

# Processes & Products



## APV Pasteurizer Systems For the Small to Medium Apple Cider Processor

### APV HISTORY

APV is a world leader in heat transfer equipment and process technology for the food, dairy, and beverage industries. In 1923, the first commercially successful plate heat exchanger was designed by the founder of APV, Dr. Richard Seligman. Today, APV supplies technologically advanced heat transfer equipment and related process systems to customers worldwide.

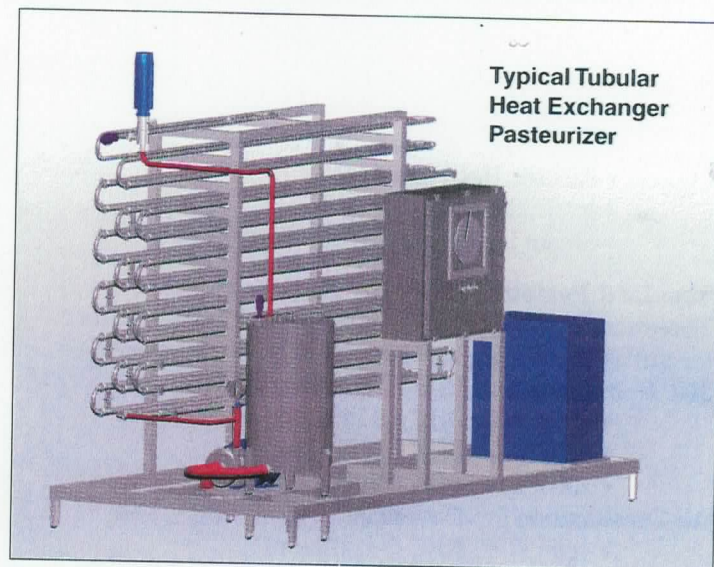
### APPLE CIDER PASTEURIZATION

Apple cider pasteurization, determined by tests conducted in college laboratories, takes place at 160°F (71°C), holding the product for 6 seconds. Pasteurizing apple cider using these parameters will reduce E-Coli bacteria count to a safe level.

### APV STANDARD APPLE CIDER PASTEURIZERS

APV standard apple cider pasteurizers are available in flow rates of 2, 5, and 10 GPM using either APV **plate** or APV **tubular** heat exchangers. These pasteurizers are designed to thermally process cider, up to 15° Brix, from 40°F to 170°F (4.4°C to 76°C) using regeneration and 185° F (85°C) hot water. The cider is held for 10 seconds in an APV holding loop and then cooled to 40°F (4.4°C) using regeneration and 34°F (1.1°C) chilled water. APV standard apple cider pasteurizers are designed using recognized sanitary equipment. The pasteurizers are assembled and wired on a 304 stainless steel base in our Tonawanda, NY factory. All product and utility piping is supplied in stainless steel and the equipment is capable of being cleaned in place (CIP).

As with all APV process equipment, the Apple Cider Pasteurizer can be customized to meet specific requirements. If this option is preferred, contact your local APV representative.



Typical Tubular  
Heat Exchanger  
Pasteurizer

### APV PLATE HEAT EXCHANGER DESIGN

Standard apple cider pasteurizers use APV plate heat exchangers with 316 stainless steel flow plates. These are available in product flow rates of 2, 5 and 10 GPM. The plate heat exchanger is known for providing high heat transfer, and consequently high rates of heat recovery or regeneration (85% or better on clear juices). The plate heat exchanger pasteurizer is the preferred solution for cider which is filtered to a minimum of 1/16" without heavy pectin deposits.

### APV TUBULAR HEAT EXCHANGER DESIGN

For greater flexibility, APV has 3 tubular pasteurizer designs, using 3/4", 1", or 1 1/2" sanitary tubes for heat transfer. In addition to apple cider that can be pasteurized in a plate heat exchanger, the tubular design can process apple cider with particle sizes greater than 1/16". The tubular heat exchanger offers less regeneration (77%), but can process cider with larger particle sizes and heavier pectin deposits. The tubular heat exchanger is also more resistant to attack by chlorides than the plate heat exchanger. The maximum chloride concentration for 316 stainless steel plate heat exchanger plates is 200 PPM at 185°F (85°C).

### APV APPLE CIDER PASTEURIZER CONTROL

APV standard apple cider pasteurizers are designed for automatic temperature control. A product temperature recorder, with a 10" circular chart is supplied. The recorder has an alarm relay wired to the divert valve for automatic diversion to the feed balance tank on low product temperature. The product feed pump has a variable frequency drive for product flow control. The pasteurizers are tested prior to shipment at the APV facility in Tonawanda, NY.

Typical Plate  
Heat Exchanger  
Pasteurizer



## Standard Apple Cider Pasteurizer Equipment

APV standard apple cider pasteurizers include the following major components:

- APV Heat Exchanger
- APV Holding Loop
- Feed Balance Tank – 30 Gallon
- Hot Water Boiler – Natural Gas or Propane
- Pasteurized Juice Temperature Recorder
- Product & Utility Valves
- Product Pump with Variable Frequency Drive
- Stainless Steel Base
- Stainless Steel Piping
- Temperature and Pressure Indicators
- UL Listed Control Panel

## Standard Apple Cider Pasteurizing Options

Standard options available for the APV Apple Cider Pasteurizer are:

- Air Compressor with Air Tank
- Balance Tank Level Control
- Electric Hot Water Heater
- Ice Builder *30 gpm*
- Steam Injector and Recirculation Pump

## Standard Pasteurizer Energy Requirements

Three supply voltages options are offered. A transformer for 110VAC power is provided. Select power for the 3HP feed pump:

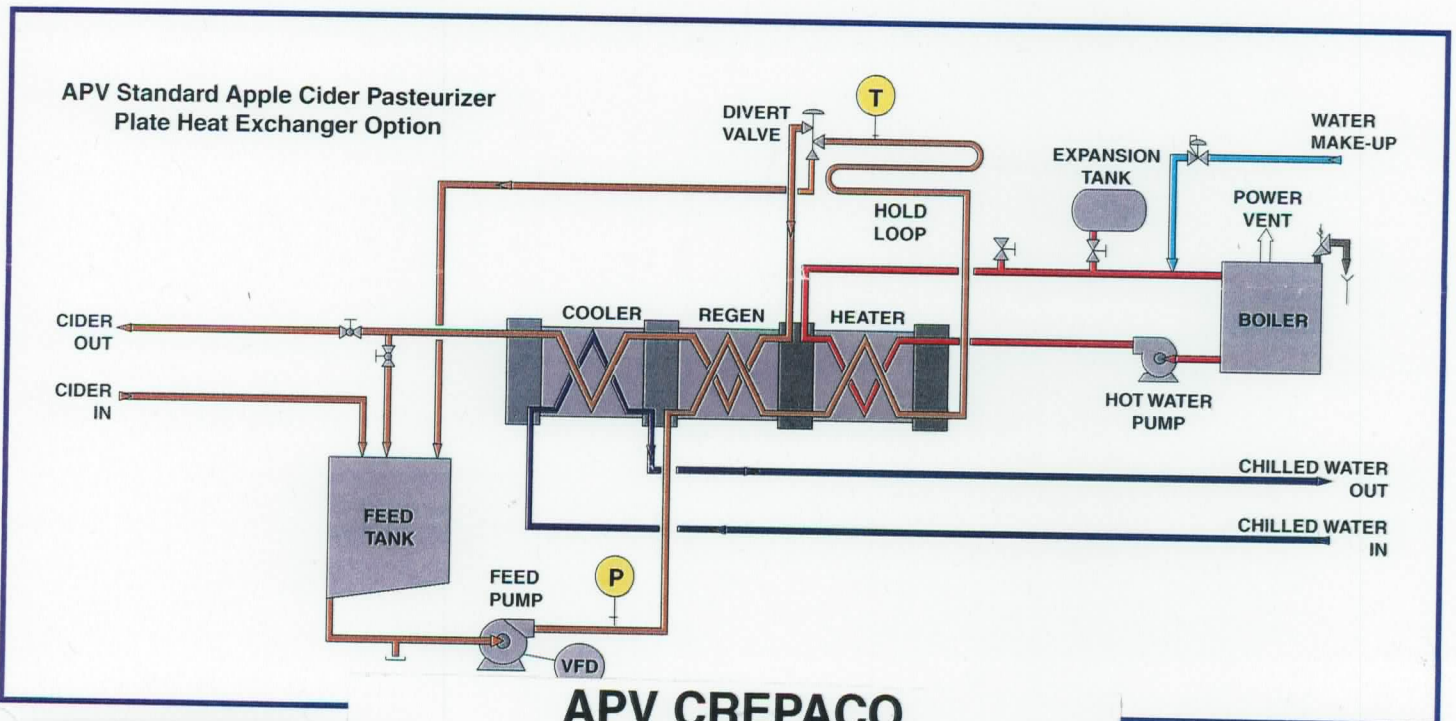
- 460VAC / 60HZ / 3 PH
- 230VAC / 60HZ / 3PH
- 230VAC / 60HZ / 1PH

