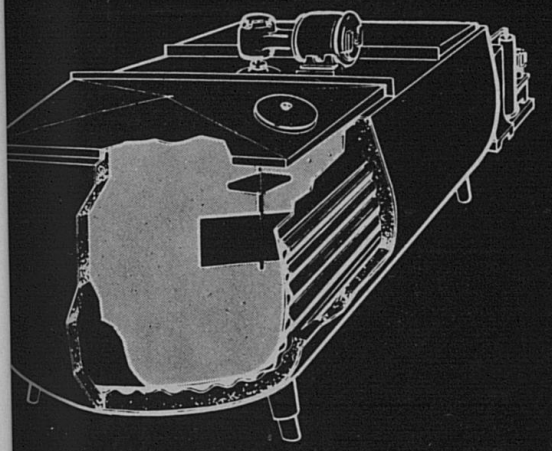
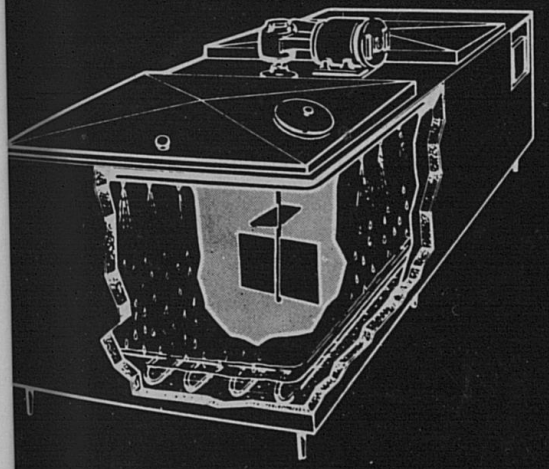
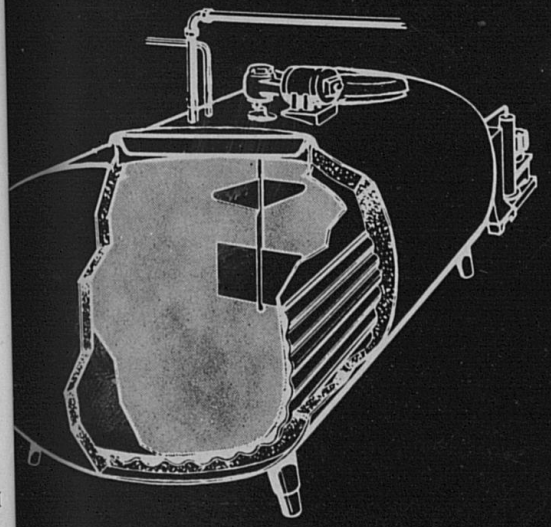
BULK TANK MILK STORAGE







BULK TANK
- Selection
- Installation
- Operation
- Maintenance

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The following references were used in preparing this publication:

"Bulk Milk Handling," Extension Circular No. 510, (1955), University of Wisconsin, Madison, Wisconsin.

"How to Select, Install, Operate, Maintain and Sanitize Farm Bulk Tanks," Extension Mimeo 1D-7 (DH, AE, EC) (1955) Purdue University, Lafayette, Indiana.

"Bulk Cooling and Storage of Milk on the Farm," Extension Bulletin No. 899, (1955) Cornell University, Ithaca, New York.

"Bulk Tank Milk Storage on the Farm," Extension Pamphlet No. 28 (1954) University of Maine, Orono, Maine.

"Bulk Milk Tanks on Ohio Farms," Research Bulletin No. 776 (1956), Ohio Agricultural Experiment Station, Wooster, Ohio.

Bulk Tank Milk Storage

By Jesse B. Brooks, James D. Foster and Elmer C. Scheidenhelm

The rapid increase in the use of bulk milk handling in Kentucky has created a need for basic information for farmers who plan to convert to this system.

The purpose of this publication is to provide this information, with suggestions and recommendations of all agencies who are interested in seeing that the farmer does a good job of planning before changing from cans to bulk tanks.

The bulk milk tank consists of a covered, refrigerated, stainless steel vat set in an insulating shell. The inside surface of the vat, which comes in contact with milk, cools the milk as the tank is filled. The milk is agitated to hasten the cooling, to blend previous milkings with fresh milk, and to provide a uniform mixture of milk that can be sampled.

The cover of the tank has openings for pouring milk into the tank or for connecting the tank to a pipe line milker.

MILK ROOMS FOR BULK TANKS

Generally the milk room should be built so as to comply with the requirements of the local health codes or building requirements of the milk buyer. Before building or remodeling milk rooms, farmers should consult their local sanitarians and plant fieldmen. A typical milk room layout for bulk tank operation is shown in Fig. 1.

Location

The milk room should be placed close to the milking quarters in order to save steps, or length of pipe if a pipe-line milker is used. The building site should be well drained to provide for draining wastes from the building. If the milk room is to be added to a present building it is better to extend the room from that building or build in a corner of the building in order to secure natural lighting and ventilation.

