THE ICHHAMATI CO-OPERATIVE MILK PRODUCERS' UNION LIMITED
(A Government of West Bengal Project)
Hatipukur Road, Barasat – 700124, North 24 Parganas, West Bengal
Regd. No. 3/IMU (N-24 Pgs.) of 1997
E-mail: ichhamati123@gmail.com / mdichhamati@gmail.com

e-TENDER NOTICE

Memo No.: IMUL/e-TENDER/138/26-27/ 307 Date: 09.06.2026

The Ichhamati Co-operative Milk Producers' Union Limited hereby invites e-Tenders from eligible, experienced and reputed manufacturers/suppliers for Supply, Installation, Testing, Commissioning, Trial Run, Operational Training and Successful Handover of Bulk Milk Coolers (BMCs) at various Chilling Plants under the jurisdiction of the Union.

1. SCOPE OF WORK

The selected bidder shall be responsible for supply, installation, commissioning and successful operation of the following Bulk Milk Coolers (BMCs):

Sl. No.	Installation Location	Capacity	Schedule
1	Ranaghat Chilling Plant, Nadia	5000 Litres	Schedule-I
2	Gopalnagar Chilling Plant, North 24 Parganas	3000 Litres	Schedule-II
3	Duckbanglo Chilling Plant, North 24 Parganas	2000 Litres	Schedule-III

WORKS INCLUDED IN THE CONTRACT

The successful bidder shall execute the following activities:

A. Supply

Supply of Bulk Milk Cooler (BMC) Units complete in all respects.

B. Accessories and Ancillary Items

The bidder shall supply all accessories including but not limited to:

- Refrigeration Compressor
- Condensing Unit
- Agitator Assembly
- Control Panel
- Electrical Accessories
- Power Cabling
- Milk Outlet Assembly
- CIP Connection
- Foundation Fasteners
- Earthing Materials
- All necessary spare parts and accessories required for successful operation

C. Transportation

Safe transportation of all equipment from factory/warehouse to the designated Chilling Plants.

D. Installation

Complete installation of BMC Units at designated locations.

E. Commissioning

Commissioning and making the system fully operational.

F. Trial Run

Successful trial operation for a minimum period of 72 hours.

G. Training

Hands-on operational and maintenance training to Chilling Plant Operators and technical personnel.

H. Handover

Submission of successful commissioning report and handing over of the system along with Acceptance Certificate.

2. INVITING AUTHORITY

Managing Director

The Ichhamati Co-operative Milk Producers' Union Limited

3. IMPORTANT DATES

Particulars	Date
Date of Publication of e-Tender	10.06.2026
Start Date of Online Bid Submission	10.06.2026
Closing Date of Online Bid Submission	22.06.2026 up to 5:00 PM
Opening of Technical Bid	23.06.2026
Opening of Financial Bid	To be intimated to technically qualified bidders

4. ELIGIBILITY CRITERIA 4.1 Manufacturer Requirement The bidder must be:

- Original Equipment Manufacturer (OEM), or
- Authorized Supplier of OEM, or
- Authorized Service Provider of OEM.

Valid Authorization Certificate shall be mandatory.

4.2 Quality Certifications The bidder must submit valid:

- ISO Certification
- BIS Certification
- Industrial Safety Certification

All certificates must remain valid throughout the tender period and contract duration.

4.3 Statutory Documents The bidder shall submit:

- PAN Card
- GST Registration Certificate

4.4 Financial Eligibility

The bidder must have achieved a minimum annual turnover of ₹1.00 Crore during each of the following financial years:

- FY 2023-24 • FY 2024-25 The following documents must be submitted:
- Audited Balance Sheet
- Chartered Accountant Certified Turnover Certificate
- CA Registration Number

4.5 Experience

The bidder must have supplied at least 20 Bulk Milk Coolers during the last three years.

Supporting documents:

- Work Orders
- Completion Certificates must be submitted.

5. BID VALIDITY

The bid shall remain valid for 365 days from the date of evaluation of Financial Bid.

6. WARRANTY

The successful bidder shall provide a comprehensive warranty of three (3) years from the date of successful installation and commissioning.

Any defective component shall be replaced free of cost within 24 hours of complaint.

7. PAYMENT TERMS

Payment shall be released through NEFT/RTGS in the following stages: First Stage

70% of the contract value shall be released upon:

- Successful delivery of complete BMC Units at site.
- Certification by the concerned authority.
- Approval by competent authority.

EMD shall also be refunded at this stage upon written request.

Second Stage

20% of the contract value shall be released after:

- Successful installation and commissioning.
- Successful completion of trial run.
- Certification by competent authority.

Third Stage

Remaining 10% of contract value shall be released after:

- Submission of Performance Bank Guarantee valid for three years.
- Value of Performance Bank Guarantee shall be equivalent to 10% of Contract Value.
- Payment shall be released three months after submission of Performance Bank Guarantee.

8. EARNEST MONEY DEPOSIT (EMD) AND SECURITY DEPOSIT

1. No interest shall be payable on EMD Rs 90,00,000.
2. EMD of unsuccessful bidders shall be refunded within two working days after issuance of Award of Contract (AOC).
3. EMD of successful bidder shall be treated as Security Deposit.
4. Security Deposit shall be refunded along with first stage payment.

9. INSURANCE

The supplier shall arrange insurance at his own cost covering:

- Manufacturing Stage
- Storage Stage
- Transportation Stage
- Unloading Stage
- Installation Stage

If installation and commissioning are delayed beyond the stipulated period, insurance coverage shall be extended at the supplier's own cost until successful handover.

10. PENAL MEASURES

Time shall be treated as the essence of the contract.

10.1 Liquidated Damages

In case of delay in supply, installation or commissioning:

- Penalty @ 0.50% of Contract Value per week shall be imposed.
- Maximum penalty shall be limited to 10% of Contract Value.
- The amount shall be recovered from Security Deposit or pending bills.

10.3 Breach of Contract

In case of violation of any contract condition:

- Contract shall be terminated.
- Security Deposit shall be forfeited.
- Financial loss suffered by the Milk Union shall be recovered.
- The bidder shall be blacklisted for three years. (Continued as per Tender Conditions.) next

11. LOADING AND UNLOADING

1. The supplier shall intimate the Milk Union in writing before dispatch of materials.
2. The supplier shall ensure proper and safe packing of all equipment before transportation.
3. Any loss, damage, breakage or deterioration during transit shall be entirely borne by the supplier.
4. All equipment shall be delivered at the designated installation locations in good condition.
5. Loading, transportation, unloading and shifting of equipment up to the installation point shall be the responsibility of the supplier.

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12. SITE PREPARATION

The Milk Union shall provide necessary site infrastructure including:

- Concrete foundation/base platform
- Electrical power connection
- Water connection
- Drainage arrangement
- Access for installation activities

The supplier shall coordinate with the concerned authority before installation.

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13. DOCUMENTATION

The supplier shall submit the following documents in both Hard Copy and Soft Copy format:

1. Warranty Certificate
2. Operation Manual
3. Maintenance Manual
4. Technical Catalogue
5. Electrical Drawings
6. Refrigeration System Diagram
7. Factory Test Certificate
8. Guarantee Card
9. Manufacturer's Quality Certificate
10. Installation and Commissioning Report

Failure to submit the above documents may result in rejection of supplied equipment.

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14. DELIVERY, INSTALLATION AND COMMISSIONING

The BMC Units shall be installed at the following locations:

Location	Capacity
Ranaghat Chilling Plant, Nadia	5000 Litres
Gopalnagar Chilling Plant, North 24 Parganas	3000 Litres
Duckbanglo Chilling Plant, North 24 Parganas	2000 Litres

The entire work shall be completed within 20 days from the date of issuance of Purchase Order. Prior coordination with the Milk Union before dispatch of equipment shall be mandatory.

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15. INSPECTION AND ACCEPTANCE

The Milk Union reserves the right to inspect the equipment at any stage, including:

- Manufacturer's Works Inspection

- Pre-dispatch Inspection
- Delivery Inspection
- Installation Inspection
- Commissioning Inspection
- Performance Verification

The following deficiencies may lead to rejection:

- Manufacturing defects
- Transit damage
- Inferior quality materials
- Deviation from approved specifications
- Incomplete supply

Rejected materials shall be removed and replaced by the supplier within 15 days at no additional cost. The decision of the Inspection Committee shall be final and binding.

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16. STANDARDS AND QUALITY REQUIREMENTS

All equipment supplied under this contract shall conform to:

- NDDB Standards
- BIS Standards
- ISO Standards
- FSSAI Requirements
- Latest Applicable Indian Standards
- Good Engineering Practices

All materials shall be new, unused and of the latest design.

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17. REGISTRATION OF GOODS

Wherever required under applicable laws, the supplier shall ensure that the supplied equipment is duly registered, certified and approved for use in India.

Any statutory approval required for operation shall be obtained by the supplier without additional cost to the Milk Union.

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18. PATENT RIGHTS

The supplier shall indemnify the Milk Union against any claims relating to:

- Patent Rights
- Trademark Rights
- Industrial Design Rights
- Copyright Issues
- Intellectual Property Rights

Any legal liability arising from infringement shall be borne entirely by the supplier.

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19. PACKING

The equipment shall be packed adequately to prevent:

- Scratches
- Denting
- Corrosion
- Moisture Damage
- Transit Damage

Packing shall be suitable for road transportation and long-distance handling.

The supplier shall be fully responsible for damages arising due to improper packing.

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20. TERMINATION FOR DEFAULT

The Milk Union may terminate the contract by written notice if:

1. The supplier fails to deliver the equipment within the stipulated period.
2. The supplied equipment does not conform to technical specifications.

3. False information or forged documents are submitted.
4. Fraudulent or corrupt practices are detected.
5. Any condition of the contract is violated.
6. The supplier fails to perform contractual obligations satisfactorily.

In such cases, the Security Deposit shall be forfeited and further action may be initiated by the Milk Union.
(Next Part: Termination for Insolvency, Termination for Convenience, Dispute Resolution, Applicable Law, Force Majeure, Reserved Rights and Annexure-I Affidavit.) next

21. TERMINATION FOR INSOLVENCY

If the Supplier becomes bankrupt, insolvent, financially incapable, or enters into liquidation proceedings, the Purchaser may terminate the contract by issuing a written notice without payment of any compensation.
Such termination shall not prejudice or affect any rights, remedies, obligations or liabilities accrued prior to the date of termination.
The Milk Union shall reserve the right to recover any loss or damage suffered due to such termination.

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22. TERMINATION FOR CONVENIENCE

The Ichhamati Co-operative Milk Producers' Union Limited reserves the right to terminate the contract, either wholly or partially, at any time in the public interest or for administrative reasons by issuing a written notice to the Supplier. The notice shall specify:

- The extent of termination.
- The effective date of termination.
- The obligations remaining to be fulfilled by the Supplier.

In such cases, payment shall be made only for satisfactorily completed and accepted works executed up to the date of termination.
The Supplier shall not be entitled to claim any compensation for loss of profit, anticipated business, or future commitments.

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23. DISPUTE RESOLUTION

Any dispute, difference, controversy or claim arising out of or relating to the contract, including interpretation, implementation, execution, termination or validity thereof, shall initially be resolved through mutual discussion and negotiation between the parties.
If the dispute cannot be resolved amicably within thirty (30) days, the matter shall be referred to arbitration under the provisions of the Arbitration and Conciliation Act, 1996 and subsequent amendments thereof. Venue of Arbitration
Kolkata, West Bengal
Language of Arbitration
English
The decision of the Sole Arbitrator shall be final and binding upon both parties. The cost of arbitration shall be borne as determined by the Arbitrator.

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24. APPLICABLE LAW

The Contract shall be governed by and interpreted in accordance with the laws of India and the applicable rules, regulations, orders and notifications issued by the Government of India and the Government of West Bengal. All legal proceedings, if any, shall be subject to the jurisdiction of competent courts located in Kolkata, West Bengal.

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25. FORCE MAJEURE

Neither party shall be liable for failure or delay in performance of obligations under the Contract if such failure or delay arises from circumstances beyond reasonable control, including but not limited to:

- War
- Hostilities
- Civil Commotion
- Riots
- Sabotage
- Fire
- Flood

- Earthquake
- Cyclone
- Lightning
- Explosion
- Pandemic
- Epidemic
- Quarantine Restrictions
- Lockout
- Strike
- Government Restrictions
- Natural Calamities ┐ Act of God

The affected party shall notify the other party in writing within seven (7) days of occurrence of such event.
Performance of obligations shall be suspended during the continuance of Force Majeure conditions.
Upon cessation of Force Majeure conditions, both parties shall resume contractual obligations within a reasonable period.

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26. RESERVED RIGHTS OF THE MILK UNION

The Ichhamati Co-operative Milk Producers' Union Limited reserves the right to:

1. Accept or reject any Tender without assigning any reason whatsoever.
2. Cancel or withdraw the Tender process at any stage.
3. Reject any or all bids received.
4. Increase, decrease or modify the quantity of equipment to be procured.
5. Seek clarification, additional documents or further information from any bidder.
6. Reject the bid of the Lowest Bidder (L-1) if found technically unsuitable.
7. Split the order among more than one bidder, if deemed necessary.
8. Verify credentials and documents submitted by the bidder from any source.
9. Conduct inspection of the bidder's manufacturing facility, service centre or infrastructure before award of contract.
10. Take any decision necessary in the interest of the Milk Union and dairy development activities. No claim, compensation or legal challenge on these grounds shall be entertained.

27. The bidding system is on internet platform. The site can be accessed through www.ncdfiemarket.com maintained by National Cooperative Dairy Federation of India Ltd (NCDFI), which will be the venue for online bid submission

28. Transaction Charges (TC): NCDFI will levy TC from the successful bidder @0.4% + GST. Unsuccessful bidders need not pay any charges.

29. TDS: NCDFI will deduct TDS u/s 194 (O) from the seller's EMD on projected trade value at the time of issuance of the Bid Evaluation Result as statutory compliance.

