

# **CRYOGENIC EXPERTS, INC.**

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## **CEXI ELECTRIC VAPORIZER**

**CEXI MODEL NUMBER 480C-30-1.5-CO<sub>2</sub>-LTBP**

**Job No.** \_\_\_\_\_

**Date:** July 1, 2006

### **I. Installation Instructions**

1. Set heater on level concrete base and anchor holes provided in the base angles.
2. Connect Process fluid lines to inlet and outlet connections. **CAUTION:** Be sure inlet is connected to inlet and outlet is connected to outlet; improper connections will damage equipment and void warranty. The inlet connection is normally the smaller connection. Bubble check all connections at 1.25 times the rated working pressure of the system. This unit has three connections.

There are two connections on the inlet side of the unit. One is the liquid supply and is connected to the run of the "T" connection on the inlet. The other is the outlet connection for the bypass. This is the outlet of the ball valve and this line is to be run back to the storage tank. The outlet connection is on the other side of the unit and is the discharge of the check valve.

**NOTE: All fittings that are painted red are to be discarded. The fittings are installed on the unit to allow the unit to be purged to maintain the cleanliness of the unit during shipping and storage. The red fittings are low grade fittings that are not meant to be used at the pressure.**

3. Connect electric power to line terminals of disconnect switch. **CAUTION:** Be sure voltage supply agrees with nameplate rating on equipment. Connect a 480 vac, 3 phase, 90 amp, 60 Hz, power supply to the top of the circuit breaker. If the unit is placed outdoors, we strongly recommend that the connections through the box be made through the side or the bottom of the box to reduce the possibility of water entering the electrical enclosure.

### **II. Operating Instructions**

#### **1. General Description:**

- A. Temperature controllers - these monitor the outlet gas temperature. If the gas temperature is above or below set point, the temperature controller will either turn the heater off if the gas temperature is above set point, or turn the heater on if the

gas temperature is below the set point. One temperature controller controls the contactor that supplies the power to the heaters. The sensor for the temperature controller is a Thermocouple that is located in a small Thermowell in the outlet gas tubing of the casting assembly. The Thermowell is installed in a well that goes up inside the casting assembly so that the Thermocouple can control the unit whether or not there is gas flow.

- B. Low Temp Cut Off System - this consists of four parts. The first is a temperature controller similar to the outlet gas temperature controller.
  - 1. This temperature controller monitors the gas temperature of the outlet header.
  - 2. If the gas temperature is too low, it will open a pneumatically operated ball valve that will then bypass the liquid being pumped into the unit back to the tank. The ball valve receives its "instrument air" from the outlet header of the unit.
  - 3. A regulator takes the high pressure CO<sub>2</sub> gas from the outlet of the unit and reduces the pressure to 100 psig to supply it to the ball valve.
  - 4. On the outlet of the vaporizer is a check valve that will stop the gas that was pumped through the unit from back flowing through the unit. This valve will close when the ball valve opens keeping the high pressure gas in the vaporizer downstream piping.
- C. Casting Assembly - this is the heat transfer section of the unit. It is made up of alternating tube and heater castings. The heater plates have precision machined faces that allow the heat to be transferred from the heater plate to the tube plate. A heat transfer compound is used between the plates to enhance the heat transfer.
- D. High Temp Cut Off Switches - these are small round switches that will shut off the heater if the heater plate temperature exceeds 200<sup>0</sup>F. The switches will automatically reset once the heater plate cools to approximately 180<sup>0</sup>F. The switches are wired in series with the contactor and are normally closed. The switches open on temperature rise.

2. **Initial Check Out:** The temperature controllers are set at factory at approximately correct setting for normal operation, however it is advisable to test controller settings before putting the equipment into service. The following is the recommended test procedure before starting flow of gas.

- A. Turn the circuit breaker disconnect switch to the ON position. When the unit has power the green (Power on) light will illuminate.
- B. Turn ON/OFF control switch to the ON position. The contactor enabled light, (amber), will illuminate if the temperature of the unit is below the temperature set on the temperature controllers.
- C. The set point on the controllers was set at 70<sup>0</sup>F at the factory. The unit has a total of 3 temperature controllers installed in the unit.