Size

The size of room required will depend upon the daily production of milk, the size and type of tank, location of condensing unit, and the amount of milk that must be held between truck tank pickups. Since health regulations require that there be sufficient clearance on all sides of the tank for thorough cleaning, these regulations will also

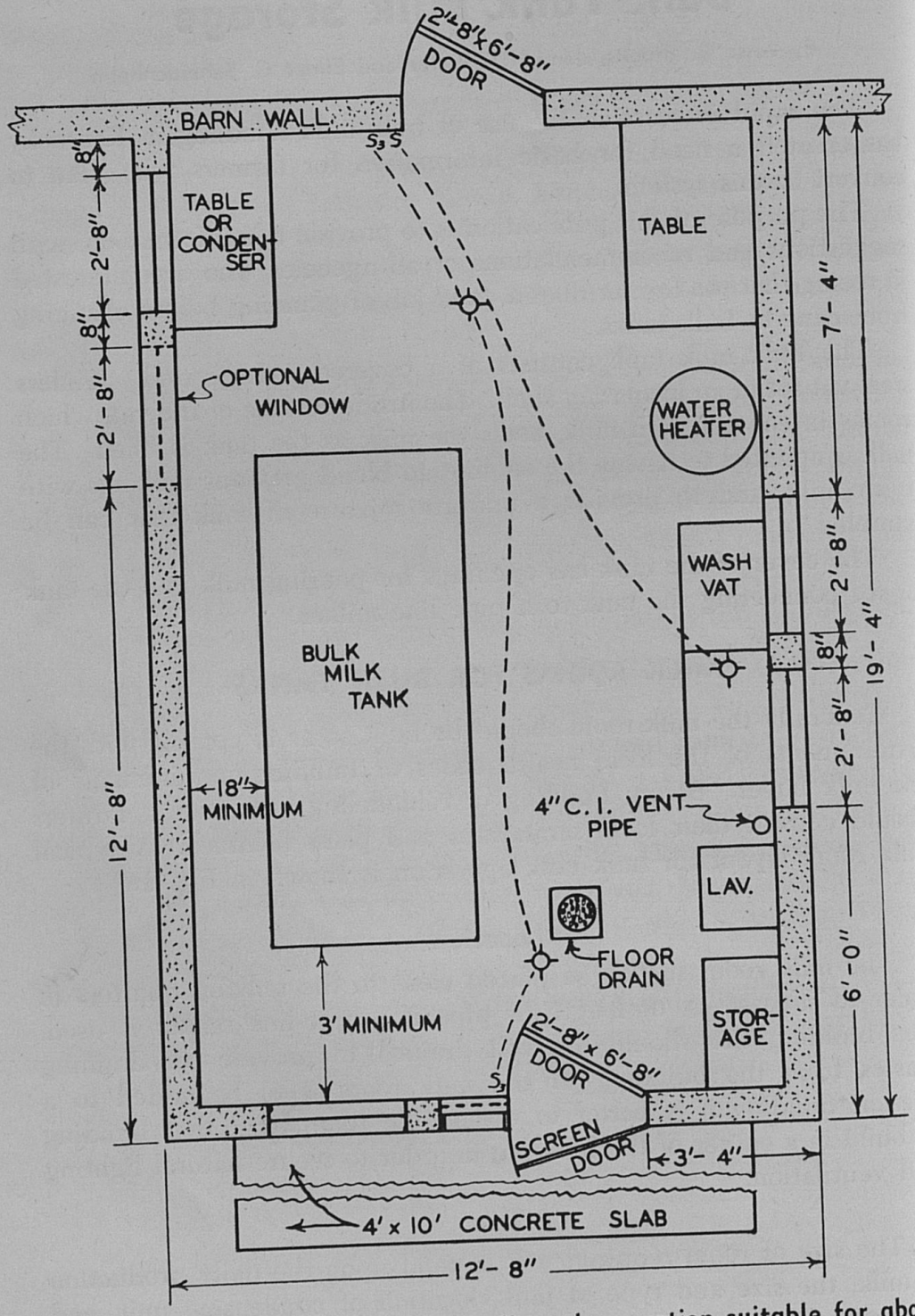

Fig. 1.— Layout of milk room for bulk tank operation suitable for about 30 cows. See Table 1, page 5.

affect the size of room and general layout of equipment. A room large enough for properly handling milk in cans will usually be of adequate size for bulk tank operation. The information in Table 1 may be helpful in planning new milk rooms.

Table 1.— Suggested Floor Area for New Milk Rooms

Milk production in gallons per day	*Can milk sq ft*	*Bulk milk, sq ft*	
		Every-day pickup	*Every-other-day pickup*
50 or less	144	168	168
50-100	168	192	216
100-160	192	208	240

Add 0.4 square feet for each gallon of milk over 160 gallons produced daily to the column which applies.

The room sizes given above will be adequate for tanks large enough to hold three milkings in case of every-day pickup and five milkings where pickup will be every other day.

Plumbing and Plumbing Fixtures

All plumbing should be installed in accordance with the State Plumbing Code. The plumbing should be inspected, if possible, by the local plumbing inspector before the trenches are backfilled.

Drains and waste systems for existing milk rooms may not be adequate since more water will be required to clean bulk tanks. This may be especially the case if a cleaned-in-place pipe line milker is used. Because wastes of higher milk content are usually encountered with the use of such a system, grease traps or catch basins are recommended.

Wastes from new milk rooms and the milking quarters may be joined and drained into a common catch basin or septic tank. Basins and tanks should be easily accessible for cleaning.

Floor drains should not be placed under bulk tanks as such drains would be difficult to service. All drains should be trapped adequately.

Safe, hot and cold water from an approved supply and under continuous pressure must be provided for cleaning the equipment. Handwashing facilities within the milk room are also required.

A mixing valve is desirable to combine hot and cold water for washing and rinsing equipment. A hose with a closing spray nozzle would conserve water.

A water heater which operates under continuous pressure is required. The minimum capacity heater should be 50 gallons. A larger heater would be needed where bulk tanks of over 300 gallons capacity are used. Larger heaters may also be advisable if a pipe line milker

is used, if the heater is to supply some heat for the milk room or if the heater is to be operated on off-peak electric service.

Heating

Means for heating the milk room in cold weather is desirable. A minimum temperature of 50° F is suggested, and there should be no evidence of freezing at any time. Heaters should be so constructed and installed as to prevent the formation of undesirable gases or odors while the heater is in operation.

