Handling Milk

BULK TANK COMPARED WITH CANS

Bulk milk handling is a new and more efficient method of handling and marketing milk than the conventional can system. It offers considerable saving to the dairyman by reducing his milk handling costs. It eliminates the lifting of heavy cans and reduces the milk and butterfat losses that occur from stickage to cans. The consumer also benefits by having a higher quality dairy product on the market.

The bulk tank system of handling milk on the farm consists of holding milk in a refrigerated stainless steel milk cooling storage tank or vat. This system replaces the traditional 10-gallon can container and milk cooler in the farm milkhouse. Milk is delivered to a receiving plant or dairy by a specially equipped, insulated stainless steel tank truck in place of a can hauling truck.

Milk is transferred from the farm cooling tank, to the tank truck, to the milk plant storage through a reversible sanitary pump and hose mounted on the truck. The tank truck operator inspects the milk on the farm for quality, measures and records volume and temperature, and samples milk for butterfat test and bacterial count.

FARM BULK TANK MILK COOLER

The bulk tank used for cooling and storage of milk on the farm is a covered vat with a stainless steel liner in an insulated housing. The top of the tank consists of a bridge on which the agitator motor is usually mounted. The top is closed by covers hinged from the bridge or set on the top. These covers may have openings in them for a strainer or a pipe line. The agitator circulates the milk for rapid cooling. Either the bottom or the sides of the tank, or both, serve as cooling surfaces for the milk. The cooling surfaces of the tank are chilled directly by the refrigerant, or by water, which in turn is cooled by a bank of ice.

KINDS OF COOLING SYSTEMS

Two major types of cooling systems are available in bulk tanks: (1) Direct expansion and (2) ice bank. Either will cool milk satisfactorily to 40 degrees F. or below and maintain it at this temperature which is ideal for milk storage and prevention of bacterial growth.

Direct Expansion System

The direct expansion system circulates a refrigerant through a plate or tubing, in contact with the inner liner of the tank. As the gas expands in the plate or tubing, it absorbs the heat directly from the area touched. This system of cooling milk requires accurate and reliable thermostatic control to prevent the milk from freezing.

This system will be more expensive to buy than an ice bank system. It may be more expensive to maintain because of the larger refrigeration equipment. However, it will operate at 25 to 40 percent less cost for electricity than will an ice bank system.

Ice Bank System

The ice builder type, or sweet water system as it is some times called, is so named because the copper tubing, or expansion plates containing the refrigerant, are submerged in a reservoir of water in the bottom or sides of the tank. As the refrigerant passes through the tubing or expansion plates a block of ice is frozen around it. When milk is poured into the tank, a circulating water pump forces water around the block of ice and against the liner or inner wall thus cooling the milk.

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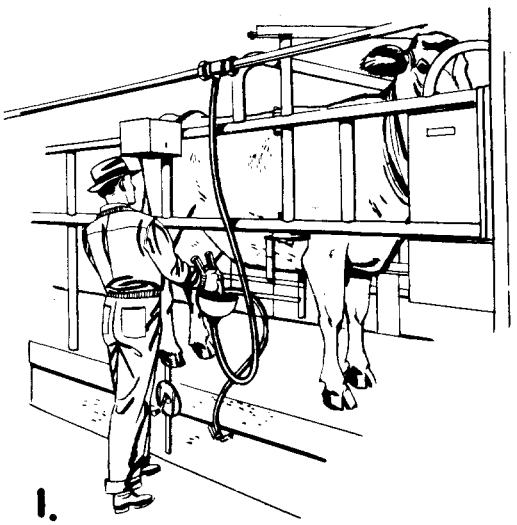
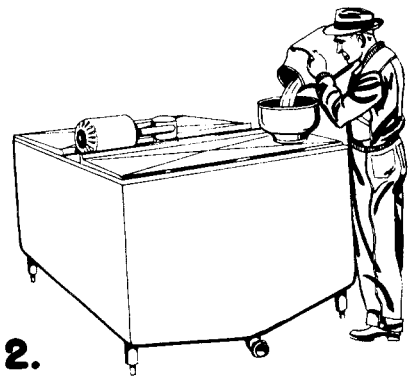
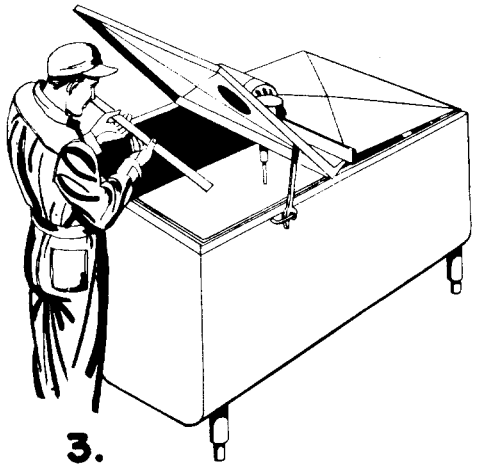


Milking - Regular bucket, or pipeline can be used.



Milk poured or piped into insulated bulk tank for cooling.



