Using a Hose to Improve Farm Biosecurity During Milk Pickup in a FAD Emergency: An Alternative from a New England Perspective

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Contents

[1] See New England Animal Agricultural Security Alliance (NESAASA), New England Secure Milk Supply Project (2013).

BACKGROUND

Most milk produced in New England moves from cows to market by way of a tank truck. By necessity (given the physiology of cattle, limited on-site storage, a perishable product, and public-health regulations), dairy farms have to ship milk every day or at least every other day. So, livestock, farms, farmers, coops, processors, and consumers depend on regular, tank-truck service. As a tanker eases its way through the farm gate, backs up and connects to a bulk tank, it also connects the farm to the food supply chain and a source of revenue to keep the links intact.

The bulk tank stores milk that it receives – normally by way of stainless-steel pipe – from milking machines that a farmhand attaches to each cow, two or three times per day. Before each use, the pipe and the bulk tank are sanitized by procedures that are specified in the Grade "A" Pasteurized Milk Ordinance ("the PMO") and administered by state and federal authorities.[2] The driver ("the bulk milk hauler/sampler") transfers milk from the bulk tank to the tank truck via a hose carried for that purpose and an onboard suction pump.

Risk assessors generally agree that this step in milk production – the arrival and departure of a truck, the operation of a pump, the connecting and disconnecting of hose, all (epidemiologically) "close" to susceptible livestock – represents one of the greatest risks for spreading disease during an outbreak, especially if it is as contagious as Foot-and-Mouth Disease (FMD). Each tank-truck stop constitutes an opportunity for one farm to become a victim or source of infection to another. The most likely culprit would be contaminants in spilled milk or muck on the exterior of the rig.

In New England, the risk is significantly increased by the dominance of long-haul, combined loads. Centers of production are distant from major processing plants, and few farms produce enough milk of their own to fill a tanker and cover its cost; so, milk from several farms is collected on each trip to the processing plant. (Split loads may be delivered to smaller plants on the way.) Throughout the region, single-pickup runs are a small share of the total, and 6-12 pickups per run are common. So, even though single-pickup runs (with a cleaning or two at each end) could well reduce risks in an outbreak, existing logistics and economics of the supply chain in New England render that remedy unaffordable.

More realistic mitigation strategies to-date entail many cleanings per run. Cleaning and disinfection (C&D) would be required at each farm gate before and after every pickup. C&D would have to be thorough enough to assure that haulers could not inadvertently carry FMD virus (which can well escape early detection) from infected to uninfected premises along their routes.

[2] U.S. Department of Health and Human Services, Public Health Services, and Food and Drug Administration (USPHS/FDA), Grade "A" Pasteurized Milk Ordinance [PMO] (2011 Revision). See also The Dairy Practices Council, Guidelines for Farm Bulk Milk Collection Procedures, DPC 50 (2003) and state-level guidance such as Wisconsin Department of Agriculture, Bulk Milk Haulers Training Manual: Accepted Producers for Collecting Milk from Bulk Tanks (2011), Michigan Department of Agriculture, Bulk Milk Haulers Training Manual, DY-360 (2006), or University of Kentucky College of Agriculture, Procedures for Milk Sampling and Weighing, video (March, 2012).

CONCERNS

There are a number of concerns about the capacity for on-farm C&D of tank trucks at every stop in New England.

- **Farm resources**.
  Few farms (less than 10%) currently have a vehicle wash station, and most lack an ideal site to improvise one, especially if recovering waste water is required or if the outbreak occurs during winter or "mud season." Furthermore, most farms would find it difficult to assemble a response-ready C&D team from existing staff. Despite talent and dedication, their number and training may be inadequate. New England farms have an average of just three employees. Many of them are barely salaried relatives or recent immigrants, with limited formal education or literacy. Many work part-time, with competing commitments to second or third jobs, school, or family care, and turnover is high. Since farmhands who are counted in one census are often gone by the next, benefits of C&D training (even if it were readily available, which it is not) would be short-lived.

- **Hauler resources**.
  As it is, most haulers maintain just enough assets to service existing routes. If, as in an outbreak, the time per stop is extended (at least 40-60 minutes for C&D at each pickup, multiplied by the number of pickups per run), haulers will quickly run short of trucks, drivers, and time. Even under normal circumstances, in runs from northern New England farms to southern New England processors, drivers have to hustle to stay under the maximum number of hours per day that Department of Transportation regulations permit. Adding a single C&D to some routes could, in effect, double the number of drivers required.

- **State resources**.
  Experience suggests that training and oversight may be necessary to assure proper C&D, but the New England states employ very few people who are qualified to provide it (e.g., dairy regulators and public-health veterinary staff). For example, the six offices of State Veterinarians are lean (just two or three people per state), and in an outbreak they are likely to be needed for Incident Command, 24/7 in Emergency Operations Centers, rather than available for field assignment. The number of state Milk Inspectors is barely sufficient to handle visits to in-state dairy farms once every six months, much less a substantial share of them every day or two, in time to assure proper C&D. Moreover, a recent field trial in Vermont suggests that in-state supplements, such as decontamination teams from local fire departments, would also be inadequate.[3]

[3] The exercise took place on Arbutusland Farm in Orwell, Vermont on March 31, 2012. Responders were members of the Addison County Decontamination Team, one of the state's largest, best-trained and best-equipped teams, recruited from local volunteer fire companies. Dr. Julie Smith was the Incident Commander. C&D of just one truck at one stop (out of 8 dairy farms in Orwell and 145 in the county) required nearly all of the decon assets of the entire county for most of a day. Julie Smith, Milk Truck Cleaning and Disinfection Drill in Orwell, VT blog (April 11, 2012); UVM Extension: Milk Truck Decontamination Drill video on You Tube (May 16, 2012); Louis Bedor, Milk Truck Cleaning and Disinfection Drill, Addison County Regional Planning Commission Update (April 2012); University of Vermont Extension, Developing and Implementing a Community-wide Biosecurity Plan, broadcast on "Across the Fence", WCAX TV (May 22, 2012). Note, too, that the Canadian Food Inspection Agency (CFIA) conducted a winter field trial of manual cleaning and disinfection of vehicles during a foreign

AN ALTERNATIVE

> Why not reduce risk of contaminating trucks in the first place?
> Why not move milk to the truck rather than the truck to the milk?

