Steam High-Temperature Short-Time Pasteurizers

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THE operation of a steam high-temperature short-time pasteurizer is more easily explained by the use of a schematic flow diagram. (See attached flow diagram.) While this flow diagram was made up to cover a Creamery Package full-flow short-time pasteurizer, the flow of the milk is similar in all other types of steam-plate pasteurizers. The raw milk is sucked from a small supply tank located below the level of the machine, through the regenerator, to the positive raw milk pump. The milk is pushed from this raw-milk pump through the heater section into the holder tube. The milk passes through the holder tube to the flow diversion valve, which is nothing more than an air-operated three-way valve.

If the milk is under 161° F. when it reaches the end of the holder tube, it is automatically diverted back to the raw-milk tank and put through the unit again. If the milk is over 161° when it reaches the end of the holder tube, it is forced through the pasteurized milk side of the regenerator and on through the cooler section, from which it is discharged to the line feeding the bottler or storage tank.

Water which is preheated by steam is circulated on the sides of the plates opposite the milk in the heater section. This hot water is usually 2° above the final temperature of the milk, and since it is at a pre-controlled temperature, the final milk temperature will be indirectly controlled. Cooling is accomplished by circulating a cooling medium such as brine or refrigerated water on the opposite side of the cooler-plate. This cooling medium is automatically controlled in the case of brine. Since the differential between the brine and the milk is very small, this results in a controlled milk temperature.

The only difference between steam pasteurization and Electropure pasteurization is in the method of heating. With modern control instruments, accurate control can be expected from either unit. Ordinarily, control within 0.2° above or below the set point can be expected.

Steam offers many advantages as a heating medium in the processing of milk through a high-temperature short-time pasteurizer. The biggest single advantage is the lower operating cost for heating. The familiarity of the plant personnel with steam, which is normally used as a heating medium also makes it desirable.

Steam is normally required in a plant for the operation of the bottle washer, can washer, and for heating other products which cannot be satisfactorily processed in a short-time high-temperature pasteurizer. The high-temperature short-time pasteurizer usualy represents one of the smaller loads in the plant, and use of steam for this pasteurizer works out advantageously without greatly increasing the boiler capacity.

The enthusiasm for something new and the sales promotional work which normally accompanies any new piece of equipment has resulted in many plant operators believing that the high-temperature short-time pasteurizer is the answer to all their processing problems. Unfortunately there is no single answer to plant processing problems.

ADVANTAGES AND DISADVANTAGES

Along with its many good features, high-temperature short-time pasteurization has definite limitations. Many

plant operators have installed a high-temperature short-time pasteurizer only to find that they have acquired another piece of equipment to maintain and clean without eliminating a single piece of the equipment which they formerly used for processing milk. While it is not possible to draw up an exact formula to determine when a short-time pasteurizer should be used and when it should not be used, we shall attempt to give some of the limiting factors which should assist the plant operator in determining whether a high-temperature short-time pasteurizer is desirable.

A high-temperature short-time pasteurizer is most satisfactory when operated at a steady flow rate. Frequent shut-downs or operation at reduced capacity result in a lower cream volume and in over-heating of the milk. In plants which lend themselves to high-temperature short-time pasteurization operations, almost all of the shut-downs or periods of operation at reduced capacities can be eliminated by intelligent planning of the processing.

Steady capacities are not always easy to maintain where a single filler is used to fill a large number of one-half pint and third-quart bottles as well as full-quart bottles. A machine that is engineered to operate satisfactorily when the bottler is handling quarts results in an over-capacity of milk when the plant is filling one-half pint, or one-third quart bottles. In some cases this difficulty can be overcome by arranging to fill cans of milk during the time when the one-half pint and one-third quart bottles are being handled by the fillers.

High-temperature short-time pasteurizers are ordinarily not as desirable where the milk run is very short. The longer the milk run on a short-time pasteurizer, the greater the saving that can be effected. While this is a generalization that can be applied to any piece of equipment, it is more apparent in the case of a short-time pasteurizer, where the clean-up time is the same whether the unit is used one hour or sixteen hours.

Ordinarily high-temperature short-time pasteurizers are not as adaptabe for very small capacities, since the clean-up time is almost the same for a 4,000-pound unit as the 16,000-pound unit. The plates in a short-time pasteurizer are cleaned by the circulation of a cleaning solution, so that the actual scrubbing time spent in brushing plates is very low. Most of the time required for cleaning a short-time pasteurizer is spent in assembling and disassembling the unit. Aside from the number of plates, the number of parts in a 4,000-pound unit equals those in a 16,000-pound, or larger, unit. In case of very short runs or in the case of very small units, the clean-up time on a high-temperature short-time pasteurizer will exceed that on a vat system of pasteurization.

A high-temperature short-time pasteurizer does not ordinarily lend itself to the processing of by-products. Buttermilk or other cultured products must always be handled in vats. While some plants are processing chocolate milk through a short-time pasteurizer, most plants are not satisfied with the product processed in this manner. The long hold at high temperature seems to improve the flavor of the product. The product loss in processing very small volumes of cream makes this operation undesirable with the plate-type unit.

