

Equipment Definitions

Furnace or steam boiler



Purpose To heat water for washing up. To heat product to desired temperature.

Scale Differences

Micro-Dairy You may be able to use just hot water as a way to heat product or do dairy dishes. Also for the more micro, an alternative heating element, such as a stove top may be employed.

Others Outdoor hot water furnaces are not ideal and inspectors as a general rule, do not care for heating with wood.

This is a rather expensive piece of equipment to purchase and install and is the number one reason why plants fail (when there is debt involved in an operation). Steam generators do not like to be turned on and then off. They are designed to be on most of the time. They must NEVER freeze. Cast iron and ice do not mix.

Cautions: When considering an installer, be sure they are familiar with the type of installation you are asking them to do. Have the equipment manufacturer give specific boiler specs for that piece of equipment. Do NOT allow the sales person or installer to convince you to purchase or install a steam boiler that is smaller than the equipment sales person recommends. When you are offered a bid, double the price for installation. This is also something that you are generally not allowed to install yourself, because you're dealing with steam.

Milk Pump and hauling tank or milk cans

Purpose To move milk from bulk tank to processing vat.

Scale Differences

Micro-Scale This can be milk cans, jars, or other covered, food grade receptacle. Milk cans come in many grades. Some have the traditional lids. Some cans also have lids that clamp down. Those are handy for people hauling distances or for storing in can coolers with a water bath.

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Others You can move the milk – in line – from the receiver pump/jar to the cheese vat during milking. Taking milk from the body temperature of a cow to set temperature uses less energy.

Dumping Stations with a motor are also handy for moving milk from a bulk tank to a processing space. You will need plenty of sanitary dairy hosing and ideally a line dryer for that hose. This is also a great way to move from cans in the milk house to the process vat in another room and building.

Bulk Tanks on Trailers are the next scale up. This can be refrigerated or not. It is important to keep the milk cold until it gets to the processing facility, but for short jogs, it may stay cool enough from the bulk tank to the storage vat or process vat in the processing building. If using a bulk tank that is not working, make sure it is easy clean and the valve is sanitary. You may or may not need a receiving room for this tank. Check with state inspectors prior to investing in one.

Milk trucks are handy for the larger plants. There are “straight-jobs” available. You may also contract with a hauling company to move your milk just like a handler does.

Stainless Steel Piping and/or Milk Hose

Purpose To move milk from one place to another in a sanitary fashion.

Scale Differences

Micro-Dairy This will not be necessary unless using a mechanical filler for bottled milk or cultured products. Most dairy supply houses will have dairy hosing suitable for this purpose.

Others In a dairy processing facility, you can use 1 ½” pipes. This type of piping is obsolete in dairy pipelines (milking systems). This means that it is cheaper to purchase and in some cases free. Ask around. Many people who install dairy pipeline systems have this type of piping around.

For moving larger volumes of milk, get scale appropriate piping or hoses.

For smaller cheese operations, pumps and angles of piping may be hard on the milk. Goats milk is especially fragile. Try to move manually using cans or consider limiting the damage to the milk when moving via pipes, especially when pumps are involved.

Cautions

If purchasing or installing pipelines, make sure that the sanitary welder knows what they are doing. One of the best ways to reduce product quality and shelf life is to have poor welds. Not all inspectors are capable of inspecting welds anymore either.

The more piping and hoses you have, the more shrink you have. This means that you will lose some of the milk/product into “the system”. Place equipment in a logical flow. Think about this before installing systems. Try to limit the amount of movement of product from one tank to another. Installers love to include as much stainless steel as they can.

Also think about cleaning and how easy it will be for you to break down and clean up. For smaller systems, you can break down the piping and place into a CIP wash sink. For larger systems, you will be doing CIP in line. How tall are you? How strong are you? Does it make sense?

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Cheese Vat

Purpose To hold milk and whey/curd at specific temperatures to eventually make cheese.

Scale Differences

Micro Scale You can start with a stock pot and a larger one to hold water bath, or a sink to act as a water bath. This is the cheapest way to get started, especially if doing raw-aged cheeses.