Tank truck driver measures milk with stainless steel rod. Receipt is left with farmer.

This system will have a smaller refrigeration unit than will the direct expansion type, usually a 1/3 to 3/4 horsepower unit. This small unit may require less wiring, less space and less maintenance. The ice bank will have some cooling reserve in case of power failure.

FARM TANK SIZE AND COSTS

Bulk tanks commonly used come in sizes from 100 to 1,000 gallons capacity. Tanks should be large enough to hold at least two days peak milk production, since every other day pick up is a common practice on bulk tank pick up routes.

TABLE 1. SIZE OF TANK TO BUY AND COST

Size based on every other day pick up.

Greatest number of 10-gallon cans milk produced daily	Minimum size of bulk milk tank needed (in gallons)	Cost of bulk milk tanks
5 - 7 cans	150 gallons	$1,500 - $1,850
7 - 10 cans	200 gallons	1,700 - 2,250
10 - 15 cans	300 gallons	2,300 - 2,700
15 - 20 cans	400 gallons	2,500 - 2,950
20 - 25 cans	500 gallons	2,800 - 3,350

Range in price is explainable in many cases by differences in construction material, differences in type and capacity of compressors, controls, wiring etc. included or excluded in quoted price.

MILK HANDLING ON BULK TANK FARMS

Two methods are in common use for putting milk in the tank. (1) Piping the milk direct from milk machine to tank will give a maximum savings in labor. (2) Milk from each cow may be carried into the milk house and poured through a strainer placed in an opening provided in the tank lid.

Warm milk is added directly to the previously cooled milk. The cooling capacity of the tank is sufficient to cool the added milk rapidly.

COLLECTION OF FARM BULK MILK BY TANK TRUCK HAULER

The bulk tank truck hauler follows this procedure as he stops near the farm milk house to pick up the milk.

1. Checks odor of the milk
2. Measures quantity of milk and records on duplicate receiving tickets (a) The depth of milk in inches is measured on a stainless steel rod and converted to gallons from printed conversion table.
3. Turns on the agitator in farm tank to mix milk for sampling.
   a. While milk is being circulated driver uncoils hose from pick up tank truck and attaches it to the tank. The milk may be pumped out from bottom or top depending on type of bulk tank. It takes 3 to 5 minutes to thoroughly mix the milk for sampling. While this is being done the temperature can be recorded and sample dipper and composite sample bottles can be brought in from tank truck.
4. Takes sample of milk for butterfat test and puts it in pick up tank's ice chest.
5. Plugs in the electric pump and pumps out milk from farm tank into pick up tank.
6. Disconnects hose from farm tank, caps loose end, and returns hose and electric cable to pick up tank.

7. Hauler then rinses out farm bulk tank with clear water, closes milk house door and drives away.

The dairy farmer completes the washing of the tank, agitator and other detachable fittings as soon as possible after milk is picked up.

The farm bulk tank may be put on legs so milk may be drained into milk cans until tank truck pick up route is established in your community.

COST OF BULK TANK MILK HANDLING

Studies conducted in dairy states of bulk milk handling have shown that savings credited to the bulk tank system (table 3) will return the cost of equipment in 4 to 8 years. The cost per hundredweight for bulk handling milk from different size herds and tanks is shown in table 2. These costs are based on 10-year tank depreciation and 4 percent interest on investment. Note the cost of handling milk under the bulk system decreases as the volume of milk increases.

TABLE 2. COST OF HANDLING MILK IN BULK TANKS*

Herd size	Tank capacity (every other day pickup)	Cost per cwt. milk
12 cows	100-150 gallons	15.7¢
20 cows	150-200 gallons	11.3¢
30 cows	300-400 gallons	7.7¢

TABLE 3. SAVINGS CREDITED TO BULK MILK HANDLING*

Item	"Every other day pick up" Savings per cwt.
Reported saving in hauling (every other day pick up)	$0.05 - 0.10
Bonus paid by plant when completely converted	.05 - .10
Milk and fat loss saved	.02 - .04
Can cost and maintenance saved	.02 - .02
Total savings per cwt.	$0.14 - 0.26

*Data taken from Michigan Extension Folder F178 (Bulk Tank Cooling of Milk)

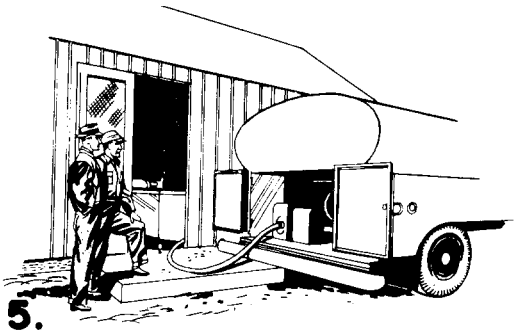
ADVANTAGES OF BULK MILK HANDLING

Producers report these advantages of bulk tank system of handling milk:

