

**Technical Specification – 5KL Bulk Milk Cooler  
Version 1 (Prepared in August 2025)**

**General Description and Scope of Work**

The project involves the design, supply, installation, and commissioning of a Bulk Milk Cooler (BMC) system including all accessories and optional components. This work is to be executed on a turnkey basis, with the equipment operating under challenging village conditions such as hot, humid, dusty environments with voltage fluctuations ranging from 300 V to 600 V for 3-phase supply, design for 48°C ambient temperature.

The BMC shall be a complete integrated unit comprising:

- Refrigeration system
- Agitator
- Lockable inlet and outlet valves with union
- Stainless steel piping and food-grade milk hoses
- Milk transfer pump
- Electrical and control panels, oil-cooled servo voltage stabilizer, APFC Panel etc.
- Earth pits and earthing chambers
- Interconnecting cables, conduits, pipe supports, floor plates, and clamps

The indicative distance between:

- BMC outlet to milk pump inlet minimum: 6 metres mains power point to Stabiliser and to DG set: up to 60 metres

Exact measurements will depend on site conditions. The supplier must provide complete piping and cabling as required for the full installation.

All bought-out components must be of reputed make and must receive approval from the Purchaser prior to contract finalization.

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## **1. Bulk Milk Cooler**

### **1.1 General Description**

- Tank inner shell, outer shell, intermediate dimple jacket and openable top cover shall be fabricated from Stainless Steel AISI 304.
- Piping, fittings, filter body, lockable covers, agitator shaft, blade, adjustable ball feet, inlet/outlet valves and blank flanges must also be AISI 304.
- Gaskets to be of food-grade nitrile or neoprene rubber.
- The supporting skid shall be galvanized steel.
- Milk contact surfaces will be passivated for corrosion resistance.

### 1.2 Standard applicable and cooling time required at 48°C ambient conditions:

- As per ISO 5708 Type 2 II (latest version) for 2 milk collections.
- **Cooling requirements at 48°C:**
  - First collection (50% of rated capacity) from 35°C to 4°C: within 3 hours 15 minutes
  - Second collection (remaining 50%) from 10°C to 4°C: within 1 hour 40 minutes

### 1.3 Capacity:

- **Rated Capacity:** 5 KL (5000 litres) for 2 milk collections.
- The actual capacities (100%) shall be determined with the tank filled to a level that the sprayers and sprinklers for CIP provision shall not come in contact with the milk and milk should not drained outside via the washing spray system for example, rotary sprayer and sprinklers/spray jet with forks and deflector plate.
- **Gross Capacity (Litres): +10% of Rated Capacity (sprayers/spray balls must be above the rated capacity)**

### 1.4 Material of Construction: AISI 304

### 1.5 TYPE / Capacity : Closed Type / 5000 L

### 1.6 Tank Evaporator:

- The tank evaporator plate should have adequate surface area ensuring that the Milk (Rated Quantity) is cooled in the ambient conditions of **48 Deg. C** and in the time periods as specified above.
- Laser welded with Operating pressure of 30 bars and crash test pressure of 60 bars. In case of rectangular/circular type bulk milk cooler, the evaporator shall be fixed at the bottom plate of the inner tank.
- For 5000 litre tanks the total evaporative area shall be divided and separated into two sections. Each section shall have separate suction & discharge ports connecting to each compressor.
- Suction and Discharge line of Evaporator plate SS (lines) to copper lines joints **should be flaring type. It should not be in Brazing/welded type.**
- If the evaporator plates are placed horizontally, each quadrant of the evaporator should be connected to a separate compressor. This setup ensures redundancy, so if one compressor fails, the other compressor can continue to operate, keeping the milk in contact with a functioning evaporator and maintaining the cooling process.
- Note: When the milk volume is only 10% of the BMC capacity, the system can still chill the milk using the remaining compressor, even if one fails.
- All evaporator suction and discharge connections should be routed to the outside. If both evaporators need to connect to a single compressor, all suction

and discharge branch or tee connections must be external, not internal. This ensures proper gas flow, facilitates maintenance, and minimizes the risk of leaks or issues within the system.

**1.7 Tank Shape and Orientation:**

- Closed cylindrical or elliptical tank with 450 mm manhole (minimum), lockable cover and gasket.
- International sanitary design standards to be followed.

**1.8 Evaporator Plate and Shell Thickness:**

- Bottom plate: 2 mm, Top plate: 0.8 mm
- Inner shell: 2 mm, Outer shell: 1.6 mm

**1.9 Agitators:**

- For 5KL – minimum 1No as per Standard/ ISO 5708 Type 2 II (latest version & Separate contactor, Overload relay with **MPCB Provision**) compliance ensuring even distribution of the milk fat when milk is agitated. The agitator motor RPM should be 1440 and minimum 180Watt.
- Preferred gear box and induction motor should be inline type arrangement. Agitator blade shaft should be made of AISI 304 SS and gap between agitator blade and shell bottom is 30 mm. Cup type Nitrile Gasket to be provide for protection against Oil/Grease in Agitator Blade shaft. In Gear box, the grease should be used of Food grade type. Final agitation running RPM should be 23RPM to 28RPM.
- Require high-quality, reliable, and energy-efficient agitator motors that meet stringent standards for performance and durability, ensuring long-term operational efficiency and minimal maintenance.