Instead of backing up to the bulk tank (close enough for the onboard hose to reach, normally 30 feet or less), park the tanker farther away, in an area that is better isolated from livestock, milk, feed, or manure handling and related fomites. Park the truck on the public way, just outside the farm gate or, if necessary, at an on-farm site that is biosecure, strictly separated from operations that touch livestock. A farmhand could unroll a long coil of sanitary, food-grade hose maintained on-farm to connect the bulk tank to the tanker.[4] Depending on the intervening distance and elevation, a standard pump aboard the tanker or on-farm could be used to pull or push milk from the bulk tank onto the tank truck. (See "Practical Limitations" below.) The hose could then be capped, disconnected, and rolled back to an on-farm facility for sanitizing, per the PMO. In the meantime, after disinfecting the point of connection on the truck and any spilled milk, the truck could be on its way to the next stop, without extra time or effort to C&D the truck or the driver.

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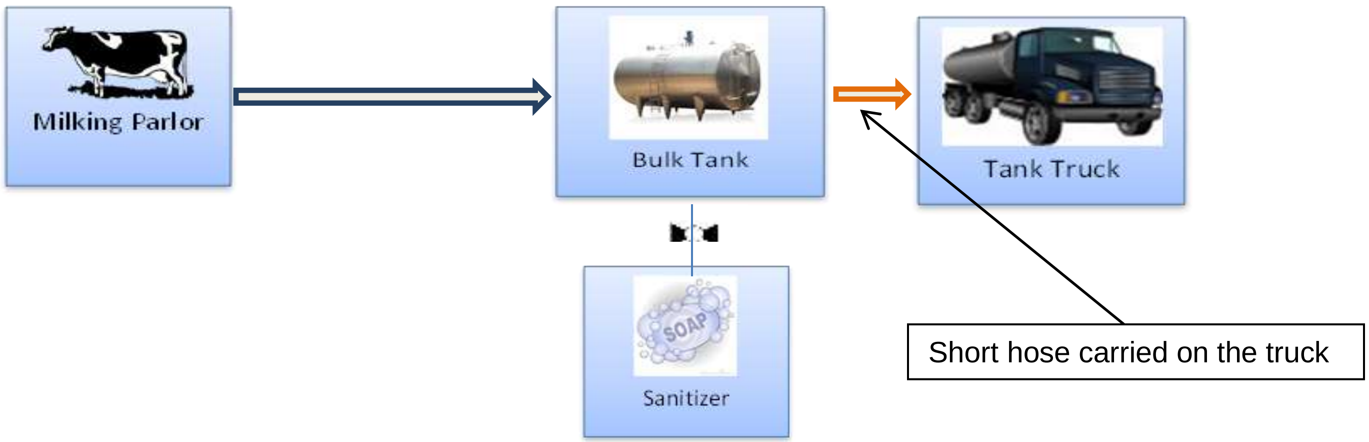
animal disease outbreak. Six people, working with the benefit of state-of-the-art training, equipment and supplies required 16 man-hours to C&D just one vehicle. Nevertheless, undercarriages remained soiled and sampled surfaces failed to meet an EPA benchmark for pesticide reduction in pathogen loads. A USDA/APHIS environmental engineer detailed to DHS to work on the C&D challenge, concluded: "Canadian field trial showed manual decon is slow and ineffective." Lori Miller, Presentation to the Secure Milk Supply Risk Assessment Working Group (January 15, 2013).

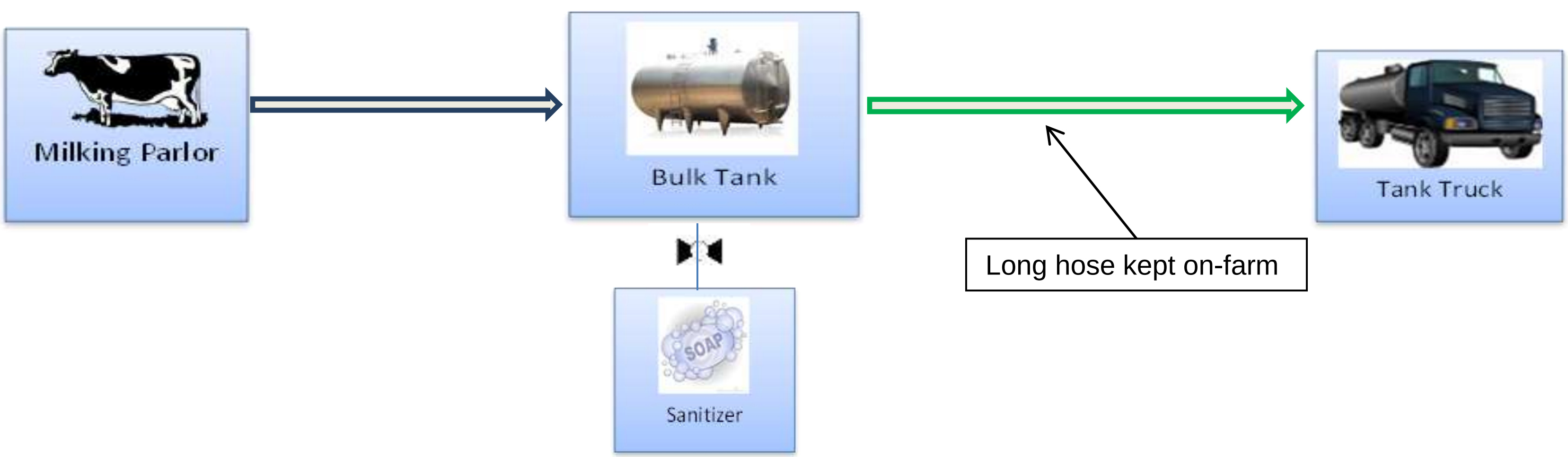
[4] See U.S. Department of Health and Human Services, Public Health Services, and Food and Drug Administration (USPHS/FDA), Grade "A" Pasteurized Milk Ordinance [PMO] (2011 Revision), especially conditions required for making milk hose connections to a tank truck in Item 5 r., "Milkhouse – Construction and Facilities," pp. 36-41.