Air Consumption for all models:

- scfm @ 80 PSIG (Maximum)

PASTEURIZER DATA TABLE				
MODEL	APPLE CIDER	HOT WATER	HEATING BTU'S	CHILLED WATER
PLATE HEAT EXCHANGER PASTEURIZER				
PPAC-02	2 GPM 8 LPM	4 GPM 15 LPM	19,000	7 GPM 27 LPM
PPAC-05	5 GPM 19 LPM	10 GPM 38 LPM	47,000	16 GPM 61 LPM
PPAC-10	10 GPM 38 LPM	20 GPM 75 LPM	94,000	36 GPM 137 LPM
TUBULAR HEAT EXCHANGER PASTEURIZER				
PTAC-02	2 GPM 8 LPM	8 GPM 30 LPM	30,000	10 GPM 38 LPM
PTAC-05	5 GPM 19 LPM	20 GPM 76 LPM	75,000	20 GPM 76 LPM
PTAC-10	10 GPM 38 LPM	40 GPM 152 LPM	150,000	30 GPM 114 LPM

PASTEURIZER DATA TABLE				
MODEL	WIDTH	LENGTH	HEIGHT	WEIGHT
PPAC-02	4 FT 1.22M	8 FT 2.44M	6 FT 1.83M	600 LB 272 KG
PPAC-05	4 FT 1.22M	8 FT 2.44M	6 FT 1.83M	650 LB 295 KG
PPAC-10	4 FT 1.22M	8 FT 2.44M	6 FT 1.83M	750 LB 340 KG
PTAC-02	4 FT 1.22M	10 FT 3M	7 FT 2.13M	750 LB 340 KG
PTAC-05	4 FT 1.22M	10 FT 3M	7 FT 2.13M	800 LB 363 KG
PTAC-10	4 FT 1.22M	10 FT 3M	7 FT 2.13M	950 LB 431 KG



**APV CREPACO**

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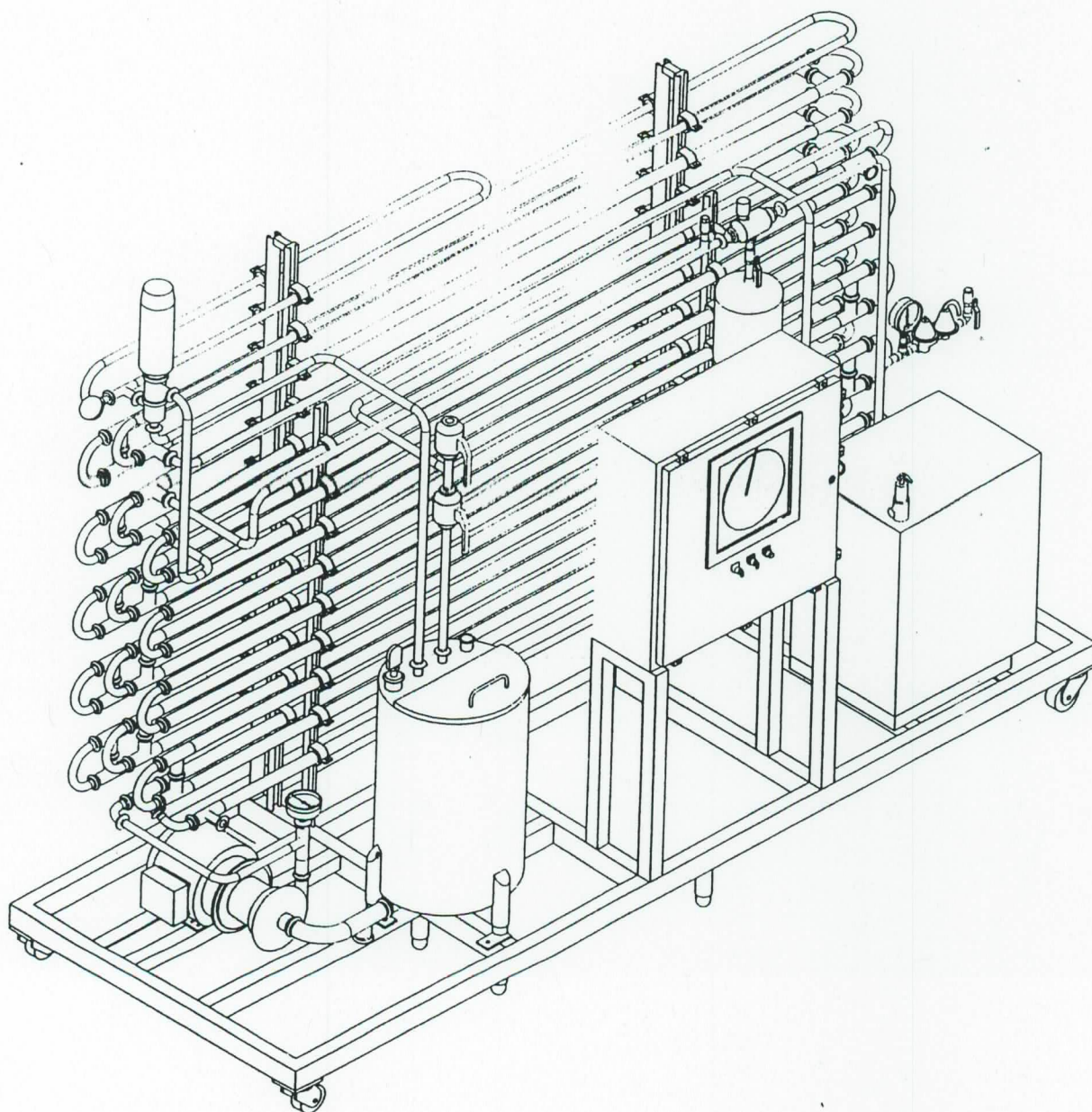
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PTAC-10

# Standard Apple Cider Pasteurizer Instruction Manual



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## 1.0 INTRODUCTION

### 1.1 General

The purpose of this manual is to provide instructions for the safe installation, operation and maintenance of your APV Standard Apple Cider Pasteurizer.

### 1.2 Safety

#### ! Warning

Read and understand the entire manual before unpacking the equipment and installing it.

Safe installation, operation and maintenance of the APV Standard Apple Cider Pasteurizer requires proper training of all plant operating personnel. Section 2.0, titled "Safety Instructions", should be read and understood before proceeding. This section discusses general safety practices. In addition, specific hazards are indicated by the appropriate hazard label in bold type throughout this manual.

It is the objective of APV to identify each area of potential hazard and guide workers in safe operation, service and maintenance procedures.

### 1.3 General Apple Cider Pasteurizer Design

APV Standard Apple Cider Pasteurizers are available in flow rates of 2, 5, and 10 GPM using either APV Plate or APV Tubular heat exchangers. These pasteurizers are designed to thermally process cider, up to 15° Brix, from 40°F to 170°F (4.4°C to 76°C) using regeneration and 185°F (85°C) hot water. The cider is held for 10 seconds in an APV holding loop and is then cooled to 40°F (4.4°C) using regeneration and 34°F (1.1°C) chilled water. The pasteurizers are assembled, wired and air tubed on a 304SS base. All product and utility piping is stainless steel and the equipment is capable of being cleaned in place (CIP).

### 1.4 Plate Heat Exchanger Design

Standard Apple Cider Pasteurizers designed using an APV Plate Heat Exchanger are supplied with 316 stainless steel flow plates. The plate heat exchanger is known for providing high heat transfer, and consequently high rates of heat recovery or regeneration (85% or better on clear juices). The plate heat exchanger is the preferred solution for cider which is filtered to a minimum of 1/16" without heavy pectin deposits. The maximum chloride

concentration for 316 stainless steel plate heat exchanger plates is 200 PPM at 185° F (85°C).

### 1.5 Tubular Heat Exchanger Design

Standard Apple Cider Pasteurizers designed using an APV Tubular Heat Exchanger offer greater flexibility. In addition to apple cider that can be processed in a plate heat exchanger, the tubular design can process a wider range of cider blends. The tubular heat exchanger offers less regeneration (77%) than the plate heat exchanger, but can process apple cider with particle sizes up to 1/4" and cider with heavier pectin deposits. The tubular heat exchanger is also more resistant to attack by chlorides than the plate heat exchanger. The maximum chloride concentration for the tubular heat exchanger is 500 PPM at 185° F (85°C).

### 1.6 Standard Pasteurizer Components

The APV Standard Apple Cider Pasteurizer is comprised of the following standard components:

- APV Heat Exchanger (Plate or Tubular)
- APV Holding Loop
- Feed Balance Tank - 30 Gallon
- Hot Water Boiler - Natural Gas or Propane
- Pasteurized Juice Temperature Recorder
- Product & Utility Valves
- Product Pump with Variable Frequency Drive
- Stainless Steel Base
- Stainless Steel Piping
- Temperature and Pressure Indicators
- UL Listed Electrical Enclosure

Standard options that can be provided on an APV Standard Apple Cider Pasteurizer are listed in Section 1.9.

