

## **Constructional Features**

- **1.1 Bulk Milk Cooling Tank**

- **1.1.1 Material of construction**

- Tank inner, outer, intermediate dimpled jacket & top openable cover shall be fabricated from Stainless Steel AISI 304 material. All piping, fittings, filter body, lockable cover, agitator shaft & blade adjustable ball feet, dip stick, outlet & inlet valves & blank flanges shall also be made out of AISI 304. The filter screen shall be from AISI 304 fine wire mesh. All the gaskets shall be of food grade nitrile or neoprene rubber material. The skid on which tank & refrigeration unit is mounted shall be of galvanised steel. The bottom evaporation surface in contact with milk shall be passivated by standard treatment to impart corrosion resistance.

- **1.1.2 Shape & Orientation**

- The preferred shape of the tank shall be closed type elliptical with top man hole in case of BMCs higher than 2000 lit capacity.

- **1.1.3 Tank Fittings & accessories**

- The tank shall be provided with no-foam inlet, outlet valve & blank union with locking arrangement, inspection window/ manhole with locking arrangement, agitator, and top cover with locking arrangement.
- All SS fittings shall be of SMS standard. Top cover lifting handle and approach ladder for manhole cover shall be an in-built feature of the unit. The tank shall be provided with AISI 304 adjustable ball feet having provision of 50 mm height adjustment. Number of ball feet shall be minimum 4 for small capacity tank and 6-8 for bigger tank.
- The tank shall be equipped with agitator(s) capable of producing a uniform distribution of fat in the milk.
- The tank shall be provided with SS calibrated dipstick to measure the volume of milk inside the tank.
- A union with a blind SS plate should be provided so as to plug the outlet valve of the tank to prevent entry of unwanted materials.
- 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 temperature indicator shall be provided in the control panel.

- A bubble type level indicator 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. The indicator shall be fitted in such a way that they are easily accessible and does not get damaged due to the top cover movement.
- **1.1.4 Milk Filter**
- Each system shall be provided with two AISI-304 filters with SS fine wire mesh suitable to filter extraneous matter such as dust particles, hay, flies, cow dung pieces / particles etc. One filter shall be on balance tank and the other at the inlet of the bulk milk cooler. The filter shall be designed and installed in such a way that it can frequently and easily be cleaned and sell be provided extra SS Strainer on 200 Ltr balance tank.
- **1.1.5 Stainless Steel Process Pipe and Fittings**
- Stainless Steel AISI 304 process pipe shall be used for milk transfer from balance tank to Bulk Milk Tank either gravity flow or through SS sanitary milk pump and CIP line. The pipe shall be welded type having minimum 2.0 mm thickness. Inside of the tube shall be acid pickled and outer surface mirror polished. All bends and Tees required to complete milk and CIP lines shall also be manufactured from the prime quality process tube as described above. All the valve and fittings required shall be AISI 304 SMS standard made out of entire investment casting or forging. The milk contact surface shall be ground smooth or lapped, having minimum surface roughness 150 grit. The outer surface shall be mirror polished. Material of gasket for milk application shall be neoprene / nitrile rubber. The required number of two way / three way valves should be provided. There should be adequate pipe up to the Tanker loading of the milk collection center for easy unloading into tankers. At every three meter pipe a union shall be provided so as to facilitate manual cleaning. 1 feet S.S. plate should be supply for BMCU leg foundation and the plate thickness should be 6mm in each leg. S.S. pipe should be fitting with hinge type clamps.
- **1.1.6 Stainless Steel Sanitary Milk Pump**
- A suitable capacity milk pump shall be supplied for pumping of milk from balance 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 min.150 grit. The pump should be of sanitary design. Inlet & outlet of the pump shall 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 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 the DAIRY. The pumps should work on the three phase RPM 15000 LPH/ 10MWC supply in case of 10000L.

