



A Guide to Small Scale Dairy Operations

Welcome to the Virginia Department of Agriculture and Consumer Services, Dairy Services Program. The purpose of this guide is to help you gain a better understanding of the basic requirements for a small-scale dairy operation.

Please be aware that we are here to help you in the proper set up of your operation and to clarify any questions or concerns that you may have.

Location and Layout of the Dairy

Keep in mind that when planning your dairy, things such as ease of access, drainage, location of natural waterways and wind direction can directly or indirectly affect your operation.

At the back of this document are examples of plans/layouts for small scale dairy operations. They range from the most simple for just milking, to the more complex involving milking and processing.

Please note the plans/layouts are conceptual schematic only and not for construction purposes.

Water Supply

The water supply for your dairy can come from a well, spring, or public water supply. However, it must be potable. That is, the local health department must approve it. Prior to receiving a dairy permit, your dairy inspector will test your water supply for bacteria and then again every two years. You must have a satisfactory water sample before you can be issued a dairy permit.

The water lines carrying the water from the source must be under pressure. Submerged inlets, such as hoses submerged in wash vats, are not allowed, nor are improperly installed high-pressure pumps. Such situations can lead to contamination of a safe water supply.

You may also want to have an analysis of your water supply to determine if the water is soft or hard and the mineral content. The type of water you have and its mineral content will determine the proper cleaning program needed for your equipment. Cleaners typically work well with soft water and a low dissolved mineral content. As the mineral content increases, specially formulated cleaners may be needed.

Toilet and Wastewater Requirements

Your dairy or plant needs to have a conveniently located and properly constructed, operated, and maintained toilet. If your farm is family operated, you may use your home toilet, provided that it is convenient to the dairy. However, if you have hired employees, you will need a toilet located near the dairy. The toilet room should not open directly into the milkroom or plant. The door should be self-closing and any openings will need to be screened or protected. You may choose to use a chemical toilet; however, it still cannot open directly into the milkroom. You will need to check with your local health department to determine if a pit privy is allowed in your location. Regardless, the toilet cannot flow into a farm animal manure facility. It must drain into an approved septic system.

As far as the milkroom, parlor, and plant wastewater requirements are concerned, you should first contact the local water quality specialists. Wastewater from a milkroom,

parlor, or plant is not allowed to be discharged to ditches or waterways. The best system for handling waste is a lagoon system. Milkroom, parlor, and plant wastewater can be pumped or drained into the lagoon, and animal waste can be scraped into the system. Tanks can be used for short-term storage of wastewater. The material could then be pumped out and applied to the land in a manner that avoids runoff and protects the environment.

The Milking Facility

The milking facility is that area where the animals are milked. It may be done on a raised concrete platform, in which case the facility is called a “milking parlor”. It may also be done with individual animal platforms or in a stanchion barn. Any of these milking areas should be sized for the animals involved and should allow for adequate operator working space. In addition, sufficient overhead air space and ventilation is needed for animal and operator comfort. The milking facility should be designed so that it can be easily cleaned and maintained.

In a stanchion barn or parlor, the stalls should be constructed of corrosive-resistant metal. If you choose to use an individual animal platform for milking, such as for goats, the platform may be constructed of either metal or another material which is moisture proof and easily cleanable.

Milking Facility Construction

The floors in the milking facility need to be constructed of concrete or other similar impervious materials. They need to be graded to drain appropriately. On cow dairies, a “broom” finish is recommended for concrete floors to prevent slick floors and allow enough traction for the operator and the animals.

It is recommended that walls be constructed of cinderblock and painted or finished to provide an easily cleanable surface. Stud walls may be used with a 2-foot foundation of concrete or cinderblock. Again, these walls would need to be covered with glass board, glazed tile, or

some other product to provide a smooth and easily cleanable surface. It is important to note that the walls must be able to withstand frequent water contact.

The ceiling of the facility must be finished with a smooth, dust-tight, and easily cleanable surface. Glass board, enamel metal roofing, and painted plywood are a few materials recommended for the ceiling of the milking area. Remember to choose a light-colored ceiling material to allow for better light reflection.

Adequate natural and artificial lighting is needed in the milking area to provide a minimum of 20-foot candles of light. It is suggested that a double row of shielded florescent lights be located directly above the milking facility work area.

In addition, the milking facility should be well ventilated to avoid excess odors and condensation. Ample windows that are properly screened will provide both light and ventilation. Simple screened openings, however, between the milking area and the milk house are not allowed.