### 1.7 Receiving and Inspection

Standard Apple Cider Pasteurizers are fully assembled and inspected before shipment and are properly prepared for transportation. Upon receipt of this equipment, check all received items against the packing list for damage or missing parts. Components removed for safe shipment have been match marked for easy reassembly. **Damage or loss should be reported immediately to the carrier or insurance agent.**

APV Standard Apple Cider Pasteurizer  
Instruction Manual

**1.8 Selecting an Apple Cider Pasteurizer**

Table 1.1 is used to select the proper Apple Cider Pasteurizer for your specific needs.

Use the following steps to identify the appropriate Standard Shell and Tube Hot Water Recirculation Unit model.

1. Determine cider flow rate in GPM (LPM).
2. Determine cider particulate size.
3. Note maximum CIP chloride concentration.
4. Choose either the plate or tubular heat exchanger model.

If the standard Apple Cider Pasteurizer models listed below do not meet specific requirements, call your APV representative for more information and a quotation on a Custom Apple Cider Pasteurizer. Custom pasteurizers are available in a wide range of apple cider flow rates and heating ranges. Some

typical options available on customized units include, a shell and tube hot water recirculation unit, an electric hot water heater, an apple cider feed flow meter and PLC control. Contact your APV representative for more information.

**1.9 Standard options**

The following standard options are available on the APV Standard Apple Cider Pasteurizer:

1. Air compressor with air tank
2. Air Cooled Glycol Chiller
3. Balance Tank Level Control
4. Pressure Tube Hot Water Recirculation Unit
5. Ice Builder
6. SR15S Stainless Steel Plate Heat Exchanger Frame

APPLE CIDER PASTEURIZER	PLATE HEAT EXCHANGER MODELS			TUBULAR HEAT EXCHANGER MODELS		
	PPAC-02	PPAC-05	PPAC-10	PTAC-02	PTAC-05	PTAC-10
Apple Cider Flowrate @ 40°F	2 GPM (8 LPM)	5 GPM (19 LPM)	10 GPM (38 LPM)	2 GPM (8 LPM)	5 GPM (19 LPM)	10 GPM (38 LPM)
Hot Water Flowrate @ 185°F	4 GPM (15 LPM)	10 GPM (38 LPM)	20 GPM (76 LPM)	8 GPM (30 LPM)	12 GPM (46 LPM)	40 GPM (152 LPM)
Heating BTU's	19,000	47,000	94,000	30,000	75,000	150,000
Maximum Particle Size	< 1/16" (1.5mm)			< 1/4" (6mm)		
Minimum Heat Regeneration	85%			77%		
Max CIP Chloride Concentration	200 PPM @ 185°F (85°C)			500 PPM @ 185°F (85°C)		

TABLE 1.1

## 2.0 SAFETY INSTRUCTIONS

### 2.1 General Statement

APV Standard Apple Cider Pasteurizers are designed and built with due consideration and care for generally accepted safety standards. However, like any mechanical device, proper and safe performance of this equipment depends upon using sound and prudent operating, maintenance and servicing procedures under properly trained supervision.

For your protection, and the protection of others, learn and always follow the safety rules outlined in this section. Observe warning signs on machines and act accordingly. Form safe working habits by reading the rules and abiding by them. Keep this booklet handy and review it from time to time to refresh your understanding of the rules.

### 2.2 Hazard Level Identification

Definitions for identifying the various hazard levels shown on warning labels or to indicate proper safety procedures in the instruction manual are provided in the following labels.

### 2.3 Operating Zone

#### ! Danger

The use of the word "Danger" always signifies an immediate hazard with a high likelihood of severe personal injury or death if instructions, including recommended precautions, are not followed.

#### ! Warning

The use of the word "Warning" signifies the presence of hazards or unsafe practices that could result in severe personal injury or death if instructions, including recommended precautions, are not followed.

#### ! Caution

The use of the word "Caution" always signifies possible hazards that could result in minor personal injury or damage to product or property if instructions, including recommended precautions, are not followed.

An operating zone should be established around the Apple Cider Pasteurizer. A brightly painted guard rail or warning stripe should define the zone. Only the operator or other authorized personnel should be allowed within the operating zone when control circuits are energized or the unit is operating. No tools or other equipment should be kept within the operating zone. Refer to paragraph 3.3 for space requirements.

### 2.4 Pressure and Temperature Ratings

Pressure and temperature ratings for APV Standard Apple Cider Pasteurizers are listed below in Table 2.1. These equipment ratings must not be exceeded at any time during startup or operation of the unit.

MAXIMUM DESIGN WORKING PRESSURE		MAXIMUM DESIGN WORKING TEMPERATURE	
PRODUCT SIDE	WATER SIDE	PRODUCT SIDE	WATER SIDE
100 PSIG (6.8 bar)	50 PSIG (3.4 bar)	250°F (121°C)	250°F (121°C)

TABLE 2.1

### 2.5 Installation

Utility sources, such as water, steam, electric, air and hydraulic, should be installed by trained and authorized personnel only. Installations must comply with all applicable codes and standards, including those established by the general industry standards of OSHA.

### 2.6 Safety Instructions

#### Before Starting a Unit

Be certain that all necessary guards and safety devices are installed and operating properly. This includes safety screens or pressure relief devices.

Be sure all personnel are clear of the unit.

Remove (from the operating zone) any materials, tools or other foreign objects that could cause injury to personnel or damage the unit.

Make certain all alarms, indicating lights, pressure gauges and other safety devices or indicators are in working order.

#### After Shutdown

Make certain all water, steam, air, hydraulic and electric utilities are turned off. Make certain all pressure in the heat exchanger is released.

## 2.7 General Operating Safety

### ! Caution

Do not operate this unit until you have read and understand the operating instructions and become thoroughly familiar with the unit and its operation.

Never operate a unit while a safety device or guard is removed or disconnected.

Always wear safety glasses, hats, shoes, ear protection or any other required safety equipment.

Never remove "Warning" tags that are displayed on the unit. Torn or worn labels should be replaced.

Do not start the unit until all other personnel in the area have been warned and have moved outside the operating zone.

Remove any tools or other foreign objects from the operating zone before starting.

Do not have loose clothing, neckties, jewelry or unrestrained long hair near an operating unit.

Do not wear rings, watches, bracelets or other jewelry near an operating unit.

Keep the operating zone free of obstacles that could cause a person to trip or fall towards an operating unit.

Never sit or stand on anything that might cause you to fall against the unit.

"Horseplay" around a unit at any time is dangerous and prohibited.

Know the shutdown procedure for the unit in the event of an emergency. (See paragraph 4.4)

Never operate the unit above specified capacity, pressures or temperatures.

Keep alert and observe indicator lights and warnings that are displayed on the unit.

Do not operate faulty or damaged equipment. Make certain proper service and maintenance procedures have been performed. (see Table 5.1)

A safe work surface must be provided around the standard Apple Cider Pasteurizer. (See paragraph 2.3)

## 2.8 Service and Maintenance Safety

### ! Danger

Make sure that system pressure has been reduced to zero (0) pressure and that the hot water temperature is less than 100°F (38°C) before attempting service or maintenance on an APV Standard Apple Cider Pasteurizer.

### ! Danger

Follow plant lockout / tagout procedures before attempting service or maintenance on an APV Standard Apple Cider Pasteurizer.

Do not service a unit until you are thoroughly qualified and familiar with the tasks to be performed.

Never operate any valves, pumps or controls while persons are performing maintenance on the unit.

Do not bypass a safety device.

Always use the proper tool for the job.

## 2.9 Cleaning Safety

Do not use toxic or flammable solvents to clean a unit.

Always clean up spills around the unit as soon as possible.

Never attempt to clean a unit while it is operating.



## 3.0 INSTALLATION

### 3.1 Location

**! Warning**

**Proper installation is required for safe operation.**

The APV Apple Cider Pasteurizer should be located in an area with good drainage to allow wash down of the equipment. Fresh air and adequate venting are required for the combustion of the boiler gasses. Refer to the boiler instruction manual for more specific details on gas supply and venting. ***Strict adherence to these instructions must be maintained to avoid safety hazards.***

The pasteurizer should be set in place with consideration for the required piping connections. Product and water piping to and from the pasteurizer should be designed to minimize pressure drops and must be adequately supported to minimize the loads on the pasteurizer.

The skidded pasteurizer has been fitted with locking casters to ease setting in place. Once the unit is positioned, the ball feet should be lowered and the base leveled using the ball feet.

