Al-Mustaqbal University College

Chemical Engineering and Petroleum Industries

Unit Operations Lap

Experiment (3)

Batch Crystallization

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