Water Technologies

Wallace and Tiernan® Gas Feed System

Series 50-200 Evaporator for Liquid Cl_2, NH_3, or SO_2

SIEMENS

The Wallace and Tiernan® Series 50-200 Evaporator (sometimes called a "vaporizer") is an electrically heated, immersed tank-type heat exchanger. It is necessary wherever the required rate of gas withdrawal cannot be satisfied by direct connection to multiple containers. Such high capacity installations include:

- Disinfection in large municipal or industrial water plants
- Chlorination of municipal sewage
- Disinfection of municipal and industrial wastewater
- Bleaching and waste treatment in pulp and paper mills
- Aluminum fluxing (removal of magnesium)
- Treatment of cooling water in power plants

Key Benefits:

- **Reliable Automatic operation**
- **Easy to install-shipped completely assembled**
- **Accurate, reliable monitoring of operating conditions**
- **Meets ASME and Chlorine Institute code requirements**
- **Automatic pressure relief of gas outlet and liquid inlet standard**

Features

Reliable, Automatic Operation
To help prevent overfilling, the liquid level in the pressure cylinder is self-adjusting. Level in the water-bath tank is maintained by a solenoid that controls make-up water flow. A thermostat maintains hot water temperature. Alarms and readout monitor operation of the liquid-evaporation and hot water systems.

External Heater
The electric water heater is external to the water-bath tank, assuring uniform heat distribution. This prevents "hot spots" and minimizes the possibility of liquid being heated in excess of 100° C (212° F), causing pressure build-up that could trigger gas relief.

Alarms and Monitors
A sight glass for water-bath level and a water temperature gauge help monitor water-bath conditions. Electronic switches provide accurate and reliable water-temperature regulation. Gas pressure and temperature gauges are included. There are high- and low-alarm switches for water-bath temperature and low-water level. An automatic pressure-relief system in the gas outlet is standard. A similar relief system in the liquid-inlet line is also standard. Both systems have high-pressure alarm switches.

Weather-Resistant
The evaporator enclosure is made of rugged, pressure-formed ABS panels. An optional, gasketed ABS rear cover added to the enclosure makes it weather resistant. This arrangement is ideal for outdoor service, especially at power plants.

Meets Code Requirements
The Wallace & Tiernan® Series 50-200 Evaporator conforms to ASME standards and meets recommendations of the Chlorine Institute. The pressure cylinder and water-bath tank are cathodically protected against corrosion. The tank is heavily galvanized inside and out. The pressure cylinder and gas pressure-relief valve comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division I.

Pre-Wiring and Other Installation Economies
Pre-wiring of all evaporator controls and components is completed at the factory and included as standard. Electrical installation requires only connecting external power to a coded terminal strip. Only one 3-phase power supply is required; a transformer in the panel supplies 115-volt power for control functions. There are seven nominal voltages available for the heat exchanger. Three sets of unpowered customer alarm contacts are standard: high water temperature, low water temperature, and low water level.

Easy to Clean
The top of the pressure cylinder is a bolted flange removable for access to the interior. A bottom connection allows the cylinder to be flushed in place. An access hole in the water-bath tank permits inspection of the cylinder exterior and the tank interior. The enclosure is easily removed for access to the evaporator interior.

Easy to Install
The evaporator is shipped completely assembled. The vapor vent and overflow drain are piped separately to ensure adequate water-bath overflow. The electric heating elements are mounted from the top of the water heater. Liquid-inlet connections can be made at the top or bottom; bottom connections are required for evaporators connected to a common liquid supply. Using the bottom connection helps maintain liquid levels in all evaporators.

NEMA 4 Control Panel
The NEMA 4 panel contains a single printed circuit board incorporating all control functions and unpowered alarm contacts. Control switches, alarm lights, and readouts are also on the panel. As a precaution, a fused disconnect switch for the incoming power interlocks with the panel door.

Water-level sight glass is at left of panel. Left side of panel has indicator lights for high-water temperature (red), low-water temperature (amber), and at bottom, low-water level (red). At top are gas temperature and pressure gauges. Meters in center of panel are for water temperature and cathodic protection control, and the power-disconnect switch is at the right of the panel.