## **2. Refrigeration System**

- The refrigeration system shall be designed to comply with ISO/R1662 and to meet the requirements of milk tank (ISO 5708, Class 2A II-Latest Version). 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 Deg. C in the prescribed time frame mentioned at **3.2.1**. 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 1/3<sup>rd</sup> height of the elliptical (closed) tank. Preference shall be given to systems which would be compatible for the Futuristic Refrigerant(R 407 C).
- **2.1 Compressor**
  - The refrigeration compressor (s) shall be scroll type suitable for 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 be necessary in the refrigeration unit, preferably a self-regulating PTC crank case heater.
  - Client shall approve Emerson Climate Technologies Make(s) of the compressor & condensing unit. The compressors selected should be energy efficient and consume least power to meet the cooling load requirements.
  - For three phase compressor motors, star /delta starters will be preferable to reduce the starting current. **Separate price must be quoted for star -delta starters.**
- **2.1.1 Condenser**
  - The condenser shall be air cooled finned tube type having sufficient heat transfer area when the unit is operating at extremely high ambient temperature. The air circulation fan shall be induced draft type throwing hot air out of the place of installation. There should be a provision for safety cover for the unit and Copper piping.
- **2.1.2 Insulation**
  - The insulation of the tank shall be done by injection, in situ, of high density (minimum 40 kg/m<sup>3</sup>, CFC free and environmental friendly) polyurethane foam without having any imperfection and hygroscopicity. The efficiency of insulation should be such that at max 50 degree C. ambient temperature, the rate of rise of the mean temperature of the

milk, initially at about 4 Deg. C shall not exceed by one Deg. C in four hours when the rated volume is allowed to stand undisturbed as per the requirement of ISO 5708 2A II ( latest version) when the refrigeration unit is not working.

- **2.1.3 Cleaning In Place (CIP)**

- For closed type configuration, facilities for Cleaning- In- Place shall be provided which shall include CIP spray ball (s) and piping from milk reception/balance tank through milk transfer pump to bulk milk cooler.
- For top openable configuration, facilities for manual cleaning shall be provided with AISI-304 tank of 50-lit capacity for preparation of CIP solution.
- As mentioned at clause 4.2 above, solar water heater must be provided for supply of hot water for manual cleaning as well as CIP and auto CIP system should be given for 3000L, 5000L and 10,000L.

- **2.1.4 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.

- **2.2 Receiver**

- For refrigeration circuit a minimum 6 Litre liquid receiver to assist system during pump down cycle as well as to store refrigerant in case of maintenance should be provided duly mounted on the skid near compressor(s).

- **2.2.1 Thermostatic Expansion Valve**

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

- **2.2.2 Evaporator**

- In case of rectangular type bulk milk cooler, the evaporator shall be dimpled jacket fixed as the bottom plate of the inner tank. Whereas in cylindrical/ elliptical tank the jacket shall be at least up to 1/3 height of the tank. The gap between inner shell and jacket plate shall be such that maximum heat transfer takes place in direct expansion of the refrigerant in the jacket. The zigzag path for refrigerant travel shall be designed in such a way so that it reaches upto the extreme corner of the bottom plate. 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. The Evaporator plate should be laser welded.

- **2.2.3 Refrigerant pipe, fittings & controls**

- All pipes, valves, fittings & controls shall comply with the latest relevant code applicable. Isolation valves at suction & discharge sides of the compressors should be provided for compressor isolation, during maintenance of the system. The make of each item shall be approved by the client. 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.

### **3. Electrical Control Panel**

- **3.1 Control Panel**

- Three control panels shall be provided, one for the main power supply tapping, second for the refrigeration unit and the third for the milk tank. Each panel shall be provided with ELCB+ MCB's of suitable 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. The MOC of all control panels shall be SS 304.

- **3.1.1 Main Control Panel**

- This panel should be suitable to tap the incoming State Electricity Board supply and feed the refrigeration unit, agitator motor and milk unloading pump (from balance tank) and dispatch pump. 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 State Electricity Board supply as & when required. It should be provided with necessary phase indication lamps (LED type), contactors, MCBs, ammeter, voltmeter, energy-meter, frequency-meter, push buttons, DG set running hour meter etc. A battery charger to
- Trickle charge the battery when the DG set is in operation (charge indications shall be displayed on the panel) should be provided. Voltage stabiliser (servo type) and single-phase preventer, wherever applicable, of suitable ratings should be supplied. The supplier should find out

the voltage variation in the State Electricity supply in the region before supplying the equipment. The voltage variation from the State Electricity supply may be assumed between 150 & 310 volts in case of single phase and between 350 & 500 volts in case of three phase mains supply.

- **3.1.2 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 surge on power supply. 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.

- **3.1.3 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 agitator & a digital temperature indicator (with a battery back-up) to indicate the milk temperature to one decimal place with least count of 0.1 °C on continuous basis. In case of power failure alternate arrangement should be available to know the temperature (stem thermometer). It shall include MCBs etc as required for switching & protection. The agitator(s) 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.

- **3.1.4 Cables & Electrical Switch gears**

- All electrical switchgears and controls required for the complete system shall be of reputed make and of suitable rating & use for copper wire.

