

INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE
OF ROGERS VACUUM PANS

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GENERAL NOTES AND CAUTIONS

Because of the significant differences that will exist between installations, and because no instructions can cover all contingencies, general instructions such as these must be read carefully and critically, with modifications made to suit the situation and the actual equipment. No instructions can, nor should they be permitted to, substitute for a thorough working knowledge of the equipment, its component parts, and its functioning in the process flow. Such an understanding must be the immediate goal of supervision and operators.

It is the responsibility of plant management, implemented through training and supervision, to assure that all operating personnel develop and practice good habits regarding personnel safety, equipment care, and sanitation, including reaction to any emergency situations.

Any hazard warning signs or labels furnished by C.E. Rogers Company, including those on or with components purchased by C.E. Rogers but selected and supplied by the manufacturer of those components, may not be assumed to be in compliance with all regulations or requirements which may apply in a given plant or plant location, nor may they be assumed to mark all hazards, whether or not similar, which should be marked.

Plant safety personnel should confront the matter of hazards warning and assure that all required signs and labels are in place, in compliance with requirements, and in harmony with the total plant workplace safety program.

If not available in-plant, competent outside counsel should be obtained regarding the safe handling of all chemicals and solutions, necessary marking of all potential workplace hazards, and development of suitable procedures for all activities in which personnel safety may be a factor. Many agencies and firms offer workplace surveys for the purpose of hazard recognition and evaluation. The use of such survey guidance is urged.

Cleaning Compounds

The selection of appropriate dairy cleaning compounds and materials, their operating temperatures and concentrations, and the procedures required for their safe and effective handling are matters for the attention of specialists. Suitable compounds and procedures should be worked out and strictly observed.

Entry into Vessels - Potential Safety Hazards

Personnel entry into processing equipment, storage vessels, or confined spaces contains elements of potential hazard from such factors as air deficiency and/or presence of hazardous gas(es), height, slipperiness, possibility of contact with residual product or chemicals and so forth. Operating and safety supervisory personnel should develop appropriate procedures to be followed prior to and during such entry and assure themselves that such procedures are strictly observed.

Thermal Shock

Excessive thermal shock caused by rapid metal temperature changes may have destructive effects upon evaporators and similar equipment, and must be avoided. As a guide only, a suddenly applied differential of greater than 40 degrees F between metal and liquid (such as rinse) may be injurious to equipment.

INSTRUCTIONS FOR THE OPERATION AND CARE OF ROGERS VACUUM PAN

STARTING THE PAN

It is assumed that the pan has been thoroughly cleaned after the last operating run, and re-assembled. It is also assumed that the milk has been prepared in the hotwell (if used) and is ready (or will be ready shortly) for admittance to the pan.

Have all fittings in place except milk outlet connections, which should be left open to drain out condensed steam used in warming up the pan. Leave vacuum breaker and manhole open. Admit live steam into the pan through the superheater to warm up the equipment. If a superheater is not used, insert a steam hose through the open manhole (use due caution!). As soon as the pan is steamed out and the thermometer reads about 180F., turn off steam, close the vacuum breaker and manhole cover, and reconnect the outlet pump and piping. (Steam thus used for direct warming must be from a suitable supply.)

Turn on the seal water to the condenser pump(s) and the vacuum pump and start these pumps. Open the main water valve to the condenser about 1-1/2 turns. Allow the pumps to run, with all other valves closed, pulling 25" vacuum upon the pan and condenser.