**1.10 Adjustable Ball Feet:**

- AISI 304, tamper-proof, lockable, with 50 mm height adjustment.

**1.11 Fittings and Accessories:**

- The tank shall be provided with bottom filling with NRV, no-foam inlet, outlet valve & blank union with locking arrangement, inspection window/ manhole with locking arrangement, agitator and top cover with locking arrangement & Air vent in SS construction with vermin proof design.
- All SS fittings shall be of SMS standard. Top cover lifting handle for manhole shall be an in-built feature of the unit.
- Also provision of top feeding in the same system to be there.

**1.12 Type of Insulation & Positioning of Puff Injection Holes:**

- Injected, CFC Free PUF 40 kg / Cu. m

- All puff injection holes must be located at **the bottom of the tank with minimum holes only.**
- **Injection from the sides or any other part of the tank is strictly prohibited. This specification is essential to maintain the structural integrity and prevent potential water ingress.**

**1.13 Thickness of insulation**

- 40 kg/Cu. m density, 50 mm (min.) in the walls & 90 mm below the evaporator to allow 1 Deg. C temperature rise at given ambient conditions in 4 hours after milk is brought to 4 Deg. C. and when the BMC is not operating

**1.14 Insulation Efficiency: 0.019 W-m/k**

**1.15 Milk Volume Measurement:**

- 1 No of Dip Stick preferably V-Shaped of AISI 304 3mm thick on wall of tank. Calibration Accuracy- 0.5%. Laminated Calibration chart with soft copy.

**1.16 Surface Finish:**

- Product contact: 2B finish
- Welds: 150 grit minimum, with 25 mm radius curvature

**1.17 Cleaning Accessories:**

- 1No Tank cleaning brush and 1No long pipe cleaning brush (1500 mm).
- 6 No. SS pipe hooks (Wall mounted) for Holding Milk loading hose, water hose, and cleaning brushes.

**1.18 CIP Facility:**

- For Close type tank CIP spray balls and SS Piping from balance tank/dump tank through milk pump to BMC and back to balance tank /dump tank and other necessary accessories required for circulation

**1.19 Tank Level Indicator:**

- A bubble type level shall be fitted on the top surface of the bulk milk cooler tank so that at any point of time the tank can be checked for its proper levelling.

**1.20 Make of Dimple Jacket-Evaporation Plate:**

- **Omega**

**1.21 Warranty on Dimple Jacket-Evaporation Plate:**

- Warranty for Dimple Jacket -Evaporation Plate should be 60 months from the date of commissioning or 66 months from the date of supply, whichever is earlier.

**2. BMC Milk Tank Control Panel**

- The refrigeration unit shall be provided with a control panel made out of Stainless Steel (AISI304) suitable for wall mounting near the unit.
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- The panel shall be provided with motor starters, ON/OFF buttons & necessary MCBs, control wiring, line voltage controller to guard the compressor against the supply voltage fluctuations.
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- For 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 surge on power supply.
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- 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.
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- **Pump-Down before Compressor Shutdown:** The system must ensure that refrigerant gas is pumped down from the evaporator before the compressor switches off. This helps protect the compressor from damage caused by liquid refrigerant.
- **Automatic pump-down system:** The cooling unit must include an automatic pump-down feature that activates every time the compressor is turned off. Manual systems that need operator control will not be accepted.

#### **2.1 Panel Mounting:** Wall-mounted

#### **2.2 Material of Construction Panel, thickness & Size of opening doors**

- AISI 304, 1.6mm
- If the control panel door requires more than 2 feet of clearance to open fully, it must be designed as a split door with two openings to allow easier access and operation.

#### **2.3 Temperature Display:**

- 2 Nos LCD temperature display in red colour with one decimal accuracy with clear visible from 20 feet distance one in panel and another one temperature display at milk reception area with wall mounted SS box (distance between control panel to milk reception area approximate 15-20M.)

#### **2.4 Cooling & agitation controls:**

Required – controls for management of cooling and agitation, provision for cut-off/ restart, intermittent operation of agitator, auto and manual facility to be there.

#### **2.5 Battery Backup:** Required

#### **2.6 RS 232 port for temperature sensor**

- RS232 connectivity or equivalent compatible facility for temperature data transfer shall be provided.

