

**Commonwealth of Virginia
Department of Agriculture and Consumer Services
Dairy Services
PO Box 1163 - Richmond, VA 23218 - 804-786-1452**

**Direct Loading with an In-Line Sampler
and
Sample Collection for Official Analysis
09/2018**

This publication has been prepared for the purpose of pointing out requirements and recommendations for a direct load installation, as well as to specify procedures that a permitted in-line sampler must follow in carrying out his/her duties.

An applicant must successfully pass a written examination based on the information in this publication in order to receive a permit to *Weigh and Sample Milk from an In-Line Sampler for Official Analysis*.

NOTE: This document and accompanying test is only for individuals sampling milk from an in-line sampler. Should the individual wish to weigh and sample milk from bulk tanks and/or transport that milk, additional testing will be required. See your VDACS dairy inspector.

When an in-line sampler is installed at a dairy farm facility, a separate structure to house the bulk milk tank trucks is not required. FDA describes the application and standard operating procedures (SOPs) for the installation and use of approved in-line samplers for the collection of dairy farm raw milk samples from direct load tankers as required in Section 6 of the Grade A Pasteurized Milk Ordinance (PMO).

In-line milk sampling is used when the dairy facility is set up to direct load bulk milk tankers, bypassing the use of conventional bulk milk tanks for cooling and storage. The milk flows from the receiver through a chiller or plate cooler that cools the milk to $\leq 40^{\circ}\text{F}$. The milk then goes through to the in-line sampler where a small amount of milk drips into a sample container positioned inside a refrigerator. From there, the milk flow continues directly to the bulk milk tanker.

There are three approved in-line sampling devices: QMI, ISOLOK, and Anderson Instruments. (Note: The Anderson Instruments set-up includes a flow meter prior to the in-line sampler.) It is important for the producer, installer, field person, and regulatory personnel to meet prior to construction of the project. A Farm Plan Submission Guide and detailed drawings must be submitted to the VDACS inspector for review and approval.

1) General Construction Requirements for In-Line Samplers

- a) The bulk milk tankers must be parked on an impervious surface that is sloped to drain and maintained clean in all weather conditions.
- b) The tanker load-out connections may be made in one of three ways:
 - i) Through tight-fitting doors in the milkhouse wall that have padded bumpers on the outside, ensuring the tanker fits tight against the milkhouse wall, or
 - ii) By running a flexible milk hose out through a hoseport and hooking it directly to the tanker. A cap with a cut-out for the hose must be in place during loading, and the hoseport must have a solid cap when not loading, or
 - iii) Any other means approved by the regulatory agency.
- c) Roof
 - i) Adequate coverage for the trailer must be provided if hose to tanker connection is made outside.
 - ii) It must be a permanent, solid structure and must provide protection from contamination.
- d) A clean, well-lit, impervious work surface of adequate size must be provided in the milkhouse for the sub-sampling of milk samples.
- e) Cooling
 - i) Sweetwater, well water, and/or glycol systems may be used to cool the milk going through the chiller.
 - ii) Propylene glycol, USP or food grade, is the approved type of glycol to be used. Industrial propylene glycol is NOT approved.

- iii) The producer must have a letter from the manufacture of the glycol, posted in the milkhouse, stating it is the approved type meeting the requirements of 21 CFR 184.1666.
- iv) Sweetwater and glycol storage tanks must be of proper construction and have tight-fitting, overlapping lids.
- f) Water system concerns with installation
 - i) Plate cooler water/fresh water add lines to plate cooler water storage tanks/fresh water feed lines downstream from storage tanks.
 - ii) CIP chemical addition/water connections to the wash vat.
 - iii) Calf milk pasteurizers/water connections for CIP and to cool the coils.
 - iv) Boiler systems – some are closed and some have fresh water add lines.
 - v) Grey water recaptured for parlor wash down.
- g) The interior lid and exterior dome lid of the bulk milk tanker must remain closed and sealed during the loading process. Proper vents on the tanker lid are to be installed to insure the required airflow.
- h) If using doors in the milkhouse wall, milk transfer lines must be hard-piped to the tanker access doors using short jumper hoses to attach to the bulk milk tanker.