Many people use soup kettles with a water bath. Try to make sure that the water bath comes as close to the top of the vat as possible. You can get them as small as a gallon up to hundreds of gallons. Some have valves, some tip. You can have curd knives custom made for these kettles at www.curdknives.com .

For smaller pasteurizers, you can often use them as cheese vats. The biggest thing to consider is whether or not you can (comfortably) reach the bottom of the vat. If you cannot, you will not be able to work your curd easily. Generally, 23-28" is common from top of vat to inside floor of vat.



Cheese vats are made by many companies and have anything from bare bones water bath to all sorts of bells and whistles. Visit Vicki Dunaway's site to learn more about those companies at <http://www.smalldairy.com>

Cautions

DO homework before purchasing. Visit many vats and try to work in them. There are styles that you will and will not like.

Always consider what you are going to make five years from now, not what you are going to make today. You can process 100 or 200 gal of milk in a 500 gal vat and the larger vats tend to be cheaper per gallon when compared to the smaller ones. Also think about the time it takes to make cheese. Do

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not think you are going to milk cows, make two batches of cheese, and package everything once or twice a week. You will be lucky to do a batch a day.

Cream Separator

Purpose To separate cream from milk. Also removes many impurities missed by filter system.

Scale Differences

Micro Scale Since standardization is not the main goal of separating cream from cheeses in a more micro scale, just skimming off the cream after it sits for a period of time is sufficient. This cream will not be ideal for butter making, but can be added to other cheeses to make higher fat products.

Open Bowl Separators are the old fashioned ones we see in many photographs. Each state will vary in its regulations. Some allow them as is (assuming stainless steel and not aluminum or other funny metal). You may have to fashion a “closed” bowl to fit over the discs. Milk going through these separators must be at or around 70°F. It is handy to have someone separating during milking to use less energy in heating and then cooling product (again).

Others Most will probably be using centrifugal separators rather than hermetic separator. Differences will be in whether or not placement is before or after pasteurization.

Drain Table and/or Press Table



Purpose To drain fresh cheeses of whey. May also double as packaging table, labeling table, Cutting table, Lab bench, etc. You may clamp a lever style press to it as well.

Scale Differences

Micro Dairy May be as simple as the sink with bars above to drain chevre or cream cheese type products. May be as elaborate as a custom made table with a press attached. Many obtain stainless steel tables from box stores to suite space. You may be able to use formica or other washable table surface, depending on laws in your state.

Cautions

Consider where you are now and where you want to be five years from now. It is often easier to purchase the equipment for five years from now, rather than what you are making today.

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Hoops and followers

Purpose

Scale Differences

Cautions

Many people have started out by cutting holes into PVC pipes and making them into hoops. Make sure that the PVC meets water safety codes. The PVC that is often used for effluent (waste water) has excessive lead and other chemicals that you probably do not want in your product. Explain to the sales person what you are planning to do with it before purchasing.

Curd Harp/Curd Knives

Purpose To cut the curd into uniform pieces to aid in the release of whey. The Curd Harps generally have a stainless steel frame and have stainless steel wire running horizontally or vertically. Curd Knives are generally all stainless steel and have vertical and horizontal runs of knives on a stainless steel frame.

The particle size depends on the variety of cheese being made. While you can purchase curd harps/knives for every variety of cheese being made, it is generally easier to purchase harps of the larger curd particle size (say 1/2") and run the harps through the vat more often to cut the curd to the desired particle size (say rice grain size as for Alpine cheeses).

Many new vat manufacturers sell curd harps/knives that fit the vat that you are purchasing. This is especially true if there is an automatic stirring arrangement. For those purchasing a used vat or a vat without custom knives, the best source of curd knives/harps is www.curdknives.com. He also repairs used knives/harps.

Scale Differences

Micro-Scale There are smaller, food grade plastic curd knives/harps that are available. They are about 4" wide by 10" long. They cost less than \$100. The next scale larger are Stainless Steele. They are about 6" wide x 20" long. A set or horizontal and vertical knives run about \$600.

Others: The best place to get curd knives, if they do not come from the vat manufacturer is from www.curdknives.com. He makes quality knives that are custom to your vat. When ordering consider size (which also means weight). If you are a woman err on the side of a smaller set of knives that go through the vat more often. They can get heavy when you are cutting a batch of cheese and if you are processing every day, you do not need to dread a piece of equipment. Especially after spending any money on it.

