainless steel (AISI 304) SMS unions.

**Thermo-well:** Stainless steel (AISI 304) pockets for thermometer on all the inlets and outlets. Each pocket shall be complete with stainless steel (AISI 304) guard for mounting glass thermometers/PT 100 sensors.

**Ball feet:** The frame shall be provided with adjustable stainless steel ball feet with provision for height adjustment of 50mm. Tools: Essential tools shall be supplied with the chiller without charging any extra cost. 2 nos. of each type of plate and 20% of each type of gasket to be supplied as spares without extra cost.

3. **A MILK TRANSFER PUMP**

Capacity : 30 KLPH
Head : 35 MWC.

Type : Centrifugal.

Approved Make : LKM/APV/Alfa laval / Any Standard Make

Function: The pump shall be used for transfer of milk from milk tanker to raw milk Silos via chiller and also used for transfer of milk from pasteurized milk Silos to pasteurized HMST10KL.

Design: The pump shall be sanitary design and centrifugal mono block construction.

Finish: All stainless steel surfaces shall be polished to 150 grits.

Scope of Supply:

The Pump: It shall be made from stainless steel conforming to AISI 316.

Drive: The pump shall be provided with flanged motor with hygienic sealing arrangement. The motor shall be squirrel cage TEC with IP55 protection and class “F” insulation suitable for 415 V 50 HZ AC supply. The pump and drive shall be integrated together. The pump shaft end for fixing the impeller shall be of stainless steel.

Accessories:

Inlet/Outlet: Stainless steel (AISI 316) inlet and outlet shall end in stainless steel complete union. The inlet shall be 230 mm above the finished floor level.

Motor Shroud: The motor part of the pump shall be SS 304 shrouded. The shroud shall be easily removable. It shall have provisions for air circulation and entry of electric cable.

Legs: The pump with drive shall be supported on legs with SS ball feet. The ball feet shall have provision for height adjustment of 50mm.

Anti-splash guard should be provided to protect the motor from water splashing.

Tri – purpose centrifuge cum clarifier

Functional requirements

It shall be use as separator, clarifier and standardiser for milk at the incoming temperature of 40-50 degree C.

Capacity: 20,000 LPH

Type : Self Cleaning Type Centrifugal Separator

Make : GEA / Tetra Pak / Alfa laval

TECHNICAL FEATURES:
PRODUCT TO BE PROCESSED: COW/BUFFALO MILK at min. 45°C
Fat content: 5-6 %
TOTAL MILK SKIMMING: 20,000 LPH
SKIMMING EFFICIENCY: < 0.05% (Rose – Gottlieb method)

TECHNICAL DETAILS: 20000 LPH – CREAM SEPARATORS
FEEDING PRESSURE: 1 bar min SKIM
MILK OUTLET PRESSURE: 4 bar approx.
CREAM OUTLET PRESSURE: 2.5 bar approx.
MILK OUTLET PRESSURE: 4 bar approx.
STANDARD VOLTAGE: 400/415 V / 50 Hz / 3 phases
STANDARD FITTINGS: SMS Standard

CONSTRUCTION DETAILS:
- The cast iron frame should be entirely stainless-steel-plated to ensure the highest corrosion strength.
- All the components of the bowl should be made of special stainless steel to resist to mechanical stress and corrosion.
- All parts in contact with the product shall be manufactured in stainless steel and the surfaces are accurately finished (lapped) to ensure optimum separation efficiency and perfect cleaning after the use.
- The diameters of the two belt pulleys should have been design in such a way to optimize the diameter-ratio in order to achieve the maximum mechanical efficiency.
- The vertical shaft’s assembly shall be designed to allow easy disassembling whenever maintenance operations are required.
- Innovative lubrication system: oil bath / forced lubrication.
- Oil level can be easily checked through a proper sight glass placed on machine’s body.

OPERATING FEATURES:
1. Flat belt drive.
2. Motor operated by frequency converter.
3. Emergency braking, electronically controlled by the frequency converter.
4. The self-cleaning centrifugal separators, electronically-controlled sludge’s discharge, ensure extremely high and constant separation efficiency throughout the whole working cycle.

5. Product feeding as well as the outlet of heavy and light phases takes place under pressure.

6. The quantity of cream to be separated and the cream concentration are adjustable by means of the plug cocks that are the part of manual standardization device (compact type).

7. Sludge’s discharges take place during machine’s working and are operated by a hydraulic system which is controlled by the CPU installed in the control panel.

8. The duration of the time interval between two discharges as well as the duration of the discharges is programmed according to the characteristics of the product to be processed.

9. No disassembly is required to clean the machine once the production cycle is completed as the separator can be cleaned by the C.I.P. unit serving the plant.

**Control Panel for Separator:**

Stainless steel cabinet, IP 55 protection degree, manufactured according to CEI 44-5/Indian standards. The control panel shall be composed of two sections:

**Control Section including:**

Electronic panel both for the programming (CPU) of the working cycles and for the display of: duration of sludge’s discharges, duration of the time interval between discharges, bowl speed (RPM), hour recording meter.

- Working mode selector (production/ CIP cleaning).

- Push-button panel for: machine start/ stop, product feeding pump start/ stop, partial and total discharges (manual mode).

- Pilot light indicating low oil flow rate in the lubrication system.

- Amperometer displaying the current absorbed by the motor.

- Flash-light indicating “bowl in rotation”.

**Power section including:** Main switch

- Magnetic starter with overload and under voltage protection for the product feeding pump

- Overload cut-out for the water booster pump.

- Frequency converter which controls the following:
- Motor start-up: It is programmed in such a way to linearise the curve of the absorbed current and limit its value.

- Motor recycling after sludge’s discharges: It is carried out as above.

  Dynamic braking of the motor: The frequency converter is programmed to control the emergency braking in order to prevent belt slippage and excessive mechanical stress.

Absorbed current value: The value of the current absorbed by the motor is continuously monitored and its value is maintained as low as possible. The motor will be switched off automatically if, due to mechanical problems, an excessive torque and subsequently an excessive current are drawn.

Set of standard accessories supplied with the machine

- Hydraulic Jack for pressing the disc packs – 1 Set
- Service maintenance instruction manual. 2 Sets
- Set of special service tools – 1 Set
- Set of standard spare parts – 1 Set
- Oil Charges for initial start up and first charge 2 Sets
- Foundation plate with bolts (supplied if machine is to be fixed to the floor)

Other Accessories

1.0 **Tank Pump unit for water feeding – to ensure proper feeding of the hydraulic system which operates bowl opening/closing**

- Including Stainless steel tank with cover and float
- Centrifugal Stainless steel pump
- Water Cartridge Filter
- The unit is to be connected to the separator on site unless the separator is sold as a skid mounted machine

2.0 Hydraulic Hoist for Bowl – Wheeled hydraulic crane for easy bowl lifting

3.0 Flow Indicator for feed flow

4.0 Flow Indicator for Cream Flow

*BIDDER CAN ALSO QUOTE OPTIONAL PRICE FOR SOLID BOWL TYPE MILK SEPARATOR, BUTTER-MELTING PLANT*
1.0 FUNCTIONAL REQUIREMENT

1.1 General description - Butter /butter oil would be melted in a butter melting vat by hot water generating system before taking it to the ghee/ reconstitution section.

1.1 Capacity - 2000 L/batch

2.0 DESIGN REQUIREMENTS

The butter/butter oil melting plant would mainly comprise of the butter melting vat and the hot water generating and circulating system.

2.1 The melting vat - Should be double walled rectangular SS tank having inside dimensions of approximately 2200 mm x 1200 mm and 899 mm height.