#### **2.7 Rating of Contactors**

- **Standard to meet functional requirements of the Refrigeration Control Panel (Min. 32 ampere contactor required)**

**2.8 UV (Under Voltage) /OV (Over voltage) trip facility:** Required with LED indication.

**2.9 Neutral Protection unit:** Required with LED indication.

**2.10 Timer On-Delay:**

- Required (Required on delay timers for each compressor to avoid start at a time all compressors to minimize starting current)

**2.11 Auto/manual Mode (Selector Switch):** Required

**2.12 Single phase preventer:** Required

**2.13 MCB to On/Off refrigeration control panel**

- MCCB for the main input supply, **and separate MPCBs for each compressor and each agitator.**
- Note: -1) If a problem is detected in a compressor or agitator, only that particular equipment will be switched off.
- 2)The main power connection should be made at the main MCCB.

**2.14 Cooling Fan for Panel:** Required

**2.15 Earth Points:** 2 Points Required

**2.16 HP/LP Trip indication in LED:**

- Required in Panel for all compressors. (it should be in red for HP & Blue for LP)

**2.17 Supply indication in LED**

- R, Y, B Incoming supply Multi colour LED indication is required

**2.18 Compressor and Agitator Trip/Off Indication in LED:** Required

**2.19 Panel on-mode Indication:** required and should be in green colour

### **3. Refrigeration Unit**

- The refrigeration system shall be designed to comply with ISO/R1662 and to meet the requirements of milk tank (ISO 5708 Type 2 II standard - Latest Version).
- The refrigeration system shall be of direct expansion type, with R404A or CFC free environmentally friendly refrigerant to cool the raw milk from reception temperature to 4 Deg. C.
- The evaporator(s) of the refrigeration system shall form a part of the milk tank body as dimpled jacket in the bottom plate at least up to 1/3rd height of the elliptical (closed) tank.

### 3.1 Standard for 48°C Ambient Conditions

- ARI Standard 520-2004 applicable for refrigeration units operating at higher ambient temperature conditions. To facilitate for milk collection of BMCs operating as per ISO 5708 Type 2 II standard.
- **Note: in case of chances for liquid Refrigerant entering to the compressor suction in lower ambient, the supplier should make arrangements to prevent it.**

### 3.2 Design Parameters

- 0 Deg. C evaporation and applicable discharge temperature at minimum 60 Deg. C condensing temperature

### 3.3 Type

- Direct Expansion

### 3.4 Type of Refrigerant

- R404A or equivalent CFC-free refrigerant

### 3.5 Cooling Capacity of Each Compressor

- Adequate capacity to ensure milk cooling time periods specified and ambient conditions of **48 Deg. C** mentioned above.
- Compressor selected should be compatible for multiple refrigerants. **In case of lower ambient temperature, BMC operation will get advantage of early cooling.**

### 3.6 Number of Compressors

- For 5KL unit: Two compressors

### 3.7 Make, Model and Type of Compressor

- **Danfoss, MLZ058 compressor and hermetically sealed, scroll, energy efficient (NRV required in the discharge line to be added).**

### 3.8 Type of Condenser

- **Air Cooled-Fin and tube type.** The condensing temperature should not be less than 60°C

### 3.9 Condenser Surface Area

- Design and provide a substantially adequate condensing area to meet the functional requirements of the refrigeration unit in very hot conditions specified **above as 48°C as ambient.**

### 3.10 Receiver Volume

- A minimum of 9 litres with a rotolock valve is required in each Condensing Unit (CU) for the 5KL BMC. However, the capacity may be reduced to 8 litres, provided the supplier ensures that the receiver volume is adequate for the refrigerant charge and sufficient for pump-down operations. The provision of a rotolock valve remains mandatory.

**3.11 Condenser Fan**

- Three-phase
- With an internal thermal protection device, Enclosure shall be of metal (plastic fan is not permitted).

**3.12 Pump-Down System**

- Required

**3.13 Protective Grill**

- To preferably provide removable wire mesh screen in front of **condenser fins**.

**3.14 Expansion Valve**

- Thermostatic expansion valve with MOP (minimum operating pressure)

**3.15 Essential Components**

- **Required:**
  - Drier
  - Solenoid valve with coil
  - Sight glass
  - Fan
  - Receiver
- Required for safe and efficient operation of the unit.
- All components must be of **flaring type** (brazed or welded joints are not acceptable)

**3.16 Accessories**

- Isolation valves shall be provided at the suction, discharge, and service valves on the HRU side of the compressors. All pipes, valves, fittings, and controls must comply with the latest applicable national or international standards and codes.
- Copper piping between the BMC and the condensing unit shall be properly supported and routed using cable trays with appropriate tray supports to ensure durability, safety, and ease of maintenance.
- The condensing unit shall be installed on a platform made of a galvanized iron (GI) stand to ensure stability, durability, and corrosion resistance.