The condensing units of bulk tanks may supply some heat for the milk room during the winter months. The amount of heat supplied and rate of heating will depend upon the volume of milk to be cooled, the type and size of tank and the type and location of the condensing unit.

Lighting

For natural lighting 10 square feet of window opening should be allowed for each 100 square feet of floor area.

One lighting outlet for each 100 square feet of floor area should be installed for general illumination. These outlets should be placed over the work area but not directly over the tank.

Ventilation

A cool, well-ventilated milk room will lower the cost of cooling milk and assure better performance of the refrigerating unit. Since all or part of the heat removed from the milk is exhausted into the air about the condensing unit it is essential that this unit be well ventilated.

The need for ventilation in order to keep the milk room cool during the summer will depend upon the volume of milk cooled daily, the type and size of tank and the type and location of the condensing unit.

Wiring

All wiring in the milk room should be done in accordance with the National Electrical Code and with state and local requirements. After the "rough" wiring is completed it should be inspected for approval by an authorized inspector if possible. Also consult with the power supplier as to adequacy of wiring.

The electric service to the milk room should be a 230-volt, 3-wire system. The capacity (amperage) of the service should be determined from the planned load, but a minimum of 60 amperes is recommended. The room should be wired with non-metallic plastic or rubber-sheathed cable or other cable approved for such locations.

A 230-volt, 3-wire twist-lock weatherproof outlet is needed to supply power for the truck pump. This outlet should be placed outside the milk room near the hose port and high enough to be out of reach of children. This outlet is also wired as a separate circuit with a separate control switch near the outlet.

Concrete Apron

A concrete apron or impervious slab should be placed adjacent to the outside wall of the milk room where the truck hose port hole is located. This apron will aid in keeping the milk room clean and prevent soiling the milk truck hose. This apron should extend 4′ in front of the port hole opening (Fig. 1).

SELECTION OF A BULK TANK

All bulk tanks should meet the nationally accepted 3A standards for holding and/or cooling tanks. These standards were developed jointly by the International Association of Milk and Food Sanitarians, U. S. Public Health Service, and Dairy Industry Committee. Usually the local milk inspector or the dairy plant fieldman is acquainted with these requirements and should be consulted before purchasing a tank.

The design and shape of equally satisfactory tanks differ for the same capacity. This is an important point to consider since some shapes may be better adapted than others to an existing milk room.

It is always advisable to consider the cost and availability of service along with the initial cost of the bulk tank. Also, it is best to have one dealer alone responsible for the installation and maintenance of the tank and related equipment.

Size of Tank

The size and production of the herd, future expansion of herd size, peak production periods, and the pick-up schedule of the tank truck, are all items to consider in estimating the capacity of tank needed. After consideration of these items Table 2 may be used as an approximate guide in determining the size of tank needed.

Table 2.— Estimating the Size of Bulk Tank Needed

Maximum Production Per Day (gallons)	*Suggested Bulk Tank Capacity in gallons*	
	Every Day Pick Up	*Every Other Day Pick Up*
40	100	100
60	100	150
80	150	200
100	150	250-300
125	200	300-400
150	250	400-500
200	300	500

The tanks on which the table is based will hold three milkings in the event of every-day pick-up and five milkings where the pick-up is made every other day.

Type of Tank

All bulk tanks are cold-wall-type tanks if the inside walls of the tank are cooled and the milk is agitated to hasten cooling. Generally there are two principal types of tanks depending upon the method used in cooling the interior walls—the ice bank and the direct-expansion type. Tanks may be further classified as vacuum or open types. Either of the foregoing tanks will give satisfactory service if it is properly designed, installed, and operated.

In the ice-bank-type of tank (Fig. 2) a reserve bank of ice is built up around the evaporator coils by the cooling unit between

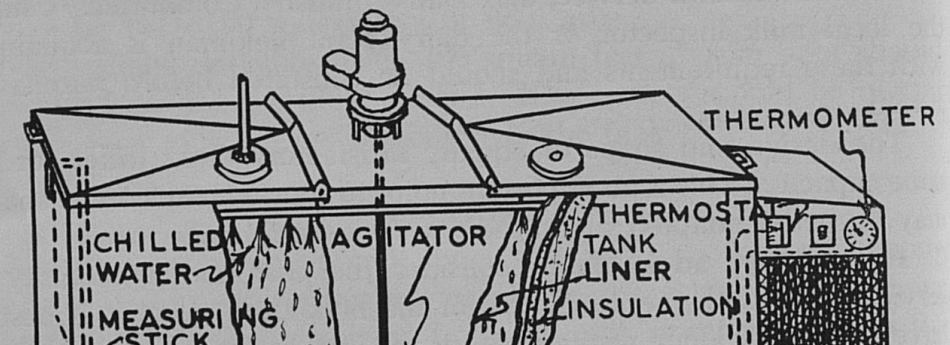

Fig. 2.— An ice-bank type tank. A pump circulates water over the ice bank and around the inner shell of the tank in order to cool the milk.

milkings. As fresh warm milk enters the tank, water chilled by the ice bank is circulated or sprayed around the inner shell of the tank in order to cool the milk. The chilled water removes the heat from the milk and, in turn, melts the ice bank. The cooling unit rebuilds the ice bank in order to maintain milk temperature and cool the next load of milk. The ice bank tank has a smaller cooling unit but runs for a longer time than the unit on the direct-expansion-type of tank.