ANNEXURE – I

AFFIDAVIT / DECLARATION

(To be executed on Non-Judicial Stamp Paper of Rs. 20/- and duly notarized) I/We, the undersigned, do hereby solemnly affirm and declare as follows:

1. That all information, statements and documents submitted along with this Tender are true, correct and complete to the best of my/our knowledge and belief.
2. That my/our Firm/Company has not abandoned any similar work in the past.
3. That my/our Firm/Company has not been blacklisted by any Government Department, NDDB, Milk Union, Milk Federation, Cooperative Institution, PSU or any other Organization.
4. That The Ichhamati Co-operative Milk Producers' Union Limited is authorized to verify any information submitted by us from Banks, Government Departments, Financial Institutions or any other sources.
5. That we shall furnish any clarification or additional information sought by the Milk Union within seven (7) days from the date of request.
6. That we agree to abide by all Terms and Conditions of this Tender and undertake to execute the work accordingly.

Bidder Details

Name of Firm/Company: _____

Registered Address: _____

GSTIN: _____

PAN: _____

Name of Authorized Signatory: _____

Designation: _____

Mobile No.: _____

E-mail ID: _____

Declaration

I/We hereby certify that the information furnished above is true and correct. In the event of any information being found false or misleading, The Ichhamati Co-operative Milk Producers' Union Limited shall have the right to reject our bid, cancel the contract and take appropriate action as deemed fit.

Signature of Authorized Signatory Name:

_____

Designation: _____

Seal of Firm/Company

Date: _____

Place: _____

NOTARY CERTIFICATION

Certified that the above named deponent appeared before me, read and understood the contents of this Affidavit and signed the same voluntarily in my presence. Signature of Notary Public Seal of Notary Public

END OF TENDER DOCUMENT

Tender Name: Supply, Installation and Commissioning of NDDB Approved Bulk Milk Coolers (BMCs) Locations:

- Ranaghat Chilling Plant (5 KL)
- Gopalnagar Chilling Plant (3 KL)
- Duckbanglo Chilling Plant (2 KL)

Tender Reference No.: IMUL/e-TENDER/138/26-27/307
Date of Publication: 10.06.2026
Closing Date of e-Tender: 22.06.2026 up to 5:00 PM

Managing Director
The Ichhamati Co-operative Milk Producers' Union Limited
Hatipukur Road, Barasat – 700124 North 24 Parganas, West Bengal.

(Schedule-I)

DETAILED TECHNICAL SPECIFICATIONS AND SCOPE OF SUPPLYCAPACITY - 5000 LITRE

1. General Description

Design, supply, installation, testing and commissioning of Direct Expansion type bulk milk cooling systems including all accessories & items given in the detailed scope of supply, on turnkey basis.

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2. Functional Requirement

These systems would be installed in village Dairy Co-operative Society (DCS) / village milk collection centre, which collects milk every day in the morning & evening from milk producers.

The milk collected shall be stored in the bulk milk cooler and cooled from ambient temperature to 4° centigrade.

The stored milk shall be dispatched to dairy plant through insulated road milk tanker once in a day.

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3. Design Requirement

3.1 Capacity

The net capacity of the bulk milk cooler shall be as mentioned above and as per the requirement given in the enquiry/tender document.

However, the gross capacity in all the sizes shall be around 10% higher than the rated capacity to avoid accidental spillage of milk due to agitation or any other reason.

3.2 Applicable manufacturing/design code

3.2.1 Bulk Milk Cooler (BMC)

The BMC tank shall meet the requirements of ISO 5708 – 2 II (Latest version) for milk collection cycle of two times in a day with not more than 3.0 hours cooling time from 35 to 4°C for all milking and not more than 1.5 hours for second milking i.e. from 10 to 4°C.

For design of condensing unit for BMC ARI Standard 520-2004 (Air-Conditioning & Refrigeration Institute, Arlington, Virginia) for ambient temperature condition shall be applicable.

The tank shall be of an established & proven Direct Expansion type design, in regular production & use and not a prototype.

Note:
All milking means quantity of milk received in either morning shift or evening shift.

When a Tank for two milkings is either empty or contains 50% of its rated volume of milk at 4°C, and 50% of the rated volume of milk at 35°C is added in one batch, all of the milk shall be cooled to 4°C in not more than the specified cooling time.

When the second milking quantity of milk is added, the total quantity of milk shall be cooled to 4°C within the specified cooling time.

3.2.2 Refrigeration System

The refrigeration system shall be designed to meet performance ratings of positive displacement condensing units specified in ARI Standard 520-2004.

The refrigeration system shall also meet the requirements of milk collection system as per ISO 5708.

3.2.3 Accessories

Accessories like diesel generator set, electric & control cables, control panel, temperature sensor, electrical switchgears, refrigeration control valves & fittings etc. shall be of approved make as detailed in the specifications and shall meet the requirement of the latest relevant Indian Electricity Rules, ISO/BIS Standards.

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4. Scope of the

Bidder 4.1 Scope

The bidder’s scope starts from SS 304 funnel with a SS mesh at inlet of the BMC tank for manual receiving of milk.

Alternatively, milk is received in milk can with SS 304 funnel with SS mesh and then manually poured into a balance tank (200 litres) and pumped to bulk milk cooler.

In some cases, the reception equipment will include a can tipping bar.

The balance tank of capacity 200 litres shall be made up of SS sheet conforming to AISI 304.

From BMC, the milk shall be transferred to Road Milk Tanker (RMT) through food grade quality flexible hose of adequate length and milk transfer pump installed either on the RMT or through the pump supplied along with BMC.

Bidders should furnish separate prices for gravity fed system as well as for pumped system.

4.2 Supply

The bulk milk cooler shall be a complete unit with the refrigeration system, agitator(s), lockable inlet & outlet valve with strainer.

Also includes supply of AISI 304 balance tank with SS 304 filter for pumped system, SS piping & milk hose of food grade quality, unions and milk transfer pump of 5000 LPH, SS 304 pipes & fittings, erection materials, pipe supports, floor plates, hinged type pipe clamps.

The hose pipe shall be 10 metres long and end with SS liner and blank nut chained with the hose.

A wall mounted SS hook of adequate size for hanging the milk hose pipe roll shall also be provided.

The scope includes electrical & control panels and interconnecting cables.

Cable conduits shall also be supplied, earth pit pipes with removable cover & earthing as required by local electrical regulation.

The indicative distances between BMC outlet to milk pump inlet – 3 m, BMC to mains power point & DG set – 20 m may be considered for calculating cable, SS piping requirement, supports etc.

However, the exact distances shall be as per site conditions and complete piping & cabling necessary for installation shall be supplied.

4.3 Installation & Commissioning

The total job is on turnkey basis and includes supply, installation, testing, commissioning and training of the field personnel.

Minor civil works, providing & grouting supports are included in the scope.

Giving satisfactory training to the staff of the collection centre and trial runs for the complete unit.

Moreover, supplier has to demonstrate performance of the unit as per operating parameters to the Client / NDDB.

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5. Constructional Features

5.1 Bulk Milk Cooling Tank

5.1.1 Material of Construction

Tank inner, outer, bottom, top openable cover shall be fabricated from Stainless Steel AISI 304 material.

All components, as under, shall be made out of AISI 304 grade stainless steel:

Piping & fittings, Filter, Lockable cover, Agitator shaft & blade, adjustable Ball Feet with provision for 50 mm height adjustment, Dipstick, Outlet & Inlet Valves, Blank flanges etc.

The filter screen shall be fine wire mesh.

All the gaskets shall be of food grade nitrile or neoprene rubber material.

The AISI 304/316 evaporator shall be dimpled pressed plate jacket put as bottom plate of the inner tank.

The bottom evaporation surface in contact with milk as well as outer SS cladding is passivated by standard chemical treatment to impart corrosion resistance.

5.1.2 Shape & Orientation

The preferred shape of the tank shall be horizontal rectangular with an openable top cover.

The shape of the BMC tank shall conform to international sanitary design.

5.1.3 Milk Cooler Tank & Evaporator

The AISI 304 tank for the bulk milk cooler should be horizontal rectangular or horizontal semicircular bottom or vertical circular shape, which imparts smooth distribution of the fat in milk when agitator is set into operation.

The tank shall be so designed that all surfaces in contact with milk are readily accessible either in their position or after dismantling to permit thorough cleaning.

Inner Vessel:

All joints shall be TIG welded, any filler rod used being suitable for the parent metal.

All welds shall be ground smooth and free from crevices, porosity and brittleness.

All milk contact metallic surfaces of the inner vessel and its attachments should have finish not less than 150 grit finish.

Any permanent attachment to the inner vessel shall be welded with fillet radii not less than 6 mm.

All parts of the inner vessel shall drain directly to the outlet.

Internal corners formed round the bottom of the inner vessel and outlet well shall be of not less than 25 mm in radius.

Other internal corners shall be not less than 15 mm in radius.

The evaporator shall be laser welded dimpled jacketed.

In case of rectangular type bulk milk cooler, the evaporator is fixed as the bottom plate of the inner tank.

Whereas in semicircular bottom tank the jacket shall be at least up to 1/3 height of the tank.

In case of double compressor, total evaporator area shall be divided and separated into two sections.

Each section shall have separate suction & discharge connecting to each compressor.

The evaporator surface in contact with the milk should be passivated by standard treatment to impart corrosion resistance.

5.1.4 Tank Fittings & Accessories

The tank shall be provided with stainless steel inlet with special “no-foam” design, outlet 38/51 mm butterfly valve & blank union with locking arrangement, inspection window/manhole with locking arrangement, agitator and top cover with locking arrangement.

At the bottom of the outlet cup on the outer surface, a temperature sensor shall be permanently fixed.

It shall sense the temperature of the surface at the outlet and transmit the signal to the digital indicator.

The digital type temperature indicator shall be provided in the control panel with back up battery.

The tank shall be provided with SS calibrated dipstick to measure the volume of milk inside the tank.

The dipstick shall be graduated from 10% or less to not less than 100% of the rated volume.

Each division on dipstick shall represent a volume not greater than 0.5% of the rated volume.

The calibration chart of dipstick having adequately bold letters shall be laminated/framed and shall be supplied with BMC.

The tank shall be equipped with agitator(s) capable of producing a uniform distribution of fat in the milk.

All SS fittings shall be of SMS standard.

The BMC shall be provided with 1 (one) AISI-304 filter with SS fine wire mesh suitable to filter extraneous matter such as dust particles, hay, flies, cow dung pieces/particles etc.

The filter shall be designed and installed in such a way that it can frequently and easily be cleaned.

Top cover lifting handle shall be an in-built feature of the unit.

The tank shall be provided with AISI 304 adjustable ball feet tamper proof type having provision of 50 mm height adjustment.

Provision of a bolt for earthing connection may be provided on one of the legs.

Number of ball feet shall be minimum 4 for small capacity tank and 6 for bigger tank.

5.1.5 Balance Tank, Capacity 200 Litres

The balance tank of 200 litre capacity shall be of sanitary design, fabricated from SS 304 sheet of 1.6 mm thick for shell & 2 mm bottom.

Outlet SS cup and sufficient slope shall be provided at bottom of tank for complete draining of milk.

The dimension of tank and fittings shall be suitable to meet milk collection operations at centre.

1 no. SS removable cover (1.0 mm thick) with handle shall be provided.

SS filter made from 1.6 mm SS plate with 2 mm dia holes (Removable type) to be provided for placement in the balance tank to remove coarse suspended impurities from milk.

Four number ball feet shall be provided for height adjustment of 50 mm.

All fabricated parts shall be polished neat to 150 grit finish.

5.1.6 Stainless Steel Sanitary Milk Pump

5 KLPH, 10 MWC capacity milk pump shall be supplied for pumping milk from balance tank to BMC and BMC to road milk tanker.

Pump impeller & casing shall be made out of SS AISI 304/316 material.

All milk contact surfaces shall be finished to minimum 150 grits.

The pump should be of sanitary design.

Inlet & outlet of the pump shall have ends with SMS union.

The pump shall be provided with approved make motor having ‘E’/’F’ class insulation and IP 55 protection.

The flanged end motor shall have stainless steel shaft having hygienic mechanical sealing arrangement to prevent leakage from pump casing to rotor side of the motor.

Pump shall have SS shroud with air ventilation grill for circulating cooling air.

The pump shall have SS adjustable ball feet.

5.1.7 Insulation

The insulation of the tank shall be done by injection, in situ, of high density (minimum 40 kg/m^3, Chlorofluorocarbon free and environmental friendly) polyurethane foam without having any imperfection and hygroscopicity.

The efficiency of insulation should be such that at max 50°C ambient temperature the rate of rise of the mean temperature of the milk shall not exceed by 1°C in four hours, when the rated milk volume initially at about 4°C is allowed to stand undisturbed as per the requirement of ISO 5708 – 2 II when the refrigeration unit is not working.

5.1.8 Cleaning In Place (CIP)

For top openable configuration, facilities for manual cleaning shall be provided with suitable brush for BMC tank as well as brush for internal cleaning of SS pipes.

4 nos. of SS hooks shall be provided to keep these brushes, loose pipes etc.

5.1.9 Welding & Finishing

Inner, outer, intermediate dimpled jacket and nozzle connections shall be welded with TIG processonly.The inner shell and all other product contact surface shall be polished up to minimum 150 grit finish.The outer surface to be polished with 150 grit dull finish or a circle finish.

5.2 Refrigeration System

The refrigeration system shall be designed to comply with ARI Standard 520-2004 and to meet the requirements of milk collection system of ISO 5708, Class 2 II.

The refrigeration system shall be of direct expansion type, with Freon-22 (R-22) or CFC free environmental friendly refrigerant to cool the raw milk from reception temperature to 4°C in the prescribed period mentioned.

The evaporator(s) of the refrigeration system shall form a part of the milk tank body as dimpled jacket in the bottom plate in case of rectangular open tank or at least up to 1/3rd height of the circular/semicircular tank.

It would be better if the system is compatible for the refrigerant R 407 C.

The refrigeration system shall be direct expansion type to perform cooling function in an ambient temperature of 46°C with air-cooled condenser.

5.2.1 Compressor

The refrigeration compressor shall be adequate enough to ensure that milk is cooled to 4°C in the prescribed time limit and suitable to operate at 0°C suction temperature and 60°C condensing temperature (air-cooled condenser) assuming 46°C ambient temperature.

The refrigeration compressor(s) shall be rotary/reciprocating, hermetically sealed type essentially suitable for refrigeration application in hot & humid Indian climatic conditions.