Cautions

While some cheesemakers like to use fishing wire, remember that lead may be a problem. Always use food grade plastic when working with food.

Curd Scoop &/or pail

Purpose To move curd and whey from vat to hoops.

Scale Differences

Micro Scale You will not need the shovels or pails, generally another hoop, a measuring cup or a ladle will do, depending on the product being made.

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Others There are specially made scoops, shovels and the like for moving curd. They are rather handy. Most cheese supply houses have them.

Cautions

Make sure the product is food grade. Some inspectors frown on glass in dairy plants.

Curd Mill

Purpose To cut curd blocks into smaller pieces. This assists in further removal of whey and texture of final paste.

Scale Differences

Micro Scale Large knives and a cutting board. You can efficiently mill up to 100 pounds of cheese curd by hand using a knife. They may not be the most uniform, but it does work.

Cheesemakers have also used potato french friers. Smaller, home cook scale up to a curd mill that Margaret Morris uses that is essentially rather similar to an industrial french fry machine. It works and you do mill curd rather quickly.



Others There are curd mills that are more traditional in style and build. Many are used. Keep your eyes open for one. They will do up to a few hundreds of pounds a process.

Cautions

Make sure they work and you like it before paying a lot of money.

Vacuum Sealing machine &/or waxing system is rindless cheeses

Purpose To protect the rind from establishing unwanted bacteria. Also to prevent drying out and cracking.

Scale Differences

Micro Dairy For waxing, double up aluminum roasting pans to melt wax over a stove top. Make sure the roasting pan is deep enough and wide enough for your larger cheeses. Do not leave unattended as it will catch on fire.

Home scale vacuum packaging systems may or may not be approved and they are expensive packaging.

Others Vacuum sealing is a tidy package for retail sales of cheeses. If you are selling to higher end customers, this may not be ideal. Consider regular cheese paper. For aging, different cheeses respond differently to vacuum sealing during aging. Some say it imparts a “sour” taste on some cheeses.

There are a number of brands available. Koch, Sipromac, and others are commonly seen in cheese operations. You will not need to have the specific atmosphere feature of the system. Ask others how they like theirs and try to purchase a brand with a repair person handy to your facility.

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To purchase the plastic packaging, try to team up with another cheesemaker, cheese house, or meat processing facility. Buying direct from manufacturers and distributors may be expensive.

Cautions

Purchase cheese wax, do not use general wax for candle making or other products. They are not food grade. If considering beeswax, remember that what the bees eat makes the wax change in consistency and quality. Older wax does not hold up as well. It is also prone to cracking and coming apart at the seams. You will also need to filter beeswax which means another piece of equipment.

Weights for direct pressing

Purpose To release whey from curd pack. To assist in texture development.

Scale Differences

This can be as simple as water in various water jugs to correspond to different pressing weights. Keep them off the ground and sanitize before every use. Bar bells, specially made weights from presses, granite or other stones, bricks, PVC with various weights added to them. All of these have been seen in cheese plants.

Cautions

Make sure you can clean and sanitize effectively before use.

Cheese Press: compressed air or hydraulic or lever action

Purpose To assist in release of whey from cheeses and to assist in texture development.

Scale Differences

Micro Dairy There are many homemade versions on the internet that can be built. “Off-the wall” presses are the most common of that style of press. Lever (Dutch-style) presses are excellent for those making continental style cheeses.

More pressure will be needed to make British style cheeses. That is where compressed air will be needed. If you get compressed air, you will need an air compressor.

Cautions

Check with your inspector prior to purchasing or building.

Wooden boards and drying kiln or metal shelving with plastic matting

Purpose Traditional surface to age most cheeses.

Scale Differences

When considering aging surfaces, think about how easy it will be for you to clean considering your processing situation.

Micro Dairy For the facilities that tend to be on the small side, needle work mats are commonly seen. They are inexpensive, conveniently purchased in many craft stores, can be boiled and bleached without losing integrity, and they can double as curd dams in the cheese vat. Get clear or white ones. Snip off the hanging tab. They look an awful lot like traditional cheese mats.