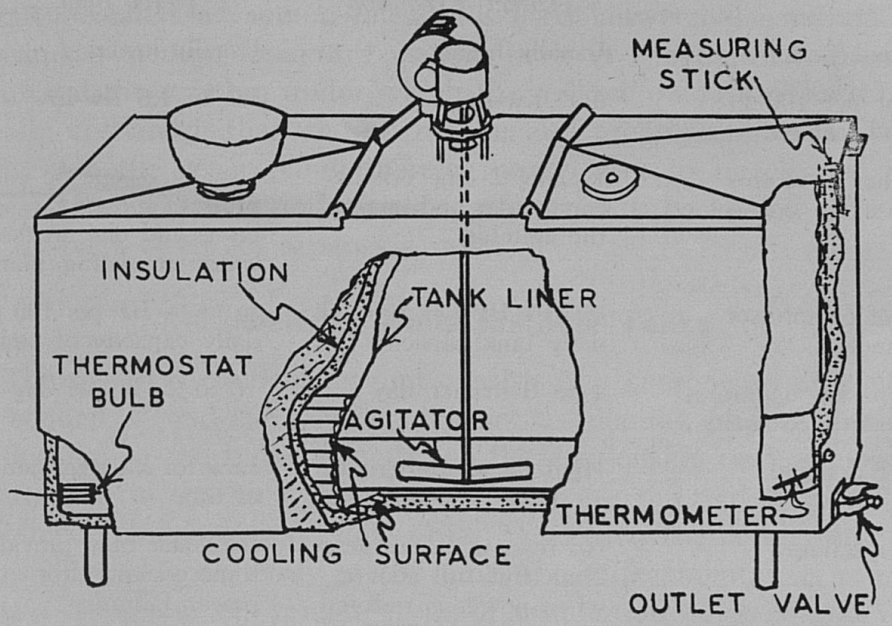

Fig. 3.— A direct expansion type bulk tank. Milk is cooled by direct contact with the cooling surface. The refrigerant, evaporating within the cooling surface liner, takes heat directly from the milk.

In the direct-expansion-type of tank, milk is cooled by direct contact with an evaporating plate or cooling surface (Fig. 3). The plate or cooling surface is usually made as an integral part of the inside walls of the tank. The refrigerant, evaporating within the plate on the cooling surface liner, takes heat directly from the milk. The cooling unit begins operating as fresh warm milk enters the tank and continues to operate until the milk is cooled to the desired temperature. The cooling unit is controlled by the temperature of the milk and operates only when cooling milk.

An ice bank may cost about 10 percent less than the direct expansion type but is more expensive to operate. Over a long period of time they will tend to be about equal in cost. Maintenance costs should be about the same; the difference is in the amount of electrical energy required for operation.

The following comparisons of the two types are detailed for further consideration:

	Direct Expansion	*Ice Bank*
Original Cost	Usually higher	Usually lower
Kw-hr per 100 lb of milk cooled	0.90 Kw-hr	1.1 to 1.6 Kw-hr
Number of motors	Usually 2—one on the compressor and one on the agitator	Usually 3—one on compressor, one on the agitator, and one on the water-circulating pump
Size of compressor and motors	⅔ to 1 HP per 100 gal daily tank capacity	⅓ to ½ HP per 100 gals daily capacity of tank
Compressor operating time at full capacity	4 to 6 hr per day	16 to 20 hr per day
Power demand	High for short period of time	Low for a longer period of time
Power failure	No reserve of refrigeration. But full cooling when power is restored	Ice bank may provide some cooling after power failure
Influence on milk room temperature	Larger amount of heat in room 4 to 6 hours after milking. Warmer at cleanup time	Smaller amount of heat in milk room over longer period of time. Uniform temperature.

Where pipe line milkers are used or planned to be used in the future, vacuum-type bulk tanks may be installed. The vacuum tank is designed to operate with the vacuum of the milking machine, and milk is drawn directly from the cow to the tank (Fig. 4). With the

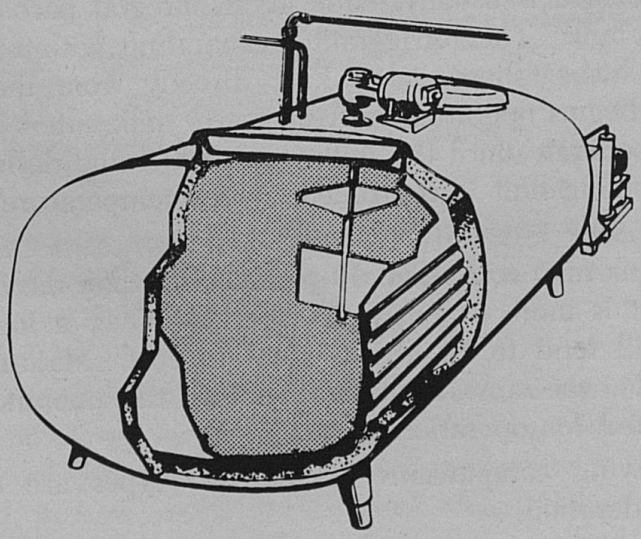

Fig. 4.— A vacuum, direct-expansion-type bulk tank. This tank is designed to operate with the vacuum of the milking machine and milk is drawn directly from the cow to the tank.

open-type tanks a vacuum releaser is used between the milkers and the tank. Vacuum tanks are usually built in a cylindrical shape to withstand the vacuum under which the milkers operate. These tanks usually cost more than the open type and are sometimes harder to clean. On the other hand, there is no releaser to be cleaned with this system. Vacuum and open-type tanks may be cooled either by the ice-bank or direct expansion method.

Condensing Units for Bulk Tanks

The so-called condensing unit consists of a compressor and motor, the condenser, and the receiver, but not the cooling coils. These coils are located in the bulk tank. When the condensing unit is mounted or attached to the tank the tank and unit are referred to as a "self-contained" or "packaged" unit (Fig. 5). When the condensing unit is installed independently of the tank, the tank and unit is referred to as a "separate" or "remote" type of installation (Figs. 6 and 7).