### 3.2 Foundations

When installing the Apple Cider Pasteurizer on a foundation pad, the pad should be level and sized properly for the outline of the equipment. It must also be of adequate strength to support the flooded weight of the equipment. See Table 3.3A or Table 3.3B for dimensions and weights.

### 3.3 Space Requirements

Sufficient clearance around the APV Apple Cider Pasteurizer must be provided to operate the equipment. Allow adequate space for service, maintenance, and cleaning. Allow thirty six inches minimum for the control panel door opening. See Table 3.3A or Table 3.3B for equipment clearance dimensions.

### 3.4 Unpacking Equipment

Take care to remove all shipping stops and packing from equipment supplied on the Standard Apple Cider Pasteurizer skid prior to operating the unit.

### 3.5 Reassembly of Equipment

Components removed for shipment and match marked should be reassembly once the skid is in place. Check to insure that all sanitary clamps and gaskets are properly installed to avoid leakage.

Remove any equipment shipping stops.

### 3.6 Connections and Piping

Level the skid and ensure that product and utility piping, and boiler gas line and vent piping are properly connected. See Table 3.4A or Table 3.4B for piping connection types and sizes.

### 3.7 Pressure / Temperature Ratings

The pressure and temperature ratings APV Standard Apple Cider Pasteurizer are listed in Table 2.1. Do not exceed these ratings at any time during startup or operation.

**! Danger**

**Do not exceed the maximum operating pressure or temperature listed in Table 2.1 or damage to the Apple Cider Pasteurizer may result.**

Provide over pressure protection if it is possible that the system may develop a higher pressure than the maximum allowable working pressure of the skid.

### 3.8 Control Panel Wiring and Tubing

Three phase electrical power must be connected to the control panel. Check the panel drawings and control panel nameplate data for the correct voltage and full load amperage.

A clean, dry source of oil free instrument air supply must be run to the panel for operation of the pneumatic valve(s). See Table 3.1 for instrument air utility requirements.

### 3.9 Utility Requirements

Utility requirements for the Standard Apple Cider Pasteurizers are listed in Table 3.1. The data in Table 3.1 is a guide only to the maximum expected utility requirements for a Standard Apple Cider Pasteurizer.

APV Standard Apple Cider Pasteurizer  
Instruction Manual

UTILITY REQUIREMENTS		PLATE HEAT EXCHANGER MODELS			TUBULAR HEAT EXCHANGER MODELS		
		PPAC-02	PPAC-05	PPAC-10	PTAC-02	PTAC-05	PTAC-10
Water Make-up supplied at 20 psig (1.4 kg/cm <sup>2</sup> ) minimum	US gpm	5	5	5	5	5	5
	lpm	19	19	19	19	19	19
Chilled Water supplied at 34°F (1.1°C) and 45 psig (3 kg/cm <sup>2</sup> )	US gpm	7	16	36	10	20	30
	lpm	27	61	137	38	76	114
Hot Water supplied at 185°F (85°C) and 20 psig (1.4 kg/cm <sup>2</sup> )	US gpm	4	10	20	8	12	40
	lpm	15	38	76	30	46	152
Hot Water Boiler Rating	BTU/hr	19,000	47,000	97,000	30,000	75,000	150,000
	kw	5.5	14	29	8.8	22	44
Electrical 230/460VAC 3 phase 50/60 Hz	hp	3	3	3	3	3	3
	kw	2.2	2.2	2.2	2.2	2.2	2.2
Instrument Air, dry & oil free, supplied at 100 psig (7 kg/cm <sup>2</sup> )	cfm	1	1	1	1	1	1
	m <sup>3</sup> /hr	1.7	1.7	1.7	1.7	1.7	1.7
Natural Gas (Note 1)	cfm	43	113	150	75	113	225
	m <sup>3</sup> /hr	73	192	255	127	192	382
Propane (Note 1)	lb/hr	2	5.2	6.9	3.5	5.2	10.3
	kg/hr	0.9	2.4	3.1	1.6	2.4	4.7
Pasteurizer Volume	US Gal	4.5	6.5	9	15	27	67
	Liters	17	25	34	55	102	254

**Table 3.1**

Note 1 - Select the utility requirement for either Natural Gas or Propane, depending on boiler gas supply.

APV Standard Apple Cider Pasteurizer  
Instruction Manual

APPLE CIDER PASTEURIZER WITH PLATE HEAT EXCHANGER						
MODEL NUMBER	STANDARD EQUIPMENT					
	Heat Exchanger HE1301B	Balance Tank TK1101A	Feed Pump PP1104C	Holding Loop HL1300N	Flow Diversion Valve PV1306E	Boiler B1003N
PPAC-02	SR15	30 Gal	3 HP 2 x 1.5	1" OD 10	1" T/C	19,000 BTU/HR
PPAC-05	SR15	30 Gal	3 HP 2 x 1.5	1" OD 10	1" T/C	47,000 BTU/HR
PPAC-10	SR15	30 Gal	3 HP 2 x 1.5	1.5" OD 10	1" T/C	94,000 BTU/HR
PTAC-02	SDT - C - 25.4 x 19	30 Gal	3 HP 2 x 1.5	1" OD 10	1" T/C	30,000 BTU/HR
PTAC-05	SDT - C - 38.1 x 25.4	30 Gal	3 HP 2 x 1.5	1" OD 10	1" T/C	75,000 BTU/HR
PTAC-10	SDT - C - 50.8 x 38.1	30 Gal	3 HP 2 x 1.5	1.5" OD 10	1" T/C	150,000 BTU/HR

TABLE 3.2

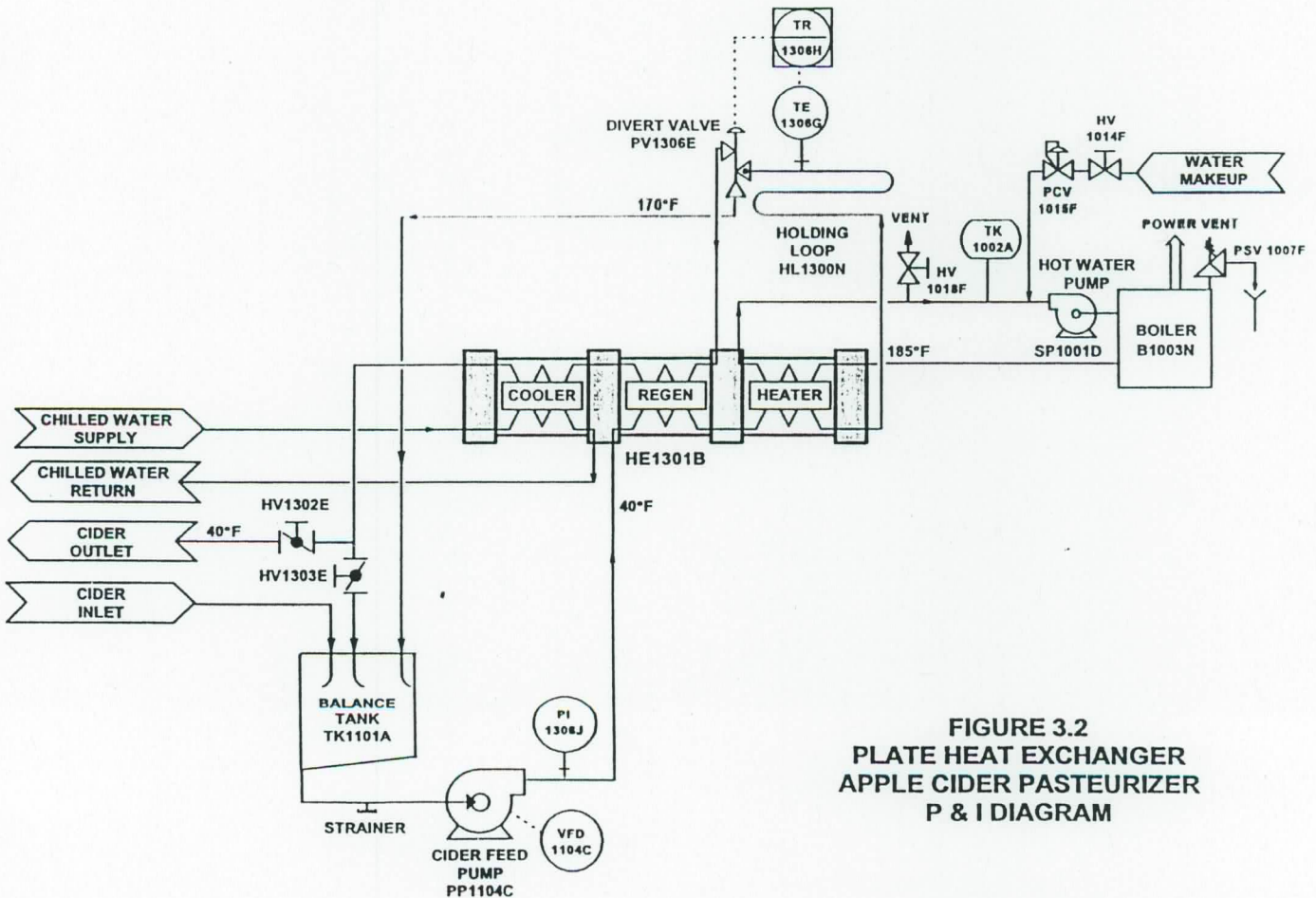


FIGURE 3.2  
PLATE HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
P & I DIAGRAM