## **4. Water**

- **4.1 Water for cleaning**

- A 1000 litre capacity overhead tank - closed type with manhole for maintenance only Sintex Brand Name make(doubled walled) - mcd-HDPE with necessary GI B class pipe of 1/2" along with single phase monoblock pump for filling of the overhead tank from the main supply is in the scope, The scope also includes GI B Class piping from overhead tank to a convenient point near the BMC.

## **5. Installation, Commissioning & Training**

### **5.1 Installation**

- Installation of all equipment, including minor civil works such as providing galvanised steel supports, clamps etc. required to secure the equipment to walls and floors, necessary conduit to lay & connect all electrical and control circuits is included in the scope. Major civil works will be undertaken by the owner. All tools & tackles required to execute the job shall be made available by the supplier.

### **5.2 Commissioning**

- Supplier shall arrange commissioning & performance trial runs of the bulk milk cooling system to the satisfaction of the client. All the consumables required during commissioning of the plant shall be supplied by the supplier.

### **5.3 Training**

- Supplier shall arrange for training of the team of DCS staff for efficient operation and maintenance of the complete system.

## **6. Spares**

- Along with the bulk milk cooler & DG Sets etc, the bidder shall supply spares for two years trouble free operation of the complete system.
- The list of spares to be supplied with the system shall be finalized by client along with prices. Separate price shall be given in the bid for this.

## **7. Tool Box**

- A GI sheet toolbox containing one set of all necessary tools required for regular maintenance of the unit shall be supplied along with the BMC. (1.Set of Spanners (All Required for maintenance), 2.Hamer, 3.Plier, 4.Screw Drive, 5.Union Spanners)

## **8. Manual**

- Two sets of operation & maintenance manual, one in English & another in local language containing complete details of starting up , putting off , critical checks and day to day maintenance of the complete system shall be supplied. The manual should also have the required electrical circuit diagrams.

## **9. General Requirement**

### **9.1 Technical Details**

- The bidder shall provide all the technical details, as per the format enclosed as appendix over and above the general description in each section.

## **9.2 Makes of Items**

- The bidder shall provide a comprehensive list of makes of all the bought out items fitted in the bulk milk cooling system. It is to be ensured that all the makes considered shall be of internationally / nationally reputed and of proven quality. Manufacturing of all these items shall be in accordance to the relevant international/national code. The bidder should mention at least one alternative make with complete details. Bidder shall obtain necessary approval from client for makes of all bought out items.

## **9.3 Drawing**

- Bidder shall submit a detailed general arrangement drawing for complete system giving complete details with bill of materials, size, capacity, quantity, material of construction, thickness etc.

## **9.4 Equipment Selection criteria**

- Bidder shall submit along with the offer detailed calculations with proper justification for selection of compressor (s), evaporator (s), condenser (s), fan (s), thickness of tank, milk pump, insulation material and thickness, DG Set etc.

## **10 Other optional items:**

### **10.1 Level transmitter / indicator**

- A diaphragm type level transmitter shall be fitted in the bulk cooler tank which shall send a signal in the form of 4-20 mA to the computing/indicating unit and shall indicate/display the total quantity of milk in liters in the bulk cooler tank. The system shall be calibrated during the commissioning of the bulk milk unit.

### **10.2 Design Requirement**

- The system should be complete sealed and temper proof and should ensure that the balance of the unit is not disturbed after installation. There should be provision of checking the balance of the Tank at the time of taking Weighment.
- The systems should be designed to take care of at least 150% Overload of the rated Gross Capacities of the respective Bulk Milk Cooler.
- The system should have one suitably placed 25 mm Letter height 7 segment LED indicator. The length of the cable may vary from one DCS to another and the same will be in the scope of the supplier.
- The system should be provided with a suitable battery backup for at least 24 hours.
- The system should enable auto calibration of the unit.
- The system should be designed to ensure complete overload and shock protection.