2) General Construction Recommendations for In-Line Samplers

- a) Construct the milkhouse and the trailer parking area on the same grade level to facilitate ease of making the tanker connections.
- b) Provide a channel drain at the rear of the tankers along the milkhouse wall. This will facilitate cleaning between the milkhouse and the tanker where the loading connections are made.
- c) Install a CIP position switch on the milk pipeline system to prevent contamination of the milk with CIP solution
- d) Maintain an alternative sampler system in case problems develop with the primary sampler.
- e) Keep replacement silicone diaphragms on hand (Anderson only)
- f) Install the recording and indicating thermometers together in one thermometer well at an elbow for better milk contact and cleaning.

3) General In-Line Sampler Device Requirements

- a) Installation
 - i) An approved in-line sampling device must be installed inside a refrigerator that can maintain temperature at 32 – 40°F (0.0 – 4.4°C).
 - ii) The refrigerator must be installed in the milkhouse, and must be in an appropriate and easily accessible location in the milk line to ensure accurate sampling and proper cleaning.
 - iii) The installation must meet the approval of VDACS.
- b) Cleaning and sanitizing

- i) The in-line sampler must be cleaned and sanitized after each milking cycle via the pipeline CIP system and/or manually cleaned if needed.
 - ii) The sample container attachment area of the sampler shall be manually cleaned and sanitized after each milking cycle.
 - iii) During CIP, sample containers must not be stored in the in-line sample refrigerator.
- c) Sample containers
- i) The in-line sampler must allow a sample collection container to be attached directly to the sampler.
 - ii) It is recommended that the sample collection container be single service. If containers are reused, they must be cleaned and sanitized appropriately. All collection containers should be stored in a sanitary manner.
 - iii) Size of the milk sample container should be determined with the cooperation of the installer and VDACS to ensure it is of an adequate volume to prevent overflow. In all cases, the sample container must not exceed $\frac{3}{4}$ full to allow enough air space for proper agitation.
 - (1) In general, for the Anderson Instruments sampler
 - (a) Bulk milk tankers with a capacity of <50,000 pounds will require a 500 mL single-service sample collection bottle
 - (b) Bulk milk tankers with a capacity of >50,000 pounds will require a 1-liter sample bottle.
 - (2) The sample collection rate must be manually adjusted on the ISOLOK sampler.
 - (3) The QMI sampler rate is adjusted by changing the sample collection needle size.
- d) A protocol specific to each milk producer who direct loads milk tank trucks while utilizing an approved in-line sampler shall be developed by VDACS in cooperation with the equipment manufacturer, the milk buyer, the milk producer, and FDA. As a minimum, the protocol should include the following:
- i) A description of how the milk sample is to be collected, identified, handled, and stored.
 - ii) A description of the means used to refrigerate the sample collection device and milk sample collection container throughout the milk sample collection period.
 - iii) A means to monitor the sampler device temperature, the milk sample temperature, and the milk temperature.
 - iv) A description of how and when the sampler is to be cleaned and sanitized, if not of a single use design.
 - v) A listing of the licensed bulk milk hauler/samplers who have been trained to maintain, operate, clean, and sanitize the sample collection device as well as to collect, identify, handle, and store the milk sample.
 - vi) A description of the method and means that will be used to determine weight of the milk on the milk tank truck.

4) Refrigerator Requirements

- a) Two refrigerators are required
 - i) The in-line sampler refrigerator must be of an appropriate size to hold the sample container and the in-line sampler (if applicable).
 - ii) The sample storage refrigerator must be in the same room as the sub-sampling area.
- b) Refrigerators:
 - i) Must be able to maintain the sample between 32 – 40°F (0.0 – 4.4°C).
 - ii) Shall only be used to collect and store samples. No food, beverage, chemicals, drugs, or any other items not related to the samples or sampling process are to be stored in the units.
 - iii) Must be maintained in good working condition and repaired when necessary.
 - iv) Must be clean inside and out at all times.