With individual coil steam valves closed, open main steam valve to coil supply header. With the vacuum gauge reading 25", open the milk inlet valve and allow milk to enter the pan. The milk entering the pan will cause the vacuum on the gauge to decrease. As the vacuum starts decreasing, the milk inlet valve should be throttled so that the vacuum does not drop below 24". Watch the milk level in the pan, and when the bottom coil is completely submerged, turn its steam valve on rapidly and fully. Upon turning on the bottom coil, the milk may have a tendency to rise rapidly, even to the point of flying out through the condenser. To prevent this, as soon as the rapid rise becomes apparent, one of the following steps should be taken:

- A. Close the water valve to the condenser slightly but rapidly, thus decreasing the vacuum and raising the boiling point of the milk. When the milk subsides, slowly reopen the water valve. This is the generally preferred method.
- B. Open the vacuum breaker valve slightly until the milk subsides, then close it. This method avoids disturbing the water valve setting, but places an additional air load upon the vacuum pump.
- C. Open the steam valve to the top coil rapidly, fully, and only momentarily. This method avoids the negative features of methods A and B, but may create a greater problem by causing product to burn on the top coil.

As the milk starts to boil around the lower coil, the vacuum in the pan will decrease. Open the water valve gradually to maintain a 25" vacuum. This valve should not be opened over 1/4 turn at a time. Opening the water valve may again cause the milk level to rise in the pan. This may be corrected by slightly closing the water valve and opening it more gradually. It must be understood that opening

the water valve causes a slight increase in vacuum, thus lowering the boiling point and bringing about the rise.

The second and remaining coils should be turned on consecutively as they become covered with milk, in the same manner as the first, maintaining the vacuum, milk level, and water balance, at the same time maintaining a vacuum of about 25" on the gauge. As each steam coil is turned on a balance must be achieved between the milk inlet valve and the condenser water valve such that the milk level and the vacuum change only slightly. When operating a vacuum pan the only valves that should ever be opened hurriedly are the valves on the steam coils - when opened or closed the operation should be completed fully and quickly. On the water and milk valves, all changes should be gradual. When starting the pan, the milk inlet valve is opened fully to fill the bottom of the pan with milk, thus allowing the bottom coil to be submerged and turned on as quickly as possible. The milk inlet valve should then be throttled and will probably be operated at a point half way open or less. The normal operating point after the pan is fully in operation is usually with the milk inlet valve just cracked. For efficient operation, the milk level in the pan should be maintained at about 12" above the top coil. This may vary slightly resulting from the adjustment of the water and milk inlet valves, but after the pan has been operated a few days, the operator will be able to maintain this level very easily.

Best operating steam pressure on the coil supply header is about 3 to 4 pounds per square inch, and should never exceed 7 pounds per square inch. This pressure will be regulated by the pressure regulating valve, thus allowing the control valves on the coils to be opened and closed fully, as previously mentioned. The proper setting of the pressure reducing valve for the steam pressure in the coil supply header is that pressure which yields a pressure of about 1/2 psig at the inlets of the steam condensate traps (but which does not exceed 7 psig, as mentioned previously).

STRIKING OR SAMPLING

To strike a sample, hold the striking cup against the rubber gasket on the striking valve, and open the valve for approximately 15 seconds, allowing the milk to run into the cup. Close the valve. If difficulty is encountered in removing the cup, force the rubber fitting away from the cup at its point of contact to break the vacuum which is holding the cup to the fitting. Pour the contents of the cup into the hotwell, or preheater balance tank, as the first filling will not be a fair sample. Repeat the striking operation, allowing the valve to remain open approximately thirty (30) seconds. Close valve and remove cup. The Baume scale may then be floated in the striking cup and the density of the product in the pan determined from the reading and a Baume chart.

When the hydrometer indicates that the solids in the milk have reached the desired point of concentration, the pumping off operation may be started as follows: Open fully the sanitary valve between the outlet of the pan and the product removal pump (this valve must be fully open whenever the product removal pump is running). Open the sanitary valve on the discharge side of the product removal pump about half way and start the pump. The discharge valve is the flow control valve. This valve should be opened only wide enough to allow the pump to pump enough condensed milk out of the pan to maintain the correct level in the pan and the desired concentration. This level is maintained by a balance of the milk inlet valve and the control

valve on the discharge of the pump. After having operated the pump for a few minutes the pan should be struck again. If the concentration of the milk has decreased, the control valve on the removal pump should be closed slightly and, correspondingly, the milk inlet valve should be throttled, thus allowing the milk to remain in the pan longer and become more condensed. If the concentration of the milk is higher than desired, the milk inlet valve may be opened slightly more, as well as the throttle valve on the pump, thus drawing more milk into the pan and decreasing the final concentration. A balance should be maintained between the milk inlet valve and the control valve on the milk removal pump, holding the level in the pan at the previously mentioned 12" above the top coil.