**3.17 Rotolock Valves**

- Required for both compressor suction and discharge

**3.18 Thickness of Copper Pipes**

- Soft Copper Pipe: SWG 18 (1.219 mm)
- Hard Copper Pipe: SWG 16 (1.626 mm)

- *Manufacturer's test certificate required*

### **3.19 Insulation Foam Tube for Copper Pipes**

- For 1 1/8" copper pipe: **Minimum foam thickness 19 mm**
- For 1 3/8" copper pipe: **Minimum foam thickness 25 mm**

## **4. Control Panel for Capacitors**

The capacitor control system shall be designed to maintain power factor and monitor electrical parameters efficiently. It includes the following components and features:

### **4.1 Automatic Power Factor Correction (APFC) Controller**

- Microprocessor or PLC-based controller capable of automatically adjusting capacitor banks, starting from a power factor of 0.75, to maintain a target of 0.99 lag.
- Real-time display for monitoring electrical parameters such as power factor, voltage, and current.
- Target power factor to be maintained at 0.99 lag to ensure optimal energy efficiency.
- Automatic disconnection of individual capacitor steps if the power factor leads, to prevent overcompensation.
- Built-in alarm system for conditions such as capacitor failure, leading power factor, overcurrent, or overvoltage.
- APFC panel to consider also other loads eg. Lighting, lab equipment. It should be with 3 CT sensing and capacitor bank to have provision for add on.

### **4.2 Metering and Monitoring**

- Digital multi-function meter (MFM) to monitor voltage, current, power factor, active power (kW), apparent power (kVA), reactive power (kVAR), and frequency.

### **4.3 Capacitor Banks**

- Capacitor Steps: The combination of capacitor steps should be suitable to handle load variations starting from 1 kVAR to maintain a power factor of 0.99 lag. Local power quality should be assessed by the vendor before finalizing the configuration.
- Type: Heavy-duty, low-loss, self-healing type power capacitors for enhanced durability and performance.
- Installation: The capacitor panel shall be installed before the servo voltage stabilizer, i.e., immediately after the fuse carrier.

## **5. Servo Voltage Stabilizer**

- This panel should be suitable to tap the incoming Grid supply and feed the refrigeration unit, agitator motor and milk unloading pump (from balance tank) and dispatch pump, lighting, lab equipment etc.
- The DG set should be hooked up with this panel through a 'change-over-switch' in order to operate the DG set in place of Grid supply as and when required.
- It should be provided with necessary phase indication lamps (LED type), contactors, MPCBs, Multi-function Meter/display with amps, voltage, KWH, KVA, frequency, push button, DG set running hour meter for DG and EB Supply separately, isosceles transformer of 2 KVA for AMCU, Voltage stabilizer and single-phase preventer, wherever applicable, of suitable ratings should be supplied.

### **5.1 Voltage Range and Rating**

- Voltage Range: 300 to 600 V for 3-phase (**Oil Cooled**)
- Rating: 45 kVA-3 Phase

### **5.2 MOC, Thickness & Structure Type**

- MS Powder coated, 1.6 mm. and pipe structure, with uni-direction wheels and braking arrangement.

### **5.3 Accessories for 3-Phase Stabilizer**

- One MCCB for incoming,
- One change-over and bypass switch,
- Servo controlled correction transformer,
- Digital V, A, F indicator for input & output,
- 63A terminal blocks,
- OV/UV trip with delay time,
- Single phase preventer,
- Digital energy meter,
- Metal glands at cable entries.

### **5.4 Operating Features**

- Cable entry from Bottom (preferably)
- Response time-5 milliseconds, should withstand 150% load on surge duty,
- Capacity of terminals should be 150% of rated current,
- Dimmer with CRGO core,
- Separate Auto/manual facility,
- Plug in type control card for each phase,
- Correction speed-105v/s, Efficiency-99.5%

### **5.5 LED Indications**

- R.Y.B. (Red, Yellow, Blue)
- Output On
- Trip
- Phase OK
- Phase Reverse
- DG On

#### **5.6 MCB / MCCB Requirements**

- 1nos MCCB for Main incoming (RYBN)
- 1nos MCCB BMC supply (RYBN),
- 2 nos MCB for Milk pump (RYB),
- 1nos MCB for dairy lighting (RYBN),
- 1nos MCB for can scrubber (RYBN.)
- 1nos MCB for Isolation transformer supply (PN)
- Each MCB/MCCB should have its corresponding equipment name indicated on a metal plate, **not on sticker**.

#### **5.7 Placement of MCB/MCCB/MPCB**

- Install the rotary operation knobs on the door stabilizer to control the MCBs inside. For easy operation without opening the door.
- Note: Channel for MCB/MCCB/MPCB should **not be fixed on the door**.

#### **5.8 Earthing Points**

- Required on both sides

#### **5.9 Placement of Oil Level Indicator**

- The oil level indication glass should also be positioned on the front side of the stabilizer for easy visibility

#### **5.10 Digital Energy Meter with VAF: Required**

### **6. Domestic Power Distribution Board – Required**

## **7. Earthing**

**7.1** As per IS: 3043 - 1987 (reaffirmed 2018) - "Code of practice for earthing". GI Plate type earthing with funnel at top and GI Plate Size: 600mm x 600mm x 6mm thick. A total of 5 earth pits are required:

- 2 for Diesel Generator (DG) body
- 1 for DG neutral
- 1 for Stabilizer body, Earthing busbar & equipment.
- 1 for Stabilizer isolation transformer neutral.

