

#### **4. BULK MILK COOLER (VERTICAL TYPE) FUNCTIONAL REQUIRMENTS**

The Bulk cooling units shall be used to cool raw milk at the village level co-operative milk societies from the ambient temperature to 4 degrees centigrade in conformity to specified ISI 5708 2A II standard.

The cooling tank shall be used for immediately cooling the milk after milking so as to conserve the quality of milk and check the growth of microorganism. It is intended for daily collection of milk. It is a hygienic container built to sanitary standards, which besides cooling also serves as buffer storage prior to transfer of milk for onwards transportation for further processing.

Two milking system has been configured such that volume of each milking is as under.

i) Milking in the morning (upto 10 AM) 60% ii) Milking in the evening 40%

The agitator provided in the cooling tank works intermittently and at a very gentle speed to avoid damage to the fat globules of milk. The agitator works only at temperatures below 20-25°C so as to conserve butter fat structure.

#### **TECHNICAL DATA**

The bulk cooling tanks shall confirm to ISO 5708 standard with categorization under Type 2AII. Bulk Milk Cooler with Cover and Standard Accessories Tank inner, outer, bottom laser evaporator jacket and to open able cover shall be fabricated from Stainless Steel AISI 304 material and welded with TIG process. The inner shell and all other product contact surface shall be polished up to minimum 150 grit.

The tank shall be complete with following.

- 1) Top un-insulated cover with locking arrangement, inspection window, provision for agitator mounting an specially configured milk inlet. The top cover shall be hinged with a rugged arrangement comprising oil filled cylinders and mechanical springs to facilitate complete opening of tank cover for inspection and tank cleaning. A proper lifting handle in SS 304 construction is provided.
- 2) Milk inlet complete with specially designed funnel terminating in no foam inlet arrangement with SS fine wire mesh.
- 3) Outlets complete with specially designed lockable butter fly valve size 51 mm and terminating in proper en connection with blank union.
- 4) 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 is confirmed as per the

requirement of ISO 5708 2A II (latest version) when the refrigeration unit is not working. - Ball feet specially made to prevent tempering, which could result in erratic measurement.

- 5) Agitator in SS 304 construction complete with direct mount specially designed motor. The agitator is designed for producing uniform distribution of fat in milk.

## **1.2 Milk Filter**

Each system shall be provided with one AISI 304 filters with SS fine mesh suitable to filter extraneous matter such as dust particles, hay flies, cow dung etc. The filter shall be on balance tank. The filter shall be designed and installed in such a way that it can frequently & easily be cleaned. This milk filter shall be provided with balance tank only.

**1.3 Stainless Steel Sanitary Milk Pump for loading and unloading of milk:** A sanitary design mono block pump of 10 KLPH @ 10 MWC and driven by three phase motor in standard design for all the BMC Modules is included in the scope. The pump shall have SS vis carbon seal and will be provided with 38 mm inlet and 51mm outlet connections. The pump shall be shrouded with SS 304 cover and the impeller and product conduct parts in SS 304 material.

**1.4 CIP Solution Holding Tank for BMC:** - The bulk milk storage tank and the piping system are designed for manual cleaning. As required one number AISI 304 plain un-insulated tank for capacity 500 ltrs. with cover shall be separately provided to prepare CIP solution for use white cleaning. The CIP solution shall be prepared in hot water manually. It shall be provided only for gravity feed systems. For pumped feed the balance tank shall serve as CIP Solution Preparation and Holding.

## **2. Refrigeration Unit:-**

The refrigeration system is designed for operation on R22 refrigerant for reciprocating/scroll compressors. The condensing units shall meet the latest safety standards. The System has to run on **SCROLL/RECIPROATING COMPRESSOR**. The refrigeration system should be designed with twin condensing units. The total evaporator circuit is divided in two segments and each segment is connected to an independent condensing unit in case of twin condensing unit.

**2.1 Compressor** – Hermetically sealed reciprocating/Scroll compressor complete with drive motor. The motor is fully enclosed suitable for specified electrical supply. It is confirmed that the hermetic is provided with thermostat temperature sensor for protection against excess heating due to over loading and short – circuiting.

2.2 **Condenser**– Air cooled, screen protected compact condenser unit comprising of finned condenser coils in several rows. Condenser fans of reputed make are fitted for the duty. The air circulation fans shall be induced draft type that will ensure blowing the air from inside to outside thereby making the system suitable for dusty and dry areas.

2.3 **Receiver** - A suitable size liquid receiver is included in the circuit of each condensing unit that would hold the refrigerant during maintenance and otherwise during the pump down cycle at the end of operation.

2.4 **Thermostatic Expansion Valve** – A thermostatic expansion valve shall be maximum operating pressure (MOP) type to ensure optimum quantity of refrigerant to the evaporator. It shall be ECTL make with suitably sized orifice if ECTL condensing units are considered and Danfoss Make if Danfoss condensing units are considered.

2.5 **Evaporator**– The Tenderer should ensure maximum efficiency of supplied system by using Laser welded evaporator having max. 5mm-9mm welding for max. cooling surface area with operating pressure of 30 bars and crash test pressure of 60 bars. Tenderer can be asked to show the sample of evaporator plate used. The evaporator shall be laser welded plate jacket put at the bottom plate of the inner tank. The total evaporator area is divided and separated in to two sections and each section shall be operated by one condensing unit. All connecting pipes terminating outside the tank are of stainless steel construction. The evaporator plate should be laser welded for all capacity bulk milk cooling tank.