Milk Flow Path

Normal

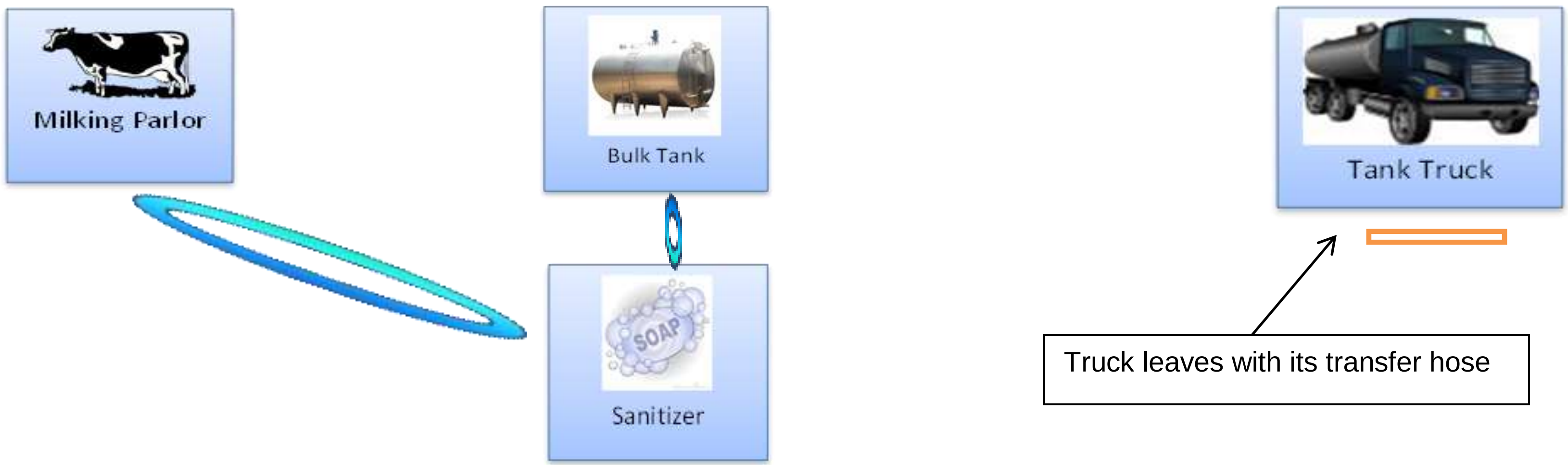


Alternative

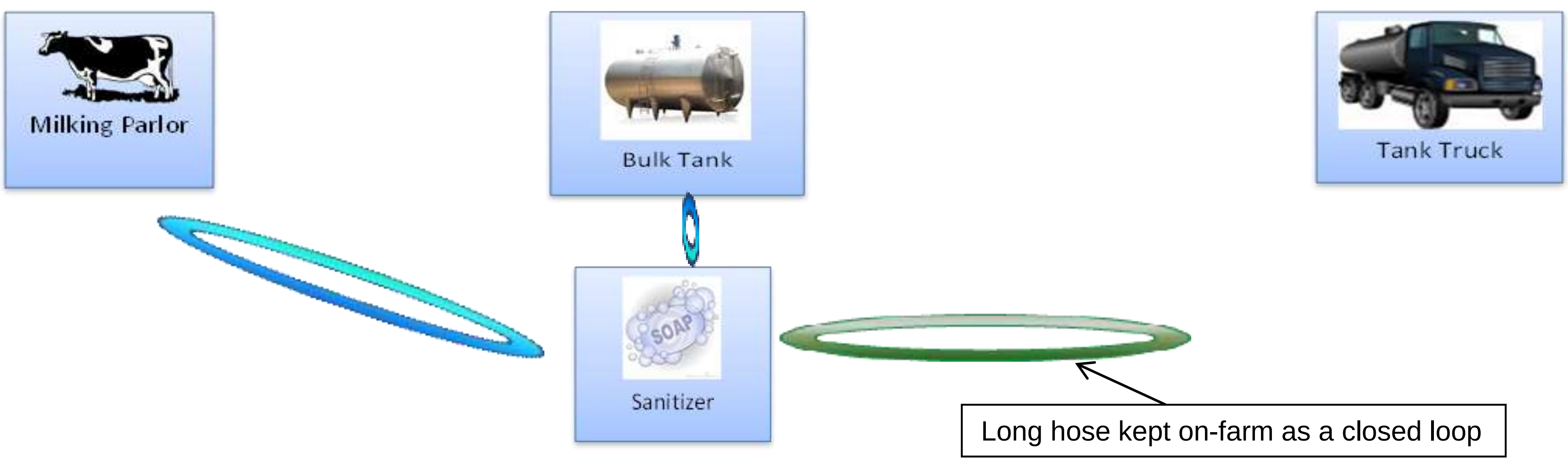


Sanitizer Flow Path

Normal



Alternative



POTENTIAL ADVANTAGES

- Reduce the hauler's exposure to contaminants that might be on a farm (e.g., less risk of tires rolling through muck that is more hazardous than what is already on the public roadway).
- Reduce the farm's exposure to contaminants that might be carried by a hauler, the vehicle, the driver, on-board hose or vents (e.g., greater distance between potentially aerosolized virus and livestock).
- Reduce or eliminate the time and effort of on-farm C&D of the truck exterior, driver, or cab interior.
- Reduce cost (e.g., one-time, per farm cost of about $500 for 100' of hose and fittings vs. as much as $500-1,000 for every farm stop for the duration of the emergency[5]).
- Reduce the strain on farm, hauler, and state resources, freeing resources for other emergency requirements and dairy continuity of operations.
- Use familiar technology. The necessary equipment and procedures are nearly identical to those farmers use every day (e.g., making and breaking connections via clamp or threaded fittings and sanitizing hose in and around the milk house).

