

Controlling and regulating continuous processes

DESCRIPTION

This unit covers the following areas :

■ REGULATING

- Vacuum regulation
- Flow rate regulation
- Temperature regulation
- Level regulation

Each regulation loop consists of :

- One sensor
- One actuator
- One controller
- One perturbation

■ CONTROLS

- Manual controls
- Sequential controls
- On/off controls

■ COMMANDS

- Hand operated
- Computerized control

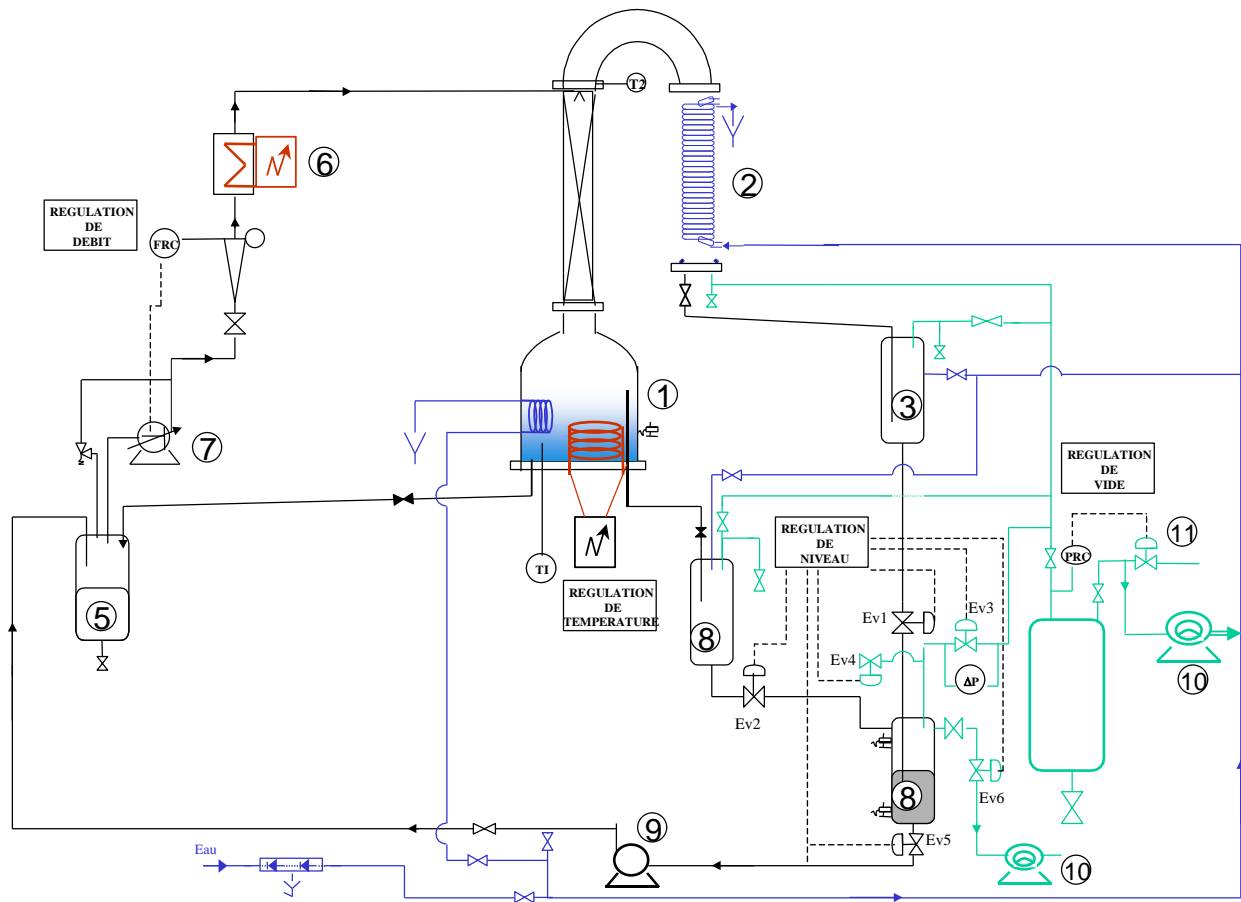
■ OPERATING MODE

Each regulation loop can be adjusted by hand or by computer. The whole process is a closed circuit, without any consumption of raw material.



SUGGESTED APPLICATIONS

- PID regulation
- Manual regulation
- On/off control
- Control of industrial components
- PC control
- Continuous process
- Study of control instruments
- Indicators – sensors – converters – transducers - controllers



DESCRIPTION OF THE MAIN COMPONENTS

- 1- Heating tube – evaporator (borosilicate glass)
- 2- Condenser (borosilicate glass)
- 3- Light phase receiver : water
- 4- Heavy phase receiver : glycerine
- 5- 5 L-supply tank (polyethylene)
- 6- Electric preheater
- 7- Supply pumps
2 exchangeable centrifugal pumps: maintenance with turbine flow meter (0-10 L/h)
- 8- 3 receivers (borosilicate glass)
one for the heavy phase on the bottom condenser: 0.5 L
one for the light phase after the condenser: 0.5 L
one for the final receipt with the level sensors: 0.5 L
- 9- Re-circulating pump (to the tank)
Centrifugal pump with a water inlet connection piece
- 10- Two vacuum pumps
1) 3.9 m³/h – P=0.37 kW
2) 0.36 m³/h for the final receipt
- 11- Vacuum regulation valve (stainless steel)
- 12- Six All-or-Nothing brass electro-valves for the level regulation

