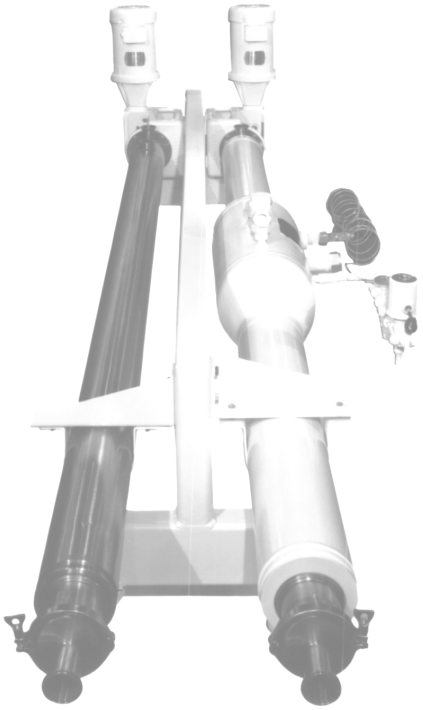
Waukesha Cherry-Burrell

Read and understand this manual prior to installing, operating or maintaining this equipment.

4” x 120” Votator

Scraped-Surface Heat Exchanger



OPERATION & INSTRUCTION MANUAL

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WARRANTY

Waukesha Cherry-Burrell warrants equipment of its own manufacture to be free from defects in materials and workmanship for a period of twelve (12) months from shipment. This warranty extends only to user, and in no event shall Waukesha Cherry-Burrell be liable for property damage sustained by a person designated by the law of any jurisdiction as a third party beneficiary of this warranty or any warranty held to survive Waukesha Cherry-Burrell's disclaimer. Replacement parts provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the Machine, as if such parts were original components of the Machine. With respect to equipment, materials, parts and accessories manufactured by others, Waukesha Cherry-Burrell will undertake to obtain for User the full benefits of the manufacturer's warranties, but in no event shall user or any other person have any remedy against Waukesha Cherry-Burrell for breach of a manufacturer's warranty. A defect in a part shall not condemn the whole machine. The warranty described in this paragraph shall be in lieu of all other warranties, express or implied, including, but not limited to, any implied warranty of merchantability of fitness for a particular purpose. Waukesha Cherry-Burrell makes no warranty of any kind with regard to this document, including but not limited to, implied warranties for fitness for a particular purpose. Waukesha Cherry-Burrell shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of this document.

Manufactured in the United States of America

First printing, 1994

SAFETY

Various WARNINGS, CAUTIONS and NOTES appear throughout this manual. Each brief statement identifies certain conditions that require special attention.

WARNING Alerts personnel to potential safety hazards.

CAUTION Is used in situations where equipment could be damaged.

NOTE Emphasizes information considered to be especially important.

INTRODUCTION

Votator 4" x 120" heat exchangers are designed and constructed to provide consistent performance in a continuous, pressurized system.

IMPORTANT

These instructions cover installation, operation and maintenance (including recommended spare parts) of the equipment described herein. They should be carefully reviewed and understood by all personnel involved in operating and maintaining the equipment.

WARNING

Use of the equipment in product applications for which it is not designed, failure to operate and maintain the equipment in accordance with these instructions, or use of unapproved replacement parts, may result in injuries to persons and damage to property.

To secure operational information, repair assistance, or to order replacement parts, contact:

Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan Wi 53115
Telephone:
1-800-252-5200 Or 262-728-1900
Fax:
1-800-252-5012 Or 262-728-4904
The country code for the USA is 1.
E-mail: custserv@gowcb.com
Website: www.gowcb.com

Receiving and Handling

1. Carefully inspect the equipment for damage immediately upon receipt.
2. It is your responsibility to file a damage claim with the carrier immediately.
3. Cover and store in a safe, clean, dry place if the equipment is not to be installed immediately.
4. Leave the unit on the shipping skids when moving it from one location to another.
5. During all movement, protect the equipment from sudden jars, shocks, dropping, etc.
6. See Bill of Lading for weight.
7. Never make a single point hitch to the unit when handling with a hoist. Attach lifting cable or chains to unit frame, or skids only. Do not attach lifting cables or chains to cylinders.
8. Some equipment is shipped disassembled into major components to be reassembled on location. When handling, protect any machined surface that may be exposed.
9. Units shipped without a frame must be removed from their shipping crates using a double hitch lifting method. This method assures even lifting and prevents possible equipment damage.

A. LOCATION

INSTALLATION

1. See equipment drawings for general dimensions.

2. Space Requirement: The floor space requirement for the equipment in its operation position is shown on the above-referenced drawings. Provide sufficient clearance around and above the unit for access and maintenance work.

3. Mutator Shaft Removal: Allow a minimum of 10'-6" clearance for removing the shaft. For vertical units provide a lifting mechanism of the monorail or traveling type to allow the shaft to be lifted clear of the unit and moved to a nearby maintenance area.

4. Other Equipment: Carefully plan location of this equipment in relationship to complementary equipment so as to arrive at the optimum processing arrangement.

5. Utility Requirements: Appropriate heat transfer medium and electrical requirements must be provided.

6. Ambient Conditions: This equipment is not suitable for locating in a corrosive or extremely dusty atmosphere. If outdoor installation is contemplated, protection from the elements and from freezing conditions must be considered.

B. Foundation

A concrete pad or substantial steel structure is advised. Anchor bolt or foot locations are shown on the drawings where applicable.

NOTE

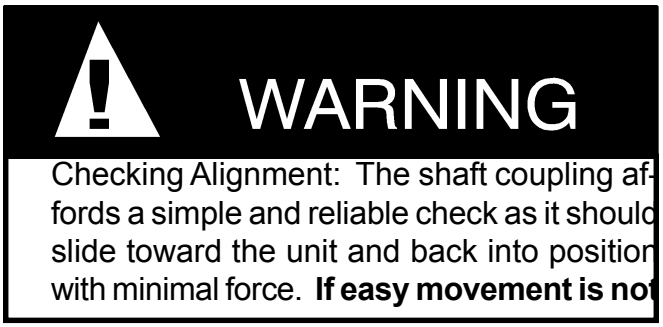
Units provided with bullet feet do not require anchoring.

C. Alignment of 4" x 120" Cylinder Assemblies

Units which are sold with appropriate bases or frames are prealigned at the factory during final assembly but still may suffer misalignment.

Units which are sold without mounting stands include brackets which must be installed approximately two (2) feet from the non-driven end to properly support the tube and shaft assembly. The bracket is designed for support only and must be installed in a manner which does not put undue stress on the locating bore in the mounting pedestal.

Prior to running under power, the alignment must be checked.



in evidence, the misalignment must be corrected prior to start-up.