**7.2** The distance between each pit to be as per local statutory requirement. Suitable G I Strip (minimum 25x3 mm) to be used for connecting earth pit with nearest equipment earthing point.

**7.3 Connections:** 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 1x 4 Sq. mm).

**7.4** The scope of work includes excavation for the earth pit, filling with necessary materials e.g., charcoal and salt, construction of suitable chamber.

**7.5** Supplier will test and demonstrate the resistance as per local EB. Requirement and furnish record as required.

## **8. Milk Pump & Feeding System Accessories**

- Milk pumps shall be supplied for pumping of milk from balance tank/dump tank to BMC and unloading of milk from BMC to milk tanker.
- Pump impeller & casing shall be made out of SS AISI 304 material. All milk contact surface shall be finished to minimum 150 grit.
- The pump should be of sanitary design. Inlet and outlet of the pump shall end 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 be covered with SS shroud having air ventilation grill.
- The pump shall have SS adjustable ball feet. Make of the pump shall be approved by user.

### **8.1 Dump Tank & Weigh Bowl**

- User will provide balance tank/dump tank.
- However, SS piping, fittings etc. from Dump tank/balance tank outlet (51mm) is in the scope of BMC Supplier.

### **8.2 SS 304 Milk Pump (suction 51x Discharge 38)**

- **2 Nos** with Centrifugal in SS construction with cap **15KLPH SS Pipes, Fittings and Supports**

### **8.3 SS Pipes, Fittings & Supports**

- 51mm SS 304 Pipes with necessary fittings and supports

### **8.4 Head in MWC**

- 10 meters

### **8.5 Pump Inlet/Outlet**

- 51 mm x 38 mm with SMS union

#### **8.6 Pump Accessories**

- Adjustable ball feet (min. 50 mm),
- Motor having 'E'/'F' class insulation and having IP 55 protection.
- Pump shall have SS shroud.
- DOL starter 2 Nos. and Remote push button (on-off) to be installed at Milk reception area for convenient operation.

#### **8.7 Food grade tanker loading/unloading hose pipe**

- 10 meters length and Size 51 mm with both side male and female SS unions.

#### **8.8 Inline Strainer**

- SS 304 inline strainer preferably cone filter with both side union shall be supplied 51mmX51mm.

#### **8.9 Gaskets**

- 20 sets for 51mm plug valve
- 5 nos for 51mm butterfly valve(silicon)
- 50 nos for 51mm Union
- 10 nos for 38 mm union
- 10 nos for 25 mm union

#### **8.10 S-Bend**

- Required 2 nos of S-Bend (**51 mm**) to maintain height between BMC outlet vs pump suction vs dump tank /balance tank outlet.

### **9. Water Handling System for BMC**

#### **9.1 Overhead Water Tank System (2000 Litre Capacity):**

- Closed-type overhead tank of 2000-litre capacity with double-walled construction for enhanced durability and insulation.
- Provided with a manhole and lockable cover for easy access during maintenance.
- Material of Construction (MOC): High-Density Polyethylene (HDPE), suitable for potable water storage.
- Supplied with all necessary fittings and fixtures, including inlet/outlet connections, overflow and drain provisions.

- Equipped with a **single-phase submersible pump** with foot valve or Monoblock pump as per site condition.
- **Arrangement to be provided to ensure automatic filling of the tank based on water level.**

### **9.2 Pump Capacity**

- **Power:** 1 HP
- **Head:** 10 MWC

### **9.3 Waterline Schematic – Valves & Fittings**

- The OH tank to supply water to BMC for cleaning and washing. Necessary CPVC piping supply and installation is in the scope of work of supplier.

### **9.4 System Interconnecting Piping**

- Piping for water should be of **2-inch CPVC ISI marked**. Piping is required between
  - Ground/Sump to overhead water tank,
  - Overhead water tank to HRU,
  - Can scrubber,
  - RMRD area.
- Piping for hot water from
  - HRU to Can scrubber,
  - Dump tank/Balance tank,
  - RMRD area
- The above mentioned CPVC piping supply and installation is in the scope of supplier.

## **10. Heat Recovery Unit (HRU)**

- The system shall be designed to heat water by recovering thermal energy from the discharge gases of a single compressor.
- It shall consist of evaporator type heat recovery unit.
- Suitable capacity SS 316 tank (water contact area), 2 mm thick with suitable insulation and outlets.
- Suitable SS ladder or stool with floor grouting with anchor bolts for cleaning and supervision to be provided.
- For 5KL BMC – 1 No with accessories
- It shall be connected with one compressor.

