

# Technical requirements for **milk cooling tanks**



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# Technical requirements for milk cooling tanks

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# Introduction

This document is part of the Arlagården quality assurance programme and of the industry code for milk supplying farms and summarises the technical requirements, recommendations and guidelines applicable to milk cooling tanks at milk producers in Denmark, Sweden, the UK and the EEA, who supply milk to Arla Foods.

## Definitions

### Milk cooling tank

An insulated tank with agitator and cooling system. The tank may be horizontal or vertical (silo tanks).

Cooling in accordance with:

1. European Standard EN 13732 - Rev. 2013 (2018) – Food Processing, Bulk milkcoolers on Farms (Currently under review)
2. ISO 5708 Refrigerated bulk milk tanks.

Cooling can be done directly in the tank or in a connected refrigeration unit (refrigeration or instant cooling).

### Location

Milk cooling tanks may be placed indoors or outdoors. Indoor milk cooling tanks must be placed in the milk storage room. Part of the tank may be placed in the equipment room or outdoors. An outdoors located milk cooling tank stands in the open air.



Fig 1. Outdoor located tank.

## Ordinary milk cooling tank

The tank where the milk is stored and collected. There may be two or more ordinary milk cooling tanks on the farm if the tank connection pipe can be reached with the suction hose without moving the vehicle. Outlet pipes must not be interconnected.

## Buffer tank

A milk cooling tank, into which part of the milk can be pumped, before it is pumped into the ordinary tank. A tank that allows milk collection independently of milking schedule. It is placed between the milking system and the ordinary milk cooling tank. It must be possible to cool the milk in the tank if the milk has not been cooled before.

## Extra tank

A separate milk cooling tank located next to the ordinary milk cooling tank, which can be used for short periods when milk volumes exceed the ordinary tank capacity. The tank must meet the same requirements as the ordinary tank. Collection from extra tank requires separate permission from Member Service.

## Milk storage room/collection room

The room in which all or part of the milk cooling tank is located and where the milk is collected for the dairy. Alternatively, room in connection with outdoors tanks, where the outlet connection pipe and all other pipe connections are led to and where the milk is collected. Possibly as an integrated collection room in connection with a free-standing tank.



Fig. 2. Buffer tank conventional milking.

## Tank guard

### Definition

A tank guard is a computer unit fitted on or located next to the milk cooling tank which records conditions and events concerning milk cooling and cleaning. The tank guard monitors, visualises and documents milk storage conditions in the cooling tank and helps maintain milk quality.

The tank guard is fully automatic and requires no operator under normal conditions. A tank guard may also be an integral part of the milk cooling tank control unit/automated washing machine. The tank guard alarm function can give critical and instructive alarms. The tank guard stores measured values for documentation purposes.

A tank guard must be able to show three critical alarms:

- Power failure > 30 consecutive minutes
- Agitation failure > 60 consecutive minutes
- Milk temperature > 9° C for more than three consecutive hours.

Other tank guard alarms are instructive and optional.

The tank guard must store all logs for a min. of 60 days. Data must be able to be exported as CSV files and exported to Excel.



Fig 3. Example of approved tank guard.

## Technical requirements

### In general

A brand new milk cooling tank must meet the requirements of the European Standard EN 13732, Rev. 2013 (2018), with cooling classification "B" or "C" for DK, SE, UK and CE in respect of temperature and cooling classification "II" in respect of maximum cooling time.

Milk cooling must start no later than 45 minutes after start of milking.

All tanks must observe Arla Foods' requirements for cooling and storage of milk.

The milk must be cooled to end temperature within two hours of completed milking and be kept cold until collection. In case of AMS, the milk is allowed to exceed end temperature for a maximum of two consecutive hours between collections.

The milk cooling tank must be fitted with an accurate thermometer.

The milk cooling tank and materials that come or may come into contact with the milk must be approved for food purposes. Oils and lubricants in, e.g., gear motors and agitators that may come into contact with the milk must also be approved for food purposes.

Insects, pests and household animals must be prevented from accessing the tank via the inspection hatch or air-vent valve.

The inspection hatch must be accessible, including any requirements for ladders and lighting. The inspection hatch must be locked if located outside the milk storage room.