Check that all mounting surfaces are properly seated in their locating bores or counterbores and that all mounting nuts and bolts are tightened.

If difficulty still persists with assembly, contact:
Technical Services
Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan Wi 53115
Telephone:
1-800-252-5200 Or 262-728-1900
Fax:
1-800-252-5012 Or 262-728-4904
The country code for the USA is 1.
E-mail: custserv@gowcb.com
Website: www.gowcb.com

D. Electrical Power Connections
(See Wiring Diagram in Equipment Prints)

Provide the following items in the branch electrical circuit from the line to the drive motor(s).

1. Start-Stop Switch installed in the control circuit for easy operational control of the motor(s).

2. Motor Controller properly sized to protect the motor against overload.

3. Safety Switch ahead of the motor controller to disconnect the equipment from the line while it is being maintained.

4. Fuse or Circuit Breaker to protect the branch against short circuits or grounds which may result in an overcurrent far in excess of the motor rating.

E. Product Piping:
(Ref.: See Figure 1, for typical arrangement)

1. Refer to equipment drawings for size and location of piping connections.

2. Support ALL piping independently.

3. Provide for line expansion and contraction.

4. Product interconnecting piping supplied between cylinders requires no additional support unless specified in drawings.

5. A safety valve must be installed on the discharge side of the product pump.

WARNING

The maximum internal product pressure rating is 200 psig @ 365°F. Failure to install a relief valve or operating at pressure above the design maximum can result in damage to property and injuries to personnel.

6. Refer to Pumping Equipment section for information.

7. Keep piping as short and as free of directional changes as possible.

8. Do not install any positive shut-off valves down-stream of the feed pump.

9. Provide temperature indicators on both sides of 4” x 120” unit. Provide pressure gauge on the discharge side of the pump.

F. Seal Flushing Connection

1. The seal flushing connections on the drive end are d" FPT.

2. Choose flushing medium compatible with product. Do not pressurize the seal flushing chamber as this could result in leakage of flushing medium into the product zone.

3. Provide unions close to heads to facilitate head removal.

4. Provide globe type valve on inlet side only to control flow.

G. Jacket Medium Piping - Liquid or Steam

1. Refer to Figures 2 and 3 for typical arrangements.

2. Refer to the equipment drawings for jacket connection sizes and locations.

3. Support ALL piping independently.

4. Provide for line expansion and contraction.

5. Install a safety valve to protect the jacket.

WARNING

Maximum jacket pressure rating is 150 psig on liquid or steam jacketed units, and 100 psig on refrigerant jacketed units.

Failure to install a relief valve or operation pressures above the design maximum can result in damage to property and injuries to personnel.

Particular care should be taken to prevent a volume of liquid from being isolated in the jackets without relief protection. Thermal expansion when the liquid warms up can generate enough force to crush the tube possibly causing damage to the internal components and drive system as well.

6. When using a liquid coolant, if practical, provide an arrangement to introduce a heating medium into the jacket to thaw an overcooled product.

7. A liquid coolant system should be provided with a bypass line around the 4" x 120" unit so that the coolant system may be brought down to operating temperature without circulating coolant through the 4" x 120" unit jacket.

H. Jacket Medium Piping - Refrigerant

Refer to Figure 4, for typical refrigerant piping.

Refer to equipment drawings for connection sizes and locations.

All interconnecting piping and relief valve venting should be made in accordance with any applicable local codes and regulations.

The Votator 4" x 120" direct expansion chilling unit employs an integral jacket-accumulator design for simplicity of operation and minimum space requirements.

Figure 4, illustrates a suggested hookup for:

1. Minimizing the loss of heat transfer ability due to the effects of oil contamination.

2. Protection of the compressor from liquid carry over in the suction line.

3. Utilization of liquid subcooling to effect routine oil separation without energy waste.

4. Quick shutdown of the 4" x 120" unit or rapid load removal to minimize freeze up possibilities.

Refrigeration systems can be adequate compressor protection against liquid carry over, sufficient liquid storage (two cubic feet minimum per 4" x 120" cylinder), and oil separation and purifying capability without using the suction line accumulator depicted on Figure 4. If the refrigeration system does not have these features, the suction line accumulator can be furnished as an accessory item with the 4" x 120" Chiller System.

IMPORTANT

Refrigeration jacketed Votator 4" x 120" Heat Exchangers are designed for a maximum refrigerant and jacket pressure of 100 psig. They are also provided with two means of preventing accidental jacket over pressurization - a relief valve and a manually adjustable refrigerant back pressure regulator (BPV). This BPV must be adjusted during the initial installation of the unit and checked periodically thereafter.

BPV High Pressure Adjustment Procedure

Refer to Drawing Number 303226-A01 or 303226-A02 while completing the following procedures.