2.6 **Refrigerant Pipes & Fittings and Controls** – Compressors are provided with isolation valves to ease the maintenance. Copper/SS tubing for refrigerant shall be properly laid to facilitate attending the leakage if occurred during operation without dismantling the total system. All pipes are properly clamped on fixed support and sponge insulated for protection.

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

Three control panels namely, 1) Main control panel with servo voltage stabilizer 2) Refrigeration control panel 3) Milk tank control panel are included in the scope. Refrigeration control panel and milk tank control panels and the main control panel shall be conforming to following specifications: -

3.1 **Main Control Panel with Servo Stabilizer 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 '**manual change-over-switch**' in order to operate the DG set in place of State Electricity Board supply and & when required. It should be provided with necessary

phase indication lamps (LED type), contractors, 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. 3 phase Voltage stabilizer (servo type) and single phase preventer: The system should have Voltage Stabilizer conforming to following features and single phase preventer of suitable rating:

- Input Range Phase – 300 to 325 VAC (three phase power supply)
- Output self-adjustable for a range of  $\pm 5\%$
- Supply Frequency - 47 to 53 Hz
- Load & Line Regulation – 1%
- Output A.C. Voltage correction for wide input variations
- No output waveform distortion
- Fast correction of output voltage :20V/sec.
- Auto/manual operation facility
- Under –voltage and over voltage cut-out arrangement Voltmeter with facility to read input or output voltage
- High efficiency
- Compact and modular construction for ease in servicing
- M.C.B. on input circuit
- The ratings considered for BMC 63 KVA

### **3.2 Refrigeration Control Panel:**

One number control panel in dust and vermin proof design in stainless steel enclosure suitable for mounting on the wall is included. The panel is pre-wired to terminal connections and shall comprise of the following: a) Incoming MCB to receive power from main control panel (In stabilizer) Line voltage Controller to guard the compressor against voltage supply fluctuation. b) Sequential controller with timer delay arrangement to avoid surge on power supply. b) Selector switch for auto/manual mode of operation. c) One number Switchgear i.e. contractors and overload relay for the motor of compressor, condenser and agitator.

### **3.3 Milk Tank Control Panel**

This panel shall be mounted on the bulk milk storage tank together with refrigeration control panel. It is a pre manufactured control panel in SS 304 construction in dust and vermin proof design comprising the following:

- Digital Temperature Indicator and display range (0 to 100 Deg.C)
- Selector facility for selecting operation of agitator and compressors on auto or manual arrangement.

### **3.5 Cables & Electrical Switch Gears**

The electrical switchgears as required are included in the control panels mentioned above. All power and control cabling between Main Control Panel, Refrigeration Panel and milk panel shall be flexible un-armoured, wherever laid through conduits. The conduits shall be heavy-duty PVC type. Earthing shall be standard copper plate earthing should be provided for DG set Body earthing of all panels and Neutral line conforming to IE rules. Supply of cables including earthing cable is within the scope of the bidder.

### **4.0 Pumped Feed System**

**Inter connecting and Fittings:** One lot of SS pipes and fittings shall be supplied to interconnect the bulk cooler with balance tank, milk pump and tanker unloading hose. The piping shall include necessary butterfly valves, SS unions and support pipe holders. SS prop support shall be used to hold SS pipe holders for supporting from walls/floor. The SS 304 inline strainer shall be provided before the balance tank.

**Balance Tank:** A plain un-insulated construction balance tank cap 500 L for complete with cover, SS ball feet, and inlet and outlet connection is included to receive milk after weighing by direct tipping. A design of the balance tank shall be such that no milk should leave in the balance tank after reception.

**Tanker loading Hose 38mm:** A nylon braided hosepipe for unloading milk from the cooling tank shall be supplied. A length of 10 mtrs. is considered in the scope of supply.

#### **4.1. Installation:**

The price quoted for installation and commissioning is considering that the entire lot of bulk coolers shall be supplied installed, commissioned and handed over for use within the period specified. The necessary pre-requisites on building, water and mains supply shall be made available timely including the availability of technical/skilled operator to be trained. Milk Unions shall make necessary arrangements at respective sites to store the dispatched material including its safe custody in case the site is not ready to take up installation. The payments against supply shall be made in the building as per pre-decided time schedule and the work shall be taken up only when the site is complete as per requirement and handed over for installation. The scope of installation shall be within specified battery limits and exclusions.

#### **4.2 Commissioning:**

The commissioning of the bulk coolers along with the performance trial shall be done at each bulk-cooling site. In case milk is not available in adequate quantity the performance test i.e. capacity trial shall be conducted on water with the results deemed to have concluded the performance trial. A

period of two/three days at each collection centre is estimated and included for performance trial and commissioning to have over the installation.

### **4.3 Training**

Tenderer shall arrange for training of the team of DCS staff for efficient operation and maintenance of the complete system. **8.4 Tool Box and Operation Manual.** 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.

Two set of operation & maintenance manual in Hindi and English containing complete details of starting, putting off, critical checks and day-to-day maintenance of the complete system shall be supplied. The manual shall also have the required electrical circuit diagrams.