APV Standard Apple Cider Pasteurizer  
Instruction Manual

STANDARD APPLE CIDER PLATE HEAT EXCHANGER PASTEURIZER WEIGHTS AND DIMENSIONS										
MODEL		DIMENSIONS				WEIGHT			VOLUMES	
		Width A	Length B	Height C	Panel D*		Dry	Flooded		Flooded
PPAC-02	ft in (M)	4'6" (1.4)	8'6" (2.6)	6'0" (1.85)	2'6" (0.76)	lbs (kg)	600 (272)	900 (408)	US Gal (Liters)	4.5 (17)
PPAC-05	ft in (M)	4'6" (1.4)	8'6" (2.6)	6'0" (1.85)	2'6" (0.76)	lbs (kg)	650 (295)	960 (436)	US Gal (Liters)	6.5 (25)
PPAC-10	ft in (M)	4'6" (1.4)	8'6" (2.6)	6'0" (1.85)	2'6" (0.76)	lbs (kg)	750 (340)	1075 (490)	US Gal (Liters)	9 (34)

TABLE 3.3A

\* Minimum clearance for panel door opening

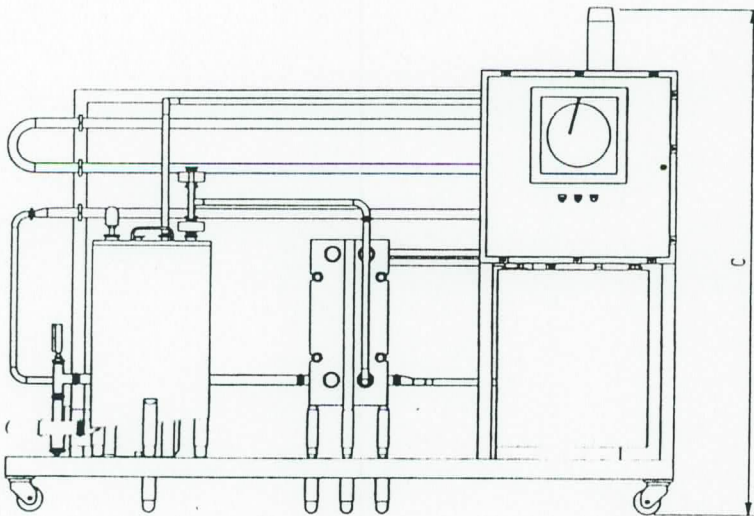


FIGURE 3.3.1A  
PLATE HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
ELEVATION VIEW

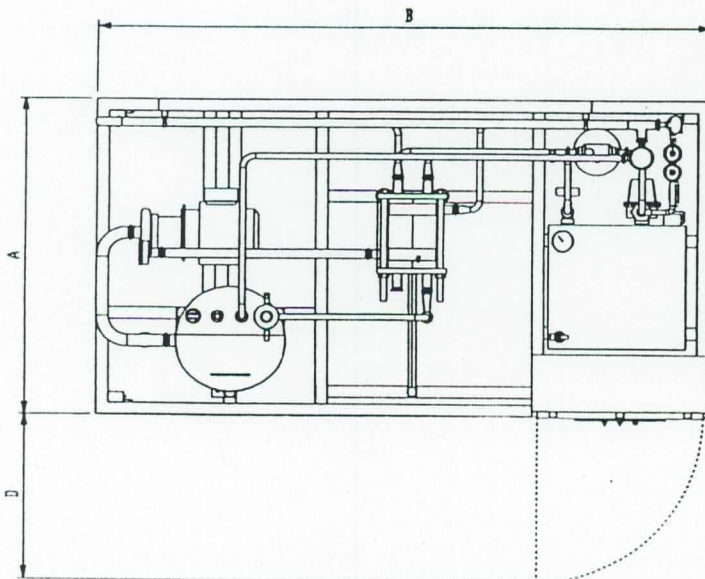


FIGURE 3.3.2A  
PLATE HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
PLAN VIEW

STANDARD APPLE CIDER TUBULAR HEAT EXCHANGER PASTEURIZER WEIGHTS AND DIMENSIONS										
MODEL	DIMENSIONS				WEIGHT			VOLUMES		
		Width A	Length B	Height C	Panel D		Dry	Flooded		Flooded
PTAC-02	ft in (M)	4'0" (1.22)	11'0" (3.35)	8'6" (2.6)	2'6" (0.76)	lbs (kg)	750 (340)	1120 (508)	US Gals (Liters)	14.5 (55)
PTAC-05	ft in (M)	4'0" (1.22)	11'0" (3.35)	8'6" (2.6)	2'6" (0.76)	lbs (kg)	800 (363)	1275 (580)	US Gals (Liters)	27 (102)
PTAC-10	ft in (M)	4'0" (1.22)	11'0" (3.35)	8'6" (2.6)	2'6" (0.76)	lbs (kg)	950 (431)	1750 (794)	US Gals (Liters)	67 (254)

TABLE 3.3B

\* Minimum clearance for panel door opening

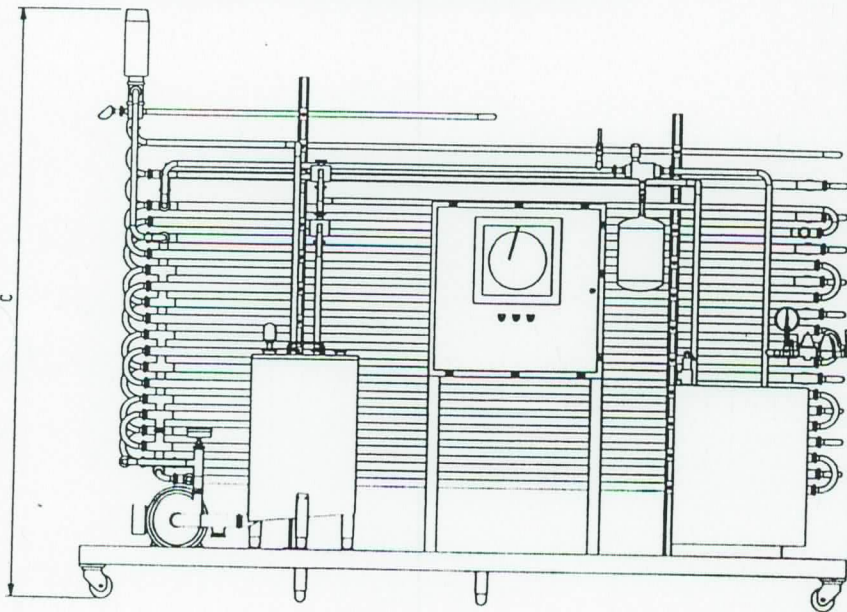


FIGURE 3.3.1B  
TUBULAR HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
ELEVATION VIEW

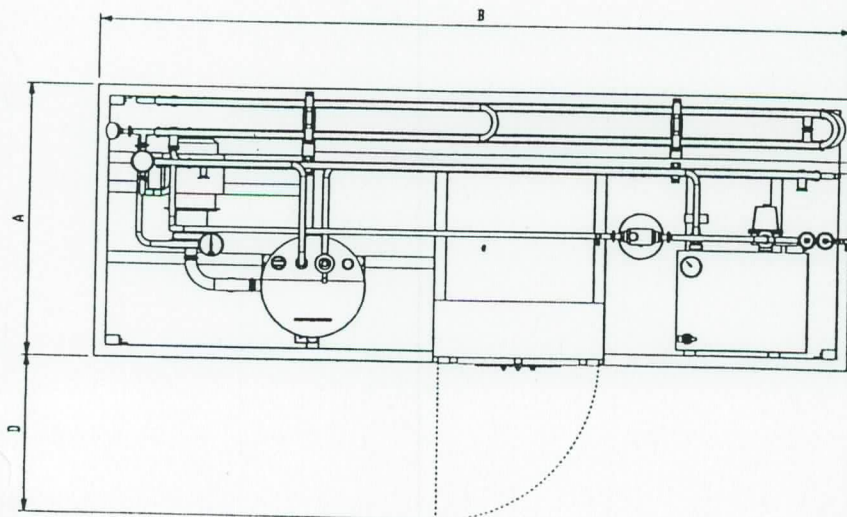


FIGURE 3.3.2B  
TUBULAR HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
PLAN VIEW

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STANDARD APPLE CIDER PLATE HEAT EXCHANGER PASTEURIZER (PPAC)						
PROCESS CONNECTIONS - SIZE AND TYPE						
MODEL	CIDER INLET A	CIDER OUTLET B	CHILLED WATER INLET C	CHILLED WATER OUTLET D	BOILER WATER MAKEUP E	BOILER GAS CONN F
PPAC-02	1" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt
PPAC-05	1" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt
PPAC-10	1" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt

TABLE 3.4A

Note: All clamp connections are Triclamp. All npt connections are female.