5) Thermometer Requirements

- a) An accurate recording thermometer (and accompanying chart) shall be installed in the milk line.
 - i) The temperature probe shall be installed in the milk line downstream from the cooling device and prior to the in-line sampler device.
 - ii) It shall be installed in a thermometer well as close as practical to the required indicating thermometer.
 - iii) Charts
 - (1) Charts shall be changed prior to overlapping pen marks.
 - (2) When the chart is changed, the following shall be recorded:
 - (a) Date,
 - (b) Farm ID,
 - (c) and the initials of the person changing the chart
 - iv) Temperature recording charts must be retained for 6 months and stored in a clean, dry location.
- b) An Indicating Thermometer (digital display or dial) shall be installed in the milk line.
 - i) It shall be installed in a thermometer well downstream from the cooling device and prior to the in-line sampler device.
 - ii) It shall be installed in a thermometer well as close as practical to the required recording thermometer.
 - iii) The indicating thermometer must have a minimum scale of 2°F (1°C).
 - iv) During an inspection by VDACS, the inspector will compare the temperature readings on the recording and indicating thermometers and document on the inspection sheet.
- c) Refrigerator Thermometers

- i) A thermometer is required in both the in-line sampler refrigerator and the sample storage refrigerator.
- ii) They may be either digital, or liquid-filled in glass type stored in glycol.
- iii) Recording temperatures
 - (1) Refrigerator temperature must be recorded AM and PM from the thermometers and documented on the monthly temperature log.
 - (2) Alternately, a recording thermometer and chart may be installed on each refrigerator. In this case, no log is necessary.
- iv) During an inspection, the VDACS inspector will conduct an annual accuracy check at ice point of the refrigerator thermometers and will tag them appropriately.
- v) Thermometers must have a minimum scale of 2°F (1°C).
- vi) Check the temperature just prior to collection of the sample to insure that it is within regulatory compliance of 32 – 40°F (0.0 – 4.4°C).
- vii) Records
 - (1) The refrigerator temperature records shall be retained for six (6) months.
 - (2) The annual thermometer accuracy check shall be retained for two (2) years.

6) Milk Sample Collection Devices and Requirements

- a) Person(s) performing the sampling:
 - i) Must possess a valid VDACS sampling permit (specific to in-line sampling)
 - ii) Must be re-evaluated every 18 months
 - iii) Must wash their hands before handling the equipment used to collect the milk sample.
- b) QMI Direct Load Sampling Procedures
 - i) Device requirements
 - (1) The QMI device shall be installed in an appropriate location in the milk line to ensure accurate sampling and proper cleaning, and must meet the approval of VDACS and the equipment manufacturer.
 - (2) Use only QMI sterile septum inserts.
 - (3) Ensure the nut holding the insert in place is tight.
 - (4) Ensure the protective septum cover is in place at all times when the septum isn't in use
 - ii) Installation location
 - (1) If the QMI sampler is installed in a refrigerator, it must maintain an internal temperature of 32 – 40°F (0.0 – 4.4°C).
 - (2) If the QMI sampler is not installed in a refrigerator, the container used for milk collection must be. Tubing shall be no longer than necessary.
 - iii) QMI septum
 - (1) There are 7 sampling ports on each QMI septum
 - (2) Use a new port each time you are loading a new tanker.
 - (3) Replace the septum after all 7 ports have been used.