The tank must be fitted with an agitator to ensure that the milk is agitated and is homogeneous on collection.

The milk must be agitated during cooling and during collection. The agitator must, as a minimum, run for a two minute period every 15 minutes.

The tank must be provided with a clear and readily comprehensible instruction manual/operating manual in the local language. Moisture-proof and clear operating instructions must be posted close to the tank in the milk storage room providing instructions as to water volumes, temperature and feeding of cleaning agents adjusted to the water quality on the property and directions on manual cleaning of any loose parts.



Fig. 4. Integrated sampling valve.

## Tank size

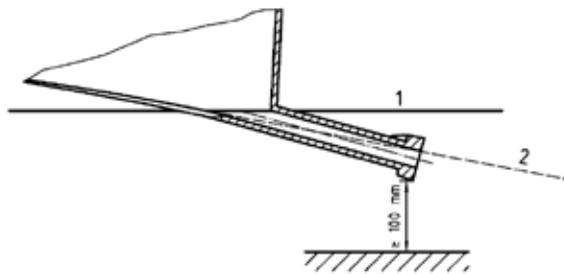
The tank should be able to hold at least 2 days' worth of production. It should also have capacity for the milk from one additional milking. In case of AMS, the capacity must be two days' production plus another 12 hours' production.

It can be agreed with Member Service that two ordinary tanks can meet the requirement of min. 2 days' storage capacity.

## Tank

Milk cooling tank filling may not exceed the nominal volume indicated on the rating plate when the tank is positioned with the prescribed dip.

A brand new milk cooling tank must be constructed so that the highest point of the outlet pipe is lower than the lowest point of the tank bottom (EN 13732). The outlet must be placed where the side and bottom of the tank meet.



**Key**  
1 Horizontal  
2 Line which represents the level of the vessel

Example of outlet pipe

The recommended dip to the outlet from all sides of the tank bottom is at least 5%. For vertical tanks, the recommended tank bottom to outlet dip is 10%. For a capacity of 40 litres, 39.8 litres must be able to pour out in 30 seconds.



Fig. 5. Agitator in a silo tank with vortex protection.

The tanks must be protected against vortex formation in connection with milk collection.

The tank must be emptiable without vortex formation or intake of false air.

A brand new tank must be provided with tank guard observing Arla Foods' requirements.

See Appendix 1.

The tank must allow taking of representative milk samples. The tank must be delivered with clear instructions specifying how to take such samples. On vertical tanks and horizontal tanks with an inspection hatch on the side, it is recommended to install an actual sampling valve.

## Filling

Filling can take place by pumping via the outlet pipe or dip tube. If pumping is made via a T-pipe connection on the outlet pipe, the construction must allow for adequate cleaning and prevent aspiration of any false air when the tank is emptied.

### **Outlet pipes (pipes from outlet on tank to the bottom outlet valve)**

- The maximum length of the outlet pipe is 2.5 metres
- Outlet pipes longer than 1.0 metre must be fitted with cooling to the bottom outlet valve, e.g. a cooling jacket containing refrigerant/ice water
- Outlet pipes longer than 1.0 metre must be insulated and be frost-proof
- The outlet pipe may have a maximum total bend of 45° from the tank to the outlet branch
- Outlet pipe incline from tank to bottom outlet valve must be at least 5%
- Outlet pipes from two tanks may not be connected.

The outlet pipe must be positioned in the bottom of the tank and be as short as possible (no cone bottom in vertical tanks).

It is recommended that one valve should be placed directly by the tank to ensure that the outlet pipe is as short as possible,

Fig. 6. Example of approved bottom outlet valve.



remains empty at all times and is only used for milking or collection of milk.

### **Tank outlet**

- 76 mm (3")
- Existing tanks: 51 mm (2"), 63 mm (2½") or 76 mm (3")

A 3" extension can be obtained if the tank is equipped with a 3" outlet and a 2½" connection branch for the collection hose. Valve blocks fitted on the outlet pipe or inserted as a manifold (branch pipe) between tank and bottom outlet valve must not have a diameter narrower than the diameter for the current outlet pipe.

The tank outlet must have the same dimension from tank to bottom outlet valve, as this may otherwise affect milk quality in respect of FFA, as well as reduce the suction capacity during tank emptying.