- The inner vessel of the melting Vat should be fabricated from minimum 2 mm thick stainless steel conforming to AISI 316. The cover of the vat should be in 3 pieces with lifting handles and should be fabricated out of 1.5 mm. thick stainless steel conforming to AISI 304.
- The inner vessel should be bent over the outer vessel and down to about 50 mm from the top edge and overlapping with the outer vessel.
- The outer vessel should be fabricated from 2 mm thick SS conforming to AISI 304.
- The top of the inner vessel should be covered with a net-work of stainless steel hot Water heating coils.
- The hot Water heating coils should be fabricated from 25 mm dia stainless steel tube having a center to center spacing of 100 mm.
- The heating coils should be properly clamped and supported from the inner SS vessel at about 100 mm below the top of the inner vessel.
- The inlet and outlet of the hot water for the heating coil network should be kept outside the outer vessel.
- The heating coils should be of quick removable for proper cleaning of the coils and the melting vat.
- The melting vat should be provided with 4 nos. MS tubular legs cladded with SS and having SS ball feet capable of 50 mm vertical adjustment.
- One number of SS agitator with geared motor should be provided on the melting vat. The agitator assembly should be mounted on a suitable MS structure and the same should be supported on the vat.
- The hot water jackets of the melting vat should be provided with inlet and outlet for the hot water and drain connection properly sized.
- The melting vat should be provided with 51 mm SS melted butter/butter oil outlet with a two way flanged valve. Make of valve must be indicated.
- The hot water jacket of the melting vat should be provided with a proper hot water distribution arrangement.
3.0 The hot water/generating and circulation system- This would include the following:

- 100 lit. Capacity hot water balance tank with top cover, fabricated out of 2 mm SS of AISI 304 quality. The balance tank should be provided with a pocket to insert the probe of thermo-statically controlled steam regulating valve.
- Hot water circulating pump of 5000 l/h capacity against a load of 10 to 15 m WC. The pump should be complete with electric motor suitable to run on 400/440 V 3 phase 50 Hz. 4.c. supply.
- Silent steam/ Water mixing equipment suitable for water flow rate of 5000 l/h. and a steam flow rate of 500 kg/h.
- Thermostatically controlled steam regulating valve to maintain the temperature of hot water between 60 to 80 degree C.
- The hot water balance tank should be provided with SS overflow pipe of 38 mm at the center of the balance tank.
- MS hot water pipes and fittings to connect hot water tank, steam/water mixing equipment, thermostatically controlled steam valve, hot water circulation pump, inlet for hot water in the heating coils and jacket of the melting vat and return water line from those points back to hot water tank.

Note: The quantity of MS pipes and fittings should be decided on a layout to be furnished by the supplier with the quotation.

- All welds should be ground smooth. All corners shall be well radiused and all SS surface coming in contract with butter/butter oil shall have a finish of minimum 120 grits.
- All SS fittings should conform to S.M.S. standard.
- All M.S. outer surfaces should have two coatings of anticorrosive epoxy primer followed by a coating of paint of approved shade.

**TECHNICAL SPECIFICATION OF BUTTER OIL DOSING PUMP**

**Quantity required-** One No.

1.0 **FUNCTIONAL REQUIREMENT:** -

1.1 **General description**

The pump shall be used for the dosing of butter oil (melted butter) in milk recombination process at desired rate. The pump should be of sanitary design.

Capacity- 150 to 2000 L/H

2.0 **DESIGN REQUIREMENT:** -
2.1 The S.S. positive displacement rotary pump should be provided with flanged motor with hygienic sealing arrangement. The motor section of the pump should be S.S. shrouded. The casing should be easily dismantable. The S.S. shroud should have a provision for air circulation and entry of cable. The S.S. used for manufacture of pump should be corrosion resistant like AISI 316 or equivalent.

2.2 The pump should be provided with a metering device, variable speed unit, presetting arrangement etc.

2.3 Pumps inlet and outlet connection should have SMS type union of suitable dia.

2.4 Electrical Design data

The electrical prime mover should be suitable for operation on 400/440 volts, 3phase, 50 Hz AC supply with Class “E” insulation.

2.5 FINISH

All parts coming in contact with butter oil should be S.S. and all S.S. Parts should be smooth having a finish of 120 grits properly applied.

3.0 Technical details of both pump and melting plant (To be provided by bidder)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Make of pump</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Type of pump</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Model</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Flow rate of pump L/Hour.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Application for viscous liquid suitable or not</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Viscosity up to</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pump R.P.M.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Discharge pressure</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Working temp.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Motor HP/RPM Make</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>M.O.C. for casing shaft and rotor/ starter</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Make and type drive whether V.F.D. or some other</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Size of suction &amp; discharge</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Model of Drive</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Make type model HP, RPM, of gear and motor.</td>
<td></td>
</tr>
</tbody>
</table>
Milk Heater

Make: Tetra Pak/APV/Alfa Laval/ Standard Make Only.

Milk manufacturing based on batch process which is accepted well in industry. Heating of Milk shall be achieved in re-circulative type PHE heater module. We have assumed a batch of 1000 Litres of milk (as requirement) to be heated to required temperature in 80 Minutes for design. Please note that insulated storage tank is not in supplier scope of supply and the same has to be arranged by union/cooperative. Regarding holding of product, the same tank (Client Scope) can be used for storing of milk up to the desired time. Milk after being heated may be taken in a Paneer vat (Ranchi dairy Scope) for further process. Specifications of the module are as below:

- Type: Plate Heat Exchanger
- Circulation Flow Rate: 5000 LPH
- MOC of plates: SS 316 (0.6 mm thickness)
- Product: Milk
- Batch Process: 1000 Liter
- Composition: 15 % TS
- Temp Program : Heating – 4 – 90 deg c in 80 Minutes
- Sections : Double (Heating & Hot water Generation)
- Holding : May be achieved in the storage Tank (Client Scope)

Utilities

Hot Water @ 93 deg C (10000 LPH)

Basis of operation:

Batch size to be heated from 4 to 90 deg in a re-circulative mode by hot water @ 93 deg C in 50 minutes.

Technical specifications and scope of supply
Plates: The plates shall be made from stainless steel (SS 316) in sanitary design. All the product contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

Gaskets: The sealing gaskets must ensure complete sealing and pre-vent any cross - leakage between product and service liquids. Gaskets shall be of sanitary type and shall continuously bonded to the heat transfer surface. The gasket material shall be food grade, non-toxic, fat resistant, non-absorbent and shall have smooth surface. The material shall withstand a water sterilization temp. of 100 Deg. C. and 2% caustic solution at 80 Degree Centigrade. It shall be SNAP IN or LOCK IN type.

Supporting Frame: The supporting frame for the plate pack shall be of a self-supporting design made of stainless steel (AISI 304) clad mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates to prevent any leakages from milk heater. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/sq.cm.

Accessories

Inlets/Outlet: The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions. The adaptor for ready connection of service connection is also included.

Thermo-wells: SS (AISI 304) pockets for thermometer on required ports for Product and service inlet and outlet connections. Suitable nos. of pockets are included. Each pocket shall be complete with a SS (AISI 304) guard of suitable length for mounting thermometers. However, Thermometers are included from scope of supply.

Ball Feet: The frame shall be provided with adjustable SS ball feet with provision for height adjustment of 50 mm.