Most of the ice-bank and a number of the direct expansion tanks, especially in the 300-gallon sizes or smaller, are made in packaged

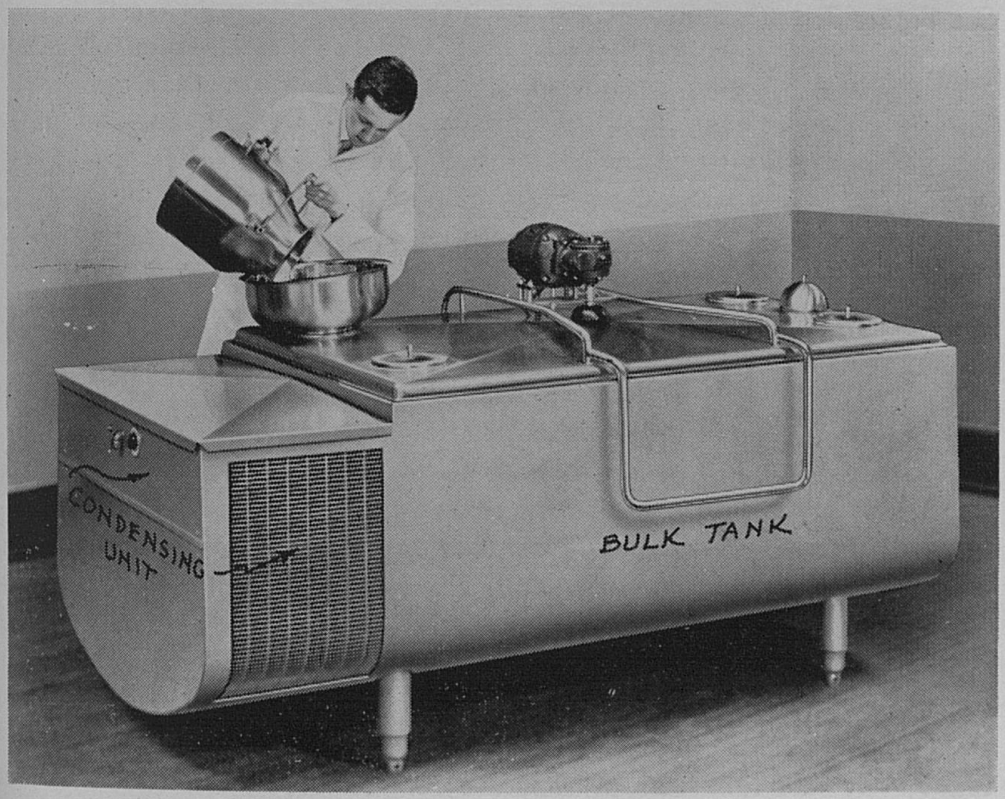

Fig. 5.— When the condensing unit is attached directly to the tank, the tank and unit is referred to as a "self-contained" or "packaged" unit.

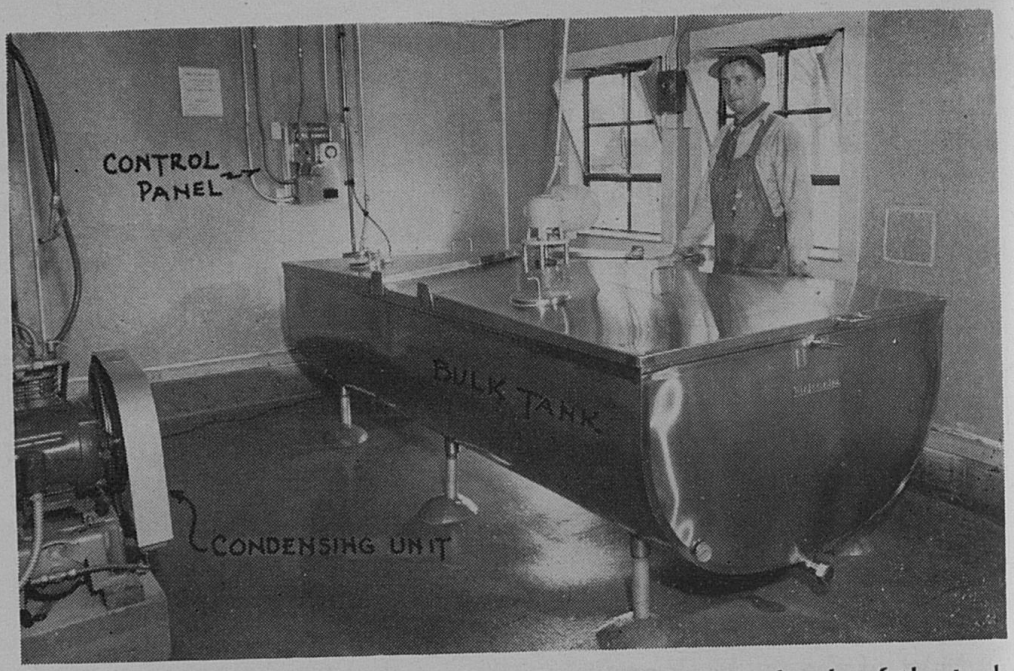

Fig. 6.— When the condensing unit is installed independently of the tank, the tank and unit is referred to as a "separate" or "remote" type of installation. A window or louver near the condensing unit is desirable. See Figure 7.