The motor of the compressor should have a thermistor temperature sensor embedded in windings for protection from excessive heating due to overloading or short-circuiting.

Similarly, a protection against off cycle migration of refrigerant to the compressor is necessary in the refrigeration unit, preferably a self-regulating PTC crank case heater.

The compressors selected should be energy efficient and consume least power to meet the cooling load requirements.

The bulk milk cooler up to capacity of 1000 L shall be provided with single compressor; however, for higher capacity units two compressors system shall be preferred.

In the offer bidder shall clearly mention whether the offered system shall work on single phase or three phase mains supply.

However, choice of single phase or three phase will rest on the sole discretion of the buyer.

Client shall approve Make(s) of the compressor.

Bidders can also offer Energy Efficient Hermetically Sealed Scroll Compressors as alternative to rotary/reciprocating compressors.

5.2.2 Condenser

The condenser shall be air cooled finned tube type having sufficient heat transfer area designed for extremely high ambient temperature given above.

The air circulation fan of condenser shall preferably be induced draft type sucking cold air over the compressors and throwing hot air out of the premises/place of installation.

The condensing temperature should not be less than 60°C considering operating ambient temperature of 46°C.

5.2.3 Receiver

For refrigeration circuit a suitable size liquid receiver mounted on the skid near compressor to assist system to store refrigerant during pump down cycle as well as in case of maintenance.

5.2.4 Thermostatic Expansion Valve

Suitable size and capacity Thermostatic Expansion Valve should be provided in the refrigeration circuit of the bulk milk cooler.The TX valve should be Maximum Operating Pressure type and of adequate capacity to feed optimum quantity of refrigerant to the milk cooling tank evaporator.

5.2.5 Refrigerant Pipe, Fittings & Controls

All pipes, valves, fittings & controls shall comply with the latest relevant BIS code applicable.

Isolation valves at suction & discharge sides of the compressors is provided for compressor isolation during maintenance of the system.

A suction pressure regulating valve (KVL) shall be provided to restrict suction pressure within a reasonable limit for preventing tripping of compressor.

Copper/SS tubing shall be routed in such a way that if any leakage occurred during operation can easily be detected and the defective portion can be repaired/replaced without dismantling the whole system.

All the pipes shall be clamped properly with fixed support.

In case of double compressor system, pipe, fitting & control should be designed in such a way that both the compressors can run independently.

The tubing shall be insulated wherever necessary.

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6. Electrical Control Panel

6.1 Control Panel

Four control panels shall be provided, one for the main power supply tapping, second for the refrigeration unit, the third for the milk tank and fourth for lighting, testing equipment and computers etc.Each panel shall be provided with suitable switchgear of required ratings for switching and protection as per the system requirement.

The incoming and outgoing power supply terminals shall be covered and secured with a lead seal to prevent tampering.The door of the panels should be provided with lockable handles.

For 15 KVA 3 Phase Automatic Stabiliser, following major components shall be provided:

1. The incoming grid power (Phase voltage 180 to 280 volts) shall be given through TPN MCB 40 A. Relay system to be provided to ensure that if incoming voltage is either less than 180 volts or more than 280 volts in any phase, stabiliser stops incoming power to stabiliser for its safety.
2. LED type Indicator lamps (R, Y, B) on the individual phases of supply.
3. A bypass switch 40 A for bypassing correcting transformer.
4. Correcting transformer, air cooled type, for each phase, with 6 steps each of 20 volts (phase 180-200220240-260-280 V) to be controlled through a relay system or servo controlled.
5. A Change-Over TPN switch 40 A between DG Set and corrected mains power supply.
6. A digital input and output (corrected) voltage/current/frequency indicator with selector switch for all three phases. The indicator shall be so provided as to be visible from a distance of at least 5 metre, and so located as to require no special effort to see the readings.
7. TPN MCB 40 A for correcting transformer ON/OFF.
8. TPN MCB 40 A for supplying power to Refrigeration Panel.
9. TPN MCB 32 A for supplying power to lighting DB.
10. TPN MCB 16 A for supplying power to starter of milk pump. Parallelly 20 A metallic power plug socket to be provided.
11. If the corrected voltage at the output side goes beyond 180-280 volt range, a control relay/power contactor combination shall cut off output power supply with a loud alarm.
12. Suitable terminal blocks, heavy duty,
    4 way for incoming mains (63 A) and

4 way (63 A) for DG Set incoming and terminal
blocks (4 way 63 A for refrigeration, 4 way 32
A for lighting DB,
4 way 32 A for milk pump) heavy duty for outputs.

13. Housing enclosure of powder coated MS of appropriate size.
14. Double compression heavy duty Brass cable glands for two incoming armoured cables & PVC cable glands.

For 15 KVA Single Phase Automatic Stabiliser,Major components are to be worked out similar to 10 KVA single phase & 15 KVA three phase respectively for which details are given above.

6.1.2 Refrigeration Control Panel

The refrigeration unit shall be provided with a control panel made out of Stainless Steel suitable for wall mounting near the unit.

The panel shall be provided with motor starters, ON/OFF push buttons & necessary MCBs, control wiring, line voltage controller to guard the compressor against the supply voltage fluctuations.

In case more than one compressor is provided in the refrigeration system, the control panel shall be provided with a sequence controller & timer to start one compressor at a time to avoid power supply surge.

The panel shall also have facility to operate refrigeration unit on auto/manual mode.

In the auto mode, as soon as the milk temperature reaches to pre-set value, the compressor should be switched off to avoid freezing of milk.

6.1.3 Milk Tank Control Panel

The milk tank shall be provided with a wall mounted control panel with timer to control the intermittent operation of the agitators & a digital temperature indicator to indicate the milk temperature to one decimal place with least count of 0.1°C on continuous basis.

It shall include suitable switchgears etc as required for switching & protection.

The agitator shall have interlocking arrangement with top cover opening limit switch.

The limit switch shall put off the agitator as soon as the top cover opens up.

Panel shall have provision for pre-setting temperature of BMC Tank (not below the milk temperature of 4 degree centigrade) for starting/stopping refrigeration compressors.

Suitable battery backup is to be provided so that temperature can be indicated when there is no electric supply.

6.1.4 Domestic Power Distribution Board

This distribution board would get single phase power from grid supply directly (it is assumed that when grid power is received in this DB, Main control panel gets power only from DG Set) as well as stabilised power from main control panel and feed power for lighting, electric geyser/solar water heating system, testing equipment/computers.

The main components of this DB shall be as follow:

1. Wall mounted distribution board, MCB type

2. 32 DP Change over switch
3. 32 A DP MCB as incoming
4. 3 nos. 10 A MCB SP for lighting
5. 3 nos. 20 A MCB SP for geyser/Solar water heater, AMCU etc.

6.1.5 Cables & Electrical Switchgears

All electrical switchgears and controls required for the complete system shall be of suitable rating.

All permanent wiring installed on the tank or associated units shall be carried out using PVC cable in heavy gauge, screwed galvanized steel conduit or plastic conduit, or in mineral-insulated copper-sheathed cable.

Flexible electrical connections shall be made only to items normally movable in service.

Such flexibles shall be PVC insulated copper conductor cable not less than 24/0.20 mm in size (see IS 694 (Part 11964)) and earth continuity conductors of PVC insulated copper conductor shall be provided.

Cable between DG Set and main panel shall be either steel armored or un-armored in steel conduits.

For all electrical cables, suitable water tight cable glands and lugs should be used at ends.

Specification for PVC insulated cables (for voltage up to 1100V): Part 1 with copper conductor (revised).

6.1.6 Earthing

The earthing should be carried out as per IS: 3043 - 1987 (reaffirmed 2001) - “Code of practice for earthing”. Pipe type earthing can be used. The chassis, framework and the fixed parts of the metal casing of the tanks, DG Set body, refrigeration plant skid, and all panels shall be provided with two separate earthing terminals.

Neutral of DG Set shall be earthed by a separate independent earth pit.

Neutral of Grid supply shall also be earthed by a separate independent earth pit.

Suitable GI Strip (minimum 25x3 mm) to be used for connecting earth pit with nearest equipment earthing point.

From this point earthing to other points can be looped by suitable GI Strip or PVC insulated copper conductor cable of green colour (size minimum 1 x 4 Sq mm).

In view of above, total four earth pits to be provided for each installation.

The earthing terminals shall be readily accessible and so placed that the earth connections of the equipment are maintained when the cover or any other movable part of equipment is removed.

The earthing terminal shall be identified by means of the “□” marked in a legible and indelible manner on or adjacent to the terminals.

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7. Diesel Generator Set (Air/Water Cooled) and Accessories

The DG set shall be either single or three phase as per the system requirement.

Proper justification with calculations should be provided for capacity of the diesel engine and alternator being considered for DG set.

The engine should be rated for continuous operation for:

The refrigeration system, milk tank agitator & milk-loading/unloading pump, hot water geyser (approx. 2 kW), AMCU, lightings, ceiling fan.

Rated maximum output of the DG set should be calculated considering the load mentioned, over and above 10% additional load shall be considered to handle any eventuality and with the ambient design dry bulb (DB) temperature (summer) _40°C, and winter 16 °C.

Performance Requirement

The working KVA rating at site conditions after accounting for de-rating as per IS: 10001/10002 or equivalent shall be obtained at 0.8 power factor.

The Genset should have the engine, alternator, control panel and silencer as an integral part of the unit.

The major components of the DG set shall comprise:

7.1 Diesel Engine

The diesel engine should be suitable for Power Generation application type air/water cooled and capable of developing required BHP when running at 1500 rpm under NTP conditions and not agricultural engine.

The engine should be built to IS 10000/ISO 3046/BS 5514/649 and rated for continuous running of 24 hours with an overload capacity of 10% for a period not exceeding 1 hour in any 12 hours running.

Diesel engine up to 20 kW should have valid BIS license and certificate clearly mentioning use for ‘General purpose’ application as per IS 10001 norms.

Engine ratings should be for operation at full load condition and should be suitable to take 100% block load.

The engine instrument panel shall be supplied with:

- Ignition key
- Starting push button
- Lubricating oil pressure gauge
- Temperature gauge for cooling water
- Temperature gauge for lubricating oil
- RPM meter (Analog type)
- Battery charging ammeter

7.1.1

The diesel engine should be four stroke, naturally aspirated/turbocharged, multi cylinders & complete with the following:

a) Flywheel & flywheel housing

b) Engine air/water cooling system with cooling fan & radiator CAC coolant with recovery bottle c) Air intake, fuel and lubricating oil filters

d) Oil bath air cleaner

e) Standard day fuel tank having capacity suitable for minimum 8 hours continuous operation.

The tank shall be made with steel sheet of minimum thickness 18 gauge and complete with standard accessories such as drain pipe, fuel level indicator, valves, lockable cover, low-level contact & alarm.

This tank to be inside the acoustic enclosure.

f) Fuel pump with mechanical governor

g) Coupling

h) Exhaust silencer residential type

i) Holding down bolts, MS combination base frame & AVM pads

j) Self-starting arrangement with 12V suitable rated heavy-duty Lead Acid accumulator type battery with solidstate battery charging arrangement and cables

k) Standard set of tools

l) First fill of lubricating oil

m) First fill of coolant

n) Lubricating oil pressure & temperature gauge

o) Control panel for engine with engine safety against over speed, high water & cylinder liner temperature, V-belt failure, low lubricating oil pressure, low water level in radiator, auxiliary failure, air cleaner choke indicator

p) One brand new oil barrel of 200 litre capacity with manually driven gear/barrel pump for diesel transfer along with reinforced PVC hose for supply

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7.2 Alternator

The engine should be closely/flexibly coupled to suitable self-excited, self-regulated (through an AVR) alternator developing required KVA at 0.8 power factor, 1/3 phase, 50 cycle/sec, 230/415 volts AC power supply under NTP conditions when running at 1500 RPM.

The alternator should be brushless type, screen protected and fitted with end shield and ball roller bearings.

The alternator shall have ‘H’ class of insulation.

It shall conform to IS 13364 (Part 1) 1992 up to 20 KVA or IS 13364 (Part II) 1992 above 20 KVA or IS 4722 of 1992.

7.3 Control Panel

The diesel generating set should be supplied with suitable floor/wall mounting type control panel duly pre-wired with the following instruments:

- One suitable scaled and rating kWh meter with accessories
- One ammeter with selector switch
- One voltmeter with selector switch
- One no. frequency meter
- One no. hour meter (time totalizer)
- One set of epoxy resin casted CTs of suitable ratings
- One suitable capacity MCCB with overload and short circuit protection to disconnect power supply in case load of generating set increases beyond permitted limits.

The rupturing capacity of the MCCB should not be less than 35 KA.

- One set of TPN bus bars insulated with heat shrinkable PVC sleeves (maximum permissible current density shall be 0.8 amps/mm^2)
- One set of indicating lamps and control fuses

The control panel should conform to the Indian Electricity Rules.

7.4 Frame

The diesel engine and alternator should be mounted on specially designed combination base plate and MS structure of extremely rigid fabrication.

The base plate should be suitable for mounting the set on AVM pads over the foundation.

7.5 Acoustic Enclosure

DG set should carry a valid approval certificate issued as per CPCB norms complying with the provision of the Environment (Protection) Second Amendment Rules 2002, vide notification no G.S.R. 371 (E), dated 17th May 2002 & amended by GSR 448 (E) dt. 12/07/2004.

The Diesel Generator sets shall have a standard acoustic enclosure of 25 dB (A) insertion loss.

The exhaust pipe with exhaust muffler with insertion loss of minimum 25 dB (A) is connected to the exhaust manifold preferably with flexible bellows.

7.5.1 General Requirement

The enclosure could be tailor made suitable for both indoor and outdoor installation as per the requirement and depending upon the capacity of D.G. Set.

The enclosure should be aesthetically designed to perform for optimum noise attenuation and in no way derate the performance of the DG set in extreme summer conditions.

Acoustic Enclosure should be environment friendly and protected against rodents etc.