2.0 Holding Section: May be achieved in the Paneer vat which will be used for re-circulative type of heating.

3.0 Feed Pump: The Milk Heater stainless steel feed pump shall be of sanitary steel shroud with louvers for air-cooling and suitable design as per dairy standard. Its capacity shall be adequate to facilitate efficient CIP. The TEFC drive motor shall be fitted with stainless arrangement for cable connection. Pump shall be supplied in location close to PHE and the interconnecting piping from Pump discharge to Flow controller & further to inlet of PHE shall be supplied by bidder. Incoming product piping from Paneer vat up to the suction of pump shall be supplied by Bidder scope.
4.0 Flow Controller (mechanical type): Flow Controller for Product: Stainless steel flow control device is required to maintain the required flow rate under varying pressure conditions. The flow controller shall be of a sanitary design.

5.0 Heating Device:

Hot water system shall be PHE based and shall have an expansion chamber and other safety devices to take care of the volume of expansion and increased pressure ensuring the complete operational safety. It will be designed as per duty parameters required for milk heater. It shall consist of PHE (with SS 316 plates and MS frame & SS 304 cladding). The system shall be supplied with steam control valve with bye-pass assembly, expansion chamber, safety valve, water make up valve and a suitable steam trap. Gasket MOC for Hot Water Generation PHE shall be EPDM to withstand high steam temperature.

Hot Water PHE: – Included in the same milk heater.

Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Hot water Pump: One number of Hot water pump will be supplied which will be used for hot water circulation for heating of milk up to 90 deg C.

One no of PID Temperature control arrangement for control of heating temperature together with Steam Regulating and control valve is included.

6.0 Instrumentation and control panel:

Automatic controls shall be provided to ensure set temperature of product (for heating only). An audible alarm shall be activated once the batch temperature has been achieved. Then the process is to be manually diverted to forward mode for processing. The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip:

6.1 PID/On-Off Controller for temperature of pasteurized Product with display of set temperature and actual Product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

6.2 Audio alarm with hooter and acknowledge and reset push button.

6.3 I/P Convertor for steam control valve operation.

6.4 Air pressure regulator cum moisture separator with isolating valve to ensure proper air supply to the I/P Convertor.

6.5 Incoming on/off switch for control supply.
6.6 Digital temperature indicators for display of milk outlet heating temperature, hot water inlet temperature.

6.7 One set of `ON' and `OFF' push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various modules. (Two numbers spare push buttons are included)

7.0 Pipes and Fittings (SS 304): All inter connecting pipes with necessary fittings for product as well as service shall be supplied within the specified battery limits and exclusions:

7.1 Product: The supply shall include all the necessary SS 304 pipes and fittings from feed pump discharge to the finished heated/cooled product outlet as required to inter-connect the above equipment.

7.2 Hot Water: The supply shall also include necessary SS 304 pipes and fittings for pumping hot water to the heating section of the PHE and return to the hot water set.

8.0 The Module shall be skid mounted

**LASSI PASTURISER Module**

CAPACITY: 2000 LPH

Make: Modules should be Tetra Pak/APV Gaulin only.

**FUNCTIONAL REQUIREMENT**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate Heat Exchanger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>2000 LPH</td>
</tr>
<tr>
<td>MOC of plates</td>
<td>SS 316</td>
</tr>
<tr>
<td>Temp Program</td>
<td>25-65-70-4 Deg. C</td>
</tr>
<tr>
<td>Sections</td>
<td>Regeneration, Heating I &amp; Heating II</td>
</tr>
<tr>
<td>Holding Time</td>
<td>20 Sec in Tube</td>
</tr>
<tr>
<td>Gasket</td>
<td>Glue free (Nitrile)</td>
</tr>
<tr>
<td>Homogenization Outlet</td>
<td>65 deg C</td>
</tr>
<tr>
<td>Pasteurisation Temp</td>
<td>70 Deg C</td>
</tr>
</tbody>
</table>

**Utilities Required**
Hot Water @ 93 deg C (4000 LPH) for heating Generated by Steam at 2.0 Bar Dry saturated steam @ 2 bars pressure

Basis of operation:

Lassi shall be pasteurized at a temperature of 70 deg C. After pasteurization lassi shall be cooled to 4 deg C and left at the outlet of Pasteurizer for onward use.

Technical specifications and scope of supply

1.0 Plate Heat Exchanger - Lassi Pasteurizer (HTST)

Plates: The plates shall be made from stainless steel (SS 316) in sanitary design. All the product contact and exterior surfaces shall be easily accessible or readily removable for cleaning and inspection.

Gaskets: The sealing gaskets must ensure complete sealing and prevent any cross - leakage between product and service liquids. Gaskets shall be of sanitary type and shall be continuously bonded to the heat transfer surface. The gasket material shall be food grade, non-toxic, fat resistant, non-absorbent and shall have smooth surface. The material shall withstand a water sterilization temp. of 100 Deg. C. and 2% caustic solution at 80 Degree Centigrade.

Supporting Frame: The supporting frame for the plate pack shall be of a self supporting design made of stainless steel (AISI 304) clad mild steel with a manually operated stainless steel (AISI 304) tightening device. The tightening device shall be able to exert uniform pressure on all the parts of heat transfer plates to prevent any leakages from Pasteurizer. The frame and tightening device shall prevent the plates from deflecting under pressure differential of minimum 4 kg/sq.cm.

Accessories

Inlets/Outlet: The inlets and outlets in each section of the heat exchanger for products as well as services shall be provided with complete stainless steel (AISI 304) unions.

Thermo-wells: SS (AISI 304) pockets for thermometer on required ports for Product and service inlet and outlet connections. Suitable nos. of pockets are included. However thermometers are excluded from our scope of supply.

Ball Feet: The frame shall be provided with adjustable SS ball feet with provision for height adjustment of 50 mm.

2.0 Holding: It shall be designed for continuous holding of the product for at least the minimum specified holding time of 20 Sec at the Pasteurization temperature of 80 deg C.

3.0 Float Balance Tank: The float balance tank of 200 L capacity shall be fabricated from 2 mm thick SS sheet conforming to AISI 304. The tank shall be provided with cover, sanitary type SS (AISI
304) float valve with the Product inlet, cup type outlet, return Product inlet, inlet for water, overflow and adjustable SS ball feet. The float valve shall be designed to give the rated flow rate and withstand an inlet pressure of 1.5 kg/sq.cm.

4.0 Feed Pump & Booster Pump (IDMC Make): The Pasteurizer stainless steel feed pump & Booster Pump shall be of sanitary steel shroud with louvers for air-cooling and suitable design as per dairy standard. Its capacity shall be adequate to facilitate efficient CIP. The TEFC drive motor shall be fitted with stainless arrangement for cable connection.

The feed pump & booster pump shall be of suitable capacity to withstand the flow rates required during product run & CIP.

5.0 Flow Controller (Mechanical Type): Flow Controller for Product: Stainless steel flow control device shall be supplied to maintain the required flow rate. The flow controller shall be of a sanitary design.

6.0 SS Duplex Filter: with accessories shall be provided for pre-filtration of Lassi.

7.0 Heating Device: – PHE Based

Hot water system shall be PHE based and shall have an expansion chamber and other safety devices to take care of the volume of expansion and increased pressure ensuring the complete operational safety. It will be designed as per duty parameters required for pasteurization. It shall consist of PHE (with SS 316 plates and MS painted frame with SS 304 cladding). The system shall be supplied with steam control valve with bypass assembly, expansion chamber, safety valve.

Safety Device: A safety device shall be provided in the hot water side of heating section to avoid damage to the heat exchanger caused by excessive pressure. It shall be of sanitary design.

Hot water Pump: One number of Hot water pump of suitable capacity will be supplied which will be used for hot water circulation for heating of milk up to 80 deg C.

One no of PID Temperature control arrangement for control of pasteurization temperature together with Steam Regulating and control valve is included.