Animal feed may be stored in the milking room, so long as it is stored in dust-tight boxes or bins. Feed mangers should be constructed of materials that are easily cleanable and resistant to corrosion. Concrete, metal, and heavy plastic are a few suggested materials.

It is important to note that all milking facilities have unique features. Please contact your dairy inspector prior to construction or renovations to be sure that the regulations are satisfied.

Types of Milking Systems

There are three different methods of milking animals on the farm: hand milking, a milking machine with a bucket milker, and a pipeline system. Small operations may not be able to justify the cost of purchasing a machine milking system; therefore, hand milking works well in

small operations of ten to fifteen animals. When milking is done by hand milking, the milker must keep their hands dry and clean. Wet hand milking is not allowed. The animals are milked into a hooded pail and then the milk is carried to a refrigerator or bulk tank for cooling.

A farm with more than fifteen animals may be able to justify the cost of a milking machine with a bucket milker. The basic milking system will include a milk bucket, milking machine(s), vacuum pump, and pulsation. By having the vacuum source to remove the milk, a milker is able to milk several animals at one time. The milk in the bucket is then carried to a bulk tank or refrigerator for cooling.

For large herds, a pipeline system works with similar equipment as the bucket system, except milk flows into the pipeline and then into a receiver jar, which is then pumped into a bulk tank for cooling. Consult with your dairy inspector and equipment dealer about which system is best for your size operation.

The Milk House or Milkroom

The milk house is the area where cooling, handling, and storing of milk occurs, as well as, the washing, cleaning, sanitizing, and storing of milk equipment.

The construction of the milk house is very similar to that of the milking facility, in that the floors, walls, and ceiling need to be smooth and easily cleanable. Please refer to the "Milking Facility Construction" section of this guide for more detailed information.

The milk house must be equipped with a hand sink where soap and paper towels are provided. A two compartment wash vat is also needed for the washing and sanitizing of equipment. Both the sink and the wash vats need to be plumbed with hot and cold water from potable sources.

The water heating capacity is very important to the cleaning of the milking equipment. The

heating requirements for the equipment must be sized according to the type of equipment, the amount of equipment, and whether you are cleaning the equipment manually or mechanically. Hot water heaters on the farm or in the plant are usually gas fired or electric. The hot water temperature for a dairy or plant needs to have a starting temperature of at least 160°F.

Small-scale dairies are not required to have a bulk tank. Bulk tanks must be equipped with a tank thermometer, a recording thermometer, and an automatic tank agitator to ensure proper cooling and storage of fluid milk. Milk must be cooled to 40°F within two hours after the first milking cycle is completed. The milk must not exceed 50°F during any subsequent milking. After the tank has been emptied of fluid milk, the tank must be cleaned and sanitized to prepare for the next milking cycle. You may want to consult with your dairy inspector for acceptable alternatives to a bulk tank.

The milk house should also be equipped with adequate lighting. This can be accomplished via artificial and natural lighting. However, in the case of artificial lighting, fixtures may not be placed directly over the bulk tank manhole.

All doors in a milkroom must open outward, be self-closing, and be tight fitting. A milkroom door must never open into a living area. The door leading from the milk room to the milking facility should be of solid material. All other doors may be screened to allow ventilation, but should be easily secured during inclement weather. It is important that the milk room be kept clean and free of insects, rodents, and other animals.

Pasteurization

Pasteurization means the process of heating every particle of milk or milk product, in properly designed and operated equipment, to one of the temperatures given in the following chart and held continuously at or above that temperature for at least the specified time.

Most small farm operations will be using batch or vat pasteurization. The requirements for such an operation are as follows:

For Batch or Vat Pasteurization:

| <u>Temperature</u> | <u>Time</u> |
|--------------------|-------------|
| 145°F | 30 minutes |

If the fat content of the milk product is 10% or more, or if it contains added sweeteners, the specified temperature would be increased by 5°F. So for a vat pasteurizer, the temperature would be increased to 150°F.

There is a special temperature/time requirement for the pasteurization of frozen dessert mixes, eggnog, and products of similar viscosity. This is:

For Batch or Vat Pasteurization:

| <u>Temperature</u> | <u>Time</u> |
|--------------------|-------------|
| 155°F | 30 minutes |

There is some High Temperature, Short-Time (HTST) Continuous Flow Pasteurization guidelines as well, but these systems are for large volume (hundreds to thousands of gallons per hour) operations.