POTENTIAL DISADVANTAGES

- Some farms – maybe most of them – will not be suitable for pickup in this manner (e.g., if the bulk tank is too far from the public way and on-farm parking options are too vulnerable to contamination. See "Practical Limitations" below.)[6]
- Some of the procedures could be difficult. The hose would be tough or at least awkward to handle, empty, and clean. (E.g., 100' of 1½" hose by itself weighs 30-100 pounds, depending on the type, and it can hold more than 9 gallons – about 80 pounds – of milk.)
- This alternative could be different enough from normal routines to require additional support, training or oversight (e.g., extending familiar routines to assure proper maintenance and cleaning of the exterior as well as the interior of a hose).
- In effect, an undetected "hot zone" risks expansion via the unrolling or emptying of the hose. (E.g., potentially contaminated milk might be spilled and require decontamination yet farther from livestock and closer to public traffic.)
- Additional equipment would likely be required either as inventory in advance of an incident or as an emergency-response resource at its onset. (See "Equipment" below.)

When feasible, using a longer hose to avoid contamination may be easier, faster, less expensive, and more effective for both disease control and business continuity than on-farm C&D of tank trucks in a control area.
(See "Practical Limitations" below.)

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[5] These are rough, "ball-park" estimates in January 2013. The equipment estimate comes from conversation with two dairy farmers and four on-line, dairy-supply catalogues. The C&D estimate comes from conversations with two clean-up contractors (one national and one regional company).

[6] In advance of developing this alternative, NESAASA began surveying regional dairy farmers. Among the questions: "Could a hauler pick up milk without the tanker entering the farm premises?" So far (with about 30% of 1800 farms surveyed), 20% said "Yes, it could"; 27% said "Not now, but it could be arranged with a day or two to prepare"; and 53% said "No, it's impossible." Note, too, with friction loss, greater distance increases the minimum required capacity of a pump (about 10 PSI per 100' of 1½" hose).

EQUIPMENT

- **Pump**
  Farmers and haulers agree that standard pumps – the models on nearly all tank trucks and farms – would likely suffice for transporting milk 100’ or even 200’, depending on the hose diameter, rise and distance required. The suction pump aboard a typical tanker is designed to establish and maintain prime for a distance of about 30’ and 20’ upgrade, but the same pump could be operated so as to pull milk as much as 100’ or even 200’ from the bulk tank, if the grade were level or downhill (using gravity to help establish prime and reducing pump speed plus a 1’-2’ vertical loop near the tanker to maintain it. Since milk parlors in New England tend to be elevated above the public way, gravity should help.) They also say that the sanitary, impeller-driven centrifugal pumps that most farms already maintain for moving milk or sanitizer could easily push milk through 1½” hose out 100’ or even 200’ and upgrade as much as 20’ at 30 gallons per minute (GPM), if the pump is rated for at least 30 PSI (70 feet of head), as most are.[7]

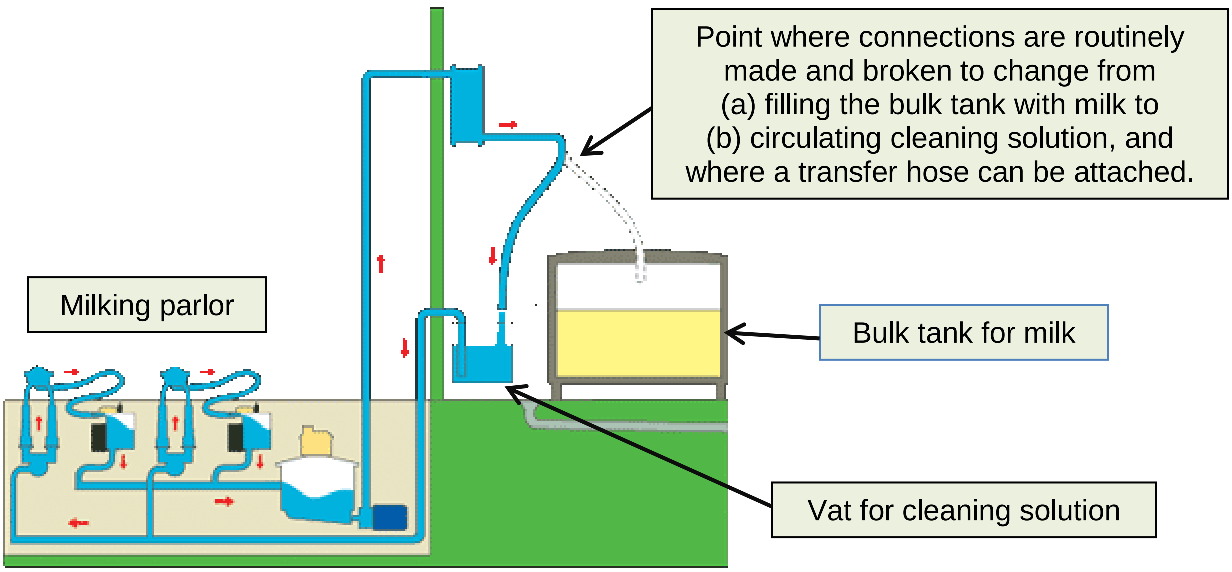
- **Hose**
  Sufficient 1½” or 2” inside-diameter (ID) food-grade hose would be needed to reach from the bulk tank to the tank truck, parked a safe distance away. Several types of hose are widely available and well-stocked (e.g. in 50’, 100’ or longer rolls) by dairy supply companies. Some farmers already have a coil hanging in the milk house for back-up transport of milk or sanitizer. (See “Demonstration of Equipment and Procedures in New England” below.) The hose costs about $5 per foot for 2” or about $3 per foot for 1½” ID, which would be easier to handle. If attached to a suction pump like the one mounted on the tanker truck, the hose would need spiral reinforcement to prevent collapse; for a standard push pump, spiral reinforcement would be unnecessary.

- **Fittings**
  Connections in dairy pipes and hoses are quite standard, and many farmers keep a stock of spare parts. In or around a milking barn, just about every pipe or hose is either 1½” or 2” ID. Connections, which are made and broken every day in normal milk handling and sanitizing, are dominated by just two types: clamp fittings and threaded fittings, also just of two sizes. (See “Demonstration of Equipment and Procedures in New England” below.) Since the need to join 1½” fittings to 2” fittings is also common, farmers often have reducers as well as caps on-hand, and many haulers carry them on their routes. In most cases, bulk tanks have a 1½” or 2” ID male threaded fitting at their outlet, while tank trucks have a 2” female threaded intake. So, a transport hose would need a minimum of two sets of fittings to make a male and female connection at each end: two 2” ID bevel seat ferrules (one threaded and one plain) and a threaded nut, plus a few hose clamps. Even if caps and adapters were also necessary (e.g. for fitting a 1½” hose to a 2” bulk tank outlet or a male-to-male adapter), the total cost of these fittings should not exceed about $200.