8.0 Instrumentation and control panel:

Automatic controls shall be provided to ensure pasteurization temperature of product. If the required temperature of product is not reached, the flow of product shall be automatically diverted to the float balance tank with an audible alarm.

The instrumentation and control panel shall be made in standard execution built to dust and vermin proof design. The control panel shall be leg supported and house the following components all pre-wired to terminal strip:
8.1 PID Controller for temperature of pasteurized Product with display of set temperature and actual Product temperature. The controller has a facility to automatically tune to the requirement of set temperature.

8.2 Six point Strip chart recorder with digital display of temperatures of pasteurized product. The temperature recorder has microprocessor based with functional key facility for zero and span calibration.

8.3 Audio alarm with hooter and acknowledge and reset push button.

8.4 Auto manual selection switch and forced forward flow provision

8.5 I/P Convertor for steam control valve operation and electrically operated solenoid valve for air supply to flow diversion valve.

8.6 Air pressure regulator cum moisture separator with isolating valve to ensure proper air supply to the I/P Convertor and solenoid valves.

8.7 Incoming on/off switch for control supply.

One set of ‘ON’ and ‘OFF’ push buttons with indicating lamps and suitable inscriptions shall be provided for operation of motors of various module. (Two numbers spare push buttons are included)

8.7 Indication lamp for showing the position of flow diversion valve (forward/diverted mode)

9.0 Pipes and Fittings (SS 304): All inter connecting pipes with necessary fittings for product as well as service shall be supplied within the specified battery limits and exclusions.

9.1 Product: The supply shall include all the necessary SS 304 pipes and fittings from the outlet of balance tank to the finished Pasteurized Product outlet as required interconnecting the above equipment. However the Piping To & Fro from the Homogenizer is excluded from the scope of Supply.

9.2 Hot Water: The supply shall also include necessary SS 304 pipes and fittings for pumping hot water to the heating section of the Pasteurizer and return to the hot water set.