- (4) NOTE: If a positive antibiotic result is obtained, the septum must be manually cleaned, sanitized, and replaced prior to next milking.
- iv) Sample collection equipment
 - (1) Sample collection containers
 - (a) Reusable containers
 - (i) Shall be hand washed and sanitized after each use.
 - (ii) NOTE: If a positive antibiotic result is obtained, the reusable sample collection container must be discarded and replaced.
 - (b) Single service use containers
 - (i) Must only be used for collecting the sample from one (1) tanker.
 - (ii) The container is discarded after the official sample is taken.
 - (2) Collection containers shall be stored in a sanitary manner.
 - (3) The sampling apparatus (needle and tubing) and sampling bag can be purchased assembled or be assembled on site. The sampling apparatus can be used to collect the sample from one (1) tanker only. After the tanker is full the sampling apparatus must be discarded.
 - (4) Needle size
 - (a) Shall be determined by the installer, user, and VDACS.
 - (b) Should meet the rate and volume state on application.
 - (5) The size of the milk sample container is to be determined in cooperation with VDACS to ensure that the container size is adequate so overflow doesn't occur and so there is enough air space to agitate.
- v) Sample collection process
 - (1) Tanker
 - (a) Ensure the tanker wash tag is in date and seals are in place.
 - (b) If the wash tag is expired or seals are missing, do not put milk in that tanker.
 - (2) Sanitize outlet valve on tanker and stub end of transfer hose.
 - (3) Hook up transfer hose to tanker.
- vi) At the start of milking or a new tanker
 - (1) Label a cleaned, sanitized, and dry sampling container (multi-use container) or a new, sterile one (single use container) with
 - (a) Date
 - (b) Time
 - (c) Producer ID
 - (d) Initials of person installing container
 - (2) Attach container to the in-line sampler and ensure proper position.
 - (3) Ensure sampling refrigerator temperature is between 32 – 40°F (0.0 – 4.4°C).
 - (a) Corrective action must be taken if there is a temperature problem.
 - (b) Document all corrective action(s) taken and retain on file for six (6) months.
 - (4) Remove the cover from the septum

- (5) Use alcohol or sanitizer to sanitize the white cover over the septum surface.
 - (6) Insert needle into a port. There are 7 ports in each septum. Use a new port each time you start a new tanker. NOTE: When subsequent milkings are going into the same tanker, you can reuse the port.
 - (7) If not using pre-assembled bags, remove the cover from the needle on the discharge side of the sampling tubing and insert the tubing into the sample bag.
 - (8) Regulate milk flow into the sample container.
 - (9) Place the sample container into the sampling refrigerator, if the unit is not already installed in a refrigerator, and close the door.
- vii) At the end of milking
- (1) If the tanker isn't full and will require more milkings to fill
 - (a) Remove needle from septum
 - (b) Replace the needle cover (stored in the fridge)
 - (c) Place the protective cover over the QMI septum.
 - (d) Place the tubing and covered needle into the fridge.
 - (e) (At the start of the next milking, repeat steps vi(1) through vi(9) until the tanker is full
 - (2) If the tanker is full and no more milkings will go in it
 - (a) Remove needles from septum and sample container.
 - (b) Immediately close sample container
 - (c) Record the milk temperature on the sample collection bag and place in the sample storage refrigerator.
 - (3) Sample containers should be no more than $\frac{3}{4}$ full.
 - (4) CIP and sanitize the QMI septum.
 - (a) When replacing the septum after all 7 ports have been used, the opening that the septum sets in must be hand washed.
 - (b) The sample collection container must be stored in the sample storage refrigerator during CIP, not stored in the sampling refrigerator.

c) Anderson Direct Load Sampling Procedures

- i) Device requirements
 - (1) The Anderson Instruments device shall be installed in an appropriate location in the milk line to ensure accurate sampling and proper cleaning.
 - (2) The Anderson sampler shall be installed in a refrigerator that must maintain an internal temperature of 32 – 40°F (0.0 – 4.4°C).
 - (3) Cleaning and sanitizing
 - (a) The Anderson sampler may be cleaned-in-place (CIP) and sanitized, or may be manually cleaned, after each milking cycle.
 - (b) The sample bottle attachment area of the sample shall be manually cleaned and sanitized after each milking cycle.
 - (c) NOTE: For the CIP cleaning of the sampler itself, make sure that the vacuum line and the two air lines are properly attached to the sampler.