1. Assure that all utility piping has been installed, pressure tested, evacuated and charged with refrigerant!

2. Turn refrigeration controls "on" to admit refrigerant to surge drum. Pressure in drum will begin to rise.

3. Turn refrigerant controls "off".

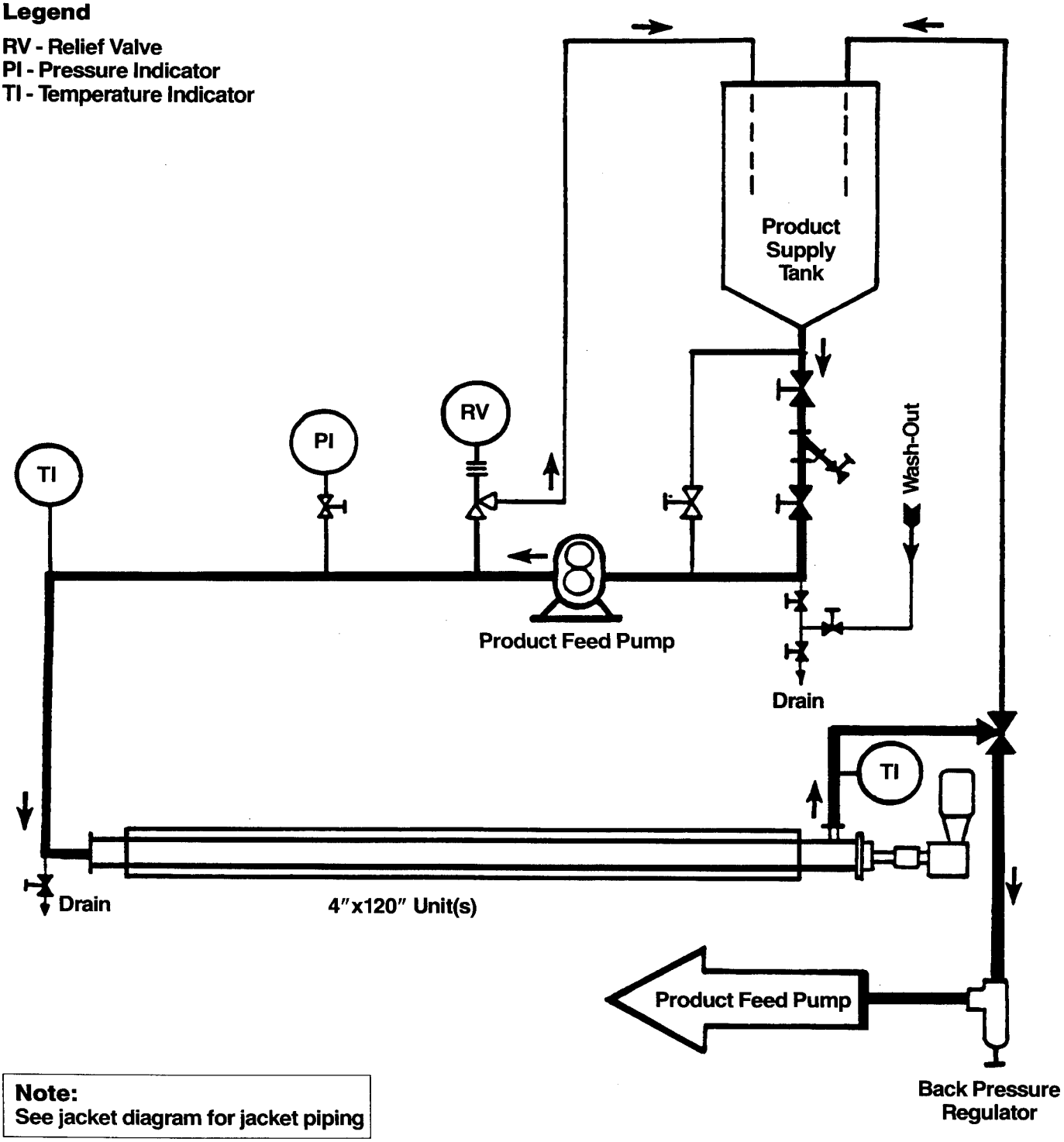
4. When pressure in surge drum reaches 90 PSIG, adjust high pressure pilot valve (valve without handle) to maintain surge drum pressure at or below 90 PSIG.

5. Refrigeration system is now ready for normal operation (refer to Operation section).

Figure 1. Typical Product Piping Arrangement

Legend

RV - Relief Valve
PI - Pressure Indicator
TI - Temperature Indicator

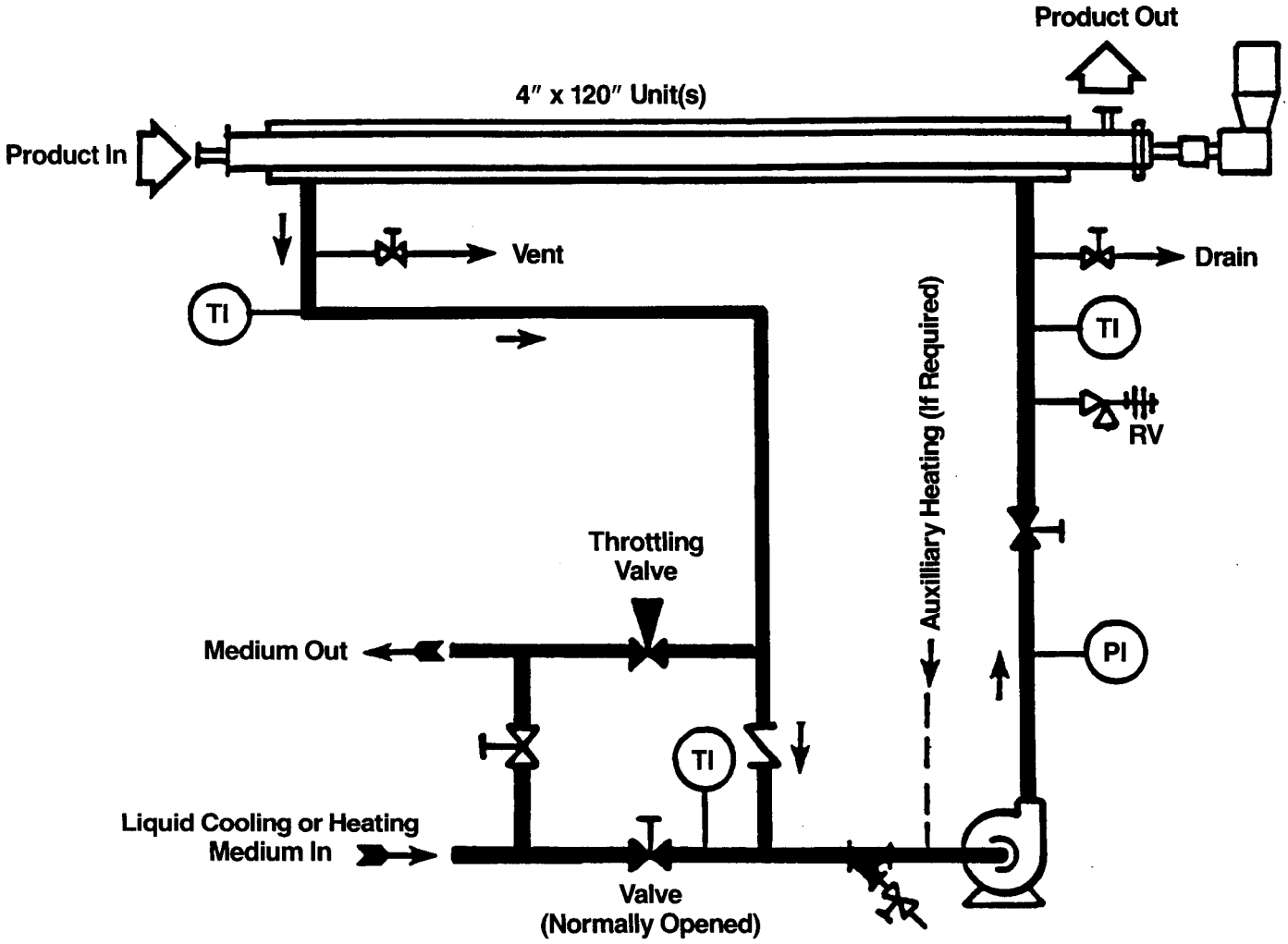


Note:
See jacket diagram for jacket piping

Figure 2. Typical Jacket Flow Diagram, Liquid

Legend

RV - Relief Valve
PI - Pressure Indicator
TI - Temperature Indicator



Note:
For multiple units it is recommended that jacket medium flow is counter current to product flow.