10.0 The module shall be mounted on SS 304 Skid as per compact layout. However, the Pasteurizer plate pack & holding coil shall be floor mounted.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item Description</th>
<th>Milk Silo</th>
<th>Process Milk Silo</th>
<th>Cream ripening /Storage Tank</th>
<th>Rinse Milk Storage Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Chilled, Milk, In-Situ CIP</td>
<td>Store Chilled Milk, In-Situ CIP</td>
<td>Store &amp; Ripen chilled cream in Situ CIP</td>
<td>Store Chilled Rinse Milk</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>100 KL</td>
<td>100 KL</td>
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<td>5 KL</td>
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<td>Location</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>Outdoor</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Vertical, double walled, insulated, sanitary design with 1:15 bottom slope, atmospheric pressure</td>
<td>Vertical, double walled, insulated, sanitary design with 1:15 bottom slope, atmospheric pressure</td>
<td>Vertical triple walled having dimple / Corrugated jacket, Reverse conical bottom</td>
<td>Vertical / Double walled / insulated</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>3 mm, AISI 304</td>
<td>3 mm, AISI 304</td>
<td>3 mm, AISI 304</td>
<td>3 mm, AISI 304</td>
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<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
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<tr>
<td>8</td>
<td>Inner intermediate shell</td>
<td>_</td>
<td>3 mm, AISI 304</td>
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<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, AISI 304</td>
<td>2 mm, AISI 304</td>
<td>2 mm, AISI 304</td>
<td>2 mm, AISI 304</td>
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<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
</tr>
<tr>
<td>11</td>
<td>Insulation Finish</td>
<td>1st layer 15 mm PUF 35 kg/cum density, 2nd &amp; 3rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PUF 35 kg/cum density, 2nd &amp; 3rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PUF 3 kg/cum density, 2nd &amp; 3rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PUF 35 kg/cum density, 2nd &amp; 3rd layer each of 50 mm EPS 20 kg /cum density</td>
</tr>
<tr>
<td>12</td>
<td>Jacket drain</td>
<td>outer shell shall have weep holes at bottom</td>
<td>outer shell shall have weep holes at bottom</td>
<td>outer shell shall have weep holes at bottom</td>
<td>outer shell shall have weep holes at bottom</td>
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<tr>
<td>13</td>
<td>Inlet</td>
<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>Common opening of 76 mm SMS union cup type with butterfly stop valve</td>
<td>63.5 mm with SMS union</td>
</tr>
<tr>
<td>14</td>
<td>Outlet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sampling port</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
</tr>
<tr>
<td>16</td>
<td>Drain</td>
<td></td>
<td></td>
<td></td>
<td>38 MM dia AISI 304 drain at the bottom of the jacket</td>
</tr>
<tr>
<td>17</td>
<td>Overflow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Airvent</td>
<td>460 mm dia AISI 304</td>
<td>460 mm dia AISI 30</td>
<td>150 mm dia AISI 304</td>
<td>150 mm dia AISI 304</td>
</tr>
<tr>
<td>19</td>
<td>Manway</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Suitable front side manhole with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>20</strong></td>
<td><strong>Level probe</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td><strong>Temperature sensor</strong></td>
<td><strong>Yes, thermowell</strong></td>
<td><strong>Yes, thermowell</strong></td>
<td><strong>Yes, thermowell</strong></td>
<td><strong>Yes, thermowell</strong></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td><strong>CIP Port</strong></td>
<td><strong>Spray ball AISI 304</strong></td>
<td><strong>Spray ball AISI 304</strong></td>
<td><strong>Spray ball AISI 304 - 2 NOS.</strong></td>
<td><strong>Spray ball AISI 304</strong></td>
</tr>
<tr>
<td><strong>23</strong></td>
<td><strong>Light Port</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</strong></td>
</tr>
<tr>
<td><strong>24</strong></td>
<td><strong>Sight Port</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts</strong></td>
<td><strong>140 mm dia AISI 304 with toughened glass &amp; fly nuts</strong></td>
<td><strong>140 mm dia AISI 304</strong></td>
<td><strong>140 mm dia AISI 304 with</strong></td>
</tr>
<tr>
<td><strong>25</strong></td>
<td><strong>Agitator / Drive</strong></td>
<td><strong>Side agitator direct type (AISI 304) with VFD , Motor shall be as per IS 12615- Eff 1</strong></td>
<td><strong>Side agitator direct type (AISI 304) with VFD , Motor shall be as per IS 12615- Eff 2</strong></td>
<td><strong>Vertical sweeping type (AISI 304) Geared motor , 12 rpm Motor shall be as per ISI 2615- 2004 Eff 1</strong></td>
<td><strong>Vertical sweeping type (AISI 304) Geared motor , 12 rpm Motor shall be as per ISI 2615- 2004 Eff 2</strong></td>
</tr>
<tr>
<td><strong>26</strong></td>
<td><strong>Level Marks</strong></td>
<td><strong>Sand blasted with 500 L intervals</strong></td>
<td><strong>Sand blasted with 500 L intervals</strong></td>
<td><strong>Sand blasted with 500 L intervals</strong></td>
<td><strong>Sand blasted with 500 L intervals</strong></td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td><strong>Instrumentation</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Provision for Diaphragm type</strong></td>
</tr>
<tr>
<td><strong>27</strong></td>
<td><strong>Level Transmitter</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Diaphragm type with accuracy of +/- 0.25 %</strong></td>
<td><strong>Provision for Diaphragm type</strong></td>
</tr>
<tr>
<td><strong>28</strong></td>
<td><strong>Level Transmitters</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>29</strong></td>
<td><strong>Low level</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>30</strong></td>
<td><strong>High</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>31</strong></td>
<td><strong>Temperature sensor</strong></td>
<td><strong>RTD, Duplex type</strong></td>
<td><strong>RTD, Duplex type</strong></td>
<td><strong>RTD, Duplex type</strong></td>
<td><strong>RTD, Duplex type</strong></td>
</tr>
<tr>
<td><strong>32</strong></td>
<td><strong>Temperature Transmitter</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>33</strong></td>
<td><strong>Temperature Display</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
</tr>
<tr>
<td><strong>34</strong></td>
<td><strong>Manhole Sensor</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
<td><strong>Proximity switch</strong></td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td><strong>Alcove</strong></td>
<td><strong>Yes, around 1800 x 1500 mm</strong></td>
<td><strong>Yes, around 1800 x 1500 mm</strong></td>
<td><strong>Yes of suitable size</strong></td>
<td><strong>Yes of suitable size</strong></td>
</tr>
<tr>
<td><strong>35</strong></td>
<td><strong>Approach ladder</strong></td>
<td><strong>Common Plate form with vertical ladder</strong></td>
<td><strong>Common Plate form with vertical ladder</strong></td>
<td><strong>Common Plate form with vertical ladder</strong></td>
<td><strong>Common Plate form with vertical ladder</strong></td>
</tr>
<tr>
<td><strong>36</strong></td>
<td><strong>Top Railing</strong></td>
<td><strong>900 mm high , 38 mm dia AISI 304 pipe - with SS kick plates</strong></td>
<td><strong>901 mm high , 38 mm dia AISI 304 pipe - with SS kick plates</strong></td>
<td><strong>902 mm high , 38 mm dia AISI 304 pipe - with SS kick plates</strong></td>
<td><strong>903 mm high , 38 mm dia AISI 304 pipe - with SS kick plates</strong></td>
</tr>
<tr>
<td><strong>38</strong></td>
<td><strong>Liting lugs</strong></td>
<td><strong>Yes 4 Nos. AISI 304</strong></td>
<td><strong>Yes 4 Nos. AISI 304</strong></td>
<td><strong>Yes 4 Nos. AISI 304</strong></td>
<td><strong>Yes 4 Nos. AISI 304</strong></td>
</tr>
<tr>
<td><strong>39</strong></td>
<td><strong>Test</strong></td>
<td><strong>DP test, water fill test</strong></td>
<td><strong>DP test, water fill test</strong></td>
<td><strong>DP test, water fill test</strong></td>
<td><strong>DP test, water fill test</strong></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Butter Milk Storage Tank</td>
<td>Past Water Storage Tank</td>
<td>Pre-stratification Tank</td>
<td>Ghee Settling Tank</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------</td>
<td>---------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Chilled Butter Milk</td>
<td>Pasteurised Chilled water</td>
<td>Store Molten Butter</td>
<td>Store Ghee</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>15 KL</td>
<td>15 KL</td>
<td>2 KL</td>
<td>2 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Butter Making</td>
<td>Butter Making</td>
<td>Ghee Making</td>
<td>Ghee Making</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Vertical, double walled, insulated</td>
<td>Vertical, double walled, insulated</td>
<td>Vertical, double walled, insulated</td>
<td>Vertical / Double walled / insulated</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2.5 mm, AISI 304</td>
<td>2.5 mm, AISI 304</td>
<td>2.5 mm, AISI 304, 3 mm conical bottom</td>
<td>2 mm, AISI 304</td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
</tr>
<tr>
<td>8</td>
<td>Inner intermediate shell</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, AISI 304</td>
<td>2 mm, AISI 304</td>
<td>-</td>
<td>2 mm, AISI 304</td>
</tr>
<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
</tr>
<tr>
<td>11</td>
<td>Insulation layers</td>
<td>1st layer 15 mm PUF 35 kg/cum density, 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>1st layer 15 mm PU 35 kg/cum density, 2 nd &amp; 3 rd layer each of 50 mm EPS 20 kg /cum density</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Jacket drain</td>
<td>outer shell shall have weep holes at bottom</td>
<td>outer shell shall have weep holes at bottom</td>
<td>SS drain with GM valve at the bottom of jack</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Inlet</td>
<td>63.5 mm SMS union</td>
<td>63.5 mm SMS union</td>
<td>No foam 63.5 mm Top inlet with SMS union</td>
<td>No foam 38.5 mm Top inlet with SMS union</td>
</tr>
<tr>
<td>14</td>
<td>Outlet</td>
<td></td>
<td></td>
<td>Side outlet 51 mm with angular valve of AISI 304</td>
<td>Side outlet 51 mm with angular valve of AISI 304</td>
</tr>
<tr>
<td>15</td>
<td>Sampling port</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>Sampling cock, sanitary design before stop valve</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>Drain</td>
<td></td>
<td></td>
<td>Bottom outlet - 51 mm with inline sight glass and valve of AISI 304</td>
<td>Bottom outlet - 51 mm with valve of AISI 304</td>
</tr>
<tr>
<td>17</td>
<td>Overflow</td>
<td></td>
<td></td>
<td>38 mm at type top of bottom</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Airvent</td>
<td>150 mm dia</td>
<td>150 mm dia</td>
<td>76 mm dia</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>Manway</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Ovel shaped 550 x 405 mm with Neoprene/ Nitrile rubber food grade gasket</td>
<td>Half openable three piece covers of 2 mm thick of AISI 304 at the top</td>
<td>Half openable three piece covers of 2 mm thick of AISI 304 at the top</td>
</tr>
<tr>
<td>20</td>
<td>Level probe, sensor, transmitter, port</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>Temperature sensor, port</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
<td>Yes, thermowell</td>
</tr>
<tr>
<td>22</td>
<td>CIP Port</td>
<td>Spray ball AISI 304</td>
<td>Spray ball AISI 30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>23</td>
<td>Light Port</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
<td>140 mm dia AISI 304 with toughened glass &amp; fly nuts, 24 V 100 W lamp</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
### Technical Specification of Tanks

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Butter Melting Vat</th>
<th>Concentrated Acid</th>
<th>Concentrated Lye Tank</th>
<th>CIP tanks for acid /lye/hot/water tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Melting of Butter</td>
<td>Store concentrated acid</td>
<td>Store concentrated LYE</td>
<td>Store Acid</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>2 KL</td>
<td>15 KL</td>
<td>15 KL</td>
<td>2 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Ghee Making</td>
<td>Outdoor</td>
<td>Outdoor</td>
<td>CIP</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Rectangular double walled, insulated with heating pipe network</td>
<td>Vertical uninsulated</td>
<td>Vertical uninsulated</td>
<td>Vertical / Double walled / insulated</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm, AISI 316</td>
<td>3 mm, AISI 316</td>
<td>3 mm, AISI 316</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td>150 Grits</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Jacket</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, AISI 304</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Outer Shell finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
<td>Mill finish</td>
</tr>
<tr>
<td>11</td>
<td>Insulation layers</td>
<td>50 mm PUF of 42 KG/ cum density</td>
<td></td>
<td>50 mm thick (each layer) resin bonded crown 150 bigre glass insulation in 2 layers</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Heating system drain</td>
<td>Condensate outlet with strainer, float type steam trap, sight glass and by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Condensate Collection Tank</td>
<td>FO Storage Tank</td>
<td>FO Service Tank</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------</td>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store condensate</td>
<td>Store FO</td>
<td>Store FO</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>5 KL</td>
<td>50 KL</td>
<td>900 L</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Outdoor (underground)</td>
<td>Outdoor</td>
<td>Boiler house</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Horizontal, cylindrical, double walled, insulated</td>
<td>Vertical double walled, insulated with bottom steam heating coil, Height to diameter ratio not exceeding 3:2</td>
<td>Vertical single walled uninsulated with bottom steam heating coil, and electric heater of 3 KW with thermostatic control</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm, AISI 304</td>
<td>6.0 mm, MS</td>
<td>3.0 mm, MS</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 grits</td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Jacket</td>
<td></td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
<td>2 coats of heat resistant primer followed by 2 coats of heat resistance bitmen based paint</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Outer Shell</td>
<td>2 mm, MS</td>
<td>3 mm, MS</td>
<td>3 mm, MS</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Outer Shell Finish</td>
<td>2 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
<td>2 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
<td>3 coats of zinc chromate red oxide primer followed by 2 coats of synthetic enamel paint</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Insulation layers</td>
<td>50 mm glass wool</td>
<td>75 mm resin bonded crown 150 fibre glass /glass wool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Jacket drain</td>
<td></td>
<td></td>
<td></td>
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</table>

### PORTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Condensate Collection Tank</th>
<th>FO Storage Tank</th>
<th>FO Service Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Inlet</td>
<td>51 mm SS x 2 nos.</td>
<td>75 mm NB MS 'C'class flanged, vertical short U bend</td>
<td>50 mm NB MS 'C'class flanged</td>
</tr>
<tr>
<td>14</td>
<td>Outlet</td>
<td>52 mm SS, flanged type</td>
<td>200 mm NB MS 'C'class flanged with 'T' section 200 mm x 75 mm</td>
<td>150 mm NB MS 'C'class flanged with 'T' section 200 mm x 50 mm</td>
</tr>
<tr>
<td>15</td>
<td>Sampling port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sl. No</td>
<td>Description</td>
<td>Ghee Storage Tank</td>
<td>CIP tanks for acid/lye/Hotwater</td>
<td>Recuperation Tank</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------</td>
<td>-------------------</td>
<td>---------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
<td>Purpose</td>
<td>Store Ghee</td>
<td>Store Lye</td>
<td>Store CIP flushing</td>
</tr>
<tr>
<td>2</td>
<td>Qty</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Capacity</td>
<td>2 KL</td>
<td>5 KL</td>
<td>4 KL</td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Ghee making</td>
<td>CIP</td>
<td>CIP</td>
</tr>
<tr>
<td>5</td>
<td>Construction</td>
<td>Vertical double walled, jacketted with removable sprinkler pipe 25 mm dia hot/chilled wat, U bend 38 mm, stea</td>
<td>Vertical double walled, insulated</td>
<td>Vertical uninsulated</td>
</tr>
<tr>
<td>6</td>
<td>Inner Shell</td>
<td>2 mm, AISI 304</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Inner Shell Finish</td>
<td>150 grits</td>
<td></td>
<td></td>
</tr>
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<td>Jacket drain</td>
<td>SS drain with GM valve a the bottom of jacket</td>
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<td>Bottom outlet- 51 mm with valve 63.5 mm</td>
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<td>Milk Transfer Silo to pasteurise</td>
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<td>Total Heat tranfer area</td>
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<td>22</td>
<td>Pasteurising temperature (Deg C)</td>
<td>Upto 80 90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Max. Designed Pressure (Kg / sq. mm)</td>
<td></td>
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</tr>
<tr>
<td>24</td>
<td>Sp. Gravity</td>
<td></td>
<td></td>
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<tr>
<td>25</td>
<td>Specific Heat</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>26</td>
<td>Thermal Capacity (k cal/hr/m/Deg C)</td>
<td></td>
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</tr>
<tr>
<td>27</td>
<td>Volume of Liquid in PHE (litres)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Inlet, outlet connection (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Heating/ Cooling Medium</td>
<td>40000 Chilled Water 7500 Chilled Water Kg Steam</td>
<td></td>
<td></td>
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<tr>
<td>30</td>
<td>Pressure drop (Kg/ Sq. mm)</td>
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<tr>
<td>31</td>
<td>Chilled water inlet temp (Deg C)</td>
<td>1.5 to 2 1.5 to 2 1.5 to 2 1.5 to 2</td>
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<tr>
<td>32</td>
<td>Chilled water outlet temp (Deg C)</td>
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<tr>
<td>33</td>
<td>Sp. Gravity</td>
<td></td>
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<tr>
<td>34</td>
<td>Specific Heat</td>
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<tr>
<td>35</td>
<td>Thermal Capacity (k cal/hr/m/Deg C)</td>
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<tr>
<td>36</td>
<td>Volume of Liquid in PHE (litres)</td>
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<td></td>
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<tr>
<td>37</td>
<td>Inlet, outlet connection (mm)</td>
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<td></td>
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</tr>
<tr>
<td>38</td>
<td>Max design</td>
<td></td>
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<tr>
<td>39</td>
<td>Heat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Balance tank</td>
<td>300 L, AISI 304, 2 mm thick Intermediate / balance tank min 100 L, AISI 304 , 2 mm thick</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Accessories</td>
<td>Flow diversion valve, Flow controller, Duplex filter, hot water generation in plate pack</td>
<td>Flow controller, hot water pump, Hot water generation in Plate pack</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
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<tr>
<td>42</td>
<td>Automation</td>
<td>Fully automated plant, hence valves, controls &amp; instruments as per process logic specified</td>
<td>Fully automated plant, hence valves, controls &amp; instruments as per process logic specified</td>
<td>Fully automated plant, hence valves, controls &amp; instruments as per process logic specified</td>
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**List of Approved Makes**