Others You can purchase specially made cheese matting. Fromegex has large rolls of it. There are different sizes depending on the product to be drained/aged on it. Learn what size matting is desired

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prior to purchase.

For wood shelves, ask local cheesemakers what they are able to use. Do not use oak. It discolors cheese and leaves an unpleasant taste.

Cautions

Many states frown on wood shelving. Ask before you install or use. Also consider the style of wood preferred by inspectors.

Whey removal system

Purpose To prevent whey from entering waste water system. To save for animal consumption or field spreading

Scale Differences

The most handy system involves a bucket/pail or new rubbermaid style hog pan with a sump pump. This is placed under the outlet valve. The hose then runs to containers for storage of whey. Some direct it to a feed trough for heifers or doelings.

Cautions

Minimize curd entering the system to prevent clogging. Also consider splash and backflow into vat.

Hot Water kettle

Purpose To heat anything to boiling. Ricotta is most common use. Also a hot water source for stretching pasta filata cheeses or boiling cheesecloth.

Scale Differences

Basically a soup kettle heated with steam. \You can also use a stock pot on a stove top, but the soup kettle is most efficient.

Cautions

Make sure it works.

Vat or tubs or basins

Purpose To hold milk at required temperatures to provide ambient culture growing temperatures.

Scale Differences

With products that like meso-style cultures, this can be as simple as plastic food grade pails, Milk-cans, dry-storage buns on wheels, etc. Have a lid to prevent flying insects and dust. For thermo-loving cultures, you can set product in your pasteurizer or other water bath that keeps warmer temperatures. You may also place those in a yogurt incubator or closet (see yogurt incubator/closet for more details)

Cautions

Use food grade storage containers. Think about ease of cleaning. The products need to be pristine and free from smells as well as contamination.

Vat or HTST pasteurizer

Purpose To heat milk to required minimum pasteurization temperature.

Scale Differences

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Micro Dairy Tricia Smith at Carlisle Dairy has the best model for those milking a small number of animals or who plan to use dairy as an enterprise as part of a farm enterprise.
http://www.carlislefarmsteadcheese.com/ma_microvat.html

The next scale is for those milking a few more animals or only taking a small portion of their milk out to make product. Jaybee Precision and Frank Kipe's system are the most commonly seen on those dairies.

Others This is for those processing 50 gallons or more. Consider where you plan to be five years from now, not where you are now. You will also have to consider how much water you have available to heat and cool product, heating source (does it need to have a heating element or do you have a steam boiler or hot water). Design it to heat to temperature in as short a period of time as possible. Ideal is 20-40 minutes to get to temperature. Finding vats that are 100 gallons or more are easier than 100 gallons or less. Remember that you can process as little as 20-30 gallons in a 100 gallon vat.

Cautions

When buying new or used, ask questions. Vicki Dunaway at the Small Creamery project has a great website to help you learn about equipment dealers and any problems that people have had with them.
<http://www.smalldairy.com/>

Do your homework before you buy anything. Understand what you need, don't ask the dealer to help you figure that out – or you may buy things that are not suitable.

Air compressor

Purpose May need if using HTST. Also may need if press uses.

Scale Differences

You will buy to suit other equipment.

Cautions Inspector will want one that is sanitary. You will not be sharing this with the barn. An air filter may need to be used.

Cooling water system

Purpose To cool product in pasteurizer to set temperature for further processing.

Scale Differences

Micro Scale Move stock pot from water bath to ice or water bath in sink. For slightly larger, well water may work.

Others The least expensive way is to use a bulk tank 3 times the size of the processing vat. Have a pump move water from vat to bulk tank in a closed loop. This works if the pasteurizer is a water bath system. Some vats that heat with steam, release steam and then add cold water to bath to cool the milk. It is important to understand if your vat can handle that type of temperature shock. Many cannot.

An ice bank is designed to do just this. They are not easy to find used. There is an outfit in Quebec selling a Belgian ice bank.

Cautions

You can use a lot of water if you are not careful. Make sure the ice bank works before you purchase it.

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Have it in writing that you will get your money back if it fails.