The enclosure should have:

- Adequate ventilation for genset cooling air requirement

- Absorbent/insulating material used is fire radiant
- Suitable thermal lagging to avoid localized heating of adjoining part of exhaust

- Appropriately located control panel
- Easy access side doors to service points on gensets
- Doors fitted with high quality gaskets to avoid leakage of sound

- Provision for engine air filters to suck the fresh inlet air for engine directly from atmosphere
- Sufficient space inside to fit different accessories like batteries etc & the maintenance can be done inside with easy movement of working person on DG set
- Enough space for control panel and fuel tank inside enclosure

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For proper ventilation and to maintain the temperature inside the enclosure forced ventilated air circulation system using axial flow fan(s) to meet total engine requirements &air changes should be provided.(Air volume required for ventilation is to be based on combustion air, cooling air & alternator cooling air as per specifications given by engine and alternator manufacturer.)

Temperature of enclosure should not exceed beyond 50°C of ambient temperature.

7.5.2 Constructional Features of Acoustic Enclosure

The enclosure shall be fabricated out of CRCA sheets of minimum 1.6 mm thickness and shall be reinforced adequately to ensure structural stability.

The enclosure shall be powder coated after seven tank pretreatment process.

The inside of the enclosure shall be lined with suitable fire retardant acoustic material to achieve the specified noise reduction level.

The enclosure shall be provided with suitable number of doors for access to engine, alternator and control panel for maintenance and servicing.

All doors shall be fitted with neoprene gaskets to prevent sound leakage.

The enclosure shall have provisions for lifting hooks/eye bolts for ease of handling and transportation.

The exhaust piping inside the enclosure shall be suitably insulated with glass wool and aluminum cladding to prevent excessive heating and ensure safety.

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8. Water for Cleaning at Milk Collection Centre

Hot water facility shall be provided at milk collection centre for cleaning of BMC tank, milk cans and other equipment.

8.1 Solar Water Heating System (200 LPD)

The solar water heating system shall conform to IS 12933.

The collector shall have 4 mm thick toughened glass with minimum transmissivity of 82%.

The absorber plate shall be of copper with selective coating.

The storage tank shall be of SS 304 with minimum thickness of 1.2 mm.

The tank shall be insulated with minimum 40 mm thick PUF insulation.

The system shall be complete with electric back up heater of 2 kW capacity.

GI Class-B pipes shall be used for water connections.

Hot water pipe shall be insulated with minimum 50 mm thick rock wool insulation.

8.2 LPG Instant Gas Water Heater

As an alternative to solar water heater, LPG operated instant gas water heater of 6 or 10 LPM capacity may be provided.

The heater shall have automatic ignition, over temperature protection and oxygen depletion sensor.

8.3 Electric Water Heater

As another alternative, electric storage type water heater (minimum 50 litres capacity) may be provided along with 200 litres SS 304 hot water storage tank.

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9. After Sales Service

The supplier shall have a service centre in the specified district or nearby district with adequate trained service personnel and infrastructure.

In case of breakdown, service engineer shall attend the site within 3 hours of receiving the complaint.

Regular preventive maintenance service visit shall be carried out once in every 8 weeks during warranty period. The bidder shall also quote separately for comprehensive service contract for a period of 3 years after completion of warranty period.

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10. Inspection

Inspection of BMC tank and refrigeration unit shall be carried out during fabrication stage and before dispatch.The bidder shall submit Quality Assurance Plan (QAP) and Quality Inspection Plan (QIP) for approval. Dye penetration test shall be conducted for welded joints.

Hydraulic test / Water tightness test shall be conducted before dispatch.

All necessary test certificates and inspection reports shall be furnished to the purchaser.

APPENDIX

LIST OF APPROVED MAKES OF BOUGHT OUT ITEMS

S.N.	ITEM DESCRIPTION	APPROVED MAKES
1.0	SS PUMPS	APV / ALFA LAVAL (LKM) / TETRA PACK / L&T / IDMC
2.0	SS VALVES & FITTINGS	IDMC / ALFA LAVAL (LKM)
3.0	REFRIGERATION CONTROLS	DANFOSS / ALCO / SANSEN / PARKER / AMERICAN SPECIALTIES
4.0	SS PIPES	BHANDARI FOILS / RATNAMANI / APEX TUBES

HEAVY METALS

S.N.	ITEM DESCRIPTION	APPROVED MAKES
5.0	SS PNEUMATIC VALVES	GEA / ALFA LAVAL (LKM) / KEYSTONE / IDMC
6.0	MOTORS	SIEMENS / ABB / KIRLOSKAR / BHARATH BIJLEE / SHARP / LUBI
7.0	CABLES - ARMOURED	FINOLEX / UNIVERSAL / CCI / NICCO / FORT GLOSTER / RR CABLE / HILIGHT / GREEN ELE / POLY CAB
8.0	Starters	L & T
9.0	Contactor	Telemachania / Siemens / L & T / Sprecher + Schuh
10.0	PUSH BUTTONS	L&T / SIEMENS / ABB / SCHNEIDER
11.0	Relays	SEGC / Siemens
12.0	INDICATING LAMPS	L&T / SIEMENS / SCHNEIDER / TECHNIC / VAISHANAV / PRECITECH
13.0	Current Transformers	Kappa
14.0	PRESSURE SWITCH	DANFOSS / ALCO / PARKER / HANSEN
15.0	DIGITAL INDICATOR	HONEYWELL / RAXIX / MASIBUS / PROTOCOL / VIBHUTI
16.0	D G SET	CUMMINS / KIRLOSKAR / MAHINDRA / EICHER / GREAVES / ASHOK LEYLAND
17.0	Alternator	Stamford / Leroy Somer
18.0	BATTERY FOR THE DG SET	EXIDE / STANDARD-FURUKUWA / PRESTOLITE / AMCOYUASA / AMARON
19.0	STABILISER	SUVIK / MICROTECH / SEN & PANDIT / PACE / POWER ENGINEERS / ASABA / GURU NANAK
20.0	SOLAR HOT WATER SYSTEM	TATA BP SOLAR / JAIN IRRIGATION / RACOLD / SALORE / SUDARSHAN SAUR / STEEL HACKS / DGS&D - GOI APPROVED SUPPLIERS
21.0	Hot Water Electric Geyser	SPEARHOT / RACOLD / USHA / BATLIBOI / BAJAJ
22.0	HDPE TANK - HEAVY DUTY	SINTEX / KAVERI / HITANK

(Schedule-II)

DETAILED TECHNICAL SPECIFICATIONS AND SCOPE OF SUPPLY CAPACITY - 3000 LITRE

1. General Description

Design, supply, installation, testing and commissioning of Direct Expansion type bulk milk cooling systems including all accessories & items given in the detailed scope of supply, on turnkey basis.

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2. Functional Requirement

These systems would be installed in village Dairy Co-operative Society (DCS) / village milk collection centre, which collects milk every day in the morning & evening from milk producers.

The milk collected shall be stored in the bulk milk cooler and cooled from ambient temperature to 4° centigrade.

The stored milk shall be dispatched to dairy plant through insulated road milk tanker once in a day.

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3. Design Requirement

3.1 Capacity

The net capacity of the bulk milk cooler shall be as mentioned above and as per the requirement given in the enquiry/tender document.

However, the gross capacity in all the sizes shall be around 10% higher than the rated capacity to avoid accidental spillage of milk due to agitation or any other reason.

3.2 Applicable manufacturing/design code

3.2.1 Bulk Milk Cooler (BMC)

The BMC tank shall meet the requirements of ISO 5708 – 2 II (Latest version) for milk collection cycle of two times in a day with not more than 3.0 hours cooling time from 35 to 4°C for all milking and not more than 1.5 hours for second milking i.e. from 10 to 4°C.

For design of condensing unit for BMC ARI Standard 520-2004 (Air-Conditioning & Refrigeration Institute, Arlington, Virginia) for ambient temperature condition shall be applicable.

The tank shall be of an established & proven Direct Expansion type design, in regular production & use and not a prototype.

Note:
All milking means quantity of milk received in either morning shift or evening shift.

When a Tank for two milkings is either empty or contains 50% of its rated volume of milk at 4°C, and 50% of the rated volume of milk at 35°C is added in one batch, all of the milk shall be cooled to 4°C in not more than the specified cooling time.

When the second milking quantity of milk is added, the total quantity of milk shall be cooled to 4°C within the specified cooling time.

3.2.2 Refrigeration System

The refrigeration system shall be designed to meet performance ratings of positive displacement condensing units specified in ARI Standard 520-2004.

The refrigeration system shall also meet the requirements of milk collection system as per ISO 5708.

3.2.3 Accessories

Accessories like diesel generator set, electric & control cables, control panel, temperature sensor, electrical switchgears, refrigeration control valves & fittings etc. shall be of approved make as detailed in the specifications and shall meet the requirement of the latest relevant Indian Electricity Rules, ISO/BIS Standards.

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4. Scope of the

Bidder 4.1 Scope

The bidder's scope starts from SS 304 funnel with a SS mesh at inlet of the BMC tank for manual receiving of milk.

Alternatively, milk is received in milk can with SS 304 funnel with SS mesh and then manually poured into a balance tank (200 litres) and pumped to bulk milk cooler.

In some cases, the reception equipment will include a can tipping bar.

The balance tank of capacity 200 litres shall be made up of SS sheet conforming to AISI 304.

From BMC, the milk shall be transferred to Road Milk Tanker (RMT) through food grade quality flexible hose of adequate length and milk transfer pump installed either on the RMT or through the pump supplied along with BMC.

Bidders should furnish separate prices for gravity fed system as well as for pumped system.

4.2 Supply

The bulk milk cooler shall be a complete unit with the refrigeration system, agitator(s), lockable inlet & outlet valve with strainer.

Also includes supply of AISI 304 balance tank with SS 304 filter for pumped system, SS piping & milk hose of food grade quality, unions and milk transfer pump of 5000 LPH, SS 304 pipes & fittings, erection materials, pipe supports, floor plates, hinged type pipe clamps.

The hose pipe shall be 10 metres long and end with SS liner and blank nut chained with the hose.

A wall mounted SS hook of adequate size for hanging the milk hose pipe roll shall also be provided.

The scope includes electrical & control panels and interconnecting cables.

Cable conduits shall also be supplied, earth pit pipes with removable cover & earthing as required by local electrical regulation.

The indicative distances between BMC outlet to milk pump inlet – 3 m, BMC to mains power point & DG set – 20 m may be considered for calculating cable, SS piping requirement, supports etc.

However, the exact distances shall be as per site conditions and complete piping & cabling necessary for installation shall be supplied.

4.3 Installation & Commissioning

The total job is on turnkey basis and includes supply, installation, testing, commissioning and training of the field personnel.

Minor civil works, providing & grouting supports are included in the scope.

Giving satisfactory training to the staff of the collection centre and trial runs for the complete unit.

Moreover, supplier has to demonstrate performance of the unit as per operating parameters to the Client / NDDB.

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5. Constructional Features

5.1 Bulk Milk Cooling Tank

5.1.1 Material of Construction

Tank inner, outer, bottom, top openable cover shall be fabricated from Stainless Steel AISI 304 material.

All components, as under, shall be made out of AISI 304 grade stainless steel:

Piping & fittings, Filter, Lockable cover, Agitator shaft & blade, adjustable Ball Feet with provision for 50 mm height adjustment, Dipstick, Outlet & Inlet Valves, Blank flanges etc.

The filter screen shall be fine wire mesh.

All the gaskets shall be of food grade nitrile or neoprene rubber material.

The AISI 304/316 evaporator shall be dimpled pressed plate jacket put as bottom plate of the inner tank.

The bottom evaporation surface in contact with milk as well as outer SS cladding is passivated by standard chemical treatment to impart corrosion resistance.

5.1.2 Shape & Orientation

The preferred shape of the tank shall be horizontal rectangular with an openable top cover.

The shape of the BMC tank shall conform to international sanitary design.

5.1.3 Milk Cooler Tank & Evaporator

The AISI 304 tank for the bulk milk cooler should be horizontal rectangular or horizontal semicircular bottom or vertical circular shape, which imparts smooth distribution of the fat in milk when agitator is set into operation.

The tank shall be so designed that all surfaces in contact with milk are readily accessible either in their position or after dismantling to permit thorough cleaning.

Inner Vessel:

All joints shall be TIG welded, any filler rod used being suitable for the parent metal.

All welds shall be ground smooth and free from crevices, porosity and brittleness.

All milk contact metallic surfaces of the inner vessel and its attachments should have finish not less than 150 grit finish.

Any permanent attachment to the inner vessel shall be welded with fillet radii not less than 6 mm.

All parts of the inner vessel shall drain directly to the outlet.

Internal corners formed round the bottom of the inner vessel and outlet well shall be of not less than 25 mm in radius.

Other internal corners shall be not less than 15 mm in radius.

The evaporator shall be laser welded dimpled jacketed.

In case of rectangular type bulk milk cooler, the evaporator is fixed as the bottom plate of the inner tank.

Whereas in semicircular bottom tank the jacket shall be at least up to 1/3 height of the tank.

In case of double compressor, total evaporator area shall be divided and separated into two sections.

Each section shall have separate suction & discharge connecting to each compressor.

The evaporator surface in contact with the milk should be passivated by standard treatment to impart corrosion resistance.

5.1.4 Tank Fittings & Accessories

The tank shall be provided with stainless steel inlet with special “no-foam” design, outlet 38/51 mm butterfly valve & blank union with locking arrangement, inspection window/manhole with locking arrangement, agitator and top cover with locking arrangement.

At the bottom of the outlet cup on the outer surface, a temperature sensor shall be permanently fixed.

It shall sense the temperature of the surface at the outlet and transmit the signal to the digital indicator.

The digital type temperature indicator shall be provided in the control panel with back up battery.

The tank shall be provided with SS calibrated dipstick to measure the volume of milk inside the tank.

The dipstick shall be graduated from 10% or less to not less than 100% of the rated volume.

Each division on dipstick shall represent a volume not greater than 0.5% of the rated volume.

The calibration chart of dipstick having adequately bold letters shall be laminated/framed and shall be supplied with BMC.

The tank shall be equipped with agitator(s) capable of producing a uniform distribution of fat in the milk.

All SS fittings shall be of SMS standard.

The BMC shall be provided with 1 (one) AISI-304 filter with SS fine wire mesh suitable to filter extraneous matter such as dust particles, hay, flies, cow dung pieces/particles etc.

The filter shall be designed and installed in such a way that it can frequently and easily be cleaned.

Top cover lifting handle shall be an in-built feature of the unit.