Design and Operation

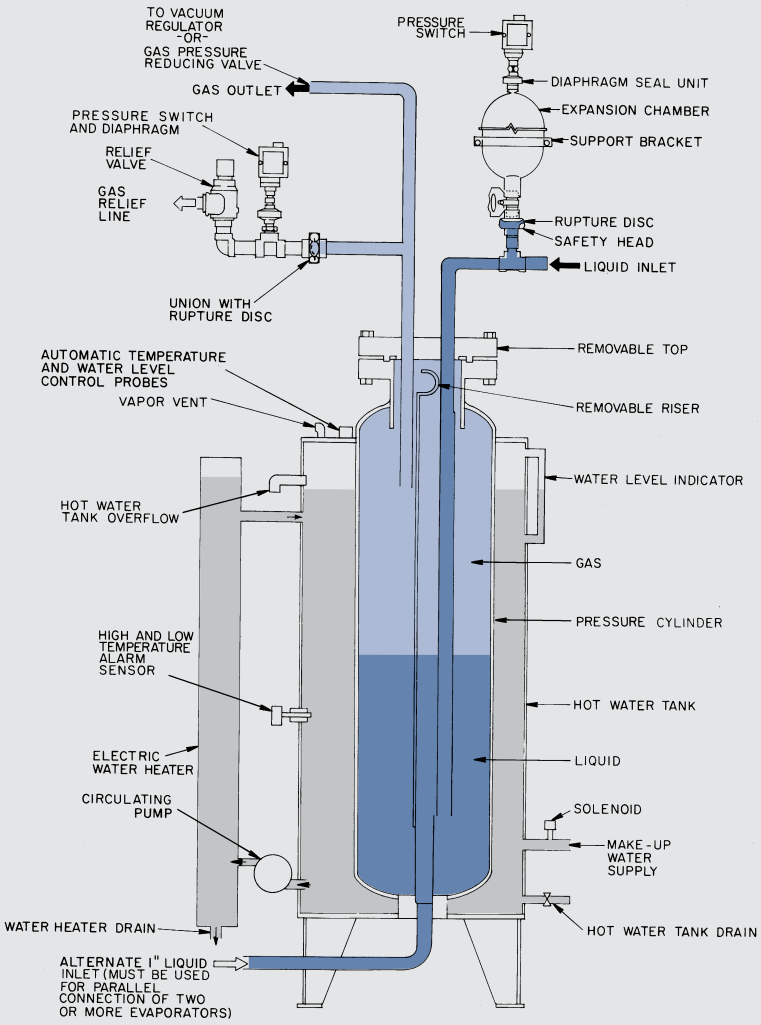
Liquid enters at the top of the pressure cylinder, but a drop pipe carries it almost to the bottom. An alternate liquid inlet at the bottom has a riser that terminates near the bottom of the drop pipe. A vaporized gas outlet at the top has a short drop pipe. This design limits pressure in the cylinder to that of the supply containers and prevents complete filling of the cylinder with liquid. The pressure cylinder is immersed in a temperature-controlled, hot-water bath. Heat transfer from the water bath heats the liquid and superheats the gas. A vacuum-regulating valve at the gas outlet reduces pressure to increase superheat and prevent reliquification beyond the valve.

Liquid level in the pressure cylinder adjusts to gas removal rate. When this rate is constant, liquid level remains constant. If the withdrawal rate is increased, gas pressure in the cylinder is reduced and the liquid rises because of the reduced pressure. This exposes more liquid to the transfer surface and it evaporates faster. Gas pressure builds up until it equals the supply pressure and the liquid level reaches equilibrium again. A reduction in the withdrawal rate has the opposite effect.

A pressure-relief system is located downstream of the gas outlet. It consists of a rupture disc, a pressure switch protected by a diaphragm seal, and a pressure relief valve. If gas pressure reaches 400 psi, the disc is designed to rupture and the pressure switch to actuate. This can provide an alarm so that corrective action may be taken. Gas pressure, in fact, must rise all the way to 560 psi before the valve relieves. Additionally, the electrically operated vacuum-regulating valve furnished with the gas feeder offers an extra measure of safety; it is designed to shut off should power fail, so that liquid cannot be drawn through the gas feeder. It also contains a low-temperature switch. If liquid reaches the valve, it lowers the temperature and the switch actuates, closing the valve.