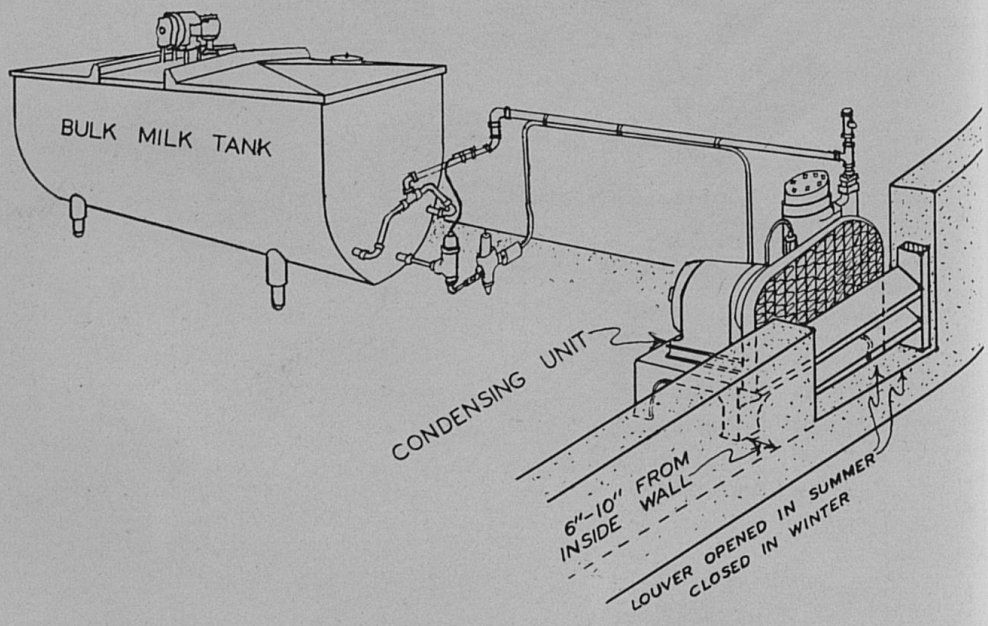

Fig. 7.— A bulk tank with a "separate" or "remote" installation of condensing unit. Warm air about the condenser may be expelled during the summer. This air will help warm the milk room during the winter.

units. These are usually easier and cheaper to install. The overall length of the packaged unit includes the length of the tank plus the space required for the condenser.

Larger condensing units for larger tanks are usually installed separate from the tank. They may be installed inside or outside of the milk room. The choice in placing the unit may depend upon the size and arrangement of the milk room.

Condenser Types

The term "condenser" should not be confused with condensing unit as the condenser is but one of the three-major parts of the condensing unit. There are usually three different types of condensers used on bulk tanks—air, water, and combination of air and water.

Air-cooled condensers are almost universally used with ice bank tanks and will be found on most direct-expansion units up to 200 gallons capacity. These condensers are more fool-proof and easier to install. To insure good performance and economical operation, an air-cooled unit must have an adequate supply of cool air. If the unit is located inside a milk room good ventilation will be needed during the summer months to remove the heated air surrounding the unit. During the winter, heat produced by the unit can be used to help warm the milk room (Fig. 7).

A combination of air and water condensers may be used to advantage where there is an adequate supply of good water. Usually these units are run on air and water during the summer and on air alone during the winter. Water may also be used during the winter; however, the unit must not be exposed to freezing temperatures. Should there be any danger of freezing, the water may be shut off and all parts of the water system drained. By using water the rate of cooling is improved during the summer months. The combination air and water unit uses about 2 gallons of water per gallon of milk cooled. If the water supply on the farm is limited or if the water contains excessive hardness, this type condenser should not be used.

Water-cooled condensers are often used on large tanks of 5-HP cooling capacity and over. The water should be of good quality and free of salts which would collect inside condenser coils. They require from 1 to 2½ gallons of water per minute for each horsepower rating of the compressor motor. Therefore the source of water must be adequate to furnish the amount of water that will be needed. Water-cooled units must be protected from freezing. The water from the cooler may be used for stock watering but should never be emptied back into the source if the same source is furnishing water for domestic use or use in the milk room.

INSTALLATION OF BULK TANKS AND CONDENSERS

The proper installation of a tank is necessary if satisfactory operation is to be obtained. The performance of bulk tank handling will often be determined by how well the milk room is planned and modified for this method of handling milk. The tank should be installed by the dealer according to the manufacturer's recommendations. The dairyman should not attempt to install the tank and refrigeration equipment himself.

Location of Tank

Where the milk is to be poured manually, locate the tank in the milk room so as to reduce steps and lifting. The outlet spout of the tank should be placed near the hose port and front entrance door to the milk room. Most farm bulk trucks are equipped with a hose 8 to 16 feet long.

Never place the tank over a floor drain. To permit cleaning, the tank should have at least 18 inches clearance from any wall or other equipment. Each service aisle or walk-way about the tank should be 3 feet in width. Three feet of clearance should be provided between the outlet spout end of the tank and the nearest wall in front of this end (Fig. 1). Extra space may be needed with pipe line milkers to facilitate cleaning the equipment. With cleaned-in-place pipe line milkers, the location of wash vats and bulk tanks should be related so that the pipe lines can be moved from one to the other with ease. Pipe-line milkers should have as few risers, elbows, or turns in the line as possible.

Regardless of the type of tank installed, the condensing unit should be placed so that there will be good ventilation from screened windows, louvers, or doors.

With tanks having *"packaged" condensing units,* the choice of location is limited but the condensing unit will be more efficient if placed in a position to receive good cross ventilation. A screened louver or window close to the condensing unit will lower costs of operation, especially during the summer. If the house is poorly ventilated an extra exhaust type fan in a window near the condenser would help in hot weather.

With tanks having *separate condensing units,* the condensing unit may be located either inside the milk room near a window or louver (Fig. 7), or it may be placed outside the room. In either case it should be mounted in a clean, dry, well-ventilated area. If the condensing unit is placed in a "doghouse" or another room outside the milk room the unit should be protected against extremely freezing temperatures.