- **Hose Reel**
  In some cases, a reel or reel cart would be handy or necessary to move, position, sanitize and store the hose.

[7] Centrifugal pump capacity is generally measured in “feet of head,” which can be converted to PSI by dividing by 2.3. GPM depends on load as well as capacity. Standard dairy industry calculators show that a centrifugal pump with a capacity of 30 psi (69 feet of head) could readily push milk at 30 gpm as much as 200’ out through 1 ½” sanitary tubing, even with 3 elbows and a rise of 10’.

Normal Flow Path for Cleaning Solution in a Milking Barn[8]



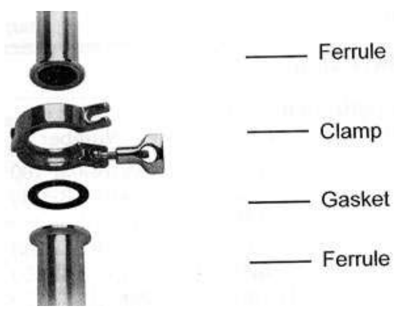
[8] Image from DeLaval, Circulation Cleaning in on-line "Dairy Knowledge" (January, 2013). See also Dairy Practices Council, "Installation, Cleaning and Sanitizing of Large Parlor Milking Systems" DPC 4 (2010) and Guidelines for Cleaning and Sanitizing in Fluid Milk Processing Plants, DPC 29 (2001).

Examples of Sanitary Connections[9]

Clamp Fittings

A Connection is made up of a plain ferrule, a clamp, and a gasket. Tees, elbows and reducers are available with Tri-Clamp connections. All three styles are in compliance with 3A standards for Clean In Place (CIP). The three types of clamp fittings are designed for use in food, dairy, pharmaceutical and chemical industries.

- Tri-Clamp connections are the industry standard, having nueter-style ferrules to simplify design and installation.
- H-Line and HDI-Line male/female ferrules self-align during tightening so joints are quick and easy to assemble or take apart.
- H-Line uses the same series of clamps as the Tri-Clamp.



Threaded Fittings

A connection is made up of a plain ferrules, a threaded ferrule, a nut and a gasket. The faces on Bevel Seat fittings are angled to create a metal to metal sealing surface. A John Perry fitting consistes of a flat-faced threaded ferrule, a flat-faced plain ferrule and a profiled gasket. These joints are particularly useful with swing connections and flow diverter panels. A DC fitting utilizes the Bevel Seat plain ferrule and a threaded ferrule with a grooved face to retain a gasket. The three types of threaded fittings are designed for use in the food, dairy, and beverage processing industries. Bevel Seat Joints are in compliance with 3A standards for manual cleaning. Both John Perry and DC fittings are in compliance with 3A standards for CIP.

[9] Description from Alfa Laval, Sanitary Fittings and Basic Valves Catalog and photos from miscellanous on-line vendors (December, 2012).

Examples of Hose Reels[10]

[10] Images from miscellaneous on-line catalogs of hose reel carts, fuel- and firehose reels, and a home-made variant, wheeled or trailer-mount, with costs ranging from $300 to about $1,000 (January, 2013).

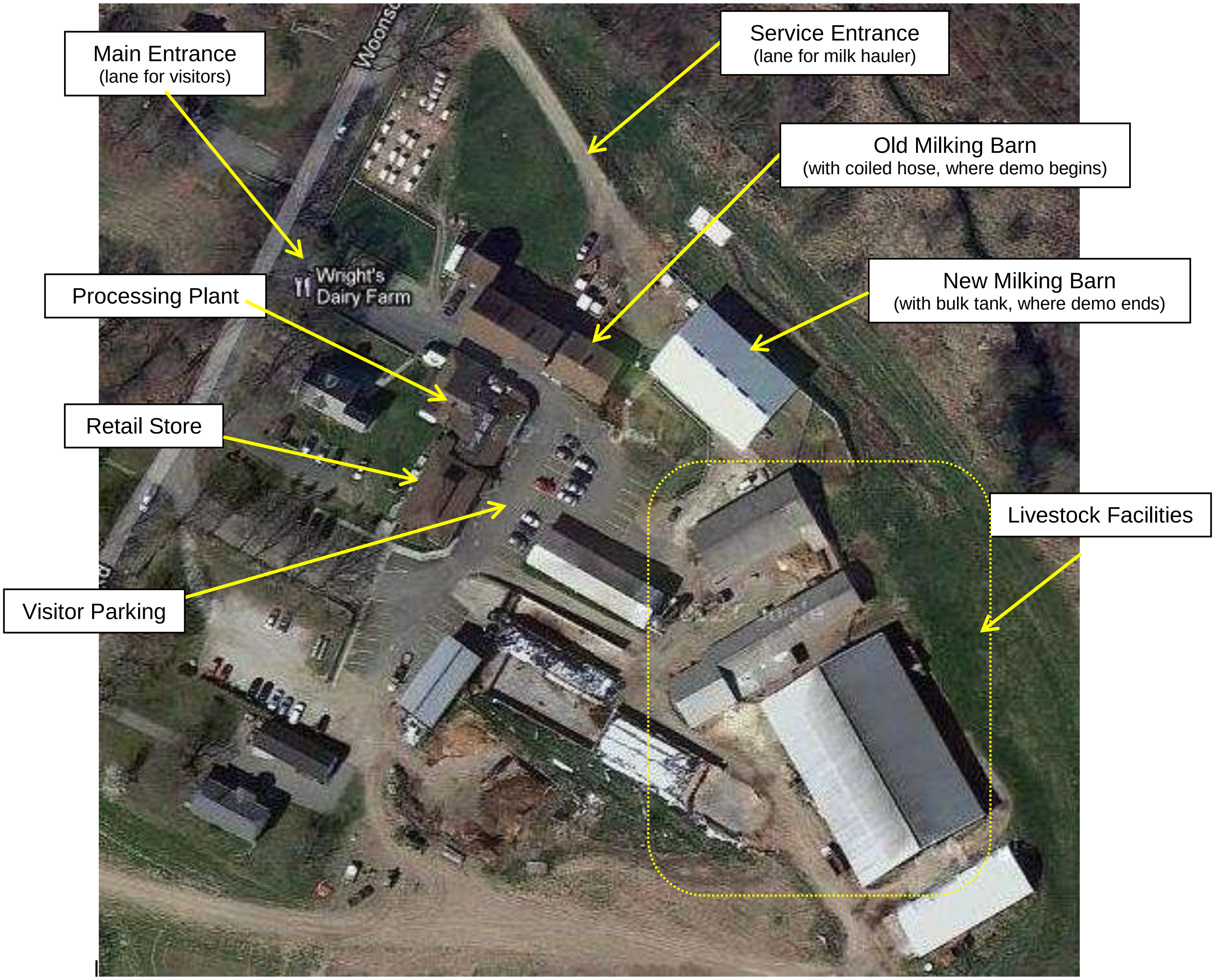
Demonstration of Equipment and Procedures in New England