## SPECIFICATION OF SOLAR WATER HEATER SYSTEM

<b>PARTICULARS</b>	<b>REQUIRED</b>
Capacity	500 Liters per day
Hot water temperature	70 <sup>0</sup> C with overnight temperature drop less than 4 <sup>0</sup> C
Evacuated tubes	Double walled hard borosilicate glass tube with 1.6 mm (optional-1.2mm) thickness having 1.0 MPa resistant. Special three layer selective coating consists of stainless steel, copper and aluminium. Absorptivity > 92% and Emittance < 7%
Storage tank	Stainless steel SS304, 2B grade having automated Argon welding for leak proof joints, Thickness: 1.6 mm (optional-1.2mm).
Tank insulation	High density 50 mm thick CFC free PUF insulation of 35-42 Kg/m <sup>3</sup> with outer cladding of Zinc Alume steel.
MOC of supporting structure	1.5 mm G.I. with powder coating for Long life and easy assembly
Nos. of tube	Mini 50 nos. for 500 LPD.
Anode protection	Magnesium / Aluminium alloy.
Tube dimensions (proposed)	length -1800 mm , OD- 58
Tube coating	AI-N/AI
Thermal Expansion	3.3 X 10 <sup>-6</sup>
Vacuum	P < 5X10 <sup>-3</sup> Pa
Heat loss	< 0.7 W/m <sup>2</sup> C
Stagnation temperature	155 <sup>0</sup> C
Flow rate	0.10 LPM/Tube / 15 LPM
System height from roof top	1.3 m for 30 <sup>0</sup> stand / 1.6 m for 42 <sup>0</sup> stand
Electric heater	3.0 kw with thermostat to ensure hot water need during non sunny days
Warranty	Min 5 years
Expected lifetime	25 years
Cold water piping	Supply and installation of 25 mm GI B class make TATA/JINDAL without insulation with required ISI mark elbow as per requirement and layout of VCS
Hot water piping	Supply and installation of 25 mm GI B class make TATA/JINDAL with required ISI mark elbow duly insulated with 50 mm rock wool and cladded with 24 SWG aluminium sheet as per requirement and layout of VCS

## Technical Specifications of D G Set

<b>PARTICULARS</b>	<b>BANAS REQUIRED</b>
Engine Make	Cummins/Kirlosker/Greaves cotton/Mahindra/Escort/Ashok Lay-land/ Eicher
Engine Features	7.5 KVA: Single Cylinder not less than 11BHP@1500rpm. 10KVA:2 Cylinder-4 stroke Diesel Engine not Less than 18BHP@1500rpm. 15KVA:2 Cylinder-4 stroke Diesel Engine not Less than 20BHP@1500rpm. 20KVA:3 Cylinder-4 stroke Diesel Engine not Less than 28BHP@1500rpm. 25KVA: 4 Cylinder-4 stroke Diesel Engine not Less than 32BHP@1500rpm. 30KVA: 4 Cylinder-4 stroke Diesel Engine not Less than 42BHP@1500rpm. 62.5KVA: 4 Cylinder-4 stroke Diesel Engine not Less than 83BHP@1500 rpm. Water Cooled/Air cooled. Turbo charger with after cooler (for 40 KVA and above). BS: 5514/ISO 3046, Class-A1-Mechanical governor Tank capacity: ----- Liters (Supplier to provide details) Overload capacity on 01 Hrs in any 12 Hrs continues duty at full load (1) Diesel consumption Lit./Hr..... Recommended Lub oil
Alternator Make	STAMFORD / KIRLOSKER / LEROY SOMER/MECCALTE/CROMPTION GREAVES
Alternator Features	Single Bearing, Self Excited, Self Regulated in Brush less construction IP 23 Enclosure Class H Insulation for stator and rotor winding BS 5000 / IS 4722
Sound Attenuated System	Sound level <75 dBA average at 1 meter distance (ISO 8528 PT 10) The enclosure should meets the norms as specified by CPCB. Sheet thick-MS CRCA Sevan tank process powder coated. Acoustic material of-96 Kg/M3 density of 100 mm thick coated with fiberglass cloth. Attenuated having inbuilt minimum Diesel tank in base rail./or for 08 Hrs operation. Base plate with Anti Vibration Pads

Control Panel	Microprocessor based Engine Management System (For 30 KVA & above) Separate control panel shall be provided with suitable size 3 Pole- MCCB. Make : L&T/Siemens/ABB and digital KWH Meter, Make : Conserv / Trinity/Meco/schinder.
Cooling	Radiator cooled/ Air Cooled.
Electrical starting Equipment with Battery	Suitable size battery of standard make, Nos :----- and AH : ----- with auto battery charger. (Supplier to provide details)
Canopy Size	
Installation and commissioning	Unloading, lifting / shifting and final placement of DG set is in the scope of supply, Installation of DG set in all respect including is in the scope of supply, 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 be consider 20 Meter),From output of MCCB purchaser shall connect power cable for further distribution. supplier shall be installed 4 nos earthing (2 nos copper for neutral & 2 nos GI Earthing for body).
Warranty/Guarantee	Dg set shall be used as a stand by therefore warranty should be five years or 2000 hours (whichever is earlier).Supplier shall be supplied filters/spares along with DG set for troubleshout operation up to five years.