ABSORPTION – DESORPTION

This trainer allows studying the absorption and desorption by analyzing the various variables affecting the process:

- liquid inflow,
- gas inflow,
- gas flow and liquid ratio.

DL CH11

OPERATION OF THE PLANT / TECHNICAL FEATURES

The main element of the trainer is a column of 1400 mm. height and 80 mm in diameter made in glass. The column is supplied filled with glass Rasching rings 9x9 mm, and also supplied with polypropylene Pall rings, for the replacement of the glass Rasching rings in order to be able to study the effect of the filler on the efficiency of the absorption and desorption process.

In both cases, the column filling maximizes the gas - liquid contact surface, so that it produces the maximum possible absorption or desorption.

The plant has pressure taps at the bottom and at the top of the column and two intermediate taps, through quick couplings connected to a water column differential manometer that allows determining the pressure drop within the column and the effects of the speeds of the liquid and of the gas on the pressure drop within the column.

The plant also has three intermediate samplers for sampling both the liquid phase and the gas phase and 4 temperature probes with digital display.

The liquid phase is stored in a tank of about 30 liters of capacity made of polyethylene. Water or absorption liquid is led into the reaction column through a metering pump, which allows setting the incoming water flow to the column.

In a flow meter positioned on the liquid inlet line can be displayed the liquid inflow. This flow meter is made of borosilicate glass and stainless steel AISI-316, with stainless steel float. The liquid is introduced through the top of the column through liquid diffuser, which permits the dispersion of the liquid and thus a better distribution of the fluid within the column.

For the plant operation, network air is used. The flow of air into the installation can be regulated and visualized with a rotameter 0-5 m^3/h of methacrylate provided with regulating valve. The plant is designed for the performance of practices of dissolved CO_2 absorption in air on a liquid stream. To do this, in a T it occurs the mixing of air and CO_2 whose inlet can be visualized and regulated in a rotameter 0-2 m^3/h.

Subsequent to the mixing point between CO_2 and air, we have the inlet of the gas stream at the bottom of the absorption column. The contact between the liquid and the gas inside the column above the surface of the filling rings favors the transfer of material.

To study the desorption processes, the circulating water will be contaminated by means of a volatile component, for example ammonia in concentrations of 100-5000 mg/l.

By circulating air in countercurrent, this produces the desorption of the contaminant dissolved in the liquid phase, and it is possible to determine the effectiveness of the process by analyzing the concentrations of ammonia at the inlet and outlet.

The output fluid is stored in a glass container, when operating in continuous mode, or can be returned to the feed tank when operating in batch regime.

To determine the effectiveness of the operation the plant has a gauge of CO_2 concentration in air, with infrared CO_2 meter; it includes a water filter before the meter. This meter may be used for determining the concentration of this compound both at the inlet and at the outlet of the column. Likewise, at the bottom of the column there is a water seal to prevent loss of gas through the bottom of the column. The gas is collected in a container made of glass.

Oil & Gas / Chemistry

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:

- Effect of the speed of the absorbent in the absorption process,
- Effect of the air flow in the absorption process,
- Effect of the CO_2 concentration in the absorption process,
- Effect of the height of the filling,
- Effect of the type of filling,
- Determination of the variables that affect the pressure drop,
- Effect of the speed of the liquid in the desorption process,
- Effect of the air flow in the desorption process,
- Effect of the ammonia concentration in the desorption process.

In this trainer it is possible to perform further experiments such as:

- Study of the concentration profile within the column,
- The effect of the pH in the absorption of CO_2
- The effect of specific absorbents such as mono-ethanolamine in different ratios.

DIMENSIONS

All items will be assembled on an aluminum frame with table and self-locking wheels.

The external dimensions are approximately 2.0m high, 0.75m wide and 0.75m deep.