The lack of vacuum does not allow the diaphragm to pulse properly in conjunction with the use of applied air pressure.

- (d) The Anderson sampler shall be disassembled, inspected, manually cleaned and sanitized, and the diaphragm changed every month.
- (e) NOTE: If a positive antibiotic result is obtained, the sampler shall be disassembled, manually cleaned and sanitized prior to the next milking.

ii) Sample collection equipment

- (1) The sample collection container shall be single-service, unless VDACS approves an appropriate method for the cleaning and sanitizing of the sample container.
- (2) NOTE: If a positive antibiotic is obtained, the multi-use sample collection container must be discarded and replaced.
- (3) New bottles should be stored in a sanitary manner.
- (4) The size of the sample container should be determined by the producer, VDACS, and manufacturer to ensure that the bottle doesn't overflow and there is enough air space for proper agitation.

iii) Sample collection process

(1) Tanker

- (a) Ensure the tanker wash tag is in date and seals are in place.
- (b) If the wash tag is expired or seals are missing, do not put milk in that tanker.
- (c) Sanitize outlet valve on tanker and stub end of transfer hose.
- (d) Hook up transfer hose to tanker.

(2) At the start of milking or a new tanker

- (a) Label a new, clean bottle with
 - (i) Date
 - (ii) Time
 - (iii) Producer ID
 - (iv) Initials of person installing container
- (b) Attach bottle to the in-line sampler and ensure proper position.

(3) Ensure sampling refrigerator temperature is between 32 – 40°F (0.0 – 4.4°C).

- (a) Corrective action must be taken if there is a temperature problem.
- (b) Document all corrective action(s) taken and retain on file for six (6) months.

(4) At the end of milking

- (a) Remove the sample bottle from the in-line sampler
- (b) Immediately cap with cap that's been stored in a sanitary manner.
- (c) Place labeled bottle in the sample storage fridge.
- (d) Sample containers should be no more than $\frac{3}{4}$ full.

iv) Cleaning and sanitizing

- (1) The sampler must be cleaned and sanitized after each milking cycle, either by hand or by CIP.

- (2) The sample bottle attachment area of the sampler must be manually cleaned and sanitized before the start of the next milking cycle.
- (3) During CIP, the sample bottle must be removed from the in-line sampler refrigerator and stored in the sample storage refrigerator.

d) ISO-LOK Direct Load In-Line Sampler Procedure

i) Device requirements

- (1) The ISO-LOK device shall be installed in an appropriate location in the milk line to ensure accurate sampling and proper cleaning.
- (2) Installation location
 - (a) The ISO-LOK sampler shall be installed in a refrigerator that must maintain an internal temperature of 32 – 40°F (0.0 – 4.4°C) if it is using the optional attachment that allows a sample collection bottle to be attached directly on the sampler and the sample goes directly from the sampler into the attached sample collection bottle.
 - (b) If the ISO-LOK sampler is using the attachment that allows for an approved milk tube to be attached to the milk sample outlet, then the container used for the collection of the milk sample shall be in a refrigerator that must maintain an internal temperature of 32 – 40°F (0.0 – 4.4°C). The sample tubing length shall be no longer than necessary.
- (3) Cleaning and sanitizing
 - (a) The ISO-LOK sampler may be cleaned-in-place (CIP) and sanitized, or manually cleaned and sanitized, after each milking cycle.
 - (b) The sample bottle attachment area of the sampler shall be manually cleaned and sanitized after each milking cycle.
 - (c) The ISO-LOK sampler shall be disassembled, inspected, manually cleaned and sanitized monthly.
 - (d) O-rings shall be checked monthly and replaced in needed.
 - (e) NOTE: If a positive antibiotic result is obtained, the sampler shall be disassembled and manually cleaned/sanitized prior to the next milking.

ii) Sample collection equipment

- (1) The sample collection container, if not single use, shall be hand-washed and sanitized after each use.
- (2) NOTE: If a positive antibiotic result is obtained, the multi-use sample collection container must be discarded and replaced.
- (3) The size of the milk sample is to be determined in cooperation with VDACS to ensure that the sample collection container size is adequate, so overflow doesn't occur and adequate air space is allowed for the proper agitation of the sample.

iii) Sample collection process

(1) Tanker

- (a) Ensure the tanker wash tag is in date and seals are in place.
- (b) If the wash tag is expired or seals are missing, do not put milk in that tanker.