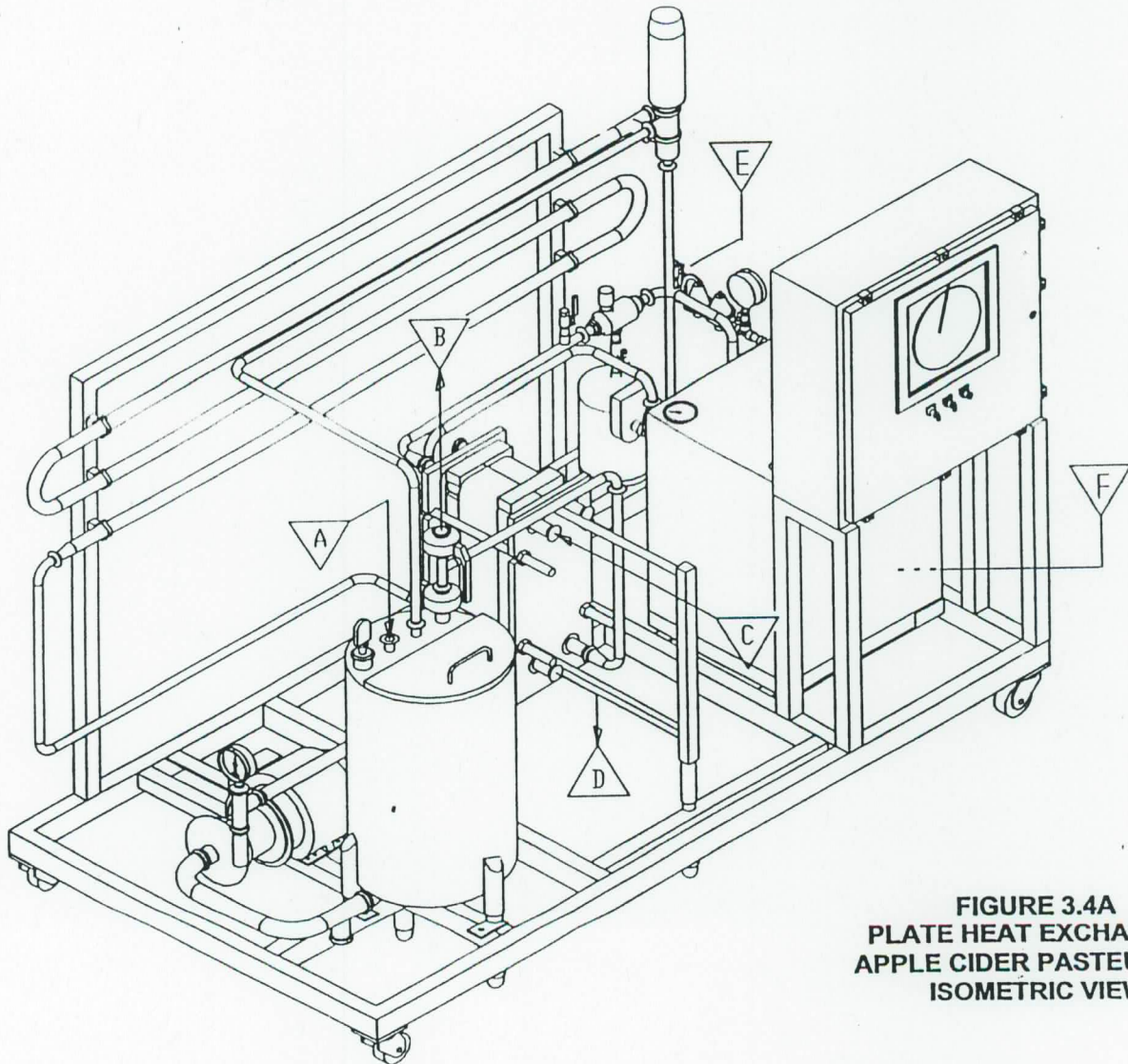


FIGURE 3.4A  
PLATE HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
ISOMETRIC VIEW

STANDARD APPLE CIDER TUBULAR HEAT EXCHANGER PASTEURIZER (PTAC)						
PROCESS CONNECTIONS - SIZE AND TYPE						
MODEL	CIDER INLET A	CIDER OUTLET B	CHILLED WATER INLET C	CHILLED WATER OUTLET D	BOILER WATER MAKEUP E	BOILER GAS CONN F
PTAC-02	1.5" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt
PTAC-05	1.5" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt
PTAC-10	1.5" T/C	1" T/C	1.5" T/C	1.5" T/C	1/2" npt	1/2" npt

TABLE 3.4B

Note: All clamp connections are Triclamp. All npt connections are female.

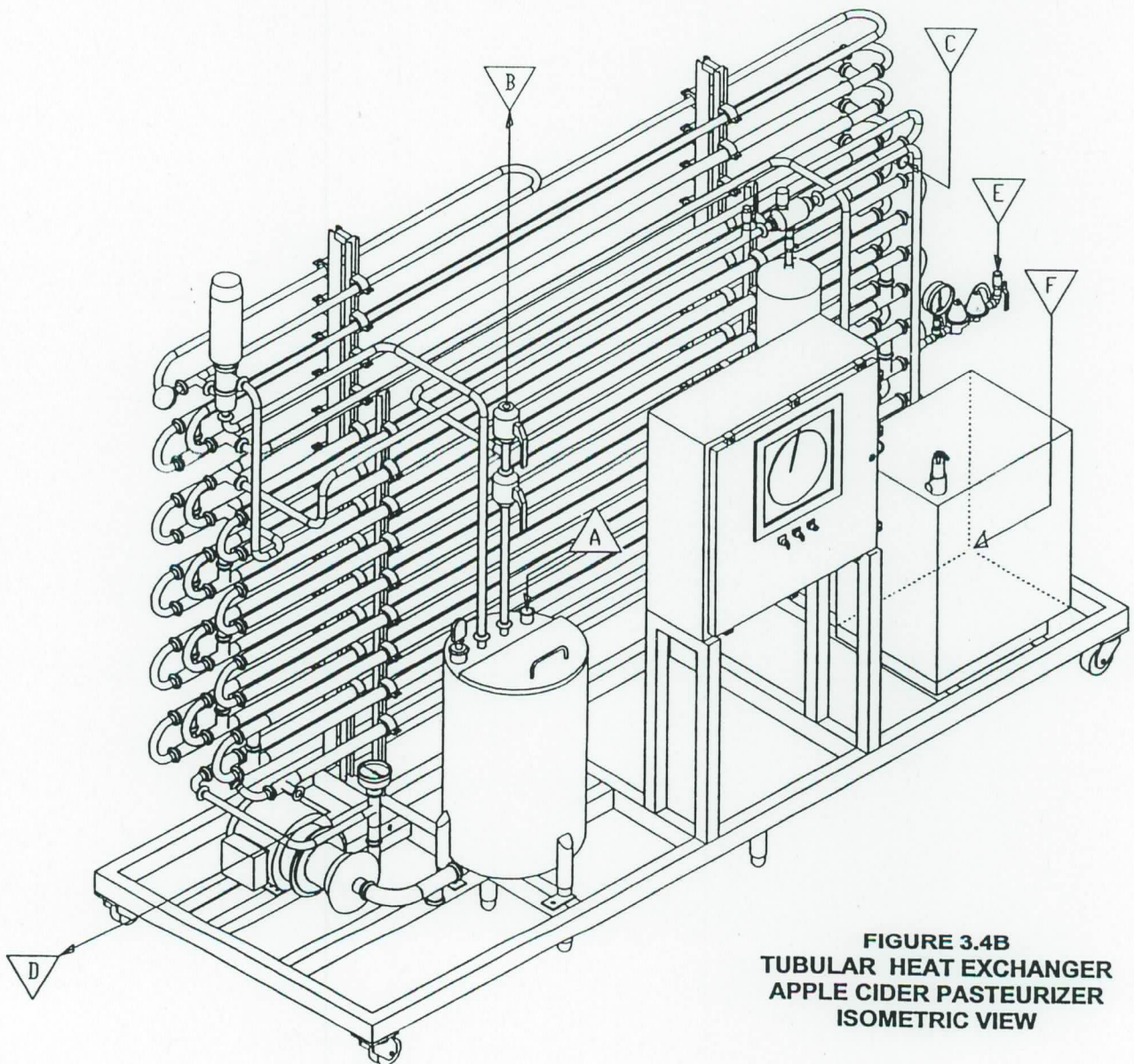


FIGURE 3.4B  
TUBULAR HEAT EXCHANGER  
APPLE CIDER PASTEURIZER  
ISOMETRIC VIEW

## 4.0 STARTUP AND OPERATION

### 4.1 General

Prior to startup, make sure the APV Standard Apple Cider Pasteurizer is installed correctly. Follow the guidelines outlined in Section 3.

