Milk Transportation Tank Cleaning and Sanitization*

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Many in this audience are readily able to recall the time when much of the milk distributed in the larger communities was transported from the country loading platforms, in cans, on “milk trains.” There was a short era during which considerable milk was pasteurized and bottled at country receiving station-milk plants, and transported to the city in bottles. But the cost of returning the empty bottles influenced a trend to pasteurization in the city. It was then that the advantages of transporting raw milk in insulated tanks became apparent. That the development of this means of milk transportation is comparatively recent is evident from the fact that in a report to this Association at the 1922 Annual Meeting, Smith (1) stated that in February of that year there were in use 13 milk transportation tanks mounted in railroad cars, and 68 mounted on motor trucks or trailers—a total of 81 tanks!

The more complete transition since 1922, from the transportation of milk in cans to the movement of bulk milk from receiving stations in the country to milk plants in the city in larger—but fewer—receptacles, has generally been regarded as an unqualified benefit to milk sanitation. Shipment in cans possessed potentialities for contamination or spoilage of milk because of the poor state of repair or ineffective cleaning of the cans, or to delayed or inadequate cooling of the milk, whereas bulk shipment is in insulated tanks with the milk at low temperatures so that the contents do not significantly warm up during transit. On the contrary, those who have—in curiosity or by force of necessity—given close attention to the operation of milk transportation vehicles realize that the transition from cans to tanks, as containers for the transportation of bulk milk, was not a complete panacea for the sanitation problems inherent in the transportation of milk.

Sanitization Difficulties

It is not necessary to describe milk transportation tanks to this audience; at least one such tank is on display at the Dairy Industries Exposition. Nor should it be necessary to enlarge upon the statement that all of the tanks currently in service are not as modern in design, nor as recent in construction, as that on display. Design which ignores principles of sanitation, and disrepair resulting from years of service, constitute serious handicaps to the effective cleaning which is a prerequisite to the complete sanitization of the tanks. This is essential to the preservation of milk quality during transit. The past six years have been a continuous nightmare to transportation tank operators. Marked increases in the volumes of milk to be transported daily, together with the inability to obtain additional tanks, a situation aggravated by the difficulties and delays attendant upon the procurement of motor and chassis parts, necessitated the retention in service of tanks which normally would have been replaced. Also it became necessary to operate transportation vehicles with fewer and shorter intervals for reconditioning and repairs.

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Because the design and state of repair of tank interiors, manholes, outlets, inlet pipes, valves, air-vents, and agitators vitally affect the feasibility and ease of effective cleaning, and the time required therefor, a resume—not necessarily complete—of defects found in milk transportation tanks which have been in long and continuous service will serve to illustrate the nature and magnitude of the difficulties which must be overcome in the maintenance of good bacterial quality of milk in transit.

**Tank lining**

Metal—dents and scratches; crudely applied patches; opened seams or welds, which permit leakage.
Glass—erosion in spots, exposing the metal, which is also corroded; chipped areas, especially at the edges of openings.

**Manhole doors**

On top—rough finish on the inner surface; connection and air-vent openings threaded completely through the casting.
At the end, and on top—hinges worn, permitting play; gaskets permanently installed, sometimes with rivets.

**Outlet valves**

Deteriorated rubber gaskets; lead or tin gaskets pulled so tight that the metal is extruded as much as 3/4 inch or more into the bore of the outlet, forming a pocket; deep shoulders in the valve construction, forming pockets; outlets located in the bottom of the tank, so that the outlet is in the form of a bend, and the valve is both inconvenient and difficult to remove.

**Inlets**—frequently of the goose-neck variety, difficult to clean and to inspect.

**Air-vents**—interiors unfinished; threaded shanks not extending through the manhole cover, thus leaving exposed threads in the threaded opening.

**Agitators**—blades rough; shaft packed, and not removable for cleaning.

**Manhole hoods and valve covers**—broken or lost hoods and covers virtually un-replaceable because of material and labor shortages.

**Insulation**—covering broken or torn, permitting the insulation to deteriorate.

The foregoing list of defects has not been included to create the impression that a majority of milk transportation tanks are in an extremely dilapidated and unsatisfactory condition. It is, however, a roster of the conditions, one or more to a tank, which are likely to be found wherever milk sanitarians are devoting little or no attention to this feature of the handling of raw milk for pasteurization. These defects play a prominent role in the deterioration in bacterial quality which sometimes takes place between receiving stations and pasteurizing plants.