It is very important to reiterate that pasteurizers must be properly designed and operated. The home pasteurizers found in several of the dairy supply catalogs, though adequate for home use, are not approved as a legal pasteurization method because they lack some of the instruments and controls needed to assure proper pasteurization.

Once a vat pasteurizer has met the construction requirements, there are other items needed for proper operation. The vat needs to have adequate agitation, which operates throughout the holding period. An indicating thermometer accurate within 0.5°F, an air space thermometer and a recording thermometer, both accurate within 1°F is also required for a vat pasteurizer. The air space thermometer bulb must be greater than one inch above the surface of the milk or milk

product. It is important that the air space thermometer be 5°F higher than the minimum required temperature for pasteurization during the entire holding time.

The recording temperature chart is the official record that pasteurization has taken place.

This chart needs to include the:

1. Date
2. A continuous record of the product temperature
3. Extent of the holding period, to include filling and emptying times
4. Reading of the air space thermometer
5. Reading of the indicating thermometer within the holding period
6. Amount and name of product pasteurized
7. Signature or initials of operator
8. Name of the milk or cheese plant

Several more items are needed for a legal pasteurizer. The vat should also have a shoebox top lid, and the outlet valve must be a close-coupled leak protector valve. A close-coupled valve means the valve seat is either flush with the inner wall of the pasteurizer or so closely coupled that no milk in the valve is more than 1°F colder than the milk in the center of the vat at any time during the holding period. In other words, there is no dead space in the valve body where agitation does not reach. A leak protector or leak-detect valve is the valve which when the valve is in any closed position, will prevent leakage of milk past the valve. This is accomplished by grooves in the valve that allow leaking product to drip to the floor.

This is some very basic information on vat pasteurization. Should you need further assistance, please contact your dairy inspector or the Dairy Services Program.

Laboratory

For manufacturing grade plants, a laboratory consistent with the size and type of plant and the volume of dairy products manufactured is needed. The lab should be adequately

equipped, maintained, and properly staffed with qualified and trained personnel for quality control and analytical testing.

Dairies which meet the definition of a small-scale cheese plant are exempt from antibiotic testing and therefore may not need to have a designated laboratory. Otherwise, the plant operation must analyze samples for beta lactams using tests evaluated by AOAC and accepted by the FDA and USDA. There are several on-site test kits available.

Small-scale farm operations, however, do not have to run analytical tests, such as standard plate count, somatic cell count, etc., on the raw milk received, as the Dairy Services Program or other regulatory authority will perform this testing.

Processing Area

The floors of the processing area must be impervious, smooth, and easily cleanable. Cement or tile is commonly used. Wood or dirt floors are not acceptable. The walls and ceiling of the processing area must also be smooth and easily cleanable.

In addition, a 3-compartment wash vat and a hand wash basin equipped with hot and cold running water are required in the processing area. Home kitchens are not allowed, as the processing area must be a separate facility.

It is important to try to avoid contamination of the processing area; therefore, a footbath should be available at the entrance door. Hairnets and gloves should also be worn during processing and during any activity in the processing area. If you have been in the milking area or outside with the livestock, then your clothing should be changed before entering this area. These few simple and inexpensive precautions will greatly assist in producing a high quality end product.

The Aging Process

Aging is a process by which cheeses are stored for a minimum of 60 days before it is

acceptable and permitted to be sold. Aged cheeses may be made with raw milk, as opposed to soft cheeses, which must be made from pasteurized milk and can be sold as soon as processing is complete.

During the aging process, cheeses are stored in a climate-controlled cooler at a temperature of 35°F or higher. They should not be stored in root cellars. Freezing of unaged cheeses does not constitute aging because the storage temperature is too low. During the aging process, the cheese is turned over every couple of days. Storage racks may be made of hardwood, such as oak or birch, of metal, or of other food grade materials.

Finished cheese product maybe sampled every three months by the Dairy Services Program and analyzed for moisture, fat content, bacteria, and coliform. Phosphatase test are conducted on pasteurized milk products to check for proper pasteurization.

Records for Aging & Antibiotic Testing

Records are a very integral part of aged cheeses. Lot records to include the manufacture date and product code (should also be referenced on the product) must be kept. If more than one batch is made on a particular day, the lot records must reflect this. This allows the producer to know when the product is ready for sale, as well as establishes the ability to identify a specific lot number should quality problems be found in the finished cheese.