Figure 3. Typical Flow Diagrams, Steam

Legend

PI - Pressure Indicator
RV - Relief Valve
TRC - Temp. Recorder-Controller
PRV - Pressure Reducer Valve

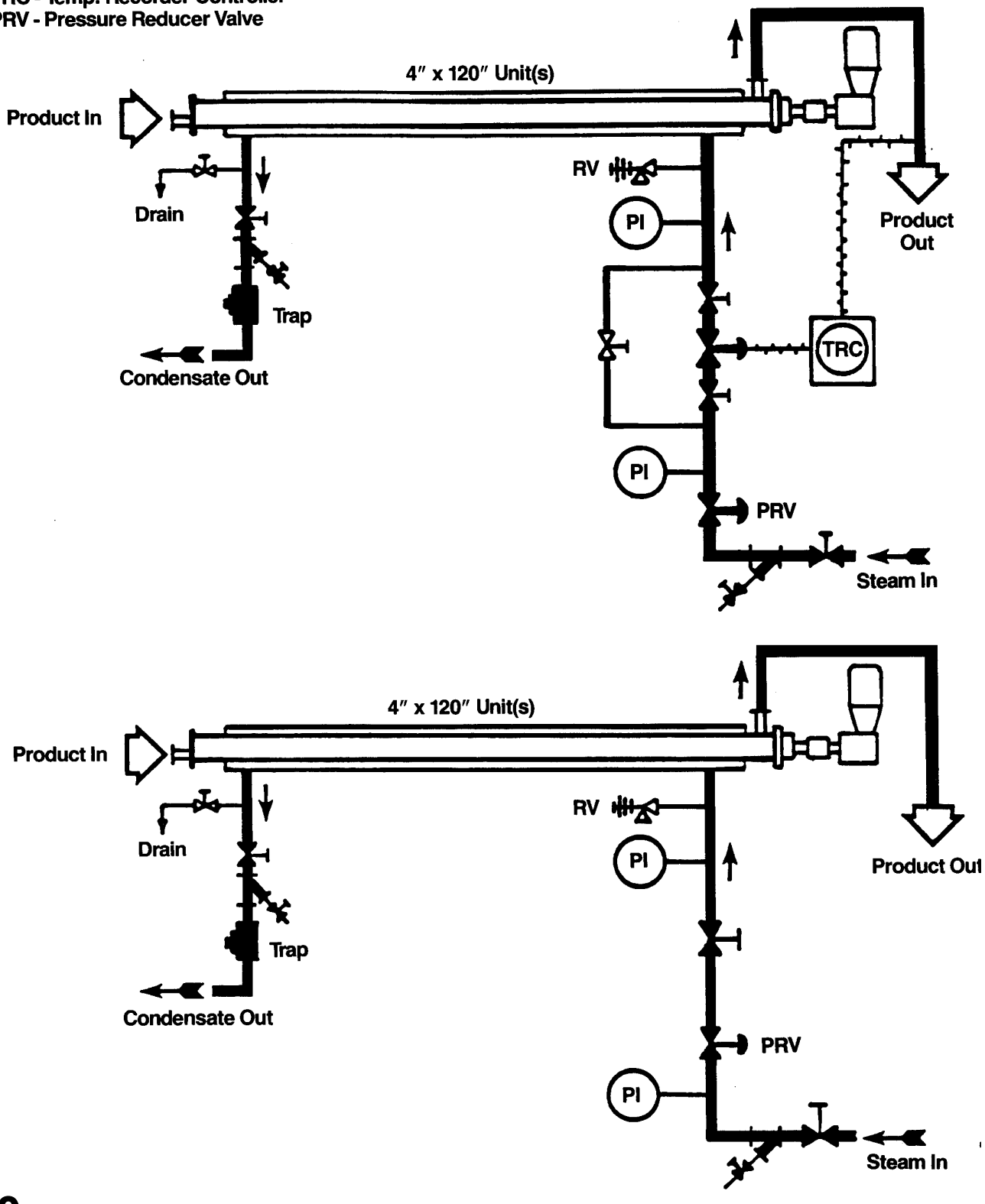
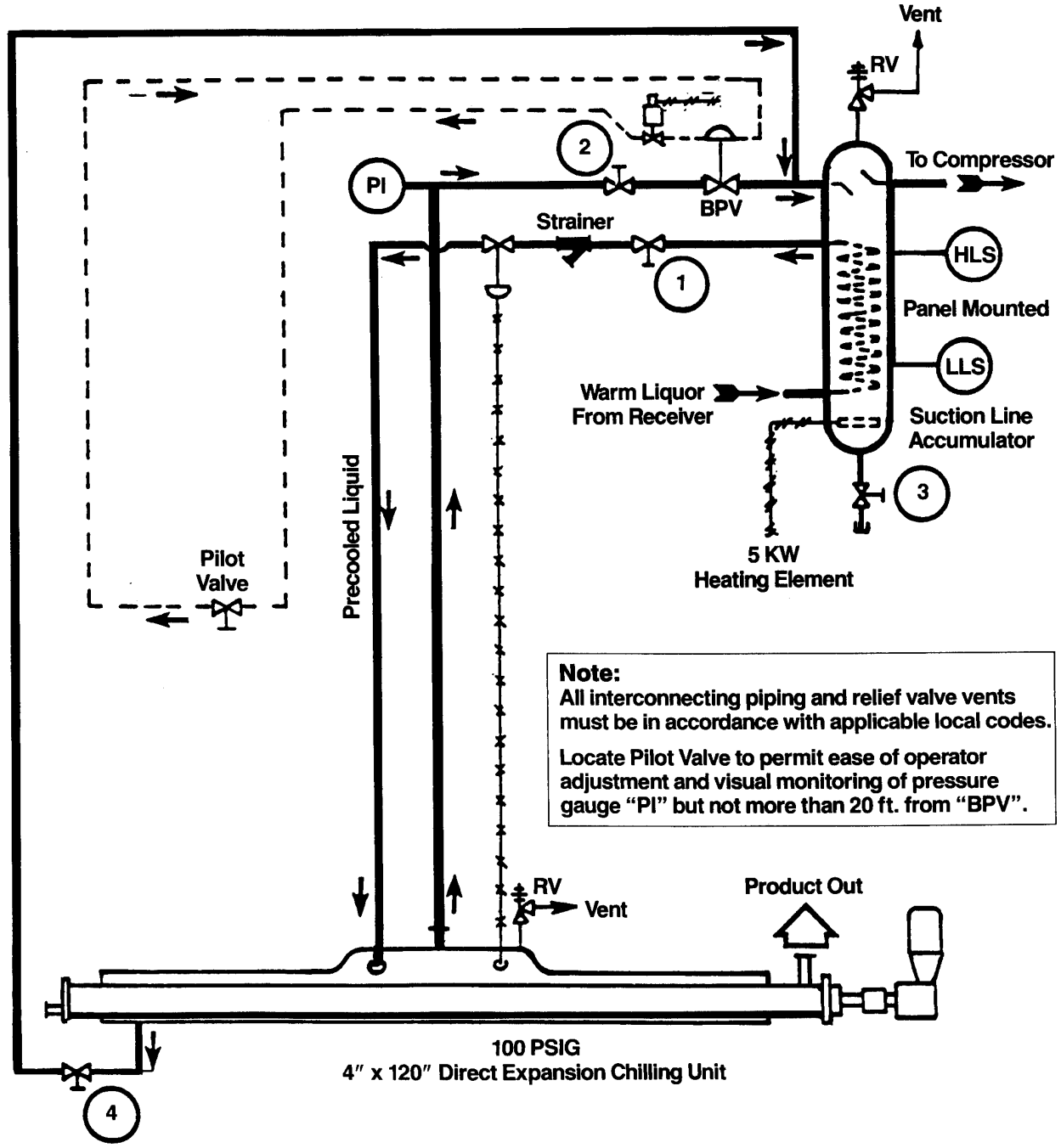