### 4.2 Startup

**! Danger**

Do not exceed the maximum operating pressure or temperature listed in Table 2.1 or damage to the Apple Cider Pasteurizer may result.

**! Warning**

Proper installation is required for safe operation.

**! Caution**

All pipe lines to and from the unit must be inspected and flushed to prevent debris from installation from entering the unit.

**! Caution**

If leaks occur during startup or operation, shut the system down and repair the leaks.

Referring to the Process & Instrumentation Diagram in Figure 3.2, read and follow the steps listed below to startup the Apple Cider Pasteurizer.

1. Ensure that a clean, dry, oil free source of instrument air, 100 PSIG minimum, is connected to the panel. Set the panel air regulator at 90 PSIG.
2. Check that power is connected to the panel and all electrical safety devices are operational.
3. Check to insure that the boiler relief valve (PSV1007F) and the boiler drain valve (HV1014F) are properly installed. Close the drain valve.
4. Open the boiler water make-up inlet valve (PCV1015F).
5. Open the boiler vent valve (HV1018F). Leave the valve open until a solid stream of water is discharged from it. This will vent most of the air from the hot water recirculation line.
6. Check to insure that the control panel power switch is on the "OFF" position. Place the disconnect switch to the "ON" position. The product feed pump (PP1104C)

should not be running at this time. If the pump is running, turn it off at the inverter control on the left side of the panel. Check the pump rotation.

7. Close manual product outlet valve (HV1302E) and open manual product recycle valve (HV1303E).
8. Fill the balance tank (TK1101A) with potable process water, turn on the feed pump (PP1104C) at the inverter control display (VFD1104C).
9. Process water will flow first through the raw regeneration section, then the heating section and then through the loop. Then, since the process water temperature at the end of the holding loop is not up to the temperature set on the chart recorder, process water will return to the balance tank via the divert valve (PV1306E) through The divert line.
10. Add water to the balance tank as required to maintain process water at mid-level of the tank.
11. Process water will continue to recirculate in this manner as heat is applied to the system. Referring to Table 4.1 below, set the frequency on the feed pump VFD controller to provide the desired flow rate.

FEED PUMP PERFORMANCE		
VFD Speed Hz	Pump Pressure PI 1306J PSIG	Product Flowrate GPM
20	3.9	3.27
25	7.5	4.1
30	11.8	5
35	16.5	6
40	22.5	6.67
45	29	7.89
50	36	8.57

TABLE 4.1

12. Check the boiler thermostat setting, adjust the setting to 185°F.
13. Turn the control panel power switch to the "ON" position. The temperature control circuit will energize, starting the hot water circulation pump (SP1001D), the boiler draft inducer, the boiler pilot control and the main burners in the boiler will ignite.
14. The hot water circulation pump (SP1001D) will continue to run. The boiler temperature control circuit will continue to cycle in a 4°F on/off pattern as long as the control power is on.
15. At this time, process water should still be recirculating through the system back to the balance tank. The process water will begin to be heated. Make sure the divert valve (PV1306E) selector switch is in the "AUTO" position.
16. Once the process water reaches 160°F, measured at the end of the holding loop (TE1306G) and shown on the temperature recorder (TR1306H), the recorder divert switch will energize the divert valve, putting it in the forward flow position.



17. The process water will then flow into the pasteurized side of the regeneration section of the heat exchanger, through the cooling section returning to the balance tank through manual product recycle valve HV1303E.
18. Customer supplied chilled water should now be turned on allowing process water to cool to 40°F.
19. To adjust the product flow rate, hang the measuring scale, provided with the balance tank, on the side of the tank. This scale is divided into 5 gallon increments. The scale is used to time and adjust product flow through the equipment.
20. To begin timing, open manual product outlet valve HV1302E and close manual product recycle valve HV1303E. Check the measuring scale and note the time it takes to empty 5 or 10 gallons of process water from the balance tank. (The flow is dependent upon Apple Cider Pasteurizer model.)
21. Reverse the manual valves to recycle back to the balance tank, by opening valve HV1303E and closing valve HV1302E recycling water back to the balance tank. Add water to the balance tank as required to maintain mid-level in the tank.
22. Speed up or slow down product feed pump, by adjusting the pump speed of the variable frequency drive (VFD 1104C), to set the system flow to the desired rate. Repeat steps 19 and 20 until the desired flowrate is achieved. Note the VFD setting for future reference.
23. Once the flowrate and temperature have been established and stabilized, the system can be switched over to product.
24. Close HV1303E and open HV1302E to purge water from the system. Once the water in the balance tank is at low level, introduce product to the tank. If the system is equipped with the optional balance tank level control and valve, the control will automatically maintain product feed to the tank by opening the feed supply tank fed from the customers raw storage tank.
25. Continue purging the pasteurizer until process water is drained out. Purge time depends on the system flow

PRODUCT FLOW AND PURGE TIMES			
Model	Flow	Volumes	Purge Time
PPAC-02	2 gpm	4.5 gals	2.25 minutes
PPAC-05	5 gpm	6.5 gals	1.3 minutes
PPAC-10	10 gpm	9 gals	1 minute
PTAC-02	2 gpm	14.5 gals	7.25 minutes
PTAC-05	5 gpm	27 gals	5.4 minutes
PTAC-10	10 gpm	67 gals	6.7 minutes

TABLE 4.2

rate and flooded volume of the equipment. Refer TABLE 4.2 below, for approximate purge times.

26. When all process water has been purged, pasteurized product can be sent to a storage tank.

27. Pasteurized product will continue going forward to storage until a decision is made to return to process water.

#### 4.3 Operation

1. During operation, juice level in the balance tank must be monitored and maintained at roughly 2/3 level in the tank. If the tank is allowed to run low air will be drawn into the pump.
2. At any time during production should the product temperature at the end of the holding loop fall below 160°F (71°C), the temperature recorder alarm switch will automatically switch the divert valve (PV1306F) from forward flow and divert product back to the balance tank.
3. At the end of the production run, allow the product level in the balance tank to fall within 6 inches of the bottom of the tank and then introduce potable process water. Purge the system to the storage tank for the same amount of time as the initial water purge.
4. If the changeover to water is temporary, the flows and temperatures can be maintained with the hot water and chilled water running. Open HV1303E and close HV1302E to recirculate back to the balance tank.
5. To return to product, repeat steps 23 - 26 of the startup procedure.

Once normal operating conditions are reached, temperature and level must be regularly checked, to ensure that the pasteurizer is running properly. See Section 4.5 Troubleshooting if problems arise during operation.

#### 4.4 CIP (Clean In Place)

The Apple Cider Pasteurizer can be cleaned in place by circulating water through the system and adding CIP solutions to the balance tank.

CIP procedures are determined by the type of equipment and product involved. It is advisable to contact a qualified supplier of cleaning chemicals for recommendations of the type and concentration of chemicals, and cycle times and temperatures.

1. Purge product from the system with process water, and continue to run, recirculating back to the balance tank.
2. Turn off cooling water supply and allow the entire system to heat up to approximately 160°F.
3. Increase feed pump speed by 50% to raise the velocity of the water in the system.
4. Turn the divert valve selector switch to the "CIP" position.
5. A general non-foaming detergent solution of 0.5% to 1.0% concentration should be introduced. Add solution sufficient to achieve the correct detergent percentage to the balance tank. The detergent should be combined with ingredients that will ensure adequate

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- wetting of surfaces to be cleaned, disintegration of product deposits, and dispersion to keep undissolved matter in suspension and away from other parts of the equipment.
6. Circulate the detergent wash for 15 to 20 minutes to clean the system, depending on how long the Pasteurizer has been in operation. Pulse product valves open and closed several times during this cycle to clean both sides of the valves.
  7. Once the Pasteurizer has been fully cleaned with detergent wash, purge detergent to drain and rinse the system with soft water. The purge time must be determined by experience factor of each particular system. Start with a 10 minute cycle, and add more time as required to completely rinse the equipment. Pulse product valves open and closed several times during this cycle to rinse both sides of the valves.
  8. The system is next washed with an acid solution, like sodium hypochloride. Caution must be observed when using chlorides with stainless steel. Too high a concentration of chlorides can be corrosive. The maximum concentration of available chlorine should be 100 ppm at 75°F. Reduce the temperature of the system to 75°F before the acid is added to the water in the balance tank. Maximum contact time is the acid wash cycle should be limited to 15 minutes. Pulse product valves open and closed several times during this cycle to clean both sides of the valves.
  9. Purge the acid wash solution to drain and rinse with softened cold water as in step 7. The final rinse cycle should be a minimum of 10 minutes. Pulse product valves open and closed several times during this cycle to rinse both sides of the valves.