1. Eliminates heavy lifting of milk cans. Milk chores less burdensome.
2. Lowers hauling costs. Saves 10 cents or more per 100 lbs., in many areas with every other day pick up of milk.
3. High quality milk -- milk is rapidly cooled to 40 degrees F. or lower.
4. Costs of milk cans are eliminated.
5. Tests are more uniform. A higher butterfat test is possible if fat stickage on cans has been heavy.
6. Milk loss is reduced. Milk cans when dumped generally retain .25 to .36 pound milk per can. (H. Rapp, "U" Wisconsin, 1954, reported the fat test of this milk was 5.4 percent as compared with 3.6 percent of composite sample) If producer delivered 10 cans per day this could mean as much as $60.00 loss per year from use of 10-gallon cans.
7. Milk weights and sampling for butterfat are made on the farm. Producers may check weights and tests if desired.
8. Investment in other milk cooling equipment not necessary.
9. Saves labor, particularly when pipeline is used.

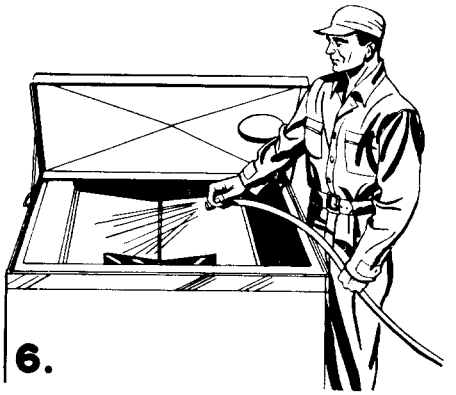
4.

Driver samples milk, after agitation, for bacteria and butterfat tests.



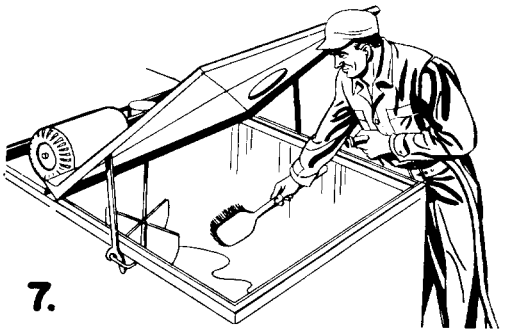
5.

Pump on tank truck pumps out the milk.



6.

Tank is rinsed clean by tank truck driver.



7.

Farmer washes tank after milk is picked up. Sanitizes tank just before milking

Disadvantage Of Farm Bulk Milk Cooling Tank Reported By Producers:

1. High initial investment in bulk tank, particularly for the small producer. A 200-gallon unit installed may cost around $2,000.
2. Remodeling, enlarging and rewiring milk house often necessary.
3. Bulk tank must be washed and sanitized by the farmer.
4. More hot water in milk house probably needed.

EFFECT OF THE FARM BULK TANK METHOD OF HANDLING MILK UPON RECEIVING AND PROCESSING MILK PLANTS

For the dairy plant to receive the greatest benefits a complete change over from the milk cans system of receiving to bulk tank system is necessary. Otherwise there is a duplication of investment and receiving facilities which may offset any advantages to be gained by the farm bulk tank system of receiving milk.

Advantages To the Dairy Plant:

1. Milk received is of higher quality, which is very important in market milk plants.
2. Refrigeration costs generally are lower. Raw milk arrives at plant approximately 40 degrees F.
3. Receiving room equipment, conveyor, scales, dump vat and can washer are not needed. This reduces investment and operating costs.
4. Every other day milk receipts from individual farmers reduce handling and bookkeeping costs.
5. Cost of picking up milk is reduced when all milk is picked up from farm bulk tanks. If both cans and bulk milk systems of receiving milk are used in same plants, there is a duplication of equipment and costs may be higher.
6. Receiving milk in bulk tank truck eliminates much of the labor in receiving room, such as sampling, dumping and cleaning. Can washing costs are eliminated.
7. Receiving milk 7 days a week is not necessary.

Disadvantages To The Dairy Plant:

1. Plant alterations are necessary. Requires redesigning of weighing and milk intake facilities.
2. Milk holding vats in plant may need to be increased.
3. Truck tank washing facilities are needed.
4. Investment in tank truck hauling facilities is required. Haulers may or may not own the truck. Plant generally owns the tank truck.
5. Tank truck operator must not only be a truck driver but must be technically trained in milk business to judge good quality milk, take milk samples and weigh milk.
6. Poor roads may be a problem and road weight limits may affect spring hauling.

FARM BULK TANK HANDLING OF MILK AS IT AFFECTS MILK HAULERS

1. Lifting of cans is eliminated. Milk is pumped into tank truck.
2. Hauling milk 7 days a week is not necessary.
3. Every other day pick up from individual farms reduces the time and effort required to pick up 100 pounds of milk.
4. Possibility of increased earning per hour for haulers. Larger pay loads and in some cases make two routes per day.
5. A tank trucker job is more desirable as it is a much cleaner job.
6. Hauler needs more technical training and wider experience in the milk sanitation and knowledge of the dairy business. He could do much toward reducing work of quality field men.
7. Tank truck operator has increased responsibility.

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