Reference has been made to these several types of transportation tank defects and disrepair because, when existent, they are constantly a contributing cause to ineffective cleaning. In these days of 40-hour weeks and increased overtime pay, time consumed in cleaning difficult-to-reach recesses, and roughened or corroded areas is costly to the concern responsible for the condition of the tanks. Consequently the time allotted for the cleaning of each tank is limited, and some of the recesses and areas are not cleaned every time the tank is washed. However, important as the physical condition of tanks is with respect to effective cleaning, it is merely incidental when compared with the prevailing disorganization of milk transportation tank cleaning and sanitization as a factor in the increase in bacterial content of milk in transit.

Milk distributing concerns which operate the receiving stations from which their raw milk supplies are obtained, and which own and operate a fleet of truck and trailer tanks, or lease a number of railroad car tanks, are in
position to maintain an organized tank cleaning and sanitization service, although break-downs in such services are not infrequent.

All of the milk transportation tanks in service do not routinely shuttle between the same receiving stations and milk plants, however. Many are operated by trucking concerns, some by individual owner-drivers, and provide a contract or single-trip merchant service. This morning a contract tank may pick up a load of whole milk at Receiving Station A and haul it to Milk Plant B; late this afternoon it may take on a merchant load of skim-milk at Receiving Station C to be delivered to a condensary or cheese plant, where it is unloaded after sunset. To-morrow morning it will return to Receiving Station A for the milk for Milk Plant B. Will the tank have been washed and sanitized after unloading the skim-milk after sunset? Will someone at Receiving Station A inspect the tank interior, and noting that it has not been cleaned, wash and sanitize it before loading the milk for Milk Plant B? The bacterial quality of the milk received at Milk Plant B to-morrow will surely reflect any omission of sanitization of that transportation tank since it was unloaded there this afternoon. I doubt that it would be possible, in fewer words, to present the nature of the problem encountered by milk sanitarians who deal with milk supplies transported in tanks.

**Regulatory Control**

Paradoxically, however, relatively few milk ordinances prescribe, in detail, the control measures which are to be applied to transportation tanks. The enforcement authorities must arbitrarily, and on their own initiative, apply to these vehicular containers the provisions prescribed for milk cans and stationary receptacles, if they undertake their control. It is quite obvious, of course, that the circumstances and conditions under which transportation tanks have to be cleaned and sanitized, and the responsibilities for their sanitary condition, do not parallel those which pertain to milk cans and milk receptacles in receiving stations and milk plants. It, furthermore, is axiomatic that control measures should preferably be predicated upon legally adopted provisions which are relatively specific.

In Chicago, where approximately 340 truck and trailer tanks, and about 40 railroad car tanks are in constant service, studies were conducted and rules discussed with trucking concerns, receiving station and milk plant operators, and health authorities, over a period of approximately two years before regulations satisfactory to all concerned were drafted, and adopted by the Board of Health on July 19, 1945. They amplify Item 26r of the specifications for Grade A Raw Milk for Pasteurization. (A copy is appended.)

In essence this regulation

1. Applies to all milk transportation vehicles.

2. Prescribes substantial construction, good repair, tight closure, and cleanliness, and prohibits the transportation of contaminating substances or materials (Item 26r, U.S.P.H.S. Milk Ordinance); it also prescribes removable shelves, if milk cans are carried in tiers, and the separation of cans of Grade A and of ungraded milk.

3. Prescribes that tank construction, and the degree of cleanliness, shall comply with Items 12 (r) and 13 (r), and with 10 (p) and 12 (p), respectively, of the specifications for Grade A Raw Milk for Pasteurization, and for Grade A Pasteurized Milk.

4. Prescribes that tanks shall be cleaned at the point of unloading, and shall then be tagged, at the manhole or inlet, to indicate where, when, and by whom that operation was conducted.

5. Prescribes that tanks shall be bactericidally treated prior to loading, the nature of the bactericide, and where, when, and by whom treated, to
be recorded on the reverse of the tag on which the cleaning data were recorded. These tags must be kept on file for three months.

6. Prescribes that the manhole and outlet valve of loaded tanks—except those in railroad cars—shall be sealed, and that railroad car doors shall be sealed.

7. Prescribes that tanks shall be tagged to identify the source and nature of the contents and the date of their receipt from producers, and

8. Prescribes that every milk transportation vehicle display on each side the legend: Chicago Board of Health Permit, and immediately thereafter the number of the permit issued, and the number assigned to that vehicle.