**10.1 Capacity:** 200L

**10.2 Evaporator Plate – OMEGA MAKE:**

- Laser welded evaporator plate ensure perfect distribution of refrigerant, higher heat transfer short time & long life of equipment.

**10.3 Diameter: Inner Shell: 700mm**

**10.4 MoC :**

- **Inner Shell: AISI 316- water contact area.**
- Outer Shell: AISI 304

**10.5 Insulation**

- High thermal efficient polyurethane (PUFF) (40 kg/m<sup>3</sup> density)

**10.6 Outlet for hot water and Drain**

- Two outlets with valves.
- 38 mm outlet with valve for drainpipe.
- 25 mm with valve with hot water outlet.
- Both these outlets shall be provided dish end of the heat recovery unit.

**10.7 Mounting Stand (AISI 304) : S.S. stand with 4 ft Height**

**10.8 Estimated length of piping: 10 Mtr**

**10.9 Inlet, outlet & overflow connections:**

- All connections should be provided with threading including overflow pipe instead of plain connections to ensure secure and proper fittings.

**10.10 Temperature Display for HRU**

- For monitoring real-time temperature of hot water

## **11. Diesel Generator (DG) Set**

**11.1 General Operating and Design Conditions**

- The DG set shall be of capacity:
- 45 kVA three-phase Air cooled
- The DG set should be heavy duty design, industrial type, rated for continuous operation for the refrigeration system, milk tank agitator & milk dispatch pump, AMCU, Lightings, Ceiling fan etc.
- The diesel engine and alternator should be mounted on specially designed combination base plate and MS structure of extremely rigid fabrication. The base frame should be suitable for mounting the set on **AVM pads** over the foundation.
- **Diesel Tank Capacity should be minimum 250 litres.**

**11.2 Confirmation to regulatory norms for environment and Approval from Local authorities**

- 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 and amended by GSR 448 (E) dt.12/07/2004.
- Compliant with the latest CPCB norms applicable as per government guidelines.
- The exhaust pipe with exhaust muffler with insertion loss of minimum 25 dB (A) is connected to the exhaust manifold preferably with flexible bellows.
- In case the DG Set is located within the BMC building, the exhaust pipe with insulation & cladding of adequate length to be provided extending the original pipe over the roof of the building to avoid pollution in and around the location.
- Supplier to obtain the approval of Local authorities in case it is required by the rules.

### **11.3 Diesel Engine**

- The diesel engine should be suitable for power generation application air cooled/ water cooled and capable of developing required BHP when running at 1500 rpm under NTP conditions.
- 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.
- Engine ratings should be for operation at full load condition and should be suitable to take 100% block load.
- Self-starting arrangement with 12V suitable rated heavy-duty Lead Acid accumulator type battery with solid-state battery charging arrangement and cables. standard set of tools. First fill of Lubricating oil, first fill of coolant, lubricating oil pressure and temperature gauge.
- Standard set of tools. First fill of Lubricating oil, first fill of coolant, Lubricating oil pressure & temp. gauge.
- Control panel for engine with engine safety temperature, V-belt failure, low oil pressure, low water level in radiator auxiliary failure, air cleaner choke indicator. External battery charger to be supplied.
- As per latest Central Pollution Control Board compliant.

### **11.4 Engine Instrument Panel (Mechanical and/or electronic gauges)**

- Consist of 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.
- Diesel quantity to be show in percentage.
- Engine safety unit (ESU)
- Two numbers of Diesel hose should be supplied as spare.

#### **11.5 Alternator**

- The engine shall be closely or flexibly coupled to a suitable self-excited, self-regulated (via AVR) alternator, capable of developing the required kVA at 0.8 power factor, 3-phase, 415 Volts, 50 Hz AC power supply under Normal Temperature and Pressure (NTP) conditions while operating at 1500 RPM.
- The alternator shall meet the following criteria:
  - Brushless type, ensuring reduced maintenance and increased reliability.
  - Screen protected, with appropriate enclosures to prevent ingress of dust or foreign particles.
  - Fitted with end shields and ball/roller bearings to support smooth mechanical operation and long service life.
  - Insulation shall be of Class 'H', suitable for high thermal endurance and extended operational life.
  - The alternator shall conform to IS 13364 (Part II):1992 or IS 4722:1992 for **ratings 45 KVA.**

#### **11.6 Control Panel**

- The diesel generating set to have suitable control panel duly pre-wired with the following instruments:
  - One ammeter with selector switch, Hour meter, 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 25 kA. One set of indicating lamps and control fuses.

#### **11.7 Installation and Commissioning of DG Set**

- Unloading, lifting / shifting and final placement of DG set is in the scope of supplier, Installation of DG set in all respect including is in the scope of supplier.
- All electrical work including power and control cabling from DG SET to control panel is in the scope of supply. (Maximum distance between DG set & Control Panel is to consider 35 Meter), From output of MCCB purchaser shall connect power cable for further distribution.