The water to water-cooled units should be shut off and the unit drained if there is danger of freezing during the winter months.

Dealers and manufacturers should be consulted before the unit is placed outside the milk room. Generally, most condensing units will give better performance if placed inside the milk room as shown in Fig. 7.

Setting Tank in Place

The tank should be mounted on a solid foundation or floor. The tank should be leveled and kept level if it is to retain accuracy in calibration. The legs should be sealed in place to prevent movement of the tank on the milk room floor.

OPERATION OF THE TANK

Every purchaser of a bulk tank should study and become familiar with the manufacturer's instructions on operating the tank. He should learn how to manipulate the various controls of the equipment. Also, he should learn how to clean and sanitize the tank after it has been rinsed by the tank truck driver. The state regulations on cleaning bulk tanks require that the tank be rinsed, washed with warm water, detergent and brush, and finally rinsed with hot water as soon as possible after emptying. A sprayer for sanitizing with an approved chemical solution is recommended.

Information on materials, equipment, and procedures for cleaning and sanitizing bulk tanks is usually available from the manufacturer or may be obtained from the local health authority.

MAINTENANCE OF BULK TANKS

Manufacturer's instructions should be followed for maintenance of compressors, motors, condensers, and bulk tanks. Dust should not be allowed to accumulate on condensers as this will reduce the efficiency of the condenser and possibly contribute to unsanitary conditions in the milk room.

Don't use steel wool, metal sponges, or abrasive cleaners on stainless steel tanks. Follow the manufacturer's recommendations in removing rust spots, milk and water stone, and other foreign particles from stainless steel surfaces.

HOW TO OBTAIN AND MAINTAIN ACCURATE MEANS OF MEASURING MILK FROM FARM BULK TANKS

Surveys have shown that the determination of the amount of milk in farm bulk tanks as originally installed is inaccurate in a considerable proportion of them. This is partly due to the fact that these tanks

were not properly leveled and calibrated or gaged when installed. These operations of leveling and calibrating require both skill and patience. This is true because adjustments and measurements to the nearest 32nd of an inch must be made. Also 30 minutes may be required for the surface of the water being measured to become smooth, free of surging and rippling and several attempts may be required before a verified reading is obtained, i.e., two or more readings being the same.

Calibration is a process by which a value in pounds is determined for each subdivision of the gage rod. These measurements and values are assembled in a calibration or conversion chart. In the calibration process several systems are used, for example,

a. The tank is factory calibrated with a conversion chart accompanying the tank. The manufacturer of course charges for this service; however, it is generally considered a good investment. When such a tank is properly installed the chart should be accurate. To be on the safe side however it is recommended that a check of the conversion chart be made when the tank is installed. The check should go up to the capacity of the tank; additions may be made in 25- or 50-gallon lots.

b. Some tanks are sold and the calibration done at the time of installation by the dealer or manufacturer's representative (the installation personnel). In this system the completion of the chart is usually done at the factory from records sent there by mail. This system is satisfactory provided the calibration is accurately done.

c. Some tanks may be sold that are not factory calibrated and without the dealer or installer obligating himself to calibrate, i.e., without calibration. (Some such tanks may have conversion charts that are duplicates for similar tanks; the accuracy of such charts is questionable.) Unless arrangements can be made beforehand with a well qualified person who can furnish assurance of satisfactory service, then this method of purchasing a tank should not be considered.

It should be realized in advance that accurate calibration is very important. If not, measurements to determine the amount of milk sold will also be inaccurate.

Outline of Installation and Calibration Procedure

Before installing a tank read carefully the manufacturer's instructions and follow them closely. Decide on one of the following methods of setting the tank legs:

1. Make a small hole in the floor for each leg so as to prevent shifting.

2. Set on smooth floor.
3. Make good sized holes in the floor so that tank's legs can be set in concrete.

The next step is to level the tank: (follow manufacturer's instructions). Have on hand a good spirit level. Level the tank, using aids for leveling on it which may be:

1. Leveling lugs on tanks outside walls,
2. Raised humps on breast of tank,
3. Plumb bob attached to the tank,
4. Scribe marks inside the tank to be made to coincide with water level (usually factory-calibrated tanks).

Equipment Required in Calibrating:

1. A spirit level with which close adjustments can be made,
2. A standard, approved 5-gallon measure (must have stamp of approval on it),
3. A large funnel with thin wall hose or tube attached to it,
4. A blank chart (furnished with the tank),
5. Water supply,
6. Bon Ami and baby powder.

Calibration Procedure:

1. Carefully measure 5 gallons of water and transfer it to the tank. Use funnel and tube to prevent waves and ripples. Readings must be made when water is smooth and motionless.
2. Scrub the measuring rod with Bon Ami, dust with Bon Ami or baby powder, and blow off excess.
3. Make several readings until one is verified.
4. Enter 43 on the chart in space agreeing with reading in inches and fractions thereof (5 gallons milk = 43 pounds).
5. Continue as above to capacity of tank.
6. Usually records of the above measurements and readings are sent to the factory for a properly completed and printed chart to be made and returned. This may take several days.

While the dealer or installer will usually guarantee the accuracy of the calibration, including the conversion chart furnished, it is recommended that dairymen make certain that they are fully protected.

Maintenance of Accuracy of Measuring

After a tank has been properly installed and correctly calibrated so as to permit accurate measuring of milk in it, it is important to maintain this condition. This applies particularly to maintaining the tank's

original level because any tilting or deviation from the original level will cause the measuring to become inaccurate.