A brief discussion of the application of the permit system to milk transportation vehicles may be of general interest. The U.S.P.H.S. Milk Ordinance prescribes that milk distribution vehicles display the number of the permit issued to the distributor whose products they transport. This provision set the precedent, in the Chicago Milk Ordinance, that milk haulers, whether of cans or of tanks, be required to obtain and hold permits. But many haulers, both milk concerns and merchant haulers, operate more than one vehicle. Therefore, a permit is now issued for each vehicle, but the basic number of all the permits issued to any hauler or concern is the same, the vehicles being numbered serially. The permit number of a vehicle may thus be: 1285-6. In this manner every vehicle is positively identified, and inspection findings may be filed against that particular unit. This also facilitates control activities, because a permit must be obtained for each new vehicle added to the fleet, and when a truck or tank is damaged or becomes unfit for use, the permit for its operation may be revoked.

This discussion of permits is somewhat of a digression from the main subject of this paper; nevertheless, reference has been made to it, because it is the mechanism by which control over the sanitization of milk transportation vehicles is exercised.

This is an appropriate point to philosophize that the adoption of control regulations does not, per se, bring about complete control; it is merely the initial step.

**Cleaning Facilities**

It was soon discovered after enforcement activities were inaugurated that numbers of the milk plants at which bulk milk was received in transportation tanks were not adequately equipped to wash them. Unloading areas (where tanks usually are also washed) were not impervious, or were not properly drained; hose connections were inconveniently located, lighting facilities were inadequate; and, one of the most serious obstacles to effective cleaning, the personnel assigned to this operation was frequently the last addition to the plant staff, and was untrained.

Parallel conditions existed at country receiving stations at which the tanks are loaded, particularly with respect to lighting. Washing facilities must also be provided at these stations, for tanks sometimes arrive in a condition unsuitable for loading and must be washed or re-washed.

Favorable progress is being made in the installation of adequate overhead lighting (much loading of tanks occurs after sunset, especially during winter) and extension lights and connections. The installation of transformers to reduce the voltage and the use of sealed beam light globes is recommended, because the effective washing and inspection of tank interiors are dependent upon adequate lighting of all parts.

**Bactericidal Treatment**

Effective bactericidal treatment of the tanks prior to loading is somewhat more difficult of attainment than was
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anticipated. The entire inner surface area of a tank cannot effectively be sprayed by leaning into the manhole and pointing the spray-nozzle first toward one end and then toward the other end. Some nozzles project a fine stream, instead of a misty spray. It would require far more time than is usually devoted to this operation to wet the entire inner surface with such a nozzle. Spray equipment, of the cheaper type, corrodes and deteriorates rapidly when chlorine compounds are used as the bactericide. It has been observed, that a few pailfuls of chlorine solution are poured into the tank, and the man detailed to treat it gets into the tank, and, with a brush attempts to sweep the solution around the periphery, and against the ends, hoping to contact all surfaces, including the top, without completely soaking himself and his clothes. This is, of course, preferable to omission of treatment until the spray is repaired; but its effectiveness is, to say the least, questionable. We are recommending that sprays which produce a fog be suspended through the manhole, the manhole closed and the outlet valve opened, and permitted to function until the fog issues from the outlet.

One inspector is detailed to transportation tank inspection. He is provided with suitable outer garments and overshoes, and a powerful flashlight and a sealed beam extension connection. (He uses the latter where there is a transformer on the line.) He removes the outlet valve and all other removable parts when making an inspection, and gets into the tanks.

Much progress has been made in fifteen months of intensive application to this undertaking. We feel assured that this activity must necessarily be reflected in improved bacterial quality of bulk milk when it reaches city milk plants. Our experience has convinced us that milk transportation tanks constitute a segment of milk handling equipment which has not been sufficiently emphasized in milk ordinances and regulations—particularly since so many communities now obtain milk from distant sources.