The demonstration was provided by [Wrights Dairy Farm]() in North Smithfield, Rhode Island on December 26, 2012.

Operating for more than a century, Wrights is a family farm, a “Producer-handler” milking about 130 cows for its own on-site processing plant and retail store. Surplus milk is also regularly shipped to market via a tanker engaged by their cooperative.

A steady stream of customers shop at Wrights bakery and store, and these visitors are welcome to walk around certain areas of the livestock facilities. The farm and the store have separate entrances, but they stand on either side of the main visitor parking lot. Wrights has already made plans for barricading the lot, in the event of an animal disease emergency.

Layout at Wrights Dairy Farm



Clayton Wright is the manager of the milking operation, and he demonstrates normal use of hose in sanitizing pipe and ways it might be used to move milk in an emergency. He is pleased to report that both “the state and the feds” (i.e., inspectors from the Rhode Island Department of Health and the U.S. Food and Drug Administration) within the past couple of weeks conducted a surprise inspection of all of the equipment that he is demonstrating and found it in compliance with existing regulations, including the PMO.

An old milking barn has been adapted to hold equipment for sanitizing the stainless-steel line that runs from the new milking barn to the processing plant (about 200’ away and 20’ upgrade). A coil of food-grade hose hangs near the sanitizing equipment, and a steel channel has been imbedded in the asphalt entry lane to the visitor parking lot to protect the hose from crossing vehicles, when the hose is unrolled. Clay says, “We use it every day. It’s handy because we have to move milk to different buildings, and we can’t have hard pipe across the lane.” Although the hose is now used for sanitizing, Clay adds that it has also been used for moving milk. Although the old milking barn pump is smaller than a tanker’s, it has proven adequate for sanitizing or pushing milk from the bulk tank in the new milking barn up to the processing plant.

Routine sanitizing entails breaking and remaking connections to form a closed loop in hoses or pipes that carry milk. Hose is a very common component of such closed loops. These photos show a connection from food-grade hose to stainless-steel line ("hard to soft line," with both clamp and threaded fittings) that is used in sanitizing: "standard food-industry stuff." A vat by the window is used to hold rinse and cleaning solution when a closed loop is formed

A simple diversion valve is used to control water in the sanitizing process. The diversion valve regulates flow into a vat, which receives sanitizing agents dispensed by an electronic wash control perched above agents stored in plastic containers: (left-to-right) acid, soap, and chlorine. On a farm without a wash control, a farmhand may simply measure and pour agents into such a vat, or the bulk tank itself could be used as a vat. The procedure, detailed in the PMO, is well known on every dairy farm: 1) Drain the pipe; 2) Rinse; 3) Wash with a hot soapy solution; 4) Drain; 5) Acid rinse; 5) Wash with a chlorine solution. If hose were added for moving milk in an emergency, it could be connected and sanitized by the same, universal and familiar connections and procedure.

Clay holds a female threaded connector attached to a food-grade hose, which fits the male threaded outlet on a bulk tank. Nearby is an older hose with a similar connector.

Clay points to the capped male threaded outlet (1½ " ID) of an old bulk tank and the motor with impeller that is now used to move cleaning solutions but that can also be used to push milk.

An idle spare pump is a variant on the pump now used in the new milking barn. Note again, standard connections, including threaded and clamp connectors between a pipe and a hose.

The bulk tank currently in-use is in the new milking barn, closer to the cattle. The tank has its own electronic wash controls. A clear plastic cap is in place both to cover the bulk tank outlet and to allow for emersion during sanitizing, at the same time as the tank interior. The lines from the milking machines are routinely connected so as to form a separate closed loop for cleaning solutions with the same controls at the bulk tank.

Clay shows some standard fittings on-hand: a pair of 1½ " ID ferrules (one plain, one female threaded) and a pair of adapters (a 2"-to-1½ " threaded reducer, and a threaded-to-clamped connector).

Clay demonstrates one way to attach a hose to the outlet of the bulk tank, in this case using a pair of adapters and a clamp fitting, as routinely done in sanitizing lines from the milking parlor.

A new vat for washing, rinsing and sanitizing is located next to the bulk tank in the new milking barn. Clay points out the lines that are attached to the closed loops, the lines for soap, acid, and chlorine, the diversion valve, and the hooked rod he fashioned to hang fittings in the vat for sanitizing.

PRACTICAL LIMITATIONS

Introduction

Existing regulations and on-farm conditions could render a longer hose, as outlined here, difficult or impossible to use in reality. Some constraints (e.g., the prescribed role of the bulk milk hauler/sampler in making tank-to-tanker connections and securing samples) could be tough to adapt, no matter how milk is transferred in a disease emergency, whether through conventional pickup with added farm-gate C&D or through this longer-hose alternative. Other constraints, though, depend on the chosen method of transfer.

> In an emergency, in fact, *could* New England farms use a longer hose to move milk from the bulk tank to the tanker?
>
> Granted, no one technology would work on all farms, but would it work on enough of them to make a longer hose worth adding to continuity-of-operation options?

Clearly the best way to gauge feasibility would be through experimentation: Try both technologies (conventional pickup with farm-gate C&D and a longer-hose alternative) on every farm or a representative sample under normal, best- and worst-case conditions, and then compare the results. Such experiments would be useful in themselves for trianing, too, but at very high cost. Second best would be to simulate such experiments: Base projections on assessments of actual farms, the site-specific conditions for application of each technology, given its known capacity. Again, the strategy would be valuable but also costly, given the large number and variety of farms in six states. Next best would be to assemble more generic projections from people with professional knowledge of prevailing conditions in the region and available technology. That is the strategy followed here.