Cheesecloth or drain bags

Purpose To assist in the release of whey from curd. Also rind texture.

Scale Differences

All scales of cheese makers will use the same stuff. They just buy larger or smaller amounts. Cloth (muslin) cheesecloth is more common in smaller dairies. There is also synthetic cheesecloth designed for one use or limited use applications. This is handy for those that do not want to launder cheesecloth or for those that know they are using a facility off the farm.

Cautions Muslin from the fabric store work fine. They just do not last as long.

Filling/sealing machine

Purpose To place cultured product into retail packages.

Scale Differences

Micro Scale For many products like chevre, cream cheese, and the like, a ladle, spoon, measuring cup, or like instrument will be used to place product into packaging. Some states allow you to hand-fill and hand-cap up to 50 gallons a day of yogurt. Check with your inspectors.

Others Some products can be moved using piston pumps. These will be for products that are more viscous, like greek yogurt or thicker. They are not handy for cup set yogurt as that is a liquid product.



For cultured butter and logs, you can use a sausage stuffer and plastic casing to package them into logs.

For cup-set yogurt, you are looking at Frank Kipe or something that starts at \$30,000. A filler/capper is a limiting factor for many yogurt operations.

Cautions

Try or see working before purchase. Many places let you send product to them to try before buying equipment. Check with Vicki Dunaway's site for a great listing of equipment dealers.

<http://www.smalldairy.com>

Equipment Definitions

Surge tank

Purpose

Scale Differences

Cautions

Batch tanks for flavors and standardizing

Purpose For holding milk or other processed product for a specific period of time.

Scale Differences

This can be a milk can or glass jar up to a refrigerated bulk tank. An agitator is handy for mixing flavors. For smaller scale operations, a can stirrer or similar utensil can be used.

Cautions

Just make sure it is easy to clean and is free of dents.

Milk bottling machine and capper

Purpose To fill and cap milk jugs in a sanitary way.

Scale Differences

Micro Scale In some states, you may be able to hand-fill and cap up to 50 gallons of product a day. This is keeping in mind that a mechanical filler/capper will be purchased at some time in the future. Always good to ask. Keep caps in sanitized water. Frank Kipe has the next scale up. A custom designed system for smaller dairy operations.

Dairy Heritage sells a filler capper that is handy. Christ Stolfus builds them. It is simple and can be run by one or two people.

Others There are many mechanical cappers and sealers on the market. Some are old and simple. Others are large and complicated. You will need to consider the packaging before you consider the filler. For example, snap caps vs. screw on caps vs. foil seal caps. Are you going to have just one size, or multiple sizes?

Cautions

Must be stainless steel. No copper fittings. You can buy a filler with copper fittings, only will need a machinist to put stainless fittings onto it. The more simple it is, the less likely you are to have to fix it during a process. Check with your inspector prior to purchasing any systems.

Bottle washer for glass bottles

Purpose To wash glass bottles that are returned to the dairy.

Scale Differences

For smaller operations, a commercial dish washer will work. Dairy Heritage also has a smaller batch bottle washer. You will not be allowed to just wash in the sink, even CIP, and sanitize for reuse. You must have either a commercial dishwasher or specific use bottle washer. For larger operations that focus on fluid milk in glass bottles, you will have to invest in a milk bottle washer. These are horribly expensive and are like working on a space shuttle. There are a few places that rebuild them and they do have some come up for sale.

Cautions

If you have water issues, look at other packaging or try single-use glass bottles.

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Incubation chamber for cup-style yogurt



Purpose To incubate yogurt in their final packaging.

Scale Differences

Micro Scale Many smaller processors have started with picnic coolers with towels, hot water bottles, etc. Hot water bottles and towels can be replaced with ice packs, bottles that have frozen water, or other like containers.

For the next scale up, many take bread proofing ovens and have them adapted to keep a steady temperature of 109°F.

Others A yogurt closet is next. This is a room that is heated to 110°F and after culturing, is often cooled to below 40°F. For closet systems, a bread trolley with trays are often used to make moving product easier.

The larger you are the larger the closet. This could in fact become a room.