Figure 4. Typical Jacket Flow Diagram – Refrigerant

Legend

BPV - Back Pressure Valve
HLS - High Level Switch
LLS - Low Level Switch
PI - Pressure Indicator
RV - Relief Valve
— — - Pilot Supply Line
-x-x- - Capillary Expansion Line
~~~ - Electric Line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OPERATION

A. General

WARNING

Use of the equipment in product applications for which it is not designed, failure to operate and maintain the equipment in accordance with these instructions, operation with safety guards removed, or use of unapproved replacement parts, may result in injuries to personnel and damage to property.

Rotation of mutator shaft is clockwise looking from the opposite drive end. The blades scrape, they do not wipe. NEVER RUN SHAFT BACKWARDS as damage to unit will result.

1. Never allow mutator shaft to run continuously unless product is flowing through unit.

2. In case of freeze up or shaft seizure, never try to put shaft under motor power until there is complete assurance the freeze up in unit is completely cleared. Freeze ups can be caused by:
   a. Overcooling (freezing) or overheating, (burn on, coagulation, etc.).
   b. Flow stoppage caused by pump failure, allowing supply tank to run dry, or power failure.
   c. Processing product for which unit was not designed.
3. Never allow supply vessel to empty before the unit is empty of coolant or heating media. Anticipate shutdown by having available sufficient quantity of product or cleaning medium to warm a cooling unit above freezing conditions, or to cool a heating unit below scorching or boiling conditions.
4. Before initial operation, equipment should be dismantled and thoroughly cleaned. (refer to Cleaning & Sanitizing section).

B. Operating Instructions

These instructions are general in nature and should be superseded by DAILY START AND STOP PROCEDURES written to conform to actual in-plant processing conditions.

1. Start-Up - Liquid Coolant or Steam jacketed 4” x 120” Units.
   a. Jog mutator shaft to insure freedom of movement.
   b. Start product pump, recycle through system, and return to supply, or divert to waste container if product cannot be recycled.
   c. Start 4” x 120” mutator shaft after flow is established. (Shaft should rotate clockwise when viewed from the non-driven end.)
   d. Admit coolant (or steam) to cylinder jacket gradually.
   e. Establish operating pressure.
   f. Divert product to usage point when system equilibrium is reached.
   g. Readjust operating pressure if necessary.

2. Shutdown - Liquid Coolant or Steam jacketed 4" x 120" Units.

   Shutdown procedure is normally the reverse of start-up procedure. The following approaches are recommended:
   a. Air or high pressure gas may be used to blow the equipment free of product after cooling (or heating) medium has been secured and product circulated to approach ambient temperature.
   b. Compatible fluids, i.e., water, oil, or other solvent, may be used as flushing media after the jacket medium has been secured and product circulated.

3. Start-Up and Shutdown - Refrigerant Coolant 4" x 120" Units. Refer to Figure 4, page 11.

   a. Jog mutator shaft to insure freedom of movement.
   b. Start product pump, recycle through system, and return to supply, or divert to waste container if product cannot be recycled.
   c. Start 4" x 120" mutator shaft after flow is established. (Shaft should rotate clockwise when viewed from the non-driven end.)
   d. Check jacket drain valve (4) to insure that it is closed.
   e. Open suction line stop valve.
   f. Admit liquid refrigerant to the unit by opening the liquid line stop valve 1 and energizing the electrical heating element of the Sporlan level control.
   g. When the refrigerant level has been established (approx. 2 minutes), gradually adjust the back pressure control pilot valve (BPV) to attain the desired outlet temperature.
   h. Divert product to usage point when system equilibrium is reached.
   i. Readjust operating pressure if necessary.

IMPORTANT

Insure that BPV High Pressure Adjustment has been made in accordance with (refer to Installation section, H. Jacket Medium Piping-Refrigeration.)

4. Process Interrupt
   a. Interruptions of short duration are best handled by diversion of the outlet flow to a suitable alternate collecting point without upsetting control conditions.
   b. In the event refrigeration must cease rapidly for any reason, close solenoid valve to isolate pilot valve, close the liquid refrigeration feed valve 1, and open the drain valve 4 to evacuate the jacket of refrigerant.

   The refrigerant charge at operating level is approximately one cubic foot. To accommodate evacuation, the drain must be connected to a suitable low pressure liquid collecting vessel such as a drop tank, "slop" tank, oil rectifier, or suction line accumulator having a <u>minimum of two cubic feet of storage capacity per 4" x 120" cylinder devoted exclusively to the 4" x 120" requirement.</u>

   The above provision insures that at least one and possibly two emergency shutdowns can be realized in succession.

   Suitable boil off means must be available to facilitate evacuation of the liquid thus collected to separate the trapped oil remaining in the vessel, which may then be drained periodically (valve 3).

5. Shutdown procedure

   To maintain peak efficiency it is absolutely necessary to exclude, or at least minimize oil contamination in the 4" x 120" jacket. Assuming a less than perfect oil separator in the high side system, the following steps are recommended.

   a. Direct product to alternate receiving vessel.
   b. Circulate warm product or alternate flushing fluid through the system.
   c. Close liquid stop valve (1) and de-energize the Sporlan heater.
   d. Raise back pressure to maximum setting by closing pilot valve solenoid.
   e. Allow majority of the liquid to boil off under above conditions.
   f. Open drain valve (4) and allow remainder to be evacuated to collecting vessel.
   g. Reduce back pressure to permit pump down by operating pilot valve solenoid.
   h. Secure all stop valves (1), (2), and (4) after pump down is complete.

NOTE

Oil contamination of refrigerant in the 4" x 120" is readily detected by observing the jacket drain line between the jacket and drain valve (4) for frost during normal operating when frost is present on the jacket. <u>This line should frost first and defrost last</u> relative to the jacket. If conditions are otherwise, oil contamination is present and lowered operating efficiency can be expected as a result.

DISASSEMBLY & ASSEMBLY OF PRODUCT SIDE

A. Disassembly

WARNING

Do not disassemble the unit without first shutting off electrical power to the equipment at the main disconnect switch and making sure no product or jacket medium at elevated temperature or pressure is present in the unit.

1. Disconnect product piping connections and seal flushing connections if used.
2. Remove drive coupling guard.
3. Remove head and mutator bushing at opposite drive end.