The tank shall be provided with AISI 304 adjustable ball feet tamper proof type having provision of 50 mm height adjustment.

Provision of a bolt for earthing connection may be provided on one of the legs.

Number of ball feet shall be minimum 4 for small capacity tank and 6 for bigger tank.

5.1.5 Balance Tank, Capacity 200 Litres

The balance tank of 200 litre capacity shall be of sanitary design, fabricated from SS 304 sheet of 1.6 mm thick for shell & 2 mm bottom.

Outlet SS cup and sufficient slope shall be provided at bottom of tank for complete draining of milk.

The dimension of tank and fittings shall be suitable to meet milk collection operations at centre.

1 no. SS removable cover (1.0 mm thick) with handle shall be provided.

SS filter made from 1.6 mm SS plate with 2 mm dia holes (Removable type) to be provided for placement in the balance tank to remove coarse suspended impurities from milk.

Four number ball feet shall be provided for height adjustment of 50 mm.

All fabricated parts shall be polished neat to 150 grit finish.

5.1.6 Stainless Steel Sanitary Milk Pump

5 KLPH, 10 MWC capacity milk pump shall be supplied for pumping milk from balance tank to BMC and BMC to road milk tanker.

Pump impeller & casing shall be made out of SS AISI 304/316 material.

All milk contact surfaces shall be finished to minimum 150 grits.

The pump should be of sanitary design.

Inlet & outlet of the pump shall have ends with SMS union.

The pump shall be provided with approved make motor having ‘E’/’F’ class insulation and IP 55 protection.

The flanged end motor shall have stainless steel shaft having hygienic mechanical sealing arrangement to prevent leakage from pump casing to rotor side of the motor.

Pump shall have SS shroud with air ventilation grill for circulating cooling air.

The pump shall have SS adjustable ball feet.

5.1.7 Insulation

The insulation of the tank shall be done by injection, in situ, of high density (minimum 40 kg/m^3, Chlorofluorocarbon free and environmental friendly) polyurethane foam without having any imperfection and hygroscopicity.

The efficiency of insulation should be such that at max 50°C ambient temperature the rate of rise of the mean temperature of the milk shall not exceed by 1°C in four hours, when the rated milk volume initially at about 4°C is allowed to stand undisturbed as per the requirement of ISO 5708 – 2 II when the refrigeration unit is not working.

5.1.8 Cleaning In Place (CIP)

For top openable configuration, facilities for manual cleaning shall be provided with suitable brush for BMC tank as well as brush for internal cleaning of SS pipes.

4 nos. of SS hooks shall be provided to keep these brushes, loose pipes etc.

5.1.9 Welding & Finishing

Inner, outer, intermediate dimpled jacket and nozzle connections shall be welded with TIG processonly.The inner shell and all other product contact surface shall be polished up to minimum 150 grit finish.The outer surface to be polished with 150 grit dull finish or a circle finish.

5.2 Refrigeration System

The refrigeration system shall be designed to comply with ARI Standard 520-2004 and to meet the requirements of milk collection system of ISO 5708, Class 2 II.

The refrigeration system shall be of direct expansion type, with Freon-22 (R-22) or CFC free environmental friendly refrigerant to cool the raw milk from reception temperature to 4°C in the prescribed period mentioned.

The evaporator(s) of the refrigeration system shall form a part of the milk tank body as dimpled jacket in the bottom plate in case of rectangular open tank or at least up to 1/3rd height of the circular/semicircular tank.

It would be better if the system is compatible for the refrigerant R 407 C.

The refrigeration system shall be direct expansion type to perform cooling function in an ambient temperature of 46°C with air-cooled condenser.

5.2.1 Compressor

The refrigeration compressor shall be adequate enough to ensure that milk is cooled to 4°C in the prescribed time limit and suitable to operate at 0°C suction temperature and 60°C condensing temperature (air-cooled condenser) assuming 46°C ambient temperature.

The refrigeration compressor(s) shall be rotary/reciprocating, hermetically sealed type essentially suitable for refrigeration application in hot & humid Indian climatic conditions.

The motor of the compressor should have a thermistor temperature sensor embedded in windings for protection from excessive heating due to overloading or short-circuiting.

Similarly, a protection against off cycle migration of refrigerant to the compressor is necessary in the refrigeration unit, preferably a self-regulating PTC crank case heater.

The compressors selected should be energy efficient and consume least power to meet the cooling load requirements.

The bulk milk cooler up to capacity of 1000 L shall be provided with single compressor; however, for higher capacity units two compressors system shall be preferred.

In the offer bidder shall clearly mention whether the offered system shall work on single phase or three phase mains supply.

However, choice of single phase or three phase will rest on the sole discretion of the buyer.

Client shall approve Make(s) of the compressor.

Bidders can also offer Energy Efficient Hermetically Sealed Scroll Compressors as alternative to rotary/reciprocating compressors.

5.2.2 Condenser

The condenser shall be air cooled finned tube type having sufficient heat transfer area designed for extremely high ambient temperature given above.

The air circulation fan of condenser shall preferably be induced draft type sucking cold air over the compressors and throwing hot air out of the premises/place of installation.

The condensing temperature should not be less than 60°C considering operating ambient temperature of 46°C.

5.2.3 Receiver

For refrigeration circuit a suitable size liquid receiver mounted on the skid near compressor to assist system to store refrigerant during pump down cycle as well as in case of maintenance.

5.2.4 Thermostatic Expansion Valve

Suitable size and capacity Thermostatic Expansion Valve should be provided in the refrigeration circuit of the bulk milk cooler.The TX valve should be Maximum Operating Pressure type and of adequate capacity to feed optimum quantity of refrigerant to the milk cooling tank evaporator.

5.2.5 Refrigerant Pipe, Fittings & Controls

All pipes, valves, fittings & controls shall comply with the latest relevant BIS code applicable.

Isolation valves at suction & discharge sides of the compressors is provided for compressor isolation during maintenance of the system.

A suction pressure regulating valve (KVL) shall be provided to restrict suction pressure within a reasonable limit for preventing tripping of compressor.

Copper/SS tubing shall be routed in such a way that if any leakage occurred during operation can easily be detected and the defective portion can be repaired/replaced without dismantling the whole system.

All the pipes shall be clamped properly with fixed support.

In case of double compressor system, pipe, fitting & control should be designed in such a way that both the compressors can run independently.

The tubing shall be insulated wherever necessary.

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6. Electrical Control Panel

6.1 Control Panel

Four control panels shall be provided, one for the main power supply tapping, second for the refrigeration unit, the third for the milk tank and fourth for lighting, testing equipment and computers etc.Each panel shall be provided with suitable switchgear of required ratings for switching and protection as per the system requirement.

The incoming and outgoing power supply terminals shall be covered and secured with a lead seal to prevent tampering.The door of the panels should be provided with lockable handles.

For 15 KVA 3 Phase Automatic Stabiliser, following major components shall be provided:

15. The incoming grid power (Phase voltage 180 to 280 volts) shall be given through TPN MCB 40 A. Relay system to be provided to ensure that if incoming voltage is either less than 180 volts or more than 280 volts in any phase, stabiliser stops incoming power to stabiliser for its safety.
16. LED type Indicator lamps (R, Y, B) on the individual phases of supply.
17. A bypass switch 40 A for bypassing correcting transformer.
18. Correcting transformer, air cooled type, for each phase, with 6 steps each of 20 volts (phase 180-200220240-260-280 V) to be controlled through a relay system or servo controlled.
19. A Change-Over TPN switch 40 A between DG Set and corrected mains power supply.
20. A digital input and output (corrected) voltage/current/frequency indicator with selector switch for all three phases. The indicator shall be so provided as to be visible from a distance of at least 5 metre, and so located as to require no special effort to see the readings.
21. TPN MCB 40 A for correcting transformer ON/OFF.
22. TPN MCB 40 A for supplying power to Refrigeration Panel.
23. TPN MCB 32 A for supplying power to lighting DB.
24. TPN MCB 16 A for supplying power to starter of milk pump. Parallelly 20 A metallic power plug socket to be provided.
25. If the corrected voltage at the output side goes beyond 180-280 volt range, a control relay/power contactor combination shall cut off output power supply with a loud alarm.
26. Suitable terminal blocks, heavy duty,
    4 way for incoming mains (63 A) and

4 way (63 A) for DG Set incoming and terminal
blocks (4 way 63 A for refrigeration, 4 way 32
A for lighting DB,
4 way 32 A for milk pump) heavy duty for outputs.

27. Housing enclosure of powder coated MS of appropriate size.
28. Double compression heavy duty Brass cable glands for two incoming armoured cables & PVC cable glands.

For 15 KVA Single Phase Automatic Stabiliser, Major components are to be worked out similar to 10 KVA single phase & 15 KVA three phase respectively for which details are given above.

6.1.2 Refrigeration Control Panel

The refrigeration unit shall be provided with a control panel made out of Stainless Steel suitable for wall mounting near the unit.

The panel shall be provided with motor starters, ON/OFF push buttons & necessary MCBs, control wiring, line voltage controller to guard the compressor against the supply voltage fluctuations.

In case more than one compressor is provided in the refrigeration system, the control panel shall be provided with a sequence controller & timer to start one compressor at a time to avoid power supply surge.

The panel shall also have facility to operate refrigeration unit on auto/manual mode.

In the auto mode, as soon as the milk temperature reaches to pre-set value, the compressor should be switched off to avoid freezing of milk.

6.1.3 Milk Tank Control Panel

The milk tank shall be provided with a wall mounted control panel with timer to control the intermittent operation of the agitators & a digital temperature indicator to indicate the milk temperature to one decimal place with least count of 0.1°C on continuous basis.

It shall include suitable switchgears etc as required for switching & protection.

The agitator shall have interlocking arrangement with top cover opening limit switch.

The limit switch shall put off the agitator as soon as the top cover opens up.

Panel shall have provision for pre-setting temperature of BMC Tank (not below the milk temperature of 4 degree centigrade) for starting/stopping refrigeration compressors.

Suitable battery backup is to be provided so that temperature can be indicated when there is no electric supply.

6.1.4 Domestic Power Distribution Board

This distribution board would get single phase power from grid supply directly (it is assumed that when grid power is received in this DB, Main control panel gets power only from DG Set) as well as stabilised power from main control panel and feed power for lighting, electric geyser/solar water heating system, testing equipment/computers.

The main components of this DB shall be as follow:

6. Wall mounted distribution board, MCB type

7. 32 DP Change over switch
8. 32 A DP MCB as incoming
9. 3 nos. 10 A MCB SP for lighting
10. 3 nos. 20 A MCB SP for geyser/Solar water heater, AMCU etc.

6.1.5 Cables & Electrical Switchgears

All electrical switchgears and controls required for the complete system shall be of suitable rating.

All permanent wiring installed on the tank or associated units shall be carried out using PVC cable in heavy gauge, screwed galvanized steel conduit or plastic conduit, or in mineral-insulated copper-sheathed cable.

Flexible electrical connections shall be made only to items normally movable in service.

Such flexibles shall be PVC insulated copper conductor cable not less than 24/0.20 mm in size (see IS 694 (Part 11964)) and earth continuity conductors of PVC insulated copper conductor shall be provided.

Cable between DG Set and main panel shall be either steel armored or un-armored in steel conduits.

For all electrical cables, suitable water tight cable glands and lugs should be used at ends.

Specification for PVC insulated cables (for voltage up to 1100V): Part 1 with copper conductor (revised).

6.1.6 Earthing

The earthing should be carried out as per IS: 3043 - 1987 (reaffirmed 2001) - “Code of practice for earthing”. Pipe type earthing can be used. The chassis, framework and the fixed parts of the metal casing of the tanks, DG Set body, refrigeration plant skid, and all panels shall be provided with two separate earthing terminals.

Neutral of DG Set shall be earthed by a separate independent earth pit.

Neutral of Grid supply shall also be earthed by a separate independent earth pit.

Suitable GI Strip (minimum 25x3 mm) to be used for connecting earth pit with nearest equipment earthing point.

From this point earthing to other points can be looped by suitable GI Strip or PVC insulated copper conductor cable of green colour (size minimum 1 x 4 Sq mm).

In view of above, total four earth pits to be provided for each installation.

The earthing terminals shall be readily accessible and so placed that the earth connections of the equipment are maintained when the cover or any other movable part of equipment is removed.

The earthing terminal shall be identified by means of the “□” marked in a legible and indelible manner on or adjacent to the terminals.

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7. Diesel Generator Set (Air/Water Cooled) and Accessories

The DG set shall be either single or three phase as per the system requirement.

Proper justification with calculations should be provided for capacity of the diesel engine and alternator being considered for DG set.

The engine should be rated for continuous operation for:

The refrigeration system, milk tank agitator & milk-loading/unloading pump, hot water geyser (approx. 2 kW), AMCU, lightings, ceiling fan.

Rated maximum output of the DG set should be calculated considering the load mentioned, over and above 10% additional load shall be considered to handle any eventuality and with the ambient design dry bulb (DB) temperature (summer) _40°C, and winter 16 °C.

Performance Requirement

The working KVA rating at site conditions after accounting for de-rating as per IS: 10001/10002 or equivalent shall be obtained at 0.8 power factor.

The Genset should have the engine, alternator, control panel and silencer as an integral part of the unit.

The major components of the DG set shall comprise:

7.1 Diesel Engine

The diesel engine should be suitable for Power Generation application type air/water cooled and capable of developing required BHP when running at 1500 rpm under NTP conditions and not agricultural engine.

The engine should be built to IS 10000/ISO 3046/BS 5514/649 and rated for continuous running of 24 hours with an overload capacity of 10% for a period not exceeding 1 hour in any 12 hours running.

Diesel engine up to 20 kW should have valid BIS license and certificate clearly mentioning use for ‘General purpose’ application as per IS 10001 norms.

Engine ratings should be for operation at full load condition and should be suitable to take 100% block load.

The engine instrument panel shall be supplied with:

- Ignition key
- Starting push button
- Lubricating oil pressure gauge
- Temperature gauge for cooling water
- Temperature gauge for lubricating oil
- RPM meter (Analog type)
- Battery charging ammeter

7.1.1

The diesel engine should be four stroke, naturally aspirated/turbocharged, multi cylinders & complete with the following:

a) Flywheel & flywheel housing

b) Engine air/water cooling system with cooling fan & radiator CAC coolant with recovery bottle c) Air intake, fuel and lubricating oil filters

d) Oil bath air cleaner

e) Standard day fuel tank having capacity suitable for minimum 8 hours continuous operation.