In small plants, tanks are frequently used for many purposes. They may be used for holding the raw milk when it is received, and then for pasteurizing it. Following this, they may be used to set-up the buttermilk, which is bottled prior to the receipt of the milk on the following morning. After the regular run of milk, the tanks may be used for handling chocolate milk and cream. Since the milk, or other products, are pumped directly from the tank and through the cooler, they may be handled without the need of a pasteurized product surge tank.

When a short-time pasteurizer is used, it is necessary to have some form of a holding tank for the milk before it enters the pasteurizer. It is also necessary to have a pasteurized milk

balance tank to hold the milk after it has been pasteurized. The type and location of tanks used for storage purposes ordinarily make their use impractical for other purposes.

Only after a very thorough study of each individual plant operation is it possible to determine whether a high-temperature short-time pasteurizer is adaptable. No set formula can be set up which will determine whether or not a short-time pasteurizer should be purchased. While a high-temperature short-time pasteurizer has certain limitations, they also have inherent advantages which have made them the popular piece of equipment that they are. The biggest single advantage is the completely automatic operation provided by controls which have proven thoroughly reliable.

Human errors and short-comings in controlling the processing are eliminated. The process is uniform from day to day and from hour to hour, when the unit is operated at the capacity for which it was engineered. When the pasteurizer is properly engineered and operated at its rated capacity, the cream volume will be uniformly large and the flavor of the raw milk will be unimpaired.

In plants which lend themselves to efficient short-time pasteurizer operations, substantial savings in refrigeration, fuel, and labor can be shown. Frequently the installation of a high-temperature short-time pasteurizer will eliminate the necessity for purchasing a larger boiler or additional refrigeration. The use of regeneration for heating and cooling results in the elimination of the water necessary for cooling. In areas where water is a problem, this saving will frequently outweigh all others.

The continuous operation of a short-time pasteurizer will speed up the bottling operation by eliminating interruptions between batches of milk. Where a batch system of pasteurization is used, the bottling operation is frequently shut down for a few minutes rest period. In a continuous pasteurizer such a shut-down does not occur because the pasteurizer would get ahead of the bottler. Actual field experience has shown that a reduction in the bottling time of milk usually follows the installation of a high-temperature short-time pasteurizer.

The labor savings resulting from the use of the short-time pasteurizer over the batch system is quite sizable when the run is long and the rate of flow is sufficiently high. Since the clean-up time is practically the same for small units, or for short runs, as it is for large units or long runs, this works to the advantage of plants where the more economical runs are possible.

MAINTENANCE

Since maintenance today is one of the most difficult and important problems, plants which own short-time pasteurizers should follow a definite service plan in order that they may realize the best possible service from their unit. While the instruction manual accompanying your machine is the best source of information on the proper care for it, special emphasis should be given to the following points.

When installing a new piece of equipment such as a short-time pasteurizer, have your plant engineer or plant maintenance man who is to be responsible for this piece of equipment present at the time the installation is made. Encourage him to ask questions so that he thoroughly understands the operation of each component part of the equipment.

Make certain that the instruction manuals are in the hands of the parties who will operate and service the machinery. You will find that the equipment manufacturers will be more than willing to give you extra copies of the instruction manuals should you need them.

Set up a regular maintenance schedule. Check the gaskets weekly. Recement any loose portion of the gaskets promptly. Use only the cement and the procedure recommended by the manufacturer of your equipment.

Many of the gaskets supplied today are made of synthetic rubber which requires special adhesives to cement them properly to the plate. The cement supplied for one manufacturer's gaskets may not be suitable for use with another manufacturer's gaskets.

Take out a service policy on your instruments. If this is not possible or if this service is not offered by the instrument manufacturer who supplied the instruments on your unit, have your maintenance man study the instruction manual carefully and give the instruments regular service himself. While the instruments supplied with short-time pasteurizers are very reliable, they do require a certain amount of service if they are to be maintained in satisfactory operating condition.

Reguarly wash the water and brine sides of the plate in your milk unit. Stainless steel will corrode if it is not kept clean and polished. Even with the most corrosive water or brine, very little trouble is experienced where the plates are cleaned daily. These plates may be cleaned by circulating the same milkstone remover used on the milk sides of your plate. Ask your manufacturer to give you definite instructions for circulating these plates.

If you have a brine cooler, keep the brine neutral or slightly on the alkaline side. Use a dichromate inhibitor in your brine. Keep all air out of the brine. Frequently the brine is dumped back into the brine tank above the level of the brine and a large amount of air is incorporated in the cold brine. This air makes the brine very corrosive. Excellent books on how properly to maintain brine are available from the Solvay and Dow Chemical Companies. These books are free for the asking and give detailed information on how to maintain properly the strength of the brine as well as how to reduce corrosive action.

Finally, above all else, do not be afraid to write the manufacturer of your equipment regarding any question which you may have on the proper maintainance or operation of the unit. Field men for equipment companies are constantly checking these units in the field and from their observations come new ideas on how to best take care of the units. If you have some particular problem which is causing you difficulty, possibly these field men have found the answer in some other plant, and the information would be available to you for the asking.