<table>
<thead>
<tr>
<th>Description</th>
<th>Makes</th>
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<tbody>
<tr>
<td><strong>MILK RECEPTION, PROCESSING &amp; PACKAGING</strong></td>
<td></td>
</tr>
<tr>
<td>Crate Washer &amp; Crate conveyor</td>
<td>SHREE VISHWAKARMA / SWASTIK (Rajahmundry) / UNICORY / CHENGALVA</td>
</tr>
<tr>
<td>Electronic Weighing Machine Platform Type</td>
<td>SARTORIUS / ESSAERTAOKE / AVERY</td>
</tr>
<tr>
<td>Electronic Weigh Bridge (Pit less)</td>
<td>METTLER TOLEDO / SARTORIUS/ AVERY / ESSAE-DIGITRONIX</td>
</tr>
<tr>
<td>SS Milk Pump</td>
<td>APV / LKM / GEA TUCHENHAGEN / FRISTAN</td>
</tr>
<tr>
<td>Cream Pump (screw type)</td>
<td>ROTO PUMP / ROTOMAC</td>
</tr>
<tr>
<td>PHE Type Milk Chiller/ Pasteurizer</td>
<td>APV / ALFA LAVAL / TETRA PAK / GEA- ECOFLEX</td>
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<tr>
<td>Milk &amp; CIP Houses</td>
<td>PEARL / B;LAUDIECK / GAYATRI / SAINATH RUBBER / INDUSTRIAL EQUIPMENT Co.</td>
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<tr>
<td>CIP Return Pump</td>
<td>APV / LKM / GEA TUCHENHAGEN / FRISTAM</td>
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<tr>
<td>Tri-purpose Centrifuge (manual / self cleaning), Ghee clarifier, Serum separator</td>
<td>TETRA PACK WESTFALIA</td>
</tr>
<tr>
<td>CBMMM for white butter</td>
<td>HMT</td>
</tr>
<tr>
<td>Mechanical Pouch Filling Machine</td>
<td>SAMAPRAN / NICHROME / VIJAYAPAC</td>
</tr>
<tr>
<td>Pneumatic Pouch Filling Machine</td>
<td>SAMPRAN/ NICHROME</td>
</tr>
<tr>
<td>CIP System (Automatic)</td>
<td>GEA PROCESS / APV / TETRA PAK / CHENGALVA</td>
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<tr>
<td>EPS/ PUF Insulation Materials</td>
<td>LLOYDS / BEARDSELL / FRICK</td>
</tr>
<tr>
<td>Pre-fabricated PUF Insulating</td>
<td>LLOYDS / BLUE STAR / FRICK / CARRIER/</td>
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<tr>
<td>Panels (Insulation)</td>
<td>RINAC/ BERDSELL</td>
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<tr>
<td>Saddles for Cold Insulation</td>
<td>SUPER THERM (LLOYD) / BEARDSELL</td>
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<tr>
<td>Water Chilled Water Pumps</td>
<td>GRUNDFOS / MATHER &amp; PLATT / BEACON/ KIRLOSKAR / KSB</td>
</tr>
<tr>
<td>Programmable Protection relay</td>
<td>MINILEC</td>
</tr>
<tr>
<td><strong>INSTRUMENTATION, CONTROLS &amp; AUTOMATION</strong></td>
<td></td>
</tr>
<tr>
<td>VFD</td>
<td>SIEMENS / ALLEN BRADLEY</td>
</tr>
<tr>
<td>Frequency converter</td>
<td>SIEMENS / ALLEN BRADLEY</td>
</tr>
<tr>
<td>Level Transmitter &amp; indicator</td>
<td>E &amp; h / ROSEMOUNT</td>
</tr>
<tr>
<td>Temperature / Pressure Transmitter</td>
<td>E &amp; h ROSEMOUNT</td>
</tr>
<tr>
<td>Conductivity &amp; pH Transmitter</td>
<td>E &amp; a / ROSEMOUNT / YOKAGAWA / POLYMETRON</td>
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<tr>
<td>Density transmitter</td>
<td>E &amp; a / ROSEMOUNT / YOKAGAWA / KROHNE MARSHALL</td>
</tr>
<tr>
<td>RTD</td>
<td>PYROELECTRIC / ALLOT / GIC / TOSHNIWAL / RADIX</td>
</tr>
<tr>
<td>PID controller</td>
<td>YOKAGAVA/ CHINO / FOXBORO / RADIX/ TATA HONEYWELL / SIEMENS / ROSEMOUNT</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>DANFOSS / SWITZER / IFB, Gmbh / HONEYWELL / JOHNSON</td>
</tr>
<tr>
<td>Level Switch (float type for liquid &amp; vibrati fork type for powder)</td>
<td>E &amp; H / ROSEMOUNT / P &amp; F / HONEYWELL/ TECHROL / SB ELECTRONICS</td>
</tr>
<tr>
<td>Vortex / Magnetic Flow meter</td>
<td>E &amp; H / ROSEMOUNT / YOKAGAWA / FORBES MARSHALL</td>
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<tr>
<td>Mass Flow meter</td>
<td>E &amp; H / ROSEMOUNT</td>
</tr>
<tr>
<td>Control Valve</td>
<td>DANFOSS/ DEMBLA / SAMSON/AVCON / TOSHIBRO / FISHER XOMOX / MASONELAN</td>
</tr>
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</table>


<table>
<thead>
<tr>
<th><strong>ELECTRICALS</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Electric Motors</strong></td>
<td>FIEBIG / H GURU / PRICOL / WARREE</td>
</tr>
<tr>
<td><strong>Air Circuit Breaker</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>MCCB</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>MPCB</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>Contactors</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>Starter Overload Relays</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>Timers Electronic</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>Switch Fuse U:nits</strong></td>
<td>L &amp; T SIEMENS</td>
</tr>
<tr>
<td><strong>MCBs</strong></td>
<td>SIEMENS / L &amp; T- HAGER</td>
</tr>
<tr>
<td><strong>Push Buttons</strong></td>
<td>ESBEE / SIEMENS / GE / VAISHNO / TEKNIC</td>
</tr>
<tr>
<td><strong>Indicating Lamps</strong></td>
<td>L&amp;T / SIEMENS / VAISHNO / TEKNIC / BINAY</td>
</tr>
<tr>
<td><strong>Digital Ammeter &amp; Voltmeter</strong></td>
<td>ANERCON / CONZERV / MECO /I&amp;T / HPL / SOCOMEC / CABLE</td>
</tr>
<tr>
<td><strong>Analog Ammeter &amp; Voltmeter</strong></td>
<td>RISHABH / IMP / MECO /AE</td>
</tr>
<tr>
<td><strong>Digital Energy Meter</strong></td>
<td>ENERCON / L&amp;T / HPL SOCOMEC /CADEL / AE / INDIAMETER / CONZERV</td>
</tr>
<tr>
<td><strong>Analog Energy Meter</strong></td>
<td>GEC / UNIVERSAL / HAVEL /JAIPUR METERS</td>
</tr>
<tr>
<td><strong>PVC Conduit &amp; accessories</strong></td>
<td>PRECISION / CLIPSAL / P-PLAST</td>
</tr>
<tr>
<td><strong>Power Factor Meter</strong></td>
<td>RISHABH / IMP / MECO /AE</td>
</tr>
<tr>
<td><strong>Current Transformer</strong></td>
<td>KAPPA / MECO /AE /IMP /INDCOIL / KALPA</td>
</tr>
<tr>
<td><strong>LT Power Cables</strong></td>
<td>CCI /FORT GLOSTER / RPG ASIAN / INCAB/ FINOLEX / UNIVERSAL / NICCO / POLYCAB</td>
</tr>
<tr>
<td><strong>LT Copper Control Cable</strong></td>
<td>CCI /RPG ASIAN / FINOLEX / RR KABELS (UNILAY)</td>
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<tr>
<td><strong>Signal &amp; Instrument cable</strong></td>
<td>LAPP KABEL /POLYCAB / THERMOPAD</td>
</tr>
<tr>
<td><strong>Power Capacitors</strong></td>
<td>EPCOS / MEHER /KHATAU JANKAR / SIEMENS / UNISTAR / MOMAYA</td>
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<tr>
<td><strong>APFC Relay</strong></td>
<td>L&amp;T / BELUKE / EPCOS /PHASITRON / MECO</td>
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<tr>
<td><strong>Cable Tray</strong></td>
<td>INDIANA / MEK / SUNRISE /SUPER / PILCO / ELCON / METALICA PRESSINGS / POWER CONTROLS</td>
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<tr>
<td><strong>Isolating Switches</strong></td>
<td>SIEMENS / L &amp;T /ABB SCHNEIDER</td>
</tr>
<tr>
<td><strong>HRC fuses</strong></td>
<td>L &amp; T /SIEMENS / EE /C&amp;s / BUSMAN / GE POWER</td>
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<tr>
<td><strong>IP 55 boxes for motor isolators, push buttons, junction boxes etc.</strong></td>
<td>HENSEL / RITTAL / HANSU</td>
</tr>
<tr>
<td><strong>Plug &amp; Socket</strong></td>
<td>B;CH / LEGRAND /CLIPSAL</td>
</tr>
<tr>
<td><strong>Terminal Blocks</strong></td>
<td>WAGO LAPP INDIA / CONNECT WELL / ELMEX</td>
</tr>
<tr>
<td>Component</td>
<td>Manufacturers</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Electronic Load Manager</td>
<td>ENERCON / KRYKARD / L&amp;T</td>
</tr>
<tr>
<td>Rotary Selector Switch</td>
<td>KAYCEE / SALZER /L&amp;T / SIEMENS / TEKNIC</td>
</tr>
<tr>
<td>Cable Glands</td>
<td>COMET EX-PROTECTA/ DOWELS/ LAPP KABEL /BRACKO</td>
</tr>
<tr>
<td>Cable Lugs</td>
<td>DOWELS / COMET / LAPP KABEL</td>
</tr>
<tr>
<td>Mechanical Interlock</td>
<td>L&amp;T / SCHNEIDER / ABB</td>
</tr>
<tr>
<td>Electronic Soft Starter</td>
<td>SIEMENS / L&amp;T</td>
</tr>
<tr>
<td>Programmable Protection Relay</td>
<td>MINILEC</td>
</tr>
<tr>
<td>Servo Voltage Stabilizer</td>
<td>SUIVIK / APLAB / NEEL / CRYCARD</td>
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<tr>
<td>UPS</td>
<td>NUMERIC / EMERSON-LIEBERT /AP / HIREL /DB ELECTRONICS/ APLAB</td>
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<tr>
<td>SMF Battery</td>
<td>EXIDE</td>
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**VALVES & PIPES (MS & GI)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturers</th>
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</thead>
<tbody>
<tr>
<td>Water Valves (Butterfly / Ball)</td>
<td>SAUNDERS / AUDCO / INTERVALVE / BDK / CRESCENT / LEADER</td>
</tr>
<tr>
<td>Water Valves (Diaphragm)</td>
<td>SAUNDERS/ BDK</td>
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<tr>
<td>Non-return Valve for water</td>
<td>AUDCO INTERVALVE / BDK</td>
</tr>
<tr>
<td>Water Foot Valve</td>
<td>KIRLOSKAR /GG /LEADER</td>
</tr>
<tr>
<td>GI Pipes for water</td>
<td>TATA /JINDAL</td>
</tr>
<tr>
<td>MS Pipes for air, steam &amp; condensate</td>
<td>TATA / INDAL</td>
</tr>
<tr>
<td>NRV for air / Oil Line</td>
<td>INTERVALVE / AUDCO</td>
</tr>
<tr>
<td>Solenoid Valve for Water line</td>
<td>AVCON</td>
</tr>
<tr>
<td>Water Flow Meter</td>
<td>DASHMESH / ANAND ASAHI /KENT</td>
</tr>
<tr>
<td>FO flow meter</td>
<td>TOSHNIWAL / KENT /GHEMTROL</td>
</tr>
<tr>
<td>HP/ LP Steam / condensate Valves</td>
<td>AUDCO / CRESCENT / LEADER / THERMAX / BDK</td>
</tr>
<tr>
<td>Steam relief valve, traps &amp;</td>
<td>SPIRAX/MAZA / SAMSON / THERMAX</td>
</tr>
<tr>
<td>Strainers</td>
<td></td>
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<tr>
<td>Expansion bend for steam line</td>
<td>JN MARSHALL / MAZA</td>
</tr>
<tr>
<td>Steam Pressure Reducing Valve</td>
<td>SPIRAX// MAZA</td>
</tr>
<tr>
<td>Steam Pressure Reducing Station</td>
<td>JN MARSHALL (SPIRAX) / MAZA</td>
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**SS PIPES & VALVES**