The following are major, nationwide suppliers of CIP chemicals. They have representatives in most areas of the country who can visit your facility and recommend CIP chemicals and procedures for your installation.

Diversey Corp.  
12025 Tech Center Drive  
Livonia, MI 48150-2193  
Ph (800)521-8140 Fax (313)458-2471

Klenzade Division  
Ecolab Inc.  
St. Paul, MN 55012  
Ph (612)293-2233 Fax (612)293-2260

Local dairies may have CIP chemical suppliers calling on them. We suggest you contact them for recommendations.

#### 4.5 Shutdown

The APV Standard Apple Cider Pasteurizer must be shut down slowly and allowed to cool naturally to room temperature. Use the following steps to shutdown the Standard Apple Cider Pasteurizer.

1. Turn off the boiler.
2. Introduce cold water into the balance tank.
3. When the water at the end of the holding loop falls below 160°F, put the divert valve into the CIP position and allow the water to cool to 100°F.
4. Turn off control panel power and shut off disconnect switch at the control panel. Shutoff the Feed pump VFD controller
5. Remove the strainer to drain the system. Clean the strainer
6. Replace the strainer and make sure the balance tank is covered.
7. If the system will not be run for an extended period of time, turn off the main gas supply valve.

#### 4.5 Troubleshooting

APV Standard Apple Cider Pasteurizers are designed to provide trouble free service over the life of the unit. However, conditions or processes may change, resulting in reduced performance. Refer to Table 4.3 for guidelines to diagnosing common problems and their suggested solutions.

This table is intended as a general guide only. For additional assistance in specific cases, call your nearest Service Center listed in Section 6.

**Troubleshooting APV Standard Apple Cider Pasteurizers**

Problem	Possible Causes	Suggested Solutions
1. No Water Circulation.	1a. Pump not running. 1b. Pump running in wrong direction. 1c. Pump is air bound. 1d. No water at pump suction.	Check the pump motor fan to see if it is running. If it is not running, check power. If pump is running, go to 1c. Check motor wiring, reverse leads if necessary. Make sure the system has been properly bled of air at valve HV1018F. Check to make sure all valves in the water lines are open.
2. Pump not running.	2a. Supply power is turned off. 2b. Safety disconnect switch is off.	Turn on supply power, check VFD control. Turn on disconnect switch. If pump still does not run, check that pump fuses are operational and that the pump overload relay has not tripped.
3. Can not heat system.	3a. Boiler not running.	Check thermostat setting. Check to see if gas supply is turned on.
4. Unable to control temperature.	4a. System is air bound.	Bleed air from high point(s) of the hot water piping (customer supplied air vent valve).
5. Pipe leaks.	5a. Joints need tightening.	Tighten threads. If this does not stop leak, remove and check threads. If threads are bad, replace pipe, if OK, clean coat with pipe dope and reassemble. Tighten flanges. If this does not stop leak, replace flange gaskets and reassemble.

TABLE 4.3

## 5.0 MAINTENANCE

### ! Danger

Never perform maintenance on an Apple Cider Pasteurizer until the hot water temperature has cooled to below 100°F (38°C).

Never perform maintenance on an Apple Cider Pasteurizer until system pressure has been reduced to zero pressure.

#### Before performing maintenance:

Use plant lockout / tagout procedures

Always disconnect electrical power

Always disconnect instrument air supply

### 5.1 Inspection

Good inspection and maintenance practices will ensure that the Apple Cider Pasteurizer you have purchased will be operational for years. Inspect the pasteurizer prior to each use for visible signs of wear.

### 5.2 Maintenance

Refer to Tables 5.1 for a maintenance schedule of the APV Standard Apple Cider Pasteurizer.

Review the safety procedures outlined in Section 2 before performing maintenance.

### 5.3 Cleaning

Follow CIP procedures outlined in paragraph 4.4.

### 5.4 Storage

An APV Standard Apple Cider Pasteurizer can be placed in storage for a short period of time. The unit must be fully cleaned and drained of all residual water. The unit must be stored in a cool, dry environment, loosely covered by a tarp to allow air circulation and protection from water, debris and sunlight.

### ! Caution

An Apple Cider Pasteurizer that has been in storage for more than six months should be inspected by an APV representative prior to putting the unit back into operation.

### 5.5 Long Term Storage

If the system will not be used for an extended period of time the following steps should be taken.

1. Follow steps 1 - 7 detailed in section 4.5.
2. Open the hot water loop vent valve HV1018F, and the boiler drain valve 1019F, and allow all water to drain from the hot water loop and boiler.
3. Close vent valve HV1018F, but leave boiler drain valve HV1019F open.
4. Remove the strainer from the tee in the product piping between the balance tank and feed pump PP1104C. Place the strainer, and the clamp and gasket in the balance tank.
5. Drain the chilled water lines at their low points.
6. Remove the line between the feed pump discharge and the heat exchanger inlet.
7. If the pasteurizer has a tubular heat product heat exchanger, remove the line from the pasteurized regen outlet and the cooler inlet.
8. Remove the feed pump casing cover and drain water from the pump.
9. After all water has been drained from the system, replace the feed pump casing and all piping.
10. Turn off and disconnect power from the system.
11. Cover the entire pasteurizer with plastic.

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STANDARD EQUIPMENT MAINTENANCE SCHEDULE						
Component	Maintenance Action	Weekly	Monthly	6 Mnths	Yearly	Comments
Hot Water Pump	Inspect shaft seal	X				Replace if leaking
	Pump motor		X			Verify tightness
Water makeup Relief Valve	Verify ground connection	X				
	Actuate relief valve		X			Follow manufacturers instructions
	Pressure relief test				X	Refer to manufacturers instructions.
Thermometers	Inspect for leaks	X				Inspect for corrosion, scale buildup, clear discharge line
	Inspect gage glass	X				Check for scratches or breakage. Replace as required
Pressure Gauges	Verify temperature reading				X	Bench test
	Inspect gage glass	X				Check for scratches or breakage. Replace as required
Manual Valves	Verify pressure reading				X	Bench test
	Tighten retaining nut		X			Tighten if seepage is noted at stem
Hot Water Boiler	Clean sealing surfaces		X			Inspect for nicks or damage. Replace as required
						Refer to manufacturers instructions.
Temperature Recorder	Inspect connections		X			Verify connections are secure
	Check calibration			X		Refer to manufacturers instructions
I/P Transducer	Inspect connections		X			Verify connections are secure
	Check calibration			X		Refer to manufacturers instructions
Air Filter	Inspect Filter		X			Clean as required
	Blow down Filter	X				
Air Solenoid Valve	Inspect connections		X			Verify connections are secure
	Test function		X			Turn valve on / off
Panel Wiring	Inspect Wiring			X		
	Tighten electrical terminals				X	Clean as required
Panel Air Tubing	Inspect Tubing			X		
	Tighten Tube Fittings				X	

TABLE 5.1

## 6.0 PARTS AND SERVICE

### 6.1 Spare Parts

A spare parts kit is available for the APV Standard Apple Cider Pasteurizer. The kit includes spares recommended for typical operation of the pasteurizer for one year or 2,000 hours of service, whichever occurs first.

The Spare Parts Kit includes the following items:

- Pump Seals
- Valve Seal Kit
- Panel Fuses
- Tri-Clamp Gaskets
- Recorder pens and Chart paper

Refer to Table 6.1 when ordering a spare parts kit for a particular Apple Cider Pasteurizer.

APPLE CIDER PASTEURIZER SPARE PARTS KITS	
PASTEURIZER MODEL NUMBER	SPARE PARTS KIT NUMBER
PPAC-02	SPK-PPAC-02
PPAC-05	SPK-PPAC-05
PPAC-10	SPK-PPAC-10
PTAC-02	SPK-PTAC-02
PTAC-05	SPK-PTAC-05
PTAC-10	SPK-PTAC-10

TABLE 6.1

### 6.2 Ordering Parts

Parts may be ordered at the following address. Please refer to the W.O. Number listed on the Apple Cider Pasteurizer nameplate when ordering.

APV Heat Transfer  
Customer Service Department  
395 Fillmore Avenue  
Tonawanda, NY 14150  
Tel: (800) 828-7391  
Fax: (716) 744-2379

### 6.3 Service

APV maintains service facilities at several locations around the country. These sites are equipped to repair or rebuild your Standard Apple Cider Pasteurizer. Service personnel are also available to provide on-site assistance. Call the number listed below to inquire about or arrange for service.

APV Heat Transfer  
Factory Service  
Tel: (800) 278 6080

### 6.4 Documentation

Copies of this or other documents referenced by this manual may be ordered from the Customer Service Department listed in Paragraph 6.2.

### 6.5 Parts Substitution

APV reserves the right to substitute any part whatsoever of the originally specified equipment for another part with equal or greater quality and function.