### **Bottom outlet valve**

Must be of the "butterfly" valve type with a lock for open and closed position.

### **Dimension**

- 76 mm (3")
- Existing tanks may still be used with the bottom outlet valve already fitted (51 mm (2"), 63 mm (2½") or 76 mm (3")).

### **Connection branch for collection hose**

- Local agreements

All pipe dimension transitions should be made as conical transitions, with the reducing piece being straight at its bottom.



All new tanks are provided with 3" outlets and a 2½" connection branch. Conical decrease to 2½" immediately before, in or after the washing collar.

Normally a welded conical decrease is used, but a conically decreased dairy connection may also be used if it is firmly mounted. The welded cone must be self-draining.

The connection branch must be placed at least 20 cm and no more than 100 cm above the milk storage room floor – measured from the centre of the outlet pipe. 40-50 cm is recommended.

## Outdoor tanks

The tank may be located completely or partially outside the milk storage room. If only a part of the tank is placed outdoors or in an unclean space, for example, a shed, there must be a sealed wall around the tank into the milk storage room.

The tank air vent and outlet pipe must be routed to the milk room and the bottom outlet valve must be placed in the milk storage room.

The tank must be off the ground, e.g. by placing it on a cast platform/ tank foundation. The distance from the tank to trees and other planting must be at least 5 m.

Motors for agitators, etc. must be covered so that they are protected against weather.

All pipelines for milk and washing water must be separated and led directly between the tank and the indoor installations, so that all connections are made from indoors.



Fig. 7. Extra protection of a top mounted inspection hatch.

The outdoor milk pipelines must be welded completely airtight and must not be disassemblable by means of e.g. pipe connectors. Connections on the silo tank must be made with dairy couplings that can be disassembled quickly for quality defect control or tank replacement.

The tank air vent must be made so that ventilation is made with air to/from the milk storage room.

May alternatively be performed in a way that obtains the same protection against contamination of the air drawn into the tank from the milk storage room to e.g. the equipment room.

If the ventilation is made to a non-frost-proof room, the ventilation must be protected against freezing to eliminate the risk of the ventilation being blocked and resulting tank collapse. The ventilating tube must be made with a dip to prevent any condensation from running into the tank.

Tanks with hatches that are not located in the milk storage room must be provided with a lock.

Horizontal tanks may be provided with an inspection hatch on the side or with extra cover of the hatch on top. Both types must be provided with a lock.

The same requirements apply to outdoor tanks regardless of whether the tank is horizontal or vertical.

The following tank models must be used:

#### **Model 1**

##### ***Outdoor tank with access to bottom outlet valve and inspection hatch from the milk storage room***

Milk cooling tank with inspection hatch to be opened from inside the milk storage room. The tank will typically be connected to the milk storage room via a wall recess or with part of the tank placed in the milk storage room.

The wall recess must observe current material choice requirements in respect of durability, ease of cleaning, etc. as those applying to the milk room. Covering to be made of stainless steel, epoxy, tiles, etc.

The milk room and the wall recess may be integral parts of the tank (mini collection room).

#### **Model 2**

##### ***Free-standing tank with outlet pipe and tank air vent led to the milk room***

Milk cooling tank with outdoor hatch. The hatch must have a lock and must only be opened for cleaning checks after collection and in connection with maintenance.

#### **Models 1 and 2**

Hatch requirements. The inspection hatch should be no more than 1 metre above level. Horizontal tanks with inspection hatch on top must have an approved ladder or steps.

#### **Buffer tank**

Tank placed between milking system and the ordinary cooling tank. Collection from



Fig. 8. Engine cover for agitator.

the buffer tank is not allowed. When used, the buffer tank must be emptied and cleaned before the next collection.

If a buffer tank is used, the collection time can be planned without considering milking schedules. Moreover, the milk can be checked before it is pumped to the milk cooling tank.

The buffer tank system must be designed in such a way that the driver can at all times collect milk from the ordinary tank.

### Conventional milking

In respect of conventional milking, the buffer tank capacity must be sufficient to hold the largest milk volumes of one milking (typically the morning milking).

### Automatic milking (AMS)

The buffering tank must be able to contain milk that is milked during the time of emptying and washing the regular milk cooling tank by automatic milking.