- (c) Sanitize outlet valve on tanker and stub end of transfer hose.
- (d) Hook up transfer hose to tanker.
- (2) At the start of milking or a new tanker
 - (a) Label a cleaned, sanitized, and dry bottle with
 - (i) Date
 - (ii) Time
 - (iii) Producer ID
 - (iv) Initials of person installing container
 - (b) Attach bottle to the in-line sampler and ensure proper position.
- (3) Ensure sampling refrigerator temperature is between 32 – 40°F (0.0 – 4.4°C).
 - (a) Corrective action must be taken if there is a temperature problem.
 - (b) Document all corrective action(s) taken and retain on file for six (6) months.
- (4) At the end of milking
 - (a) Remove the sample bottle from the ISO-LOK sampler or the sampling tube from the sample container.
 - (b) Immediately cap the milk sample bottle using the approved storage cap that's been stored in a sanitary manner.
 - (c) Place in the sample storage refrigerator.
 - (d) Sample containers should be no more than $\frac{3}{4}$ full.
- iv) Cleaning and sanitizing
 - (1) Prepare the ISO-LOK sampler for CIP cleaning and sanitization, if not hand cleaning and sanitizing the sampler. The sampler must be cleaned and sanitized after each milking cycle.
 - (2) The ISO-LOK sampler and milk sampling tube, if one is used, shall be hand-cleaned and sanitized before the start of the next milking cycle.

7) Taking the Representative Sample and Sample Handling Requirements

- a) Person(s) taking the representative sample (sub-sampling):
 - i) Must possess a valid VDACS sampling permit with in-line sampler endorsement
 - ii) Must be re-evaluated every 18 months
 - iii) Must wash their hands before completing the sub-sampling
- b) Procedure
 - i) Verify sample storage refrigerator temperature is between 32 – 40°F (0.0 – 4.4°C).
 - (1) Corrective action must be taken if there is a temperature problem.
 - (2) Document such action on the temperature log or recording chart and retain records for 6 months.
 - ii) Remove the sample container from the refrigerator.
 - iii) Observe the sample for off odors, visual defects, extraneous material, and ice. Frozen sample cannot be used for official testing.

- iv) Agitate the sample container one of two (2) ways:
 - (1) Shake the sample container twenty-five (25) times in seven (7) seconds with a one (1)-foot arc of movement, OR
 - (2) Agitate the sample container by rapidly inverting it completely twenty-five (25) times.
- v) If the milk sample is foamy after agitation, the sampler may wait up to three (3) minutes to allow foam to disperse before transferring to sample vials.
- vi) Transfer (sub-sample) milk into sterile sample vials
 - (1) This should be completed on a well-lighted, clean work surface in the milk room.
 - (2) Fill each bottle not more than $\frac{3}{4}$ full.
 - (3) A temperature control (TC) sample must also be taken with each set of samples.
- vii) Milk sample vials, TC vials, and the weight ticket shall be labeled with the following:
 - (1) Producer ID
 - (2) Date of sampling
 - (3) Temperature of sample (using the TC)
 - (4) Time of sampling (time of sample split)
 - (5) Initials of permitted sampler performing the sub-sampling
- viii) The method for weighing milk will differ at each farm and installation. Regardless of method, the weight ticket shall include the name and permit number of the authorized sampler.
- ix) Store the samples in the sample storage refrigerator until the bulk milk tanker leaves the farm. The samples must accompany the load to the milk plant, receiving station, or transfer station.
- c) Duplicate samples may be taken for the regulatory agency, hauling company, or milk cooperative.