Nearing the end of the run, when all the milk to be condensed is in the pan, the concentration should be checked repeatedly until the desired degree of concentration for the entire quantity has been reached. At this point the pan may be shut down and then the concentrated milk pumped out. During this final period the evaporation will reduce the volume of the pan contents. Starting with the top coil and working downward, the individual steam valves to each coil should be turned off (fully) before the coil becomes uncovered, or product will burn on the coil surface.

SHUTTING DOWN

To shut down the pan, first turn off the main steam supply valve located in the main steam line ahead of the pressure regulating valve. Shut the milk inlet valve. Rapidly shut off the water to the condenser. Shut off the water removal pump and the vacuum pump, close the seal water valves on the pumps, and fully open the vacuum breaker valve. The control valve on the milk outlet pump will again have to be regulated so that with the vacuum off it does not pump more milk than can be handled by the cooler or other equipment.

CLEANING THE PAN

After the pan is empty, disconnect the pipe between the pan outlet valve (not the control valve) and the removal pump, leaving the outlet valve wide open. Rinse the side walls and coils with a hose, allowing this water to run to waste. Close the valve on the bottom of the pan and fill the pan with water to the top of the top coil. Add a suitable alkaline dairy cleaner (see remarks under General Notes and Cautions). Close the manhole and start the pan as you would with milk and bring this solution to a boil, allowing it to boil for approximately fifteen (15) or twenty (20) minutes. In starting the pan for the cleaning operation, the coils may be all turned on at once, as a flying up of the cleaning solution will rinse the walls of the pan and the entrainment separator. After the solution has boiled for about twenty (20) minutes, shut down the pan and allow the solution to remain in the pan until a man is ready to hand clean it. Just previous to hand cleaning, the solution should be drained off to waste and the interior of the pan again rinsed with water.

Prior to personnel entering the pan to hand clean it, personnel are urged to review the cautions set forth under General Notes and Cautions regarding potential safety hazards. Only after reviewing such information and operating instructions by plant safety personnel, should personnel enter the pan using a hose or comparable cleaning implement, remove all deposits of milk from the side walls and coils, rinsing the surface with fresh water as he goes along. The use of an abrasive on the coils will scratch their surface, thus greatly increasing the tendency of milk to

burn onto them. NEVER USE ANY ABRASIVES, HOWEVER MILD, IN CLEANING THE COILS. After the coils and side walls have been washed, the entrainment separator in the top of the pan should be dropped by unhooking one of the three (3) hooks holding it in place, and all of its surfaces entirely washed. While the entrainment separator is dropped down in the cleaning position, the top inside of the pan, the dome, and the short stainless steel neck leading to the condenser should also be washed in the same manner, so that all of the area with which the milk comes in contact is fully cleaned. After the pan has been cleaned and the man has gotten out, the entire interior of the pan should again be rinsed with clean, fresh water. All of the sanitary piping leading to and from the pan, including the milk removal pump, check valve, and control valve, should be dismantled and carefully cleaned. This piping and pump should not be reassembled until just before the pan is to be used.

When the pan and piping is reassembled for another operation, care must be taken to see that all gaskets have been put in, and that all fittings are tight. A leak in the pan may frequently be detected by a shrill whistle or squeal. If this condition exists, it must be corrected immediately before going further with the operation.

NOTE: Valve positions given in these instructions are generalities. Actual positions will vary with vacuum pan size, product type, and valve size and type, but will become apparent with operating experience.