HEATING

- Electric resistance heating
- Temperature controller
- Pt 100 in the heating tube: to control
- Stainless steel perturbation coil, supplied with network water

COLD WATER COOLING UNIT

- Connected to the water network
- For the condenser (2)
 - Rotameter
 - Control valve
- For the heating tube coil
 - Rotameter
 - Control valve

VACUUM UNIT

- Vacuum pump
- Control valve (12)
- Pressure sensor
- PID controller
- 6 Electro-valves
- The unit is used under atmospheric or reduced pressure
- The vacuum pump is connected to the vacuum network. Connection to outside air is regulated by the control valve

SUPPLYING UNIT

- Tank containing a water/glycerine mixture. Capacity: 5 L
- Centrifugal pump (with a spare pump for maintenance), the flow rate can be adjusted through a PC or locally.
- Frequency control
- Electric preheater
- Injection into the heating tube

SEPARATION UNIT

- In the heating tube (1), the mixture is heated by an electric resistance
- The water phase evaporates at a temperature corresponding to the pressure in the heating tube.

AUTOMATION

Industrial programmable controller
2 All-or-Nothing digital inlets (high and low level)
8 All-or-Nothing digital outlets (6 electro-valves, 1 pump and 1 vacuum pump)
1 digital outlet for connection to a PC
permits the regulation of the level in the final receiver

4 CONTROL PANELS

Each one:

- Is composed of all the elements relating to the security and to the protection of goods and people
- Allows control of every component in the unit, manually or individually
- Allows control of the equipment by PLC
- Includes the interfaces and the software which allow working with a PC (not supplied)
- Condensing into the condenser, which receives cold water for the network
- Arrival in the recipient
- The electro-valves and the level detectors control every stage
- The heavy phase remains in liquid phase and leaves the heating tube by its lateral weir, towards its receiver

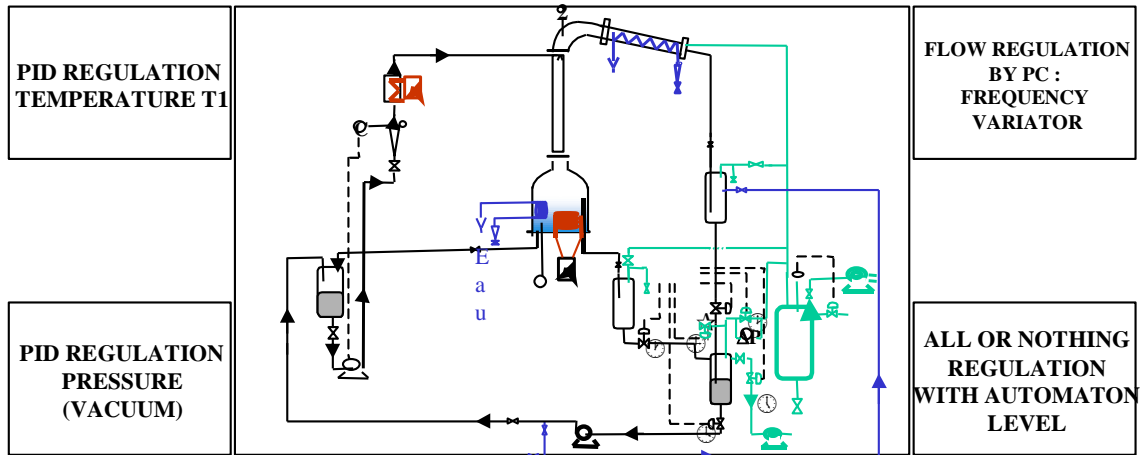
RETURN TO THE TANK

- Centrifugal pump controlled by the levels in the receivers (3-4) and by the solenoid valves
- Cooling heat exchanger
- Return to the tank (1)

INSTRUMENTS

- **Temperature**
Temperature sensors
 - liquid - heating tube
 - vapour column
- **Flow rate**
Rotameter
 - cold water flow rate – exchanger (5)
 - turbine flow meter for the supply
- **Level**
Detectors of:
 - level in the heating tube
 - level in the receiver (high-low level)
- **Pressure**
Pressure in the unit connected to the vacuum regulation.

DISPOSITION OF THE UNIT



TEMPERATURE

- ◆ Control panel with synoptic
- ◆ PID temperature controller with temperature indicator
- ◆ Electric resistance: ON/OFF (only runs when the resistance is immersed)
- ◆ Perturbator: a stainless steel coil with a manual adjustment valve

PRESSURE

- ◆ Control panel with synoptic
- ◆ Piezoresistive sensor: -1/0bar
- ◆ PID temperature controller with pressure indicator
- ◆ Vacuum pump: ON/OFF
- ◆ Perturbator: manual vacuum-breaker valve

WEIGHT AND DIMENSIONS

Length: 2500 mm
 Width: 800 mm
 Height: 2000 mm
 Weight: 300 kg

FLOW RATE

- ◆ Control panel with synoptic
- ◆ Supplying pump: ON/OFF
- ◆ Turbine flow meter: 20-200 ml/min with indicator
- ◆ Frequency variator
- ◆ PID controller with a RS232 outlet for driving the PC
- ◆ PC (not included)
- ◆ Supervision software (under Windows 2000 or XP)
- ◆ Perturbator: manual vacuum-breaker under the flow meter

LEVEL

- ◆ Control panel with synoptic
- ◆ Industrial automate
- ◆ Recirculating pump: ON/OFF
- ◆ Control of the 6 electrovalves of the centrifugal pump and the little vacuum pump with data from high and low level sensors of the final receipt.
- ◆ Permits the work by simulating: with synoptic and DIN plugs for the connection.