#### **11.8 Warranty / Guarantee**

- **Warranty should be minimum 24 months from the date of commissioning or 30 months from the date of the supply whichever is earlier.** Supplier shall supply filters/spares along with DG set for troubleshoot operation up to warranty period.

**12 Manual (Gravity) Milk Can Conveyor System for BMC**

- **Can Compatibility: 40 L and 50 L aluminium / SS milk cans**
- **Load Capacity: Minimum 120 kg per running meter**
- **Conveyor Width: Minimum 600 mm**
- **Conveyor Height: 750–900 mm with adjustable legs**
- **Conveyor Length: As per site requirement (up to 06 meters)**
- **Roller Diameter: 60–76 mm**
- **Roller Pitch: Maximum 150 mm**
- **Conveyor Slope: 2°–5° for smooth gravity movement**
- **Material of Construction (MOC)**
- **Conveyor Frame: SS 304**
- **Rollers: SS 304**
- **Shaft & Bearings: Food-grade, sealed type**
- **Fasteners & Hardware: Stainless Steel**
- **Finish: Smooth, corrosion-resistant, food-grade**
- **Minimum 14 no's roller are required for 1 meter Lenth of conveyer**

**13 Dump Tank 1000 ltr**

**SS 304 minimum 2 mm thick sheet 1000l rated capacity 1100 Liter (Gross), rectangular type with SS cover consisting of 3 parts slopes 1:15 towards outlet (from all three sides) all weld joints ground smooth all SS surface to be polished to 150 grits. All inside corners shall have minimum radii of 25 mm. Top edges of the tank shall be bent outward smoothly with SMS 51 mm BFV at outlet.**

**14. Can Drip Saver**

- **This shall be used to recover milk residue in milk cans and after dumping milk of can in milk weigh bowl. A pipe structure to keep 4-5 Nos. 40 litre milk can in inverted slant position to drain out manually residue milk in can & then to collect it in a tray. Pipe structure- This is to be made of 50 mm SS304 thickness 2 mm collection tray this to be made of 2 mm thick ss 304 sheets with slope towards one end & a 25 mm SS ball valve. Approximate dimension of can drip saver 2000x465x1250 mm.**

**15. Weigh Bowl Cap: 500 Ltr**

- **Bowl to be fabricated from 2 mm thick SS 304 sheet with holding capacity of 500 l. Bowl to have sufficient slope towards outlet where a special liver operated SS**

valve complete with gasket (approximate 245 mm) and other accessories fixed. Bowl to be complete with the SS wire mesh strainer complete with the mounting breaker and grill but without anti splash unit.

#### 16. Weighing Machine

- **Weighing Mechanism-** It should be fully electronic with load cells. The complete mechanism shall be housed in a dust/waterproof enclosure & fitted with damping facilities and all other adjustments. An electric heater should be provided to prevent condensation inside the enclosure. Load cell to have IP 65 Protection & to withstand over load of 300% minimum to take care of the impact loading when milk is poured into milkweigh bowl. Considering this, there should be at least two load cells of capacity 1000 kg each.
- **Display unit:** Weight of milk to be indicated by bright 7 segments LED of 25 mm height., having display resolution of 1/6000 on a table top SS display unit. Accuracy-100 gm. Display unit to have features of Tare (up to 50% of machine capacity), weight addition up to 6 digits & cumulative weight through a8 keys key board. Unit to have calibration facility through software. System to be suitable for operation with 230 V, 50 Hz, operating temperature of 0-48 deg C, operating humidity of maximum 85% RH ( noncondensing). Unit to have in built battery backup for 20 hours. Unit to have facility for interfacing with a PC for entry/recording of weigh data.
- **Supporting Structure:** Hangers should be provided for suspending weigh bowl. The complete weighing machine shall be supported on a rigid bridge type steel structure. The two main legs for supporting structure to be of Mild stee Complete weighing system to meet the requirement and approval of Indian Weight& Measure Department & after installationat site, the supplier to obtain the stamping

#### 16. Can Washer

- The Capacity of Can washer shall be 425 liters and it shall be having SS 304 bath made from 1.6 mm thick sheet. Can washer tank is same as Can Scrubber without motor/brush.
- Lid cleaning tank with capacity of 425 liters with partition for can lid cleaning and rinsing (double section). It shall be having SS 304 bath made from 1.6mm thick sheet. Lid washer tank is same as Can Scrubber without motor/brush.

