# Oil & Gas / Chemistry

## CONTINUOUS DISTILLATION

The continuous distillation plant allows the study of removing a volatile liquid to
enrich a solute; it allows working at atmospheric pressure or in depression.
With this equipment we can perform studies by changing the main variables that affect the continuous distillation process:

- Inlet feed temperature
- Heating power
- Liquid inflow
- Column pressure
- Ratio of the reflux
- Inflow cooling

## DL CH13

**OPERATION OF THE PLANT / TECHNICAL FEATURES**

The main element of the plant is a packed column of 50 mm. diameter and 1100 mm. in height, made in high strength glass (borosilicate). Packed columns ("packing towers") are columns that normally have a low diameter-height relationship, filled in their inside with small solid elements (relatively to the diameter of the column). These fillers are inert to the circulating phase and are distributed randomly or orderly.
The stream of liquid falling on them brakes into droplets, and is brought into intimate contact with the steam flowing in the opposite direction (counter flow). There are many different types of commercial fillers, and, among other, the following features are pursued: a high surface area per unit volume, low weight, good mechanical strength and that the constituents will not compact together. Our packed column is supplied with 5 mm. borosilicate Raschig rings.
The vapors given off during distillation pass to a distillation head equipped with a temperature probe. This head is responsible for distributing the vapor before being condensed. It is used with a solenoid valve and an electronic timer to achieve an automatic and precise control of the reflux ratio. The glass valve that determines the reflux ratio is driven by the solenoid valve. In the rest position all the vapor is condensed in the condenser head and returned to the column as reflux, whereas when the valve is held suspended, the vapor is separated as distillate through a condenser and collected in a graduated collector of 1 l and in a flask.
The heating of the column is performed from the base in a kettle of stainless steel AISI-316 of 20 liter and with an immersion resistance of 5 kW, and provided with
overflow with concentric tube type heat exchanger that cools the residues of the boiler before their evacuation, low level alarm and control system of the heating power.
The fraction of residue that overflows from the boiler is stored in a stainless steel tank of 10 l capacity that will be hermetically sealed to maintain the vacuum conditions throughout the process; it will communicate through a valve with a graduated container of 4 l capacity.
The feed is stored in a reservoir of plastic material, and is introduced into the distillation tower through a metering pump with an adjustable and maximum flow of 15 l/h. It has a rotameter to regulate and control the feed rate. Before entering the distillation column, the feed passes through a heater provided with a resistance, a Pt100 temperature probe and a PID controller for carrying out the preheating of the feed. To study the distillation at low pressure, the plant has a vacuum system that allows working at pressures of 200 mbar; the operating pressure can be monitored and controlled thanks to a manometer gauge and an inverter. The vacuum is achieved by a liquid ring pump.

**DESCRIPTION OF THE PLANT**

The plant includes a cabinet with the switches for both activation of the different elements by the user and with the electrical control and protections elements necessary to ensure the safety of people and equipment. The power supply is three-phase and grounded. The entire assembly is robustly mounted on a frame of stainless steel, self-locking wheeled for easy movement and location.

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**TRAINING OBJECTIVES**

The equipment is supplied with appropriate operation and maintenance manuals, including technical documentation of all equipment, and manual of the possible experiments such as:

- Calibration Curve: refractive index versus the molar fraction,
- Study of the influence of the feed rate in the distillation without reflux,
- Study of the influence of the feed composition in the distillation without reflux,
- Study of the influence of the temperature of the feed in the distillation without reflux,
- Study of the influence of reflux.