4. Loosen retaining screws to permit shaft to slide from coupling.
5. Slide shaft back approximately 2" to relieve tension on seal spring.
6. Remove drive end head clamp.
7. Slide shaft out far enough to remove drive end head and seal assembly.

CAUTION

The seal face is delicate. To avoid damaging, place in a safe location, on a clean, soft cloth.

8. Pull shaft and blades from cylinder as a unit.
9. Perform required inspection and servicing. Clean all parts before assembly.

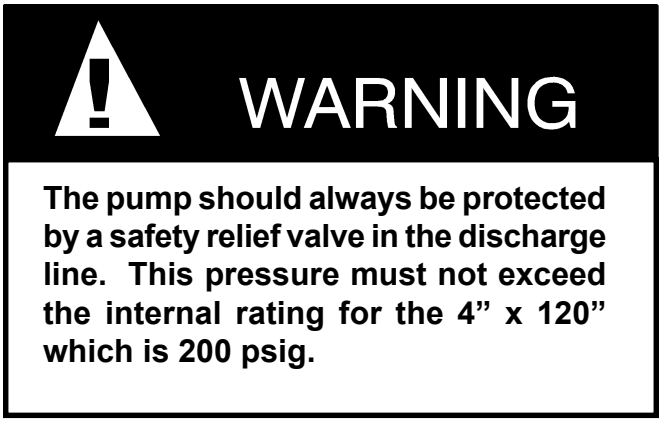
B. Assembly

1. Replace seal insert in drive end head. Lubricate O-ring before installing.
2. Carefully slide shaft into cylinder. Hold blades against shaft to prevent them from striking end of cylinder. Insert shaft until enough protrudes through cylinder to allow reassembly of seal spring, washer, O-ring, seal body, head gasket, and drive end head.
3. Slide seal body assembly onto shaft until spring comes in contact with shoulder of shaft.
4. Clamp head in place.
5. Slide shaft into coupling aligning key slot. Tighten retaining screws. Replace coupling guard.
6. Replace mutator bushing and opposite drive end head.
7. Complete product piping and seal flushing piping if used.
8. Connect electric power to motor and prepare unit for operation.

PUMPING EQUIPMENT

To obtain consistent results and maintain desired product quality, it is mandatory that the product be delivered to the 4" x 120" unit at a continuous, controllable rate. This requires the proper application of a pump capable of constant delivery of the product at elevated pressures. The pump should be provided with a variable drive to effect rate changes.

The Pump and supply tank should be located reasonably close to the 4" x 120" unit. The pump should be placed under the supply tank and connected using a minimum length of piping and turns. A flushing line is normally installed in the line between the tank and pump. This line should be closed, using a double block and bleed arrangement to prevent inadvertent contamination of the product.



Care of the 4" x 120" Heat Exchanger

Four simple rules for maintaining production efficiency:

1. Keep the scraper blades sharp.
2. Keep scraped side of heat transfer tube smooth.
3. Keep the jacket side of the tube clean.
4. Keep rotary seals and rotary seal areas in good repair.

A. Correct Use and Care of Blades

The scraper blades and heat transfer tube must be properly maintained to achieve continued maximum production. Abnormal blade and tube wear can be avoided.

Causes of Unnecessary Blade and Cylinder Wear

1. Using blades other than those furnished by Waukesha Cherry-Burrell (Votator).
2. Dulling blades on tube end by careless shaft handling.
3. Careless assembly of blades, shafts, seals and heads.
4. Running shafts without product or product flow.
5. Starting shaft with stiffened or solidified product in cylinder.
6. Using blades below minimum width specification.
7. Using blades with bearing surfaces below minimum radius specification.
8. Dull blades.
9. Causing excessive scraping pressure by unnecessary product pressure.
10. Starting flow of jacket medium (Ammonia, Freon, Steam, Water, etc.) before establishing FULL product flow.
11. Failure to remove product from cylinder after every use.
12. Starting operation before completely dissolving such abrasive substances as salt, sugar, detergents, etc.
13. Use of wrong detergent or incorrect use of right detergent.
14. Operating unit without mutator bushing or with worn mutator bushing.

Minimum Blade Width and Bearing Radius Determination

NOTE

Use of the 4" x 120" blade gauge is recommended to determine when the minimum blade width or minimum bearing radius has been reached. This gauge is included with all 4" x 120" units for this purpose.

B. Care of 4" x 120" Heat Transfer Tube Product Side

The product contacting surface is polished 316 stainless steel.

WARNING

When this surface is appreciably damaged, honing is not recommended, since the pressure capability of the 4" x 120" could be reduced, resulting in possible injuries to personnel through rupture of the equipment and release of the contents. The Heat Transfer Tube should be replaced and is designed to be economically replaceable. Causes for tube wear or damage are listed in Maintenance section-A, this page.

Jacket Side (Steam or Liquid)

The jacket side of the heat transfer tube will become coated with foreign matter over a period of time. The magnitude of the resultant loss of heat transfer will depend upon the quantity and type of coating. Steam or liquid jacketed units must be cleaned by periodic recirculation of an automobile radiator type cleaner. We do not recommend using the rust inhibitor which is sold with some radiator cleaners. A water pump and 55-gallon drum can be utilized to circulate the cleaning solution through the jacket. A steam coil, or portable heating plates, can be used to heat the cleaner in the drum, if required.

The frequency of this cleaning procedure will vary greatly from one installation to another. Past experience with similar problems and records of the 4" x 120" unit's performance will be your best guide. The period between cleanings may be from six months or less to several years.

Jacket Side (Refrigerant)

Since it is practically impossible to completely prevent compressor oil carry over and because the 4" x 120" Heat Exchanger operates on the flooded system or direct refrigerant "boil off", the jacket side tube surface will eventually become fouled with compressor oil and sludge.

The severity and rapidity of the fouling (insulating film build up) depends entirely on how much or how little compressor oil is "thrown" into the refrigerant by the compressor and the cleanliness of the entire refrigerant system.

The unit cooling capacity fall off necessitates cleaning of the jacket side tube surface. The cleaning frequency depends on how efficiently compressor oil is separated from the refrigerant. However, at least once every 12 to 18 months the carbon steel jacket should be removed for tube cleaning. Longer periods between cleaning will make the film and dirt removal more difficult because, with time, this film becomes polymerized.

C. Jacket Removal Procedure

WARNING

Do not disassemble the unit without first shutting off the electrical power to the equipment at the main disconnect switch and making sure no product or jacket medium at elevated temperature or pressure is present in the unit.

1. Liquid and/or Steam Style Jacket
   It will first be necessary to prepare the unit for jacket removal. To do this, first drain and isolate unit. Next, carefully vent the jacket of the unit to atmosphere to relieve any remaining pressure. The unit is now prepared for jacket removal.

2. Refrigeration Style Jacket
   It will first be necessary to prepare the unit for jacket removal. To do this, first pump down the refrigeration system, draining the 4" x 120" jacket contents to the receiver or drop tank. Completely isolate the unit. Next, carefully open the refrigeration system of the unit to atmosphere to bleed off any remaining refrigeration gas pressure. The unit is now prepared for jacket removal.