#### 17. Can Tipping Bar

- Should be a horizontal wooden bar supported ontwo legs of MS 'B' class pipe and flange on

- **bottom of the pipe for grouting. Top bar should be made of teak wood. All MS surfaces are to be painted with a coat of epoxy primer followed by two coats of epoxy paint of ivory color after thorough de-rusting.**

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#### **18. Can Scrubber**

- **The capacity of can scrubber shall be 425 litres & it shall be having S 304 bath made from 2 mm thick sheet. Cleaning nylon brushes shall be driven by 1 HP 1440 rpm three phase electric motor and gear box. For motor and gearbox, SS 304 cover to be provided for avoiding splash of water. Supply of DOL electric starter for can scrubber is included in scope.**

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### **12. Installation, Commissioning, Trial Runs and Putting the BMC in Operation on Milk**

#### **12.1 Installation of BMC and Supporting Accessories**

- The installation work should be carried in the best workman like manner in conformity to the relevant codes of practices of BIS standards applicable for mechanical & electrical installation.
- Please Supply all Cables, SS Pipes & fittings and CPVC/PVC Pipes as per the appropriate BMC building size Minimum 60feet x 40feet, & Compressor and condenser planned to be kept at outside of the building.
- Installation of all equipment & interconnecting piping, including minor civil works such as opening the wall for copper pipes, milk transfer pipes, all conduit pipes, water line pipes etc. and construction of earthing pit chambers.
- Providing stainless steel pipe supports, SS base plates, clamps, valves, unions etc. required to secure the equipment & piping to walls and floors is to be provided.
- Supply, laying, connecting, terminating all necessary electrical and control cables through the cable trays, GI pipes/conduits, cable gland sockets at ends, isolators, junction boxes etc. are included in the scope of the work.
- Cable trays and supporting steel members such as Galvanized angles /channel / flats shall be used and fixed/installed at appropriate places to ensure safe installation.
- The laying of cables on the floor or under the floor is not permitted Install a 25mm heavy duty PVC pipe on both sides of the BMC tank bottom, along the tank's length, to route the milk pump cable.

#### **12.2 Interconnecting Piping for the Entire Plant**

- SS 304 piping 51mm for 5KL 1.6 mm thick
- Provide and install extended pipe for connecting milk hose for milk tanker loading – unloading.

- **Milk should be feeding from the bottom of BMC Tank. Necessary NRV and Plug Valves shall be included in scope of supply.**

### **12.3 Cables & Electrical**

- 60mtr Copper Armoured Cable between D G Set, EB, main control panel and Refrigeration Control Panel shall be steel armoured (for 5kl: 4 C x 16 Sq mm (Min)copper. For all electrical cables, suitable water-tight cable SS glands and lugs should be used at ends. Specification for PVC insulated cables (for voltage up to 1100V): Part 1 with copper conductor (revised).
- Flexible electrical connections shall be made only to items normally movable in service. Such flexible cables shall be PVC insulated copper conductor not less than 24/0.20 mm in size (see IS 694 (Part1-1964\*) and earth continuity conductors of PVC insulated copper conductor shall be provided.
- Note: Please consider minimum 120-meter wire required for milk pump connection

### **12.4 Toolbox with Required Tools & Spares:**

- A standard toolbox of GI sheet with necessary tools for normal maintenance.
- It should include Electric Tester, Screwdriver Set, Allen Key 3mm & 6mm, Pipe Wrench 12" Long, Screw Spanner 6", Fix spanner Set 6-27, Gasket for SS Unions/valves- 3 sets and extra mechanical seal for pump.

### **12.5 Operation Manuals**

- 2 sets to be provided.

### **12.6 Drawing for the Complete System Offered**

- Drawing must be provided.

### **12.7 Commissioning**

- Supplier shall arrange commissioning & performance trial runs of the bulk milk cooling system ensuring that BMC meets all performance parameters. The supplier shall supply all the consumables except diesel for D G Set required during commissioning of the plant. Diesel for commissioning of D G Set shall be provided by purchaser.
- In case of unavailability of Milk, Supplier has to take trial on Water.

### **12.8 Training**

- Supplier shall arrange for training of the operating team of BMC centers for efficient operation and maintenance of the complete system for 3 days in local language at our site

### **12.9 Warranty**

- All equipment (including bought-out items) supplied & installed by the contractor shall have a comprehensive warranty of 24 months from the date of commissioning or 30 months from the date of the supply whichever is earlier.

- **Special warranty 60 months for dimple jacket from the date of commissioning or 66 months from the date of supply and for this supplier will give warranty in Company letter head.**
- **Consumables are not included, however refrigerant included during the warranty period.**
- During the warranty period, Breakdown calls to be resolved on or before next shift milking reception.

**12.10 Inspection & Trial**

- Client reserves the right to inspect all the components of the bulk milk cooling system during the fabrication/ manufacturing stage and finished stage before dispatch of the equipment. The milk cooling tank shall be checked with dye penetration test for welding defect, surface roughness check, water tightness test /hydraulic test.

**12.11 Fire Extinguisher**

- Supply and install A B C Stored Pressure type fire extinguisher of capacity 1 kg with each:

**12.12 Logo**

- Milk Producer Organization shall provide the soft copy of logo to supplier.
- **Supplier will fix logo of Milk Producer Organization in SS Plate with multicolour.**

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