Cautions

You want a consistent temperature for 4-8 hours at or above 109°F. It takes longer to heat the product than to cool it. You may not like the change in texture, mouth feel or acidity if the temperature ranges too much.

Butter churn

Purpose To convert cream to butter.

Scale Differences

Micro Scale There are smaller, more home scale butter churns that have been allowed for use in some states. Check with your state inspectors.

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Kleen Flo has a butter churn that is used in some small operations. For other equipment, see Vicki Dunaway's site <http://www.smalldairy.com>

Cautions

Ice cream freezer

Purpose To convert a liquid mix into ice cream.

Scale Differences Two types of ice cream freezers are used.

Batch Freezers

Continuous Freezer

Cautions

Fruit feeder

Purpose

Scale Differences

Cautions

Freezer for finished products

Purpose

Scale Differences

Cautions

Cave

Purpose To age cheese at set temperature and humidity.

Scale Differences

Micro Scale Florist coolers are the best types of coolers. They have humidity and are fine with warmer aging temperatures. If you use regular reach-in coolers, you will have to wax or vacuum seal your cheeses to prevent cracked rinds.

Others A walk in cooler with low-velocity fans as seen in apple/potato storage or for florists are ideal for cheese. Set at ideal temperature and humidity for cheese. Some cheese supply houses have humidifiers for cheese processing (fromegex is one). Do not use household humidifiers.

A basement or cave is ideal for aging cheese. The temperature and humidity tend to be perfect for

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most cheeses. You may need to supplement temperature with low velocity cooling system.

Cool Bot systems are inexpensive and popular as well. It is basically an override system for a household air conditioner. Used successfully for many years by vegetable and cheese people.

Cautions

Finished product cooler

Purpose To store finished product for sale.

Scale Differences

Micro Scale This can be a reach in cooler. Commonly sold in many penny saver like fliers or at restaurant supply stores.

Others A walk in cooler.

Cautions Compressors will last a week or forever. Never turn coolers on their side when moving.

Have an alarm to tell you when cooler is not working. You can lose everything in a matter of hours if you are not aware of temperature problems. It happens at least once in every dairy operation.

Insulated storage tank

Purpose To keep product at set temperature

Scale Differences

Cautions

Farm bulk tank or can cooler

Purpose To keep milk cool until processing

Scale Differences

Micro Scale A jar and a household refrigerator works for many micro scale processors. It is very important to cool milk fast. Placing milk in ice water first may cool it faster.

Next scale up are milk cans in a can cooler. It is important to invest in a can chiller (Ashland is one brand). These cool milk in the cans in 8-12 minutes and agitate them as per PMO regulations. The farmer then keeps in a can cooler of some sort. This can be one of the few remaining can coolers build in the days of shipping in cans or a chest freezer with water in it.

Others A farm bulk tank is commonly seen on most dairy farms today. There are many reputable dealers of new and used bulk tanks.

Cautions If a tank has been sitting and you move it, it may not work. Be prepared to have new compressor and or condenser if you move an old tank.

By law, milk must hit agitator in the first milking. You may use a combination of can cooler and bulk tank for seasonal lows. It is important that the tank is clean and sanitary. Also make sure that it cools milk fast.

Centrifugal pump

Purpose for pumping raw milk or whey

Equipment Definitions

Scale Differences

Cautions

Ice builder

Purpose To cool product as quickly as possible.

Scale Differences Only needed in larger processing plants (50 gal or more). Not micro.

Cautions Make sure it does not leak and it works.

Positive pressure pump

Purpose for pumping curd and or soft cheeses and cultured product

Scale Differences

Cautions

Refrigerated or freezer trucks

Purpose To transport product in a mechanically refrigerated or frozen truck.

Scale Differences

You will only need if delivering a lot of product. You may be able to stay with a sea of picnic coolers and a van or truck like most people. More important to invest in one if delivering fluid or frozen product.

Cautions

Make sure it works. The more used, the more likely it will break when 100°F and you are in traffic heading to large account.

Jet-recirculation parts washer

Purpose to make doing dairy dishes easier. The larger you the more likely you will have one.

Scale Differences

For micro dairies, you can probably just have a manual sink and a commercial dish washer. The steam and water source may be a limiting factor.

Cautions