1. The main controller is TC1. This controller is the controller that monitor the outlet gas temperature and turns the heaters on to maintain the desired outlet gas temperature - these controllers should both be set at 70 to 80°F.
  2. The 2nd controller monitors the outlet gas temperature and will open the bypass ball valve in the event the outlet gas temperature drops below the set point set on the LTCO controller. This controller should be set at approximately 45°F.
  3. To make sure that the temperature controllers are working properly, turn the dial of the pot assemblies up and down and the contactor should turn on and off. Increasing the temperature controller set point should cause the contactor pull in (there will be an audible clunk as the contactor pulls in). Do not leave the temperature controllers set at an elevated temperature for very long as this may cause the unit to overheat.
  4. Do the same with the LTCO pot and the ball valve should open and close. The ball valve will only open and close if there is gas pressure supplied to the unit. Turning the LTCO temperature controller to a higher set point should cause the ball valve to open. Turning to a lower set point should cause the ball valve to go closed.
- D. Start flow of gas. Check discharge gas temperature. If gas temperature is to low, adjust the controller set point up 2 or 3°F at a time until gas temperature stabilizes to desired temperature. If the gas temperature is too high, low the temperature setting until the gas temperature is at the desired temperature.
- E. For maximum heater life and best operation, the discharge gas should be as cold as possible and still remain compatible with the user's needs. The unit is designed to deliver 70°F gas so the heaters will run around 90-100°F. These heaters should not be operated at temperatures above 125°F (unless specifically ordered to deliver a higher temperature gas).
3. The heaters are powered by a contactor. The contactor is given a signal from the temperature controllers to energize the heaters. The temperature controller senses the temperature of the outlet gas temperature with a device called a Thermocouple. The Thermocouple is a temperature sensitive device that will vary its milli-volt output with temperature.
  4. One temperature controller – TC1 - controls the heater assembly. It is also important to note that if a Thermocouple needs to be replaced, it must be installed exactly where it came from or the unit may not control the temperature properly.
  5. High temperature safety switches (HTCO)'s are mounted on top of the heater castings to prevent overheating in case of temperature controller failure. The HTCO's are connected in series with the contactor that controls the heaters on which the HTCO's are mounted. These switches have a setting of 200°F, and will shut off power to the heaters anytime any portion of the casting temperature exceeds 200°F. These switches will reset automatically when casting cool to approximately 190°F. If one of the HTCO's trip out, the contactor will drop out and all the heaters will be shut off.
  6. **Operation:** The following sequence should be followed for normal operation.

- A. Turn the power on to the unit
- B. Turn on the circuit breaker on the unit
- C. Turn on the ON / OFF Switch
- D. Check the set points on the temperature controllers
- E. Start the flow of gas through the unit.
- F. The unit is now in operation.
- G. In normal operation it is best to leave the power on to the unit at all times. This allows the unit to stay warm all the time - keeping the heaters dry. The power consumption will be very minimal during stand by conditions.

**Specifications**  
**Model 480C-30-1.5-CO<sub>2</sub>**

Direct to Process Electric Vaporizer

Flow	750 lbs. per hour
Mawp	1500 psig
Fluid	Liquid CO <sub>2</sub>
Inlet Temp	0°F
Outlet Temp	70°F
Operating Press	700 psig
Pressure Drop	10 to 15 psig at 700 psig and full rated flow
Fluid Passages	304 Stainless Steel / Carbon Steel
Power Required	480 vac, 3 phase, 50/60 htz
Kilowatts	30
Inlet Conn.	3/4" male pipe thread
Outlet Conn.	3/4" female pipe thread
By Pass Conn.	1/2" female pipe thread

The unit includes the following

1. NEMA 4 Electrical Enclosure
2. Circuit breaker type disconnect with door interlock
3. Aluminum casting assembly with replaceable heater castings
4. Control circuit transformer
5. Control circuit fuse
6. Control circuit on off switch
7. Power on light
8. Contactor on lights
9. Steel stand
10. Casting High Temperature Safety Switches
11. Outlet Gas Temperature Controllers
12. Power Contactors
13. Low temperature by pass system

- a. Inlet bypass ball valve
- b. Outlet check valve
- c. Pressure regulator to supply gas from the vaporizer outlet to the ball valve
- d. Outlet temperature controller to control the ball valve.