The tank shall be made with steel sheet of minimum thickness 18 gauge and complete with standard accessories such as drain pipe, fuel level indicator, valves, lockable cover, low-level contact & alarm.

This tank to be inside the acoustic enclosure.

f) Fuel pump with mechanical governor

g) Coupling

h) Exhaust silencer residential type

i) Holding down bolts, MS combination base frame & AVM pads

j) Self-starting arrangement with 12V suitable rated heavy-duty Lead Acid accumulator type battery with solidstate battery charging arrangement and cables

k) Standard set of tools

l) First fill of lubricating oil

m) First fill of coolant

n) Lubricating oil pressure & temperature gauge

o) Control panel for engine with engine safety against over speed, high water & cylinder liner temperature, V-belt failure, low lubricating oil pressure, low water level in radiator, auxiliary failure, air cleaner choke indicator

p) One brand new oil barrel of 200 litre capacity with manually driven gear/barrel pump for diesel transfer along with reinforced PVC hose for supply

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7.2 Alternator

The engine should be closely/flexibly coupled to suitable self-excited, self-regulated (through an AVR) alternator developing required KVA at 0.8 power factor, 1/3 phase, 50 cycle/sec, 230/415 volts AC power supply under NTP conditions when running at 1500 RPM.

The alternator should be brushless type, screen protected and fitted with end shield and ball roller bearings.

The alternator shall have ‘H’ class of insulation.

It shall conform to IS 13364 (Part 1) 1992 up to 20 KVA or IS 13364 (Part II) 1992 above 20 KVA or IS 4722 of 1992.

7.3 Control Panel

The diesel generating set should be supplied with suitable floor/wall mounting type control panel duly pre-wired with the following instruments:

- One suitable scaled and rating kWh meter with accessories
- One ammeter with selector switch
- One voltmeter with selector switch

- One no. frequency meter
- One no. hour meter (time totalizer)
- One set of epoxy resin casted CTs of suitable ratings
- One suitable capacity MCCB with overload and short circuit protection to disconnect power supply in case load of generating set increases beyond permitted limits.

The rupturing capacity of the MCCB should not be less than 35 KA.

- One set of TPN bus bars insulated with heat shrinkable PVC sleeves (maximum permissible current density shall be 0.8 amps/mm^2)
- One set of indicating lamps and control fuses

The control panel should conform to the Indian Electricity Rules.

7.4 Frame

The diesel engine and alternator should be mounted on specially designed combination base plate and MS structure of extremely rigid fabrication.

The base plate should be suitable for mounting the set on AVM pads over the foundation.

7.5 Acoustic Enclosure

DG set should carry a valid approval certificate issued as per CPCB norms complying with the provision of the Environment (Protection) Second Amendment Rules 2002, vide notification no G.S.R. 371 (E), dated 17th May 2002 & amended by GSR 448 (E) dt. 12/07/2004.

The Diesel Generator sets shall have a standard acoustic enclosure of 25 dB (A) insertion loss.

The exhaust pipe with exhaust muffler with insertion loss of minimum 25 dB (A) is connected to the exhaust manifold preferably with flexible bellows.

7.5.1 General Requirement

The enclosure could be tailor made suitable for both indoor and outdoor installation as per the requirement and depending upon the capacity of D.G. Set.

The enclosure should be aesthetically designed to perform for optimum noise attenuation and in no way derate the performance of the DG set in extreme summer conditions.

Acoustic Enclosure should be environment friendly and protected against rodents etc.

The enclosure should have:

- Adequate ventilation for genset cooling air requirement

- Absorbent/insulating material used is fire radiant
- Suitable thermal lagging to avoid localized heating of adjoining part of exhaust

- Appropriately located control panel
- Easy access side doors to service points on gensets
- Doors fitted with high quality gaskets to avoid leakage of sound

- Provision for engine air filters to suck the fresh inlet air for engine directly from atmosphere
- Sufficient space inside to fit different accessories like batteries etc& the maintenance can be done inside with easy movement of working person on DG set
- Enough space for control panel and fuel tank inside enclosure

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For proper ventilation and to maintain the temperature inside the enclosure forced ventilated air circulation system using axial flow fan(s) to meet total engine requirements &air changes should be provided.(Air volume required for ventilation is to be based on combustion air, cooling air & alternator cooling air as per specifications given by engine and alternator manufacturer.)

Temperature of enclosure should not exceed beyond 50°C of ambient temperature.

7.5.2 Constructional Features of Acoustic Enclosure

The enclosure shall be fabricated out of CRCA sheets of minimum 1.6 mm thickness and shall be reinforced adequately to ensure structural stability.

The enclosure shall be powder coated after seven tank pretreatment process.

The inside of the enclosure shall be lined with suitable fire retardant acoustic material to achieve the specified noise reduction level.

The enclosure shall be provided with suitable number of doors for access to engine, alternator and control panel for maintenance and servicing.

All doors shall be fitted with neoprene gaskets to prevent sound leakage.

The enclosure shall have provisions for lifting hooks/eye bolts for ease of handling and transportation.

The exhaust piping inside the enclosure shall be suitably insulated with glass wool and aluminum cladding to prevent excessive heating and ensure safety.

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8. Water for Cleaning at Milk Collection Centre

Hot water facility shall be provided at milk collection centre for cleaning of BMC tank, milk cans and other equipment.

8.1 Solar Water Heating System (200 LPD)

The solar water heating system shall conform to IS 12933.

The collector shall have 4 mm thick toughened glass with minimum transmissivity of 82%.

The absorber plate shall be of copper with selective coating.

The storage tank shall be of SS 304 with minimum thickness of 1.2 mm.

The tank shall be insulated with minimum 40 mm thick PUF insulation.

The system shall be complete with electric back up heater of 2 kW capacity.

GI Class-B pipes shall be used for water connections.

Hot water pipe shall be insulated with minimum 50 mm thick rock wool insulation.

8.2 LPG Instant Gas Water Heater

As an alternative to solar water heater, LPG operated instant gas water heater of 6 or 10 LPM capacity may be provided.

The heater shall have automatic ignition, over temperature protection and oxygen depletion sensor.

8.3 Electric Water Heater

As another alternative, electric storage type water heater (minimum 50 litres capacity) may be provided along with 200 litres SS 304 hot water storage tank.

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9. After Sales Service

The supplier shall have a service centre in the specified district or nearby district with adequate trained service personnel and infrastructure.

In case of breakdown, service engineer shall attend the site within 3 hours of receiving the complaint.

Regular preventive maintenance service visit shall be carried out once in every 8 weeks during warranty period. The bidder shall also quote separately for comprehensive service contract for a period of 3 years after completion of warranty period.

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10. Inspection

Inspection of BMC tank and refrigeration unit shall be carried out during fabrication stage and before dispatch. The bidder shall submit Quality Assurance Plan (QAP) and Quality Inspection Plan (QIP) for approval. Dye penetration test shall be conducted for welded joints.

Hydraulic test / Water tightness test shall be conducted before dispatch.

All necessary test certificates and inspection reports shall be furnished to the purchaser.

APPENDIX

LIST OF APPROVED MAKES OF BOUGHT OUT ITEMS

S.N.	ITEM DESCRIPTION	APPROVED MAKES
1.0	SS PUMPS	APV / ALFA LAVAL (LKM) / TETRA PACK / L&T / IDMC
2.0	SS VALVES & FITTINGS	IDMC / ALFA LAVAL (LKM)
3.0	REFRIGERATION CONTROLS	DANFOSS / ALCO / SANSEN / PARKER / AMERICAN SPECIALTIES
4.0	SS PIPES	BHANDARI FOILS / RATNAMANI / APEX TUBES

HEAVY METALS

S.N.	ITEM DESCRIPTION	APPROVED MAKES
5.0	SS PNEUMATIC VALVES	GEA / ALFA LAVAL (LKM) / KEYSTONE / IDMC
6.0	MOTORS	SIEMENS / ABB / KIRLOSKAR / BHARATH BIJLEE / SHARP / LUBI
7.0	CABLES - ARMOURED	FINOLEX / UNIVERSAL / CCI / NICCO / FORT GLOSTER / RR CABLE / HILIGHT / GREEN ELE / POLY CAB
8.0	Starters	L & T
9.0	Contactor	Telemachania / Siemens / L & T / Sprecher + Schuh
10.0	PUSH BUTTONS	L&T / SIEMENS / ABB / SCHNEIDER
11.0	Relays	SEGC / Siemens
12.0	INDICATING LAMPS	L&T / SIEMENS / SCHNEIDER / TECHNIC / VAISHANAV / PRECITECH
13.0	Current Transformers	Kappa
14.0	PRESSURE SWITCH	DANFOSS / ALCO / PARKER / HANSEN
15.0	DIGITAL INDICATOR	HONEYWELL / RAXIX / MASIBUS / PROTOCOL / VIBHUTI
16.0	D G SET	CUMMINS / KIRLOSKAR / MAHINDRA / EICHER / GREAVES / ASHOK LEYLAND
17.0	Alternator	Stamford / Leroy Somer
18.0	BATTERY FOR THE DG SET	EXIDE / STANDARD-FURUKUWA / PRESTOLITE / AMCOYUASA / AMARON
19.0	STABILISER	SUVIK / MICROTECH / SEN & PANDIT / PACE / POWER ENGINEERS / ASABA / GURU NANAK
20.0	SOLAR HOT WATER SYSTEM	TATA BP SOLAR / JAIN IRRIGATION / RACOLD / SALORE / SUDARSHAN SAUR / STEEL HACKS / DGS&D - GOI APPROVED SUPPLIERS
21.0	Hot Water Electric Geyser	SPEARHOT / RACOLD / USHA / BATLIBOI / BAJAJ
22.0	HDPE TANK - HEAVY DUTY	SINTEX / KAVERI / HITANK

(Schedule -III)

DETAILED TECHNICAL SPECIFICATIONS AND SCOPE OF SUPPLYCAPACITY - 2000 LITRE

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1. General Description

Design, supply, installation, testing and commissioning of Direct Expansion type bulk milk cooling systems including all accessories & items given in the detailed scope of supply, on turnkey basis.

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2. Functional Requirement

These systems would be installed in village Dairy Co-operative Society (DCS) / village milk collection centre, which collects milk every day in the morning & evening from milk producers.
The milk collected shall be stored in the bulk milk cooler and cooled from ambient temperature to 4° centigrade.The stored milk shall be dispatched to dairy plant through insulated road milk tanker once in a day.

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3. Design Requirement

3.1 Capacity

The net capacity of the bulk milk cooler shall be as mentioned above and as per the requirement given in the enquiry/tender document.
However, the gross capacity in all the sizes shall be around 10% higher than the rated capacity to avoid accidental spillage of milk due to agitation or any other reason.

3.2 Applicable manufacturing/design code

3.2.1 Bulk Milk Cooler (BMC)

The BMC tank shall meet the requirements of ISO 5708 – 2 II (Latest version) for milk collection cycle of two times in a day with not more than 3.0 hours cooling time from 35 to 4°C for all milking and not more than 1.5 hours for second milking i.e. from 10 to 4°C.
For design of condensing unit for BMC ARI Standard 520-2004 (Air-Conditioning & Refrigeration Institute, Arlington, Virginia) for ambient temperature condition shall be applicable.
The tank shall be of an established & proven Direct Expansion type design, in regular production & use and not a prototype.

Note:
All milking means quantity of milk received in either morning shift or evening shift.
When a Tank for two milkings is either empty or contains 50% of its rated volume of milk at 4°C, and 50% of the rated volume of milk at 35°C is added in one batch, all of the milk shall be cooled to 4°C in not more than the specified cooling time.

3.2.2 Refrigeration System

The refrigeration system shall be designed to meet performance ratings of positive displacement condensing units specified in ARI Standard 520-2004.

3.2.3 Accessories

Accessories like diesel generator set, electric & control cables, control panel, temperature sensor, electrical switchgears, refrigeration control valves & fittings etc. shall be of approved make as detailed in the specifications and shall meet the requirement of the latest relevant Indian electricity rules, ISO/BIS Standards.

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4. Scope of the

Bidder 4.1 Scope

The bidder's scope starts from SS 304 funnel with a SS mesh at inlet of the BMC tank for manual receiving of milk.

Alternatively, milk is received in milk can with SS 304 funnel with SS mesh and then manually poured in to a balance tank (200 litres) and pumped to bulk milk cooler.

In some cases, the reception equipment will include a can tipping bar.

The balance tank of capacity 200 litres shall be made up of SS sheet conforming to AISI 304.

From BMC, the milk shall be transferred to Road Milk Tanker (RMT) through food grade quality flexible hose of adequate length and milk transfer pump installed either on the RMT or through the pump supplied along with BMC.

Bidders should furnish separate prices for gravity fed system as well as for pumped system.

4.2 Supply

The bulk milk cooler shall be a complete unit with the refrigeration system, agitator(s), lockable inlet & outlet valve with strainer.

Also includes supply of AISI 304 balance tank with SS 304 filter for pumped system, SS piping & milk hose of food grade quality, unions and milk transfer pump of 5000 LPH, SS 304 pipes & fittings, erection materials, pipe supports, floor plates, hinged type pipe clamps.

The hose pipe shall be 10 metres long and end with SS liner and blank nut chained with the hose.

A wall mounted SS hook of adequate size for hanging the milk hose pipe roll shall also be provided.

The scope includes electrical & control panels and interconnecting cables, cable conduits shall also be supplied, earth pit pipes with removable cover & earthing as required by local electrical regulation.

The indicative distances between BMC outlet to milk pump inlet – 3 m, BMC to Mains power point & DG set – 20 m may be considered for calculating cable, SS piping requirement, supports etc.

However, the exact distances shall be as per site conditions and complete piping & cabling necessary for installation shall be supplied.

4.3 Installation & Commissioning

The total job is on turnkey basis and includes supply, installation, testing, commissioning and training of the field personnel.

Minor civil works, providing & grouting supports are included in the scope.

Giving satisfactory training to the staff of the collection centre and trial runs for the complete unit.