Disassembly

1. Remove product heads, shaft and all piping connections from unit.
2. Remove the two (2) jacket cover retaining screws from drive end of cylinder assembly.
3. Place temporary support under cylinder at opposite drive end near support bracket.
4. At this point jacket cover will slide off the cylinder assembly in the opposite drive end direction.
5. Remove jacket O-rings at each end of the cylinder assembly.
6. Perform servicing and/or cleaning.

Reassembly

1. Thoroughly clean jacket O-ring grooves at each end of cylinder assembly.
2. Lubricate and replace O-rings.
3. Slide jacket cover over cylinder assembly, being sure to properly align the retaining screw holes. (Do not force at this point as damage can occur to O-rings.)
4. Reinstall jacket cover retaining screws and opposite drive end support bracket.
5. Test jacket for leaks.
6. Replace shaft, heads and piping connections & Safety Guards.

D. Correct Use and Care of Rotary Seals

The 4" x 120" rotary seal has only one function; that is preventing product from coming through the 4" x 120" drive end head around the spinning mutator shaft stub.

The rotary seal consists of:

1. A seal body
2. A seal insert
3. Two O-rings
4. A seal spring
5. A seal backing ring

E. Rotary Seal Leaks: Causes & Remedies

Cause	Remedy
Seal Insert O-ring	
Twisted when installed	Lubricate before installing (edible lubricant)
Wrong size, distorted, deformed or cut	Replace
Wrong O-ring compound	Replace with specified compound
Damaged seal insert	Replace
Obstruction or dirt in head recess for seal insert	Clean recess
Head recess for seal insert damaged	Replace
Seal Body O-Ring	
Twisted when installed	Lubricate before installing
Wrong O-ring compound	Replace with specified compound
Wrong size, distorted, deformed or cut	Replace
Damaged seal body	Replace
Damaged seal backing ring	Replace
Damage on shaft at O-ring sealing area	Contact Waukesha Cherry-Burrell
Obstruction on shaft stub (uncleaned shaft)	Remove obstruction, clean and lubricate shaft prior to seal body installation

F. Periodic Servicing and inspection

Inspection or Service	Frequency
Removal of mutator shaft to inspect scraper blades, shaft seal parts and heat transfer tube surface	Weekly
Check spare parts stock vs. spare parts list	Quarterly or as needed
Change of gear box oil	Quarterly or as needed
Clean jacket	As needed

TROUBLESHOOTING

OPERATIONAL TROUBLESHOOTING
This equipment contains rotating and wearing parts. How frequently they must be repaired or replaced depends on the thoroughness of regular PERIODIC cleaning, inspection and lubrication. Frequency of performing Preventative Maintenance is dictated by the process, the operating conditions and the local sanitation codes. Use the following Tables I and II and operation experience as a TROUBLESHOOTING GUIDE.

Operational Troubles usually have multiple causes. Make the following checks before shutting down for repairs.

1. Make sure faulty operation is caused by the heat exchanger and not by some other process equipment.
2. Determine if the process pump(s) are operating or being operated correctly.
3. Determine whether 4" x 120" unit is being adequately supplied with the necessary utilities (electricity, refrigeration, air, etc.).
4. Determine whether the duty imposed is that for which the unit was originally rated.
5. Check if daily start and stop procedures are correctly followed.
6. Make sure all instruments and controls are functioning properly.
7. Does trouble exist on all working shifts, with all unit operators?
8. Excessive Wear: Excessive wear and damage of parts usually results when unit is operated beyond requirements specified limits, contact Waukesha Cherry-Burrell.

WARNING

Use of this equipment in product applications for which it is not designed, failure to operate and maintain the equipment in accordance with this manual, or use of unapproved replacement parts, may result in injuries to persons and damage to property.

Table 1 - Operational Troubleshooting

Loss of Unit Performance or Capacity

Cause	Remedy
Product "IN" temperature high/low	Precool or heat to normal
Product pump rate too high	Reduce to SPECIFIED RATE
Scored or rough heat	SEE Correct Use & Care of Blades, & Care of 4" x 120" Heat Transfer Tube
Jacket side surface fouled with dirt, scum or oil	Drain oil and/or clean out jacket space. SEE Jacket Removal Procedure.
Blades dull or worn out	See blade instructions
Insufficient supply of liquid refrigeration	Consult refrigeration engineer
Refrigerant valving inoperative	Consult manufacturer's bulletin's
Variation of refrigerant evaporator temperature	Check low side gauges. Incorrect compressor capacity possible.
Insufficient supply or incorrect temperature of heat transfer medium	Correct source of supply

TROUBLESHOOTING

Motor Overloading

Cause	Remedy
Process flow rate too low causing freezing or burn on	Increase flow rate
Product "OUT" thermometer out of calibration	Recalibrate, correct or replace
Faulty electrical supply	Check voltage and contacts
Product pressure gauge out of calibration	Recalibrate or replace
Excessive process pressure	Decrease process pressure
Worn bearings	Replace bearings
Jacket temperature too low or too high	Correct temperature

Excessive Vibration

Cause	Remedy
Loose adjustable feet	Tighten lock nuts
Worn bearings	Replace gear box
Motor or cylinder loose on its mount	Tighten mounting bolts

Seal Leaks

Cause	Remedy
4" x 120" head drawn up unevenly onto tube end	Remove, inspect, clean, replace any defective parts, and draw up evenly
Seal Body or Insert Seal Faces worn or damaged	Replace
Seal Insert cocked when installed	Remove and reinstall making sure insert O-ring is not twisted
Seal Spring weakened	Stretch or replace
Seal backing ring deformed	Replace
Seal Body freedom diminished or stopped due to unclean shaft, seal body O-ring recess, seal backing ring, or faulty seal body O-ring	Disassemble, clean, inspect, lubricate piece and reassemble
Seal Body and Seal Insert mismatched	Always use authorized replacement parts
Mutator shaft not being fully drawn and locked into operating position	Check that coupling pin is installed in coupling, is not worn, and pin holes in coupling inserts and mutator shaft are not worn. Replace any defective parts.
Excessive Wear of Seal Body and/or Seal Insert	Do not operate shaft without product, water, or detergent flow. <u>These are not gas seals.</u> They operate on liquids only. Excessive spring pressure.
Seal Insert or Seal Body O-ring twisted when installed	Lubricate before installing (edible lubricant)
O-ring wrong size or made compound	Replace with specified compound
O-ring not sealing properly because of obstruction or dirt	Remove obstruction, clean, and lubricate prior to installation

Table II - Periodic Servicing and Inspection

Inspection or Service	Frequency
Removal of mutator shaft to inspect scraper blades, shaft seal parts and heat transfer tube surface	Weekly