It is common to both types of milking that the buffer tank must be provided with agitation and cooling or a system for pre-cooling of the milk placed before the buffer tank. The buffer tank must comply with the current rules for milk cooling, including that the cooling of the milk must start no later than 45 minutes after milking.

The buffer tank should be placed so that the milk need not be pumped to enter into the milk cooling tank. Any pumping must be done carefully to prevent any negative impact on milk quality. The pump must be food-approved.

It is Arla Foods' long-term goal that the milk must be able to be picked up independently of the farm's milking schedules. (The



Fig. 9. Model 1. Silo tank with access from the milk storage room.



Fig. 10. Model 2. Free standing silo tank with outlet pipe and air vent led to the milk room.

intention is that all suppliers have independent collections by the end of 2022).

In connection with future constructions or changes on the farm which affect milk collections, the long-term goal changes to a requirement, so that the milk can be collected independently of the farm milking schedule.

Fig. 11. Buffertanks AMS.



## Extra tank

The tank must not be connected to the ordinary tank.

Collection from the extra tank must be possible without moving the tanker. Use of extra tanks is subject to agreement with Member Service. Signs must show the driver whether milk should be collected from the extra tank or not. (Signs are provided by Member Service).

Extra tanks must observe Arla Foods' current agitation and cooling rules as they apply to ordinary milk cooling tanks.

An extra tank cannot be used as both a buffer tank and an extra tank at the same time.

# Tank location

## Milk room

The milk cooling tank or part of the tank must be placed in the milk room, where the following distance requirements must be observed:

## Distance requirements

- Between tank and wall, at least 50 cm is recommended. Floor and walls must be easy to clean.
- The distance between the tank and the ceiling must be at least 60 cm (it must be possible to open the hatch entirely and the tank must be easy to inspect).
- If the outlet pipe points towards a wall, the distance must be at least 90 cm. The recommended distance is at least 120 cm.
- In new milk storage rooms, the direction of the outlet pipe must be towards the access door.

If only part of the tank can be placed in the milk room, then the outlet branch, tank air vent and inspection hatch must be placed in the milk storage room. The remaining part of the tank can be placed outdoor or in an adjoining room, e.g., the equipment room. Vertical tanks may advantageously be made with a wall recess to allow access to the inspection hatch from the milk storage room.

The milk storage room may also be designed as a collection room which is provided as an integrated part of the milk cooling tank.

If the entire tank is placed outdoors, all piping must be routed to the milk storage room.



Fig. 12. Outdoor located cooling unit.

Tank ventilation must be routed to the milk storage room or be placed so as to obtain the same protection against contamination of the air drawn into the tank.

May alternatively be performed in a way that obtains the same protection against contamination of the air drawn into the tank from the milk storage room to e.g. the equipment room.

In connection with construction or changes on the farm which affect the milk collection, the milk cooling tank and milk storage room must be located to allow the dairy tanker to collect the milk without having to reverse.

## **Location of compressor and condensing unit**

If the tank and cooling machinery are not integrated, the cooling machine may be placed in a room other than the milk storage room (e.g., the equipment room). Room ventilation must observe the supplier's instructions.

The condensing unit should only be placed outdoors subject to the supplier's instructions.

## **Annual inspection**

Statutory inspection of the cooling system and inspection of the cleaning system must be performed at least annually. The farmer must ensure that the technician has the required skills.

## **Requirements for documentation, logbook**

For each system, a logbook must be available, containing inspection reports and logs of the system.

After tank service and inspection, the entire tank, including piping, must be cleaned and disinfected (normal tank cleaning).

Leakage testing of the tank cooling system and any precooling system must be carried out at least once a year by an authorised cooling equipment company.

## Further information about

- Regulations under the Arlagården quality programme
- Tank guard
- Bonus terms for independent collection

are available by contacting Arla Foods' service phone:  
+45 7643 4545 in Denmark

## References

- European Standard EN 13732 - Rev. 2006 2013 (2018)  
– Food Processing, Bulk milk coolers on farms
- ISO 5708 – Refrigerated bulk milk tanks
- Guide to designing milk storage room, 4th edition, 2017,  
SEGES, Veterinary and quality conditions

