Mechanical Vapor Compression Evaporator

- Handles a wide range of waste streams simultaneously
  *Solve your wastewater problems with a single system!*
- Very clean distilled water product
  *Recycle water in your processes or simply discharge to sewer*
- Typical operating cost of $0.01 - $0.02 (USD) per gallon
  *Excellent financial justification*
- Easy to install and operate
  *Minimal manpower requirements*
- Handles volumes up to 96,000 gallons per day
  *Cost effective solution for large volume applications*

www.evaporator.com
Mechanical Vapor Compression (MVC)

The ENCON MVC Evaporator product line has standard offerings the range in capacity from 40 – 4,000 gallons/hour. These systems operate on electricity and compressed air at a typical operating cost of $0.01 - $0.02* per gallon of distilled water. Materials of construction include 316 Stainless Steel, Super Stainless alloys, Hastelloy C, and Titanium for more corrosive waste streams. The ENCON MVC Evaporator can be used for wastewater minimization, distillation, desalination, and potable drinking water.

* Assumes electricity cost of $0.10/kW-h

The ENCON MVC Evaporator is highly automated with minimal need for manpower intervention. Automation includes: wastewater feed, automatic discharge of concentrated residue from the separation tank, automatic transfer of distillate from the distillate sump, and automatic cleaning (Clean-in-Place) of heat exchangers. Numerous variables such as temperature, pressure, and water level are monitored continuously, and will trigger various alarm conditions that notify the operator of deviation from normal operating mode.

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Principle of Operation (See Fig. 1)

1. Unheated wastewater is fed to the liquid vapor separation tank (1) and is heated to a boil by the electric element (6).
2. The recirculation pump (5) begins circulating heated water through the main heat exchanger water-side (2) and back into the separation tank (1).
3. Steam flows up through the mist pad (8) to the inlet side of the vapor compressor (4).
4. Compressed steam from the vapor compressor (4) is forced through the main heat exchanger steam-side (3) giving up latent heat to the counter flowing water from the separation tank (1) on the heat exchanger water-side (2).
5. High temperature distillate flows out of the main heat exchanger steam-side (3) to the feedstock heat exchanger (7) giving up sensible heat to the feedstock wastewater.
6. This cools the distillate and heats the raw wastewater coming into the system.
7. Upon reaching steady state, cold feedstock wastewater is fed at a constant rate through the feedstock heat exchanger (7) to raise the temperature before feeding to the recirculation loop.
8. Concentrate is discharged to concentrate tank (9) at a constant rate through residue pump (10).
MVC Features & Benefits

Automated and Easy to Use Control System
ENCON MVC Industrial Evaporators are controlled with Programmable Logic Controllers in NEMA 4 enclosures and are designed to UL508 and NEC standards. The MVC control logic allows for highly automated operation to minimize the requirements for operator intervention. The graphical user interface allows for an easy to interpret “snapshot” of system status at any moment.

Durable Vapor Compressor
Highly efficient 2 lobe rotary compressors with solid closed end rotors and large diameter shaft. Roller bearing design with polished titanium dioxide coated shaft sleeve. Open seal vents to prevent contamination. High temperature synthetic lubricant for long bearing life and minimal operator intervention.

Plate and Frame Heat Exchanger
Large surface area and compact design for energy efficient operation in a small footprint. Corrosion resistant stainless, super stainless, Hastelloy C, and Titanium plates for long-term operation. High temperature and chemically resistant gasket materials for longevity and durability.

ASME Separation Tank
Stainless and Super Stainless vessels built to ASME standards for corrosion resistance and longevity. Large access door for ease of cleaning. Easy to access mist eliminator pad to ensure high quality distillate.

Modem/Ethernet Hub
All ENCON MVC control panels are equipped to allow for connectivity and remote monitoring & support by ENCON Evaporators Service Technicians.

Other Standard Features

- On-board diagnostics that monitor system inputs for correct operation and system shutdown.
- Feed/Clean in place pump, Recirculation pump, residue pump, water injection and distillate pump.
- Dual strainers for incoming fluid feed line with fluid diverter valve. Allows system to continue running while either strainer is taken out of service. Both strainers are integrated into the PLC to notify operator of need to clean.
- Pressure vent and sensor on steam line between discharge side of vapor compressor and steam inlet to distillate side of main heat exchanger.
- Pressure and temperature sensors, strainer and distillate line between outlet of main heat exchanger and inlet of feed stock heat exchanger.
- Distillate receiving tank for condensate discharge from feed stock heat exchanger. Tank includes 2 level sensors and air diaphragm distillate pump for water injection.
- Separation vessel with the following:
  - Low watt density heating element(s)
  - Low fill level control
  - High fill level control
  - Foam indicators
  - Temperature sensors for wastewater in separation tank and steam temperature above fluid
  - 1 Separation tank pressure sensor to enable PID loop for heating element
  - Dual density mist pad
  - Air vent
  - Vacuum breaker
  - Rupture disk
ENCON MVC Specifications – All Models

FABRICATION
Separation Vessel: 3/16” plate, designed to ASME standards for 15PSIG, side and top access with davit arms. 2 site glasses, internal calming cone
Heating Elements: Low watt density, 150lb. flange
Mist Eliminator Pad: Dual density, 316SS/Fiberglass blend, rated 10micron/2 micron
Skins: Aluminum clad (separation vessel and pipe insulation), fabric with Velcro straps (heat exchangers and vapor compression insulation, optional)
Insulation: 2” thickness, all sides rated to 900°F

QUALITY
Pressure test: Stamped and coded as necessary up to 15PSIG
Leak Test: Dye penetrant test on welded tank
I/O Simulation: To ensure accuracy of controls

CONTROLS
PLC Controller: Graphical operator interface display with pull down menus, scrolling messages, alarms, and E-stop. Modem/Ethernet hub for ENCON direct connection. Watertight control panel enclosure (NEMA 4,12,13)
Temperature Control/Monitoring Devices: 2 eight channel analog input cards and 6 type J thermocouples.
Level Control Inputs: 4 frequency shift level probes, 1 analog level transmitter, and 1 feed water holding tank float switch.
Pressure Inputs: 1 separation vessel vapor, 2 (I/O) for main heat exchanger steam side, and 2 (I/O) for main heat exchanger liquid recirculation side.
Probes and Drives: RF capacitance for foam detection & separation tank shutdown. Three variable frequency drives: 1 for recirculation pump, 1 for feedstock pump, and 1 for vapor compressor.
Control Scheme: Auto-fill, auto dump, and clean-in-place.

WARRANTY
One Year parts and workmanship

MVC Evaporator Components and Connections

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