The two main sources are national experts in the technology (e.g., engineers, academics, and product representatives with experience in dairy operations design, equipment manufacture and sales) and New England dairy farmers themselves.

Each group brings distinct insights. The experts, with equipment data sheets and interpretive software, are skilled in anticipating precise hardware capacities as well as serviceable rules of thumb under a range of conditions, but they have less knowledge of specific conditions and regulations that regional farmers face. Farmers, on the other hand, from daily operational and regulatory experience, well know the range of conditions and regulations, but they have had little or no experience implementing the elevated biosecurity measures that a disease emergency would require. Hence, roughly speaking, the perspectives complement each other.

The following is a summary and interpretation of projections from the two points of view.

Projections by Experts in the Technology

According to experts, most farms could transfer milk from the bulk tank to a tank truck 100-200' away.

Experts in milk transport equipment warn that an alternative, longer-hose milk transfer would not be practical in many circumstances. In particular, if the farm lacked the necessary equipment (sufficient hose being the most likely deficiency) or if the distance from the bulk tank to a biosecure spot for the tanker were greater than 200' away and 20' higher than the bulk tank, readily available pumps (whether aboard the tanker or at the farm) probably could not handle the load.

Within that limit (200' out and 20' up), however, experts warn that the technology still might not work. A key consideration is the relationship between the layout of the farm (especially the specific distance and elevation from the milk barn to a biosecure spot for the tank truck) and the variety of pump, its type and capacity.

For a suction pump on the tanker truck to suffice, the main concern is establishing and maintaining prime.[11] The pump aboard a tanker is normally designed to establish and maintain prime for a distance of about 30' and as much as 22' upgrade, but the same pump could be operated so as to pull milk as much as 100' or even 200' from the bulk tank, if and only if the grade were level or downhill (using gravity to establish prime). A reduced pump speed (ideally with a 1'-2' vertical loop added near the tanker) would help maintain prime (i.e., avoid cavitation). Since milk parlors in New England tend to be elevated above the public way, gravity would generally help.

A tanker-mounted pump can be expected to provide two key advantages over an on-farm pump.

First, tanker pumps tend to achieve a higher rate of flow and hence to unload a bulk tank more quickly. For example, the largest manufacturer of tanker pumps (Jabsco) supplies pumps for tankers with capacities ranging from 90 to 185 gallons per minute (GPM). According to local Jabsco distributors, New England haulers tend to use 90 or 100 GPM pumps, though actual unloading speeds are apt to be much slower.

On-farm pumps, however, have a larger number of manufacturers and models. In general, these centrifugal pumps tend to be less expensive and smaller in capacity. The typical speed is likely half the tanker's maximum, meaning potentially double or even triple the normal time required for transfer.

In practice, a rule of thumb transfer speed of 30 GPM (5' per second in 1½" hose) would be practical and achievable for either sort of pump.

[11] Certain kinds of pumps (e.g., a liquid ring pump) can move both fluid and air, as needed, to maintain prime. So, they could likely overcome that limitation of tanker pumps, but they are much more expensive and apparently not yet used in New England.

Typical Milk Transfer in New England[12]

Producers' current estimate of time required per pickup with tanker pump:
- Range from 5 to 120 minutes
- Average (mean): 24 minutes
- Median: 20 minutes
- Mode: 20 minutes

Amount of milk expected per pickup:
- Range from 100 pounds to 74,000 pounds (12 to 8,600 gallons)
- Average (mean): 9,082 pounds (1,056 gallons)
- Median: 5,100 pounds (593 gallons)
- Mode: 5,000 pounds (581 gallons)

Estimated time required, pumping at 30 gallons per minute:
- Range from less than a minute to almost 5 hours
- Average (mean): 35 minutes
- Median: 20 minutes
- Mode: 19 minutes

On the other hand, since on-farm pumps can be placed below the outlet of the bulk tank, establishing and maintaining prime is much less of a challenge. A small push pump can transport milk farther and higher than a suction pump many times its capacity and cost.

Second, suction pumps like those mounted on tanker trucks can more easily and thoroughly empty the hose when the bulk tank is drained. An empty hose means less potential spillage or waste and a much lighter hose to handle, when transfer is complete.

Conventional centrifugal pumps like those normally on-farms must stop when they run out of liquid, but milk could still be emptied from the hose by one of three options:
- Add a tee connection with a valve near the bulk tank, and use clean, dry air from a compressor to chase the milk out the line.
- Chase the milk with water and divert or cap the hose as soon as any water is suspected to reach the tanker.
- When flow stops, turn off the pump, and raise the hose to drain it back into the bulk tank or a safe disposal site.

With either a tanker-mounted or on-farm pump, it should be possible to get all but a small amount of the milk out of the hose.

With such limitations in mind, how often – on what share of New England farms -- could the long-hose actually work? In the absence of expert site assessments, thanks to the ongoing NESAASA Readiness Review, farmers themselves can contribute an estimate.

[12] Data are from the New England SMS Project Survey of dairy producers in New England with about 30% of farms reporting to date (2013). Note that producers' estimates of time required per pickup presumably includes time not only to operate the pump also to sample milk and connect and disconnect hose.