Aging records must also include a daily log of the aging cooler temperature. It is preferred to have an internal and an external thermometer to compare. This allows for easier detection of any cooling problems.

Antibiotic testing records must also be kept. Each lot of milk should be tested before processing. Antibiotic residue presence in raw milk means the milk is contaminated with a chemical residue and must be discarded.

Labeling

All food items manufactured in Virginia must be properly labeled. The size of the type is based on the size of the label, as well as, the size of the package. The label must include the following information:

1. The name of the food or statement of identity
2. The list of ingredients used to make the food, in order of predominance by weights (most to least)
3. The name and address of the manufacturer, packer, or distributor. The plant code is also required if the packer or distributor is not the manufacturer
4. A net weight or net quantity statement positioned in the bottom 30% of the label in U.S. and metric measurements
5. Nutritional labeling may be required, depending on the number of units of the food item being manufactured and offered for sale

Cleaning and Sanitizing Equipment

Milking equipment must be rinsed with water and washed with a chlorinated alkaline cleaner after each milking. This is necessary to prevent contamination of the milk as it goes through the system at the next milking. Milk serves as a perfect growth medium for bacteria, which lowers the quality and flavor of the milk or milk products. The equipment can be washed either manually or mechanically, depending on whether you have bucket milkers or a pipeline system.

The first step is to rinse the equipment with clean lukewarm water (95-100°F). When using a mechanical clean in place (CIP) system, the rinse should only pass through one time and then be dumped from the vat. Using water that is greater than 120°F can cause the solids to bake on the inside surface of the equipment.

The next step is to add a chlorinated alkaline detergent to hot water of at least 160°F for CIP and 130°F for manual cleaning. The chlorinated alkaline cleaner serves to removed

fat and protein buildup from the equipment. For CIP systems, the alkaline solution should circulate for 6-8 minutes or until the wash water temperature drops to 120°F, then it should be dumped out of the wash vat. Solutions that continue to circulate through the pipeline after the water temperature drops to 120°F can lead to milk fat being deposited back on the equipment.

The next cycle is called the acid rinse. Lukewarm water is put in the vat and an acid cleaner is added. The acid rinse serves to remove the chlorine film from rubber parts and equipment. After this rinse, the CIP system should drain completely and any equipment cleaned manually should be placed in a manner that allows drainage.

Before milking takes place, the equipment must be sanitized. The purpose of sanitizing is to remove any bacteria that have entered the system after the acid rinse. This process can be done by adding a chlorine or acid sanitizer to water and circulating the solution through the equipment. The system should have time to drain in order to prevent sanitizer residue from contaminating the milk. Do not rinse sanitizer off the equipment prior to use.

Manual cleaning of equipment follows the same steps, except that the equipment has to be disassembled and cleaned using brushes.

The above information for cleaning pipelines also applies to cleaning bulk milk tanks and milk cans. Bulk milk tanks can be cleaned manually or mechanically using the steps of rinse, chlorinated alkaline solution, acid rinse, and sanitize. Milk cans must be cleaned manually, following the same steps using a brush to clean the surfaces.

You should consult your chemical supplier concerning the types of cleaners to use, the amounts required, and precautions to take in using these products.

Seasonal Shippers

Regulations require inspection at least once every 6 months. They require the producer's milk to be sampled for official analysis at least four times in any six-month period.

Some producers will produce milk on a seasonal basis, utilizing seasonal markets. These producers will have extended periods with little or no milk production. They are known as "seasonal shippers".

In order to satisfy inspection and sampling requirements, a seasonal shipper may voluntarily have their permit suspended during time periods when they have little or no milk production. When milk production is resumed, the producer will request to be reinstated. The inspector will reinstate the permit after conducting an inspection.

Herd Health

One last thing of importance is the health of the animals on your farm. Milk from cows, goats,

sheep, or other mammals (except humans) must be from animals in an accredited herd, which means that the milk is free from Brucellosis and Tuberculosis.

A Tuberculosis-free accredited herd is one that has been tested negative for tuberculosis methods deemed acceptable to the Commonwealth of Virginia. A Brucellosis negative herd is one that has been tested negative by an accredited method such as blood, milk, or tissue testing. This test must be performed annually, unless the species of animal is bovine or bison.

Should you have additional questions or need further information, please contact the Virginia Department of Agriculture and Consumer Services, Dairy Services Program at (804) 786-1452.