REFERENCE


RESOLUTION

WHEREAS, Provisions pertaining to vehicles used to transport milk and milk products for consumption in Chicago are included in a number of separate Board of Health rules and regulations; and

WHEREAS, These provisions should be integrated into one section of regulations; and

WHEREAS, Certain of these provisions should be amplified, clarified, and made more specific;

THEREFORE, BE IT RESOLVED

5. That Item 26r of the regulations pertaining to Section 154-14 of the Municipal Code be hereby amended by striking out the present wording, which is as follows:

"All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect the milk or milk products from the sun and from freezing, and from contamination. Such vehicles shall be kept clean and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination." "Milk haulers shall furnish to the board of health at least once each month a list showing the name and address of each producer whose milk has been hauled during that period, the amount of milk hauled daily, and the name and address of the milk plants designated with such milk," and by inserting in lieu thereof the following:

"All vehicles used for the transportation of milk or milk products, in cans between farms and receiving stations and milk plants, shall be of substantial construction; shall be provided with means for tight closure; shall be in a state of good repair; shall be clean; and shall, when milk cans are carried in tiers, be provided with removable racks or shelves, so that the bottoms of upper tiers of cans do not come into contact with the lids of lower tiers of cans. No substance which may contaminate milk shall be transported with milk or milk products in such manner as to result in potential contamination thereof. Tanks used for the transport of fluid food products other than milk, or of milk or milk products from sources which do not hold Board of Health permits, prior to their use for the transport of milk or milk products, shall be given special treatment approved by the Board of Health, to remove all traces of the said products before being used for the transport of milk or milk products. In the event that milk from sources which do not hold Board of Health permits are transported in cans in the same vehicle with milk or milk products from sources holding permits, the cans containing the two kinds or types of milk shall be kept separate.

"Milk tanks mounted on trucks or trailer chassis, railroad cars, or other conveyances, and used for the transportation of milk and milk products shall conform in construction and state of repair to the requirements of Items 12 (r) and 10 (p); the outlet valves of all tanks so used, except those
on such tanks as are completely enclosed in the transportation conveyance, shall be provided with tightly fitting hoods or dust covers.

Tanks used for the transportation of milk or milk products, and all piping, connections, and pumps used in withdrawing milk therefrom, shall be cleaned, as prescribed in Items 13 (r) and 12 (p), as promptly as possible after the removal of the contents. Tanks shall be cleaned at the point of complete unloading, unless otherwise directed by the Board of Health. After cleaning, a tag shall be attached to the manhole or inlet closure, on one face of which is inscribed the following information: (a) the words "CLEANED," (b) the permit number of the tank or trailer unit; (c) the date and time at which the tank was cleaned; (d) the place at which the tank was cleaned; and (e) the name of the person who cleaned the tank.

"If a tank, cleaned and tagged as herein prescribed, is used for the transportation of milk or a milk product from a source to which a Board of Health permit has not been issued, the holder of the tank truck permit, or his agent, shall remove and destroy the tag bearing the legend "CLEANED," before the tank is filled at such source.

"Tanks which, upon arrival at milk receiving stations, bear tags indicating that they have been cleaned, shall, prior to the placing of milk or a milk product therein, have their milk bearing surfaces and outlet valves adequately treated with a bactericide, as prescribed in Items 14 (r) and 12 (p), as promptly as possible after the removal of the contents. Such tanks shall be cleaned, as hereinbefore prescribed, at the point of complete unloading, unless otherwise directed by the Board of Health. After cleaning, a tag shall be attached to the manhole or inlet closure, on one face of which is inscribed the following information: (a) the words "BACTERICIDALLY TREATED," (b) the nature of the bactericide used; (c) the date and time of bactericidal treatment; (d) the place at which such treatment was administered; and (e) the name of the person who administered the treatment.

"Whenever the milk or milk product content of a tank is divided among more than one consignee, the piping and fittings used in removing the tank contents shall be cleansed and given bactericidial treatment after each successive usage. The tags, reporting the cleaning and bactericidial treatment of a tank, has been completed, the tag indicating the treatment thereof shall be removed, and on the reverse side thereof shall be inscribed the following information: (a) the words "BACTERICIDALLY TREATED," in letters not less than six inches high and shall display, on the front and on the rear, in plain view, the word "MILK," in letters not less than six inches high and shall display, on both, in at least three inches high and one and one-half inches wide, the name and address of the person holding the permit to operate the said vehicle, and the legend "CHICAGO BOARD OF HEALTH PERMIT," and immediately thereafter the permit number assigned each vehicle by the Board of Health for the purpose of identification."

At the meeting of the Board of Health on July 19, 1945, the above resolution was adopted.

Make room reservations now for the thirty-fourth annual meeting.

Hotel Schroeder, Milwaukee, Wisconsin, October 16-18.