Moreover, supplier has to demonstrate performance of the unit as per operating parameters to the Client / NDDB.

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5. Constructional Features

5.1 Bulk Milk Cooling Tank

5.1.1 Material of Construction

Tank inner, outer, bottom, top openable cover shall be fabricated from Stainless Steel AISI 304 material.
All components, as under, shall be made out of AISI 304 grade stainless steel.
Piping & fittings, Filter, Lockable cover, Agitator shaft & blade, adjustable Ball Feet with provision for 50 mm height adjustment, Dipstick, Outlet & Inlet Valves, Blank flanges etc.
The filter screen shall be fine wire mesh.
All the gaskets shall be of food grade nitrile or neoprene rubber material.
The AISI 304/316 evaporator shall be dimpled pressed plate jacket put as bottom plate of the inner tank.
The bottom evaporation surface in contact with milk as well as outer SS cladding is passivated by standard chemical treatment to impart corrosion resistance.

5.1.2 Shape & Orientation

The preferred shape of the tank shall be horizontal rectangular with an openable top cover. The shape of the BMC tank shall conform to international sanitary design.

5.1.3 Milk Cooler Tank & Evaporator

The AISI 304 tank for the bulk milk cooler should be horizontal rectangular or horizontal semicircular bottom or vertical circular shape, which imparts smooth distribution of the fat in milk when agitator is set in to operation.
The tank shall be so designed that all surfaces in contact with milk are readily accessible either in their position or after dismantling to permit thorough cleaning.

Inner Vessel

All joints shall be TIG welded, any filler rod used being suitable for the parent metal.

All welds shall be ground smooth and free from crevices, porosity and brittleness.

All milk contact metallic surfaces of the inner vessel and its attachments should have finish not less than 150 grit finish.

Any permanent attachment to the inner vessel shall be welded with fillet radii not less than 6 mm.

All parts of the inner vessel shall drain directly to the outlet.

Internal corners formed round the bottom of the inner vessel and outlet well shall be of not less than 25 mm in radius.

Other internal corners shall be not less than 15 mm in radius.

The evaporator shall be laser welded dimpled jacketed.

In case of rectangular type bulk milk cooler, the evaporator is fixed as the bottom plate of the inner tank.

Whereas in semicircular bottom tank the jacket shall be at least up to 1/3 height of the tank.

In case of double compressor, total evaporator area shall be divided and separated into two sections.

Each section shall have separate suction & discharge connecting to each compressor.

The evaporator surface in contact with the milk should be passivated by standard treatment to impart corrosion resistance.

5.1.4 Tank Fittings & Accessories

The tank shall be provided with stainless steel inlet with special “no-foam” design, outlet 38/51 mm butterfly valve & blank union with locking arrangement, inspection window/manhole with locking arrangement, agitator and top cover with locking arrangement.

At the bottom of the outlet cup on the outer surface, a temperature sensor shall be permanently fixed. It shall sense the temperature of the surface at the outlet and transmit the signal to the digital indicator.

The digital type temperature indicator shall be provided in the control panel with back up battery.

The tank shall be provided with SS calibrated dipstick to measure the volume of milk inside the tank. The dipstick shall be graduated from 10% or less to not less than 100% of the rated volume. Each division on dipstick shall represent a volume not greater than 0.5% of the rated volume.

The calibration chart of dipstick having adequately bold letters shall be laminated/framed and shall be supplied with BMC.

The tank shall be equipped with agitator(s) capable of producing a uniform distribution of fat in the milk.

All SS fittings shall be of SMS standard.

The BMC shall be provided with 1 (one) AISI-304 filter with SS fine wire mesh suitable to filter extraneous matter such as dust particles, hay, flies, cow dung pieces/particles etc.

The filter shall be designed and installed in such a way that it can frequently and easily be cleaned.

Top cover lifting handle shall be an in-built feature of the unit.

The tank shall be provided with AISI 304 adjustable ball feet tamper proof type having provision of 50 mm height adjustment.

Provision of a bolt for earthing connection may be provided on one of the legs.

Number of ball feet shall be minimum 4 for small capacity tank and 6 for bigger tank.

5.1.5 Balance Tank, Capacity 200 Litres

The balance tank of 200 litre capacity shall be of sanitary design, fabricated from SS 304 sheet of 1.6 mm thick for shell & 2 mm bottom.

Outlet SS cup and sufficient slope shall be provided at bottom of tank for complete draining of milk.

The dimension of tank and fittings shall be suitable to meet milk collection operations at centre.

1 no. SS removable cover (1.0 mm thick) with handle shall be provided.

SS filter made from 1.6 mm SS plate with 2 mm dia holes (Removable type) to be provided for placement in the balance tank to remove coarse suspended impurities from milk.

Four number Ball feet shall be provided for height adjustment of 50 mm.

All fabricated parts shall be polished neat to 150 grit.

5.1.6 Stainless Steel Sanitary Milk Pump

5 KLPH, 10 MWC capacity milk pump shall be supplied for pumping milk from balance tank to BMC and BMC to road milk tanker.

Pump impeller & casing shall be made out of SS AISI 304/316 material.

All milk contact surfaces shall be finished to minimum 150 grits.

The pump should be of sanitary design.

Inlet & outlet of the pump shall have ends with SMS union.

The pump shall be provided with approved make motor having 'E'/'F' class insulation and IP 55 protection.

The flanged end motor shall have stainless steel shaft having hygienic mechanical sealing arrangement to prevent leakage from pump casing to rotor side of the motor.

Pump shall have SS shroud with air ventilation grill for circulating cooling air.

The pump shall have SS adjustable ball feet.

5.1.7 Insulation

The insulation of the tank shall be done by injection, in situ, of high density (minimum 40 kg/m^3, Chlorofluorocarbon free and environmental friendly) polyurethane foam without having any imperfection and hygroscopicity.

The efficiency of insulation should be such that at max 50°C ambient temperature the rate of rise of the mean temperature of the milk shall not exceed by 1°C in four hours, when the rated milk volume initially at about 4°C is allowed to stand undisturbed as per the requirement of ISO 5708 – 2 II when the refrigeration unit is not working.

5.1.8 Cleaning In Place (CIP)

For top openable configuration, facilities for manual cleaning shall be provided with suitable brush for BMC tank as well as brush for internal cleaning of SS pipes.

4 nos. of SS hooks shall be provided to keep these brushes, loose pipes etc.

5.1.9 Welding & Finishing

Inner, outer, intermediate dimpled jacket and nozzle connections shall be welded with TIG process only.

The inner shell and all other product contact surface shall be polished up to minimum 150 grit finish.

The outer surface to be polished with 150 grit dull finish or a circle finish.

5.2 Refrigeration System

The refrigeration system shall be designed to comply with ARI Standard 520-2004 and to meet the requirements of milk collection system of ISO 5708, Class 2 II.

The refrigeration system shall be of direct expansion type, with Freon-22 (R-22) or CFC free environmental friendly refrigerant to cool the raw milk from reception temperature to 4°C in the prescribed period mentioned.

The evaporator(s) of the refrigeration system shall form a part of the milk tank body as dimpled jacket in the bottom plate in case of rectangular open tank or at least up to 1/3rd height of the circular/semicircular tank.

It would be better if the system is compatible for the refrigerant R 407 C.

The refrigeration system shall be direct expansion type to perform cooling function in an ambient temperature of 46°C with air-cooled condenser.

5.2.1 Compressor

The refrigeration compressor shall be adequate enough to ensure that milk is cooled to 4°C in the prescribed time limit and suitable to operate at 0°C suction temperature and 60°C condensing temperature (air-cooled condenser) assuming 46°C ambient temperature.

The refrigeration compressor(s) shall be rotary/reciprocating, hermetically sealed type essentially suitable for refrigeration application in hot & humid Indian climatic conditions.

The motor of the compressor should have a thermistor temperature sensor embedded in windings for protection from excessive heating due to overloading or short-circuiting.

Similarly, a protection against off cycle migration of refrigerant to the compressor is necessary in the refrigeration unit, preferably a self-regulating PTC crank case heater.

The compressors selected should be energy efficient and consume least power to meet the cooling load requirements.

The bulk milk cooler up to capacity of 1000 L shall be provided with single compressor; however, for higher capacity units two compressors system shall be preferred.

In the offer bidder shall clearly mention whether the offered system shall work on single phase or three phase mains supply.

However, choice of single phase or three phase will rest on the sole discretion of the buyer.

Client shall approve Make(s) of the compressor.

Bidders can also offer Energy Efficient Hermetically Sealed Scroll Compressors as alternative to rotary/reciprocating compressors.

5.2.2 Condenser

The condenser shall be air cooled finned tube type having sufficient heat transfer area designed for extremely high ambient temperature given above.

The air circulation fan of condenser shall preferably be induced draft type sucking cold air over the compressors and throwing hot air out of the premises/place of installation.

The condensing temperature should not be less than 60°C considering operating ambient temperature of 46°C.

5.2.3 Receiver

For refrigeration circuit a suitable size liquid receiver mounted on the skid near compressor to assist system to store refrigerant during pump down cycle as well as in case of maintenance.

5.2.4 Thermostatic Expansion Valve

Suitable size and capacity Thermostatic expansion valve should be provided in the refrigeration circuit of the bulk milk cooler.

The TX valve should be Maximum Operating Pressure type and of adequate capacity to feed optimum quantity of refrigerant to the milk cooling tank evaporator.

5.2.5 Refrigerant Pipe, Fittings & Controls

All pipes, valves, fittings & controls shall comply with the latest relevant BIS code applicable.

Isolation valves at suction & discharge sides of the compressors is provided for compressor isolation, during maintenance of the system.

A suction pressure regulating valve (KVL) shall be provided to restrict suction pressure within a reasonable limit for preventing tripping of compressor.

Copper/SS tubing shall be routed in such a way that if any leakage occurred during operation can easily be detected and the defective portion can be repaired/replaced without dismantling the whole system.

All the pipes shall be clamped properly with fixed support.

In case of double compressor system, pipe, fitting & control should be designed in such a way that both the compressors can run independently.

The tubing shall be insulated wherever necessary.

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6. Electrical Control Panel

6.1 Control Panel

Four control panels shall be provided, one for the main power supply tapping, second for the refrigeration unit, the third for the milk tank and fourth for lighting, testing equipment and computers etc.

Each panel shall be provided with suitable switchgear of required ratings for switching and protection as per the system requirement.

The incoming and outgoing power supply terminals shall be covered and secured with a lead seal to prevent tampering.

The door of the panels should be provided with lockable handles.

6.1.1 Main Control Panel with Automatic Voltage Stabiliser

This should be suitable to receive the incoming State Electricity Authority grid supply as well as supply from BMC's DG Set.

Grid supply to be stabilised for voltage fluctuation by an automatic type voltage stabiliser.

Output electric supply either stabilised grid supply or DG Set supply, to be selected through a change over switch.

Provision to be made in this control panel to feed output supply to the refrigeration unit & BMC agitators through refrigeration control panel, to milk dispatch pump & to lighting Distribution board.

Grid supply shall be of three phase with provision in this panel to select only one healthy phase for giving output in case BMC is of single phase.

If BMC is of three phase, then this phase selector switch is not required.

DG set &stabiliser to be of single phase/three phase as per requirement specific to the project.

This panel to be of rating 10 KVA single phase for 1 KL, 15 KVA either single or three phase in case of 2 KL.

For 10 KVA Single Phase Automatic Stabiliser, following major components are required:

1. The incoming grid power (140 to 280 volts) shall be given through TPN MCB 63 A and phase selector switch of 63 A so that power can be drawn from the desired phase. Relay system to be provided to ensure that if incoming voltage is either less than 140 volts or more than 280 volts, stabiliser stops incoming power to stabiliser for its safety.
2. LED type indicator lamps (R, Y, B) on the individual phases of supply.
3. A bypass switch 63 A for bypassing correcting transformer.
4. Correcting transformer, air cooled type, with 8 steps each of 20 volts (140-160-180-200-220-240-260-280 V) to be operated through a relay system or servo controlled.
5. A Change-Over DP switch 63 A between DG Set and corrected mains power supply.
6. A digital input and output (corrected) voltage/current/frequency indicator with selector switch. The indicator shall be so provided as to be visible from a distance of at least 5 metre, and so located as to require no special effort to see the readings.
7. DP MCB 63 A for correcting transformer ON/OFF.
8. DP MCB 63 A for supplying power to Refrigeration Panel.
9. DP MCB 32 A for supplying power to lighting DB.
10. DP MCB 16 A for supplying power to starter of milk pump. Parallelly 20 A metallic power plug socket to be provided.
11. If the corrected voltage at the output side goes beyond 200-260 volt range, a power relay shall cut off output power supply with a loud alarm.

12. Suitable terminal blocks, heavy duty, 4 way for incoming mains (63 A) and 3 way (63 A) for DG Set incoming and suitable terminal blocks, heavy duty for various outputs mentioned above.
13. Housing enclosure of powder coated MS of appropriate size.

14. Double compression heavy duty Brass cable glands for two incoming armoured cables & PVC cable glands for un-armoured flexible all output cables.

For 15 KVA 3 Phase Automatic Stabiliser, following major components shall be provided:

1. The incoming grid power (Phase voltage 180 to 280 volts) shall be given through TPN MCB 40 A. Relay system to be provided to ensure that if incoming voltage is either less than 180 volts or more than 280 volts in any phase, stabiliser stops incoming power to stabiliser for its safety.
2. LED type indicator lamps (R, Y, B) on the individual phases of supply.
3. A bypass switch 40 A for bypassing correcting transformer.
4. Correcting transformer, air cooled type, for each phase, with 6 steps each of 20 volts (phase 180-200220240-260-280 V) to be controlled through a relay system or servo controlled.
5. A Change-Over TPN switch 40 A between DG Set and corrected mains power supply.
6. A digital input and output (corrected) voltage/current/frequency indicator with selector switch for all three phases. The indicator shall be so provided as to be visible from a distance of at least 5 metre, and so located as to require no special effort to see the readings.
7. TPN MCB 40 A for correcting transformer ON/OFF.
8. TPN MCB 40 A for supplying power to Refrigeration Panel.
9. TPN MCB 32 A for supplying power to lighting DB.
10. TPN MCB 16 A for supplying power to starter of milk pump. Parallelly 20 A metallic power plug socket to be provided.
11. If the corrected voltage at the output side goes beyond 180-280 volt range, a control relay/power contactor combination shall cut off output power supply with a loud alarm.
12. Suitable terminal blocks, heavy duty,
    4 way for incoming mains (63 A) and 4 way
    (63 A) for DG Set incoming and terminal
    blocks (4 way 63 A for refrigeration,
    4 way 32 A for lighting DB,
    4 way 32 A for milk pump) heavy duty for outputs.
13. Housing enclosure of powder coated MS of appropriate size.
14. Double compression heavy duty Brass cable glands for two incoming armoured cables & PVC cable glands.

