Packed distillation column

Engineering

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Experimental Procedure

The supply of mains electricity was switched on through the isolator on the control panel. This process was then followed by switching on and off the power located at the control panel. It was recommended to have both valve S and valve R in their open positions. Opening of the feed control valve followed to allow for a greater flow of the fluid. The valve that allows in the cooling water was opened and fixed to a value that was more than 18 on the initial rota meter. Switching one of the variable transformers followed to provide power to the reboiler system. In order to achieve the initial heat loss rate of the system, there was fixing of the output voltage to its maximum value and setting the reflux divider to total reflux. Once the measurement is achieved, there was changing of the reflux values to 1, 2, 4, 6, and 8 with the help of reflux divider situate on the control panel and the rate of feed flow altered to a maximum value of 70 cc/min. Waiting period of 20 minutes was recommended upon the change of reflux ratios and system reaching its steady state. It was then possible to identify the time at which the system reached its steady state by checking at the temperature indicators with the help of a thermocouple selectors. To obtain the heat loss rate of the initial experiment for every reflux ratio specific values, it was recommended to obtain the feed samples and to identify the top products with respect to the namesake valves.

These parameters were obtained in the cylinders used for measuring and cooling in the refrigerator finally followed to temperatures of 15-16oC. Once the required temperature was achieved, the solutions specific gravity was measured by use of a hydrometer. Matching the reading obtained followed to a closer figure of the charts specific gravity giving approximate alcohol percentage in the solution. In addition, the amount of fluid passing through a given time interval was measured to obtain top product flow rates.

Feed supply

A constant feed rate supply is maintained by channelling the supply from a head tank and backing it up with the help of feed tank as indicated in the start-up procedure. The other pipes are used to supply the liquid from top product tank to bottom product tank and finally to feed tank. To constitute the feed, return the products collected from the top, the bottom, and any sample that had been taken for measurements back to the feed tank (McKeown and Chalfant, 2000).

An interlock

The interlock of the system are used to protect condenser coils of the glass from thermal shock when water used for the cooling purpose suddenly moves through the hot coils of the system. The interlock achieves this by alternating the boiler operations unless there is flow of the cooling water through the system. The interlock compartment works under the pressure sensor switch located at the cooling water line cooling system. The switch is used to cut off power of the electricity to the reboiler system if flow rate of water is not greater than five based on the rota meter scale of the system. Cuts off electrical power to the reboiler if the water flow is less than about five on the rota meter scale (McKeown and Chalfant, 2000).

The reflux divider which is electromagnetically-controlled

The reflux divider works, when it is switched to an Auto mode. This is achieved by channelling the condenser flowing liquid to off take line for a given set period. These periods are set up in seconds with regard to the control panel. The column then reached an expected steady state and not an oscillating state. The expected reflux ratio of the system may not be achieved in case times set are too short. The nominal recommended nominal times should be between 70 seconds to 7 seconds to achieve the required reflux ratio (McKeown and Chalfant, 2000).

Shut-Down Procedure

Reflux controller is set to total reflux and finally switching it off. The transformer output is then switched off and the transformer output. All the contents of the top tank are moved to the bottom tank before switching off the pump. Wait for the reboiler ebullition to stop and close the cooling water valves of the blue handle. Control box power is switched off and at the mains isolator box. Take back hydrometers kit to the cupboard of the grey laboratory.

Reference

McKeown, E., & Chalfant, D. (2000). Distillation. Whately, MA: Signature Sounds.