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturers</th>
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</thead>
<tbody>
<tr>
<td>SS Pipes</td>
<td>RATNAMANI / BHANDARI FOILS &amp; TUBES / NEEKA TUBES / DECORA/ APEX TUBES</td>
</tr>
<tr>
<td>SS seat type Pneumatic Valves</td>
<td>LKM / APV/ GEA TUCHENHAGEN</td>
</tr>
<tr>
<td>SS B:utterfly/ Ball type pneumatic valves</td>
<td>TUCHENHAGEN / KEYSTONE</td>
</tr>
<tr>
<td>SS Manual Valves &amp; Fittings</td>
<td>LKM / IDMC / RECOTON (Howrah) / KPSAR (Delhi) /INDUSTRIAL AIDERS ((Delhi) / dairy engineering (Chennai)</td>
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**Refrigeration & AIR COMPRESSORES & AIR LINE FITTINGS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturers</th>
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<tbody>
<tr>
<td>Ammonia Compressor (Hi Speed)</td>
<td>Frick/ Kirloskar</td>
</tr>
<tr>
<td>PHE</td>
<td>GEA/ Alfa Level</td>
</tr>
<tr>
<td>Cooling System</td>
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</tr>
<tr>
<td>Air Compressor (Screw)</td>
<td>ATLAS COPCO /INGERSOLL RAND / ELGI / KIRLOSKAR</td>
</tr>
<tr>
<td>Air Compressor (Reciprocating)</td>
<td>INGERSOLL RAND / ELGI / KIRLOSKAR/ KHOSLA</td>
</tr>
<tr>
<td>Refrigerated Air Dryer</td>
<td>ELGI /SABROE / CHICAGO PHEUMATIC/ HIRAS</td>
</tr>
<tr>
<td>Air lines accessories</td>
<td>SHAVO NORGEN / FESTO / AIRMATIC/ LEGRIS / NUCON</td>
</tr>
<tr>
<td>Auto Drain Valve</td>
<td>ULTRA FILTER / ZANDER</td>
</tr>
<tr>
<td>Fuel Oil Pumps</td>
<td>ROTODEL / DELTA / TUSHACO</td>
</tr>
<tr>
<td>Resin bonded mineral wool</td>
<td>LLOYD / UP TWIGA/ MINWOOL / ROCKWOOL</td>
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</tbody>
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**LABORATORY EQUIPMENT**
### LABORATORY EQUIPMENT

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Brand(s)</th>
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<tbody>
<tr>
<td>Acidometer</td>
<td>METROHM / FOSS ELECTRIC / RADIOMETER</td>
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<tr>
<td>pH Meter</td>
<td>METROHM / FOSS ELECTRIC / RADIOMETER</td>
</tr>
<tr>
<td>Milk- O- Scanner</td>
<td>FOSS ELECTRIC / FUNKE GERBER / REIL</td>
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<tr>
<td>Auto Sampler</td>
<td>FOSS ELECTRIC</td>
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### MISCELLANEOUS ITEMS

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Brand(s)</th>
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<tbody>
<tr>
<td>Geared Motor / Gear Box</td>
<td>BL / POWER MASTER / ELECON / RADDICON / SHANTHI GEARS / IC BAUER / BON FIGOLIC / EURO DRIVES</td>
</tr>
<tr>
<td>Steam- Water Mixing Battery</td>
<td>SPIRAX SHREE VISHWAKARMA / SWASTIK (Rajahmundry) / CHENGALVA / UNICORN</td>
</tr>
<tr>
<td>Structural steel</td>
<td>SAIL / TISCO / RINL / LISCO / ESSAR</td>
</tr>
<tr>
<td>Plastic Crates for Milk Pouch</td>
<td>SUPREME / NEELKAMALS</td>
</tr>
<tr>
<td>Ammonia Compressor</td>
<td>Kirloskar / Frick</td>
</tr>
<tr>
<td>PHE for IBT.</td>
<td>GEA / Tetra pack / Any Standard make</td>
</tr>
<tr>
<td>Burner for Boiler (duel type)</td>
<td>Weishipt make only</td>
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</table>
LIST OF DRAWINGS : (VOLUME-IIC)

<table>
<thead>
<tr>
<th>SL No.</th>
<th>Description of Drawing</th>
<th>Rev</th>
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<tr>
<td>1</td>
<td>Site Layout Plan - 1</td>
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<tr>
<td>2</td>
<td>Main Plant Architecture-03</td>
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</tr>
<tr>
<td>3</td>
<td>Main Plant Architecture-04</td>
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</tr>
<tr>
<td>4</td>
<td>Main Plant Architecture-06</td>
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