For 15 KVA Single Phase Automatic Stabiliser:

Major components are to be worked out similar to 10 KVA single phase & 15 KVA three phase respectively for which details are given above.

6.1.2 Refrigeration Control Panel

The refrigeration unit shall be provided with a control panel made out of Stainless Steel suitable for wall mounting near the unit.

The panel shall be provided with motor starters, ON/OFF push buttons & necessary MCBs, control wiring, line voltage controller to guard the compressor against the supply voltage fluctuations.

In case more than one compressor is provided in the refrigeration system, the control panel shall be provided with a sequence controller & timer to start one compressor at a time to avoid power supply surge.

The panel shall also have facility to operate refrigeration unit on auto/manual mode.

In the auto mode, as soon as the milk temperature reaches to pre-set value, the compressor should be switched off to avoid freezing of milk.

6.1.3 Milk Tank Control Panel

The milk tank shall be provided with a wall mounted control panel with timer to control the intermittent operation of the agitators & a digital temperature indicator to indicate the milk temperature to one decimal place with least count of 0.1°C on continuous basis.

It shall include suitable switchgears etc as required for switching & protection.

The agitator shall have interlocking arrangement with top cover opening limit switch.

The limit switch shall put off the agitator as soon as the top cover opens up.

Panel shall have provision for pre setting temperature of BMC Tank (not below the milk temperature of 4 degree centigrade) for starting/stopping refrigeration compressors.

Suitable battery back up is to be provided so that temperature can be indicated when there is no electric supply.

6.1.4 Domestic Power Distribution Board

This distribution board would get single phase power from grid supply directly (it is assumed that when grid power is received in this DB, Main control panel gets power only from DG Set) as well as stabilised power from main control panel and feed power for lighting, electric geyser/solar water heating system, testing equipment/computers etc.

The main components of this DB shall be as follow:

1. Wall mounted distribution board, MCB type
2. 32 DP Change over switch
3. 32 A DP MCB as incoming
4. 3 nos. 10 A MCB SP for lighting
5. 3 nos. 20 A MCB SP for geyser/Solar water heater, AMCU etc.

6.1.5 Cables & Electrical Switchgears

All electrical switchgears and controls required for the complete system shall be of suitable rating.

All permanent wiring installed on the tank or associated units shall be carried out using PVC cable in heavy gauge, screwed galvanized steel conduit or plastic conduit, or in mineral-insulated copper-sheathed cable.

Flexible electrical connections shall be made only to items normally movable in service.

Such flexibles shall be PVC insulated copper conductor cable not less than 24/0.20 mm in size (see IS 694 (Part 11964)) and earth continuity conductors of PVC insulated copper conductor shall be provided.

Cable between DG Set and main panel shall be either steel armoured or un-armoured in steel conduits.

For all electrical cables, suitable water tight cable glands and lugs should be used at ends.

Specification for PVC insulated cables (for voltage up to 1100V): Part 1 with copper conductor (revised).

6.1.6 Earthing

The earthing should be carried as per IS: 3043 - 1987 (reaffirmed 2001) – “Code of practice for earthing”.

Pipe type earthing can be used.

The chassis, framework and the fixed parts of the metal casing of the tanks, DG Set body, refrigeration plant skid, and all panels shall be provided with two separate earthing terminals.

Neutral of DG Set shall be earthed by a separate independent earth pit.

Neutral of Grid supply shall also be earthed by a separate independent earth pit.

Suitable GI Strip (minimum 25 x 3 mm) to be used for connecting earth pit with nearest equipment earthing point.

From this point earthing to other points can be looped by suitable GI Strip or PVC insulated copper conductor cable of green colour (size minimum 1 x 4 Sq mm).

In view of above, total four earth pits to be provided for each installation.

The earthing terminals shall be readily accessible and so placed that the earth connections of the equipment are maintained when the cover or any other movable part of equipment is removed.

The earthing terminal shall be identified by means of the “□” marked in a legible and indelible manner on or adjacent to the terminals.

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7. Diesel Generator Set (Air/Water Cooled) and Accessories

The DG set shall be either single or three phase as per the system requirement.

Proper justification with calculations should be provided for capacity of the diesel engine and alternator being considered for DG set.

The engine should be rated for continuous operation for:

The refrigeration system, milk tank agitator & milk-loading/unloading pump, hot water geyser (approx. 2 kW), AMCU, lightings, ceiling fan.

Rated maximum output of the DG set should be calculated considering the load mentioned, over and above 10% additional load shall be considered to handle any eventuality and with the ambient design dry bulb (DB) temperature (summer) 40°C, and winter 16°C.

Performance Requirement

The working KVA rating at site conditions after accounting for de-rating as per IS: 10001/10002 or equivalent shall be obtained at 0.8 power factor.

The Genset should have the engine, alternator, control panel and silencer as an integral part of the unit.

The major components of the DG set shall comprise:

7.1 Diesel Engine

The diesel engine should be suitable for Power Generation application type air/water cooled and capable of developing required BHP when running at 1500 rpm under NTP conditions and not agricultural engine.

The engine should be built to IS 10000/ISO 3046/BS 5514/649 and rated for continuous running of 24 hours with an overload capacity of 10% for a period not exceeding 1 hour in any 12 hours running.

Diesel engine up to 20 kW should have valid BIS license and certificate clearly mentioning use for 'General purpose' application as per IS 10001 norms.

Engine ratings should be for operation at full load condition and should be suitable to take 100% block load.

The engine instrument panel shall be supplied with:

- Ignition key
- Starting push button
- Lubricating oil pressure gauge
- Temperature gauge for cooling water
- Temperature gauge for lubricating oil
- RPM meter (Analog type)
- Battery charging ammeter

7.1.1

The diesel engine should be four stroke, naturally aspirated/turbocharged, multi cylinders & complete with the following:

a) Flywheel & flywheel housing

b) Engine air/water cooling system with cooling fan & radiator CAC coolant with recovery bottle c) Air intake,

fuel and lubricating oil filters

d) Oil bath air cleaner

e) Standard day fuel tank having capacity suitable for minimum 8 hours continuous operation.

The tank shall be made with steel sheet of minimum thickness 18 gauge and complete with standard accessories such as drain pipe, fuel level indicator, valves, lockable cover, low-level contact & alarm.

This tank to be inside the acoustic enclosure.

f) Fuel pump with mechanical governor

g) Coupling

h) Exhaust silencer residential type

i) Holding down bolts, MS combination base frame & AVM pads

j) Self-starting arrangement with 12V suitable rated heavy-duty Lead Acid accumulator type battery with solidstate battery charging arrangement and cables

k) Standard set of tools

l) First fill of lubricating oil

m) First fill of coolant

n) Lubricating oil pressure & temperature gauge

o) Control panel for engine with engine safety against over speed, high water & cylinder liner temperature, V-belt failure, low lubricating oil pressure, low water level in radiator, auxiliary failure, air cleaner choke indicator

p) One brand new oil barrel of 200 litre capacity with manually driven gear/barrel pump for diesel transfer along with reinforced PVC hose for supply

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7.2 Alternator

The engine should be closely/flexibly coupled to suitable self-excited, self-regulated (through an AVR) alternator developing required KVA at 0.8 power factor, 1/3 phase, 50 cycle/sec, 230/415 volts AC power supply under NTP conditions when running at 1500 RPM.

The alternator should be brushless type, screen protected and fitted with end shield and ball roller bearings.

The alternator shall have 'H' class of insulation.

It shall conform to IS 13364 (Part 1) 1992 up to 20 KVA or IS 13364 (Part II) 1992 above 20 KVA or IS 4722 of 1992.

7.3 Control Panel

The diesel generating set should be supplied with suitable floor/wall mounting type control panel duly pre-wired with the following instruments:

- One suitable scaled and rating kWh meter with accessories
- One ammeter with selector switch
- One voltmeter with selector switch
- One no. frequency meter
- One no. hour meter (time totalizer)
- One set of epoxy resin casted CTs of suitable ratings
- One suitable capacity MCCB with overload and short circuit protection to disconnect power supply in case load of generating set increases beyond permitted limits.

The rupturing capacity of the MCCB should not be less than 35 KA.

- One set of TPN bus bars insulated with heat shrinkable PVC sleeves (maximum permissible current density shall be 0.8 amps/mm^2)
- One set of indicating lamps and control fuses

The control panel should conform to the Indian Electricity Rules.

7.4 Frame

The diesel engine and alternator should be mounted on specially designed combination base plate and MS structure of extremely rigid fabrication.

The base plate should be suitable for mounting the set on AVM pads over the foundation.

7.5 Acoustic Enclosure

DG set should carry a valid approval certificate issued as per CPCB norms complying with the provision of the Environment (Protection) Second Amendment Rules 2002, vide notification no G.S.R. 371 (E), dated 17th May 2002 & amended by GSR 448 (E) dt. 12/07/2004.

The Diesel Generator sets shall have a standard acoustic enclosure of 25 dB (A) insertion loss.

The exhaust pipe with exhaust muffler with insertion loss of minimum 25 dB (A) is connected to the exhaust manifold preferably with flexible bellows.

7.5.1 General Requirement

The enclosure could be tailor made suitable for both indoor and outdoor installation as per the requirement and depending upon the capacity of D.G. Set.

The enclosure should be aesthetically designed to perform for optimum noise attenuation and in no way derate the performance of the DG set in extreme summer conditions.

Acoustic Enclosure should be environment friendly and protected against rodents etc.

The enclosure should have:

- Adequate ventilation for genset cooling air requirement
- Absorbent/insulating material used is fire radiant
- Suitable thermal lagging to avoid localized heating of adjoining part of exhaust
- Appropriately located control panel
- Easy access side doors to service points on gensets
- Doors fitted with high quality gaskets to avoid leakage of sound
- Provision for engine air filters to suck the fresh inlet air for engine directly from atmosphere
- Sufficient space inside to fit different accessories like batteries etc & the maintenance can be done inside with easy movement of working person on DG set
- Enough space for control panel and fuel tank inside enclosure

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7.5.2 Constructional Features of Acoustic Enclosure

The enclosure shall be fabricated out of CRCA sheets of minimum 1.6 mm thickness and shall be reinforced adequately to ensure structural stability.

The enclosure shall be powder coated after seven tank pretreatment process.

The inside of the enclosure shall be lined with suitable fire retardant acoustic material to achieve the specified noise reduction level.

The enclosure shall be provided with suitable number of doors for access to engine, alternator and control panel for maintenance and servicing.

All doors shall be fitted with neoprene gaskets to prevent sound leakage.

The enclosure shall have provisions for lifting hooks/eye bolts for ease of handling and transportation.

The exhaust piping inside the enclosure shall be suitably insulated with glass wool and aluminum cladding to prevent excessive heating and ensure safety.

APPENDIX

LIST OF APPROVED MAKES OF BOUGHT OUT ITEMS

S.N.	ITEM DESCRIPTION	APPROVED MAKES
1.0	SS PUMPS	APV / ALFA LAVAL (LKM) / TETRA PACK / L&T / IDMC
2.0	SS VALVES & FITTINGS	IDMC / ALFA LAVAL (LKM)
3.0	REFRIGERATION CONTROLS	DANFOSS / ALCO / SANSEN / PARKER / AMERICAN SPECIALITIES
4.0	SS PIPES	BHANDARI FOILS / RATNAMANI / APEX TUBES

HEAVY METALS

LIST OF APPROVED MAKES OF BOUGHT OUT ITEMS (Contd.)

S.N.	ITEM DESCRIPTION	APPROVED MAKES
5.0	SS PNEUMATIC VALVES	GEA / ALFA LAVAL (LKM) / KEYSTONE / IDMC
6.0	MOTORS	SIEMENS / ABB / KIRLOSKAR / BHARATH BIJLEE / SHARP / LUBI
7.0	CABLES – ARMOURED	FINOLEX / UNIVERSAL / CCI / NICCO / FORT GLOSTER / RR CABLE / HILIGHT / GREEN ELE / POLY CAB
8.0	Starters	L & T
9.0	Contactor	Telemechaniq / Siemens / L & T / Sprecher + Schuh
10.0	PUSH BUTTONS	L & T / SIEMENS / ABB / SCHNEIDER
11.0	Relays	SEGC / Siemens
12.0	INDICATING LAMPS	L & T / SIEMENS / SCHNEIDER / TECHNIC / VAISHANAV / PRECITECH
13.0	Current Transformers	Kappa
14.0	PRESSURE SWITCH	DANFOSS / ALCO / PARKER / HANSEN
15.0	DIGITAL INDICATOR	HONEYWELL / RAXIX / MASIBUS / PROTOCOL / VIBHUTI
16.0	D G SET	CUMMINS / KIRLOSKAR / MAHINDRA / EICHER / GREAVES / ASHOK LEYLAND
17.0	Alternator	Stamford / Leroy Somer
18.0	BATTERY FOR THE DG SET	EXIDE / STANDARD-FURUKOWA / PRESTOLITE / AMCO-YUASA / AMARON
19.0	STABILISER	SUVIK / MICROTECH / SEN & PANDIT / PACE / POWER ENGINEERS / ASABA / GURU NANAK

20.0	SOLAR HOT WATER SYSTEM	TATA BP SOLAR / JAIN IRRIGATION / RACOLD / SALORE / SUDARSHAN SAUR / STEEL HACKS / DGS&D – GOI APPROVED SUPPLIERS
21.0	Hot Water Electric Geyser	SPEARHOT / RACOLD / USHA / BATLIBOI / BAJAJ
22.0	HDPE TANK – HEAVY DUTY	SINTEX / KAVERI / HITANK