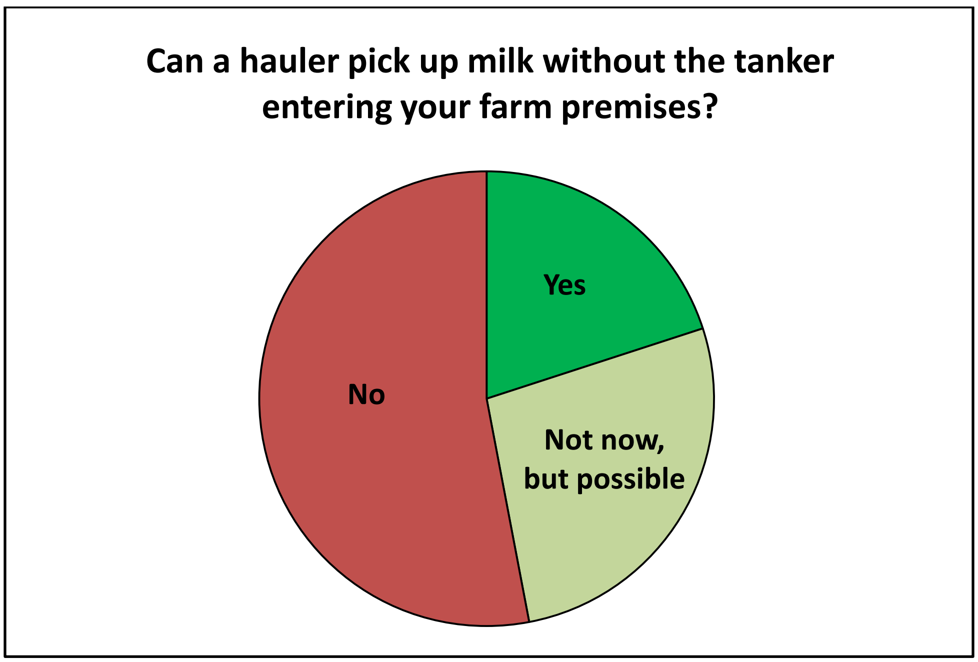
According to farmers themselves, milk could be transferred off-premises on about half of the region's dairy farms.

The six New England states have begun a systematic survey of all of their licensed dairy farms, nearly 1,800 in all. On-site and in the presence of a state official, farm managers and owners are being asked to answer questions about each farm's readiness to implement biosecurity measures that may be required in a disease control area. So far, surveys of about 30% (524) of the farms are complete.[13]

Albeit free to imagine their own standards of performance, for each measure farmers are to select one of three options:

- Yes. The capability is already in-place, ready-to-go.
- Not now, but it's possible. The capability is not yet in-place, but we could establish it with our own resources, within a day or two.
- No, it's impossible. Establishing the capability would require more resources than we could muster on our own within a couple of days.

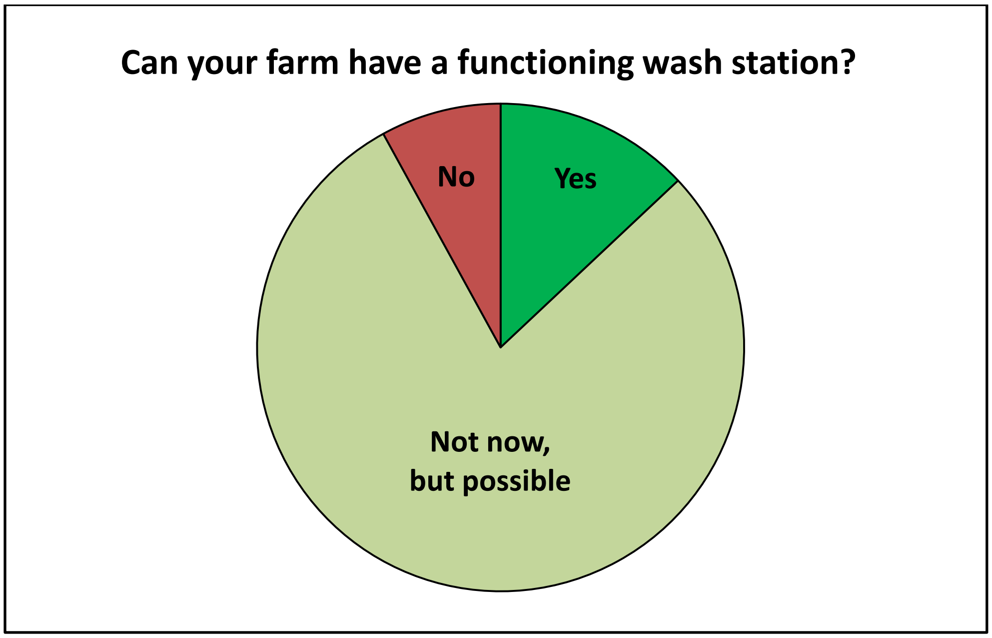
When asked if a tanker could pick up milk from their farm without entering the premises, relatively few respondents (20%) said, "Yes," that it could be done on their farm right now. A larger minority (27%) said, "Not now, but it's possible." So, according to farmers themselves, with a bit of warning and left to their own devices, milk could be transferred off-premises on about half (47%) of the region's dairy farms.[14]



[13] See NESAASA, New England Secure Milk Supply Project (2013), especially Assessing Farm Readiness for Emergency Milk Movement in New England (April, 2012).
[14] Note that the question excluded the possibility of transferring to a biosecure site on-premises. So, in this respect, feasibility is likely underestimated.

This estimate of the feasibility of transferring milk with the tanker off-premises is worth comparing with the capability to C&D trucks at the farm gate, as a more conventional milk pick up is apt to require.

When asked if their farm had a functioning wash station, an even smaller minority (13% vs. 20%) of farmers said "Yes," that they had that C&D capability right now. In other words, the longer hose alternative is actually closer to reality at the moment. But a much greater share (79% vs. just 27%) said "Not now, but it's possible," that they could mount a wash station in an emergency. So, according to farmers themselves, with a bit of warning and left to their own devices, wash stations would be more feasible on the vast majority (92% vs. 47%, nearly twice the share) of the region's dairy farms.



Of course, in an emergency, every safe way to move milk may be precious. There is little reason to foreclose options, and farmers say that they are eager to do whatever they can. Note, for example, of New England dairy farmers surveyed to-date:

- 32% of the few respondents (8%) who consider it *impossible* to establish a wash station also consider it *possible* to load a tanker off-premises.
- 72% of the few respondents (13%) who say they have a functioning wash station also say that they consider it *possible* to load a tanker off-premises.
- Only 6% say that neither technology (moving milk off-premises or mounting a wash station) would work on their farm. [15]

Farmers and experts seem to agree that a longer hose could be used on a significant share of New England farms – maybe as much as half of them – to reduce risk of tanker contamination and promote continuity of dairy operations in an animal disease emergency.

[15] "Possible" in these three sentences refers to the total share of farmers answering either "Yes" and "Not now, but possible." "Impossible" refers to the total share of farmers answering "No, impossible."