The liquid-inlet line also has its own pressure-relief system. It consists of a rupture disc, an expansion chamber, and a pressure switch. Should the liquid-inlet line be valved off accidentally and there is a rise in temperature, the disc ruptures, but the liquid is contained in the chamber. The pressure switch can be used to actuate an external alarm.

The pressure cylinder is cathodically protected against corrosion. It meets ASME code requirements. The water-bath tank has a thermostat that controls water temperature and sensors for a water-temperature meter, high- and low-water-temperature indicators, and a low-water level indicator. An automatic-water-level system consists of high- and low-level probes, which actuate a make-up-water solenoid. Water-bath level shows on a sight glass at the control panel.



Technical Data

Type
The Wallace & Tiernan® Series 50-200 Evaporator is an electrically powered, immersed-tank-type heat exchanger.

Evaporating Capacity
Maximum evaporating capacities are 2721.5 kgs (6000 lbs), 3628.7 kgs (8000 lbs), and 4535.9 kgs (10,000 lbs) of chlorine; 2041.2 kgs (4500 lbs), 2721.5 kgs (6000 lbs), and 3401.9 kgs (7500 lbs) of sulfur dioxide; or 571.5 kgs (1260 lbs), 762 kgs (1680 lbs), and 952.5 kgs (2100 lbs) of ammonia per 24 hours.

Electrical Requirements
Evaporator requires 50/60 Hz, 3-phase power supply at nominal voltages of 208, 220, 240, 380, 440, 480, or 550 volts. Heaters for the 2721.5 kgs (6000 lbs), 3628.7 kgs (8000 lbs), and 4535.9 kgs (10,000 lbs) evaporators are rated at 12, 15, and 18 kilowatts. 115-volt power for the control, circulating pump, and solenoid is produced by a 1 kVA transformer in the control panel. Unpowered customer alarm contacts are rated at 10 amps for 120 VAC or 30 VDC.

Make-up Water
City-quality water at 0.7 bar (10 psi), minimum.

Connections
For water-bath tank: ½" NPT female connection to water-supply solenoid; 1-¼" NPT female to overflow-drain and vent connections. For pressure cylinder: 1" NPT liquid inlets at top and bottom; 1" NPT gas outlet at top. Connections have ammonia-type flanges.

Cathodic Protection
The inside of the water-bath tank and the outside of the pressure cylinder have magnesium-anode cathodic protection.

Liquid-chlorine Supply Pressure
2.1-9.7 bar (30-140 psi)

Pressure Cylinder
Rated (working) pressure is 38.6 bar (560 psi). The cylinder is hydrostatically tested at 38.1 mm (1½") times the rated pressure per ASME test requirements. Design and construction meet recommendations of the Chlorine Institute and ASME Code, Section VIII, Division 1 (current edition) for pressure vessels.

Pressure Relief Valve
Gas-pressure-relief-valve setting is 38.6 bar (560 psi). The valve meets ASME code requirements.

Items Furnished
To make the evaporator more reliable to operate and convenient to install, the following components are included as standard: liquid-line pressure-relief system; gas-line pressure-relief system; external water-bath heater; two one-inch chlorine-line valves for inlet and outlet lines; cathodic-protection system for the pressure cylinder and water-bath tank; complete factory pre-wiring; vent screens for the vapor and pressure-relief lines; hot-water-recirculating pump; electronic temperature switches; alternate bottom-inlet connection; and unpowered customer-alarm contacts for high- and low-water temperature and low-water level.

Also included are: ASME-rated pressure cylinder; water-bath tank; ABS plastic enclosure; automatic water-level control (level probes and make-up water solenoid); bath-tank overflow; gas-vapor vent; water-bath tank and recirculating-piping insulation; alarm switches; water-temperature thermostat; water-level sight glass; and NEMA 4 control panel with interlocking disconnect switch and coded terminal strip. The panel also includes gauges, meters, and indicators for power, water, and gas temperature, pressure, and level.

Optional Items
Weather-resistant rear cover for outdoor service; liquid-automatic-switchover system for ton containers or tank cars. Write for Technical Data Sheet WT.050.204.000.UA.PS

Weight and Shipping Weight
385.5 kgs (850 lbs) and 419.6 kgs (925 lbs)

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