Check spare parts stock vs. spare parts list	Quarterly or as needed
Change of gear box oil	Quarterly or as needed
Clean jacket	As needed

CLEANING & SANITIZING

Please do not construe the following as anything but suggestions, recommendations, and guides regarding the cleaning and sanitizing of 4" x 120" Heat Exchangers used in the food industry.

The cleaning procedure should comply with the existing sanitation codes, in addition, it should be designed for a specific product and process.

Prior to determining a daily CIP cleaning procedure and the detergent, it must be stated and understood that:

1. Areas such as O-ring grooves, sealed rotating shafts, areas occupied by shaft within a bushing, capillary clearances between running parts, etc., are best cleaned by disassembly and manual scrubbing.

2. For all food processing equipment, especially for processing temperatures of 240°F and up, there is no substitute for cleaning by flushing with cool, clean, potable water, disassembly, and manual scrubbing at least once a week.

3. The cleaning procedure and the detergent efficiency depend on the following factors:
   a. Time allotted for cleaning solutions to do the job.
   b. Temperature of cleaning solutions while doing the job.
   c. Turbulence of cleaning solution while being pumped through or recycled through equipment being cleaned.
   d. Detergent concentration and composition: This is dictated by nature of the soil to be removed and the surface from which the soil must be removed. In short, the detergents must remove the soil without impairing the equipment.
   e. Water Composition: This is one item frequently overlooked. Good clean, potable water alone does not always suffice. In high temperature processing, the water must be soft enough to prevent mineral salt dropout and/or coating of surfaces due to the high heat. Additionally, the mineral content of the cleaning water must be such that it does not detract from the detergent's effectiveness. For example, water containing large amounts of iron, manganese and certain other metals may produce a brown deposit plus weaken the detergent strength. Ideally, the water should be soft or softened.

The following is a suggested guide for developing an in-place cleaning procedure for 4" x 120" Heat Exchangers on applications compatible with water based cleaning solutions.

Daily CIP Cleaning

1. If possible, avoid product waste at the end of the daily shift run by chasing product with potable water at a flow rate and initial temperature that will not cause the outlet temperature of the product within the system to rise or fall. This does not apply to freezing equipment.

2. When flow from 4" x 120" Heat Exchangers is diverted from production, cleaning period starts.

3. Continue to flush equipment with clean water prior to introducing cleaning solution.

4. If product supply tank is going to be used as a detergent supply tank, it must be washed down to eliminate contamination of detergent solution with product clinging to tank sides, agitators, etc.

5. If a detergent solution is supplied by a central CIP system, detergent flow through or recycle through 4" x 120" Heat Exchangers is started as soon as initial flush water runs clear.

6. The efficiency of the detergent and the time required to clean are direct functions of the flushing water and the detergent water flow rates. This should be accelerated to as high a flow (gal./min.) as practically possible.

   The detergent recycle method is the most preferable. This requires a detergent solution tank (jacketed) to hold solution at proper temperature and a high flow rate pump of mixing solution through the systems to be cleaned at 85 gpm (approximate).

7. The duration of detergent solution flow through the system ranges from 30 to 45 minutes. It is best to determine this by trail and inspection.

8. Following the washing period, the entire system should be thoroughly flushed with clean, warm, potable water.

9. It is not always necessary to drain this flushing water from units.

10. Sanitizing: Following the last rinse the equipment may be further treated by flushing with a bactericide solution and left overnight, or a bactericide solution can be run through the following day just prior to production start up.

11. Mutator shafts: To minimize blade and tube wear, do not spin the shafts continuously throughout the flushing, cleaning and rinsing operations. However, they should be spun periodically to dislodge soil. How frequently shafts should be turned on and off (jogged) during this operation is best determined by trial and inspection.

Once a week the equipment should be completely disassembled, manually cleaned, thoroughly inspected, maintenanced, and reassembled. Once a week disassembly for cleaning offers an excellent opportunity to practice preventative maintenance and maintaining an adequate spare parts supply.

Detergent Requirements

1. Burn on resulting from cooking protein, (starches, dairy products, etc.) usually requires a dual cleaning treatment-flush, alkali wash, flush, acid wash, flush.

2. Burn on resulting from cooking acidic (tomato paste, fruit purees) foods will usually yield to an alkali.

3. Detergent must be thoroughly soluble and thoroughly dissolved to prevent damage to running parts.

4. Detergents must be used within manufacturer's limits of temperature and concentration.

5. Detergent must not be corrosive to the equipment when used within the manufacturer's limits of temperature and concentration. In other words: Guard against "if one pound does well, two pounds will do better"; guard against "if hot is good, hotter is better".

6. Heating detergent solution with steam jacketed 4" x 120" Heat Exchangers must be avoided.

NOTE

Burn on refers only to that minor amount accumulated during normal operation. The burn on resulting from power failure, pump failure, and failure to keep feed tank full necessitates complete unit disassembly.

SPARE PARTS

4” x 120” Recommended Spare Parts

A. A recommended spare parts list is included with the equipment prints and specifications. Much down time can be eliminated if the suggested parts are stocked for ready installation in case of difficulties.

B. Waukesha Cherry-Burrell can furnish all 4” x 120” manufactured items and purchased components to assemble this equipment.

C. Direct all inquiries and orders for replacement parts to:

Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan Wi 53115
Telephone:
1-800-252-5200 Or 262-728-1900
Fax:
1-800-252-5012 Or 262-728-4904
The country code for the USA is 1.
E-mail: custserv@gowcb.com
Website: www.gowcb.com

Give a complete description and the number of each part. Always include the serial number of the unit stamped on the nameplate.

Get results.

Waukesha Cherry-Burrell

611 SUGAR CREEK ROAD
DELAVAN, WI 53115 U.S.A.
CUSTOMER SERVICE TELEPHONE
1-800-252-5200 OR 262-728-1900
TOLL FREE TELEFAX
1-800-252-5012 OR 262-728-4904
E-mail: custserv@gowcb.com
Web Site: www.gowcb.com

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