When properly installed, tanks having their legs set in concrete are not subject to shifting, changing of leveling adjustment, or other similar changes. The original level is therefore, in most cases, maintained (exception—floor sag). In using this system the installer should make certain that the tank is correctly calibrated before the legs are concreted in place.

Tanks that do not have their legs set in concrete may shift in position; also they may have their leg adjustments changed or have shims placed under the legs. Any one of these will cause measurements to be inaccurate. Recommended safeguards to use so as to be able to detect and correct these causes for loss of accuracy of measuring follow:

1. For shifting of position of the tank: (a) make small holes in the floor in which to set the tank legs, or (b) make permanent marks in the floor to indicate the proper position of the tank legs.

2. For changing adjustments of the tank's legs: (a) drill a small hole through the stationary and movable parts of each leg; put a small wire through the hole and seal the ends of it with a lead seal; or (b) make die marks in the metal of both stationary and movable parts of each leg so that if the level adjustment is changed it can be detected.

3. For placing of shims or other objects under the tank's legs: the use of shims is not permitted in the original leveling or at any time thereafter.

The prevention of settling or sagging of the floor is an important factor in maintaining conditions suitable for accurate measuring. The floor under the tank should consist of 4 to 5 inches of reinforced concrete on 12 to 18 inches of crushed rock or gravel. If an old floor is used, construct piers under the legs approximately 10 inches in diameter at the top and 18 inches in diameter at the bottom, extending down well below the frost line. Settling or sagging can usually be detected by cracks or breaking loose at the juncture with the walls.

On some tanks small levels are permanently attached, centered and sealed. Plumb bobs are also sometimes used. Either are convenient for checking the tank's level. The value of the information obtained from them depends upon the accuracy of their installation, no changes having been made to them and the accuracy of the reading of them.

To check a tank for any change from its original level (state of level) with a level (tool) follow the same procedure as was used

when the tank was originally installed (see factory instructions). If any deviation from the exact level existed when the tank was originally calibrated, this same deviation must remain on subsequent checks. When done with these precautions this method of checking should furnish valuable information.

Checking Calibration, Recalibration

Preliminary checks of the accuracy of the calibration of a tank can be made by checking at a few check points; for example by putting in the tank and measuring 10, 20 and 100 gallons of water. Complete checks, of course, include representative check points from 5 gallons to the capacity of the tank. When such checks show inaccuracies beyond the tolerance, then recalibration is the proper procedure to follow. (The tolerance on tanks of 500 gallons and less is 4.3 pounds, on tanks of 501 to 1,000 gallons, 8.6 pounds.)

Because the use of a farm bulk tank is governed by an agreement between the producer and buyer, this agreement should specify under what conditions the tank in question would be recalibrated. Periodic inspections or checks should be made to show the maintenance (or loss) of accuracy. Suggestions for making these checks are outlined above (see *Maintenance of Accuracy of Measuring*). When there are good reasons to recalibrate, then arrangements should be made to have it done.

QUALITY OF MILK IN BULK TANK STORAGE

Bulk storage of milk on farms requires that both the farmer and the bulk tank operator follow a certain number of necessary practices to insure a high quality milk reaching the consumer. It is considered by many that bulk-stored milk will always be higher in quality than can-stored milk. This may not be true: bulk-stored milk can be of lower quality if the milk and equipment is not cared for properly.

The quality of milk should be excellent if bulk storage is used, because of these reasons:

1. Less trouble from metallic flavor because the tanks are made of stainless steel.
2. The potential bacterial contamination contributed by ineffectively cleaned milk cans is eliminated.
3. There is a more rapid cooling of the milk following milking.
4. Milk is usually kept stored at lower temperatures than with can storage.

Dairyman can Produce High Quality Milk with Bulk Storage

Bulk-stored milk can be of high quality if the following precautions are done:

1. Properly wash and sanitize the tank. It is important that the dairyman thoroughly wash the storage tank each time that it is emptied. The rinse that the pick-up operator gives the tank is not sufficient. The tank should also be sanitized following the washing operation.
2. Be sure to wash the outlet valve and gaskets. Omitting this step can step up bacterial counts.
3. Be certain that the measuring stick is given a thorough cleaning.
4. Releasers cannot be satisfactorily cleaned in place. Follow instructions for the proper cleaning of this equipment.
5. Prevent an excess of air getting into the line with pipe line milking. It can help cause rancid flavor of the milk.
6. Allow minimum agitation of the milk. The paddles should be covered before the agitator is started. This is another way of avoiding rancid milk.
7. Have a minimum of risers in the pipe line leading to storage tank. Here again, the milk can be agitated, causing rancid flavors.
8. Properly feed cows—avoid weed and feed flavors from getting into the milk.
9. Keep the refrigeration unit running at night.
10. Avoid drawing milk through the valve outlet for home use. It is best to use a sterilized dipper of some type and remove the milk from the top of the tank.
11. Avoid obnoxious odors about the dairy barn which the cows could inhale and, consequently, cause the milk to be tainted.
12. Remove from the milking line any cows which produce rancid milk during the latter part of their lactation.

Pick-up Operator Important to Quality

The bulk tank pick-up operator must cooperate fully to help maintain a high quality of milk which has been bulk stored on the farm. He must do the following:

1. Deliver the milk to plants the day it is picked up. The pump and hose build up on bacterial count over night.
2. Empty all farm tanks completely every other day.
3. Sanitize the hose on tank truck before starting in the morning.
4. Inspect milk carefully at farms before pumping to pick-up truck.

5. Take samples of milk to inspectors promptly.

It can be readily understood that the maintaining of quality milk held in farm bulk storage is a task involving many important practices. There can be no side-stepping of responsibilities by anyone who handles the milk between the cow and the plant. High quality milk is demanded by the consumer. It is the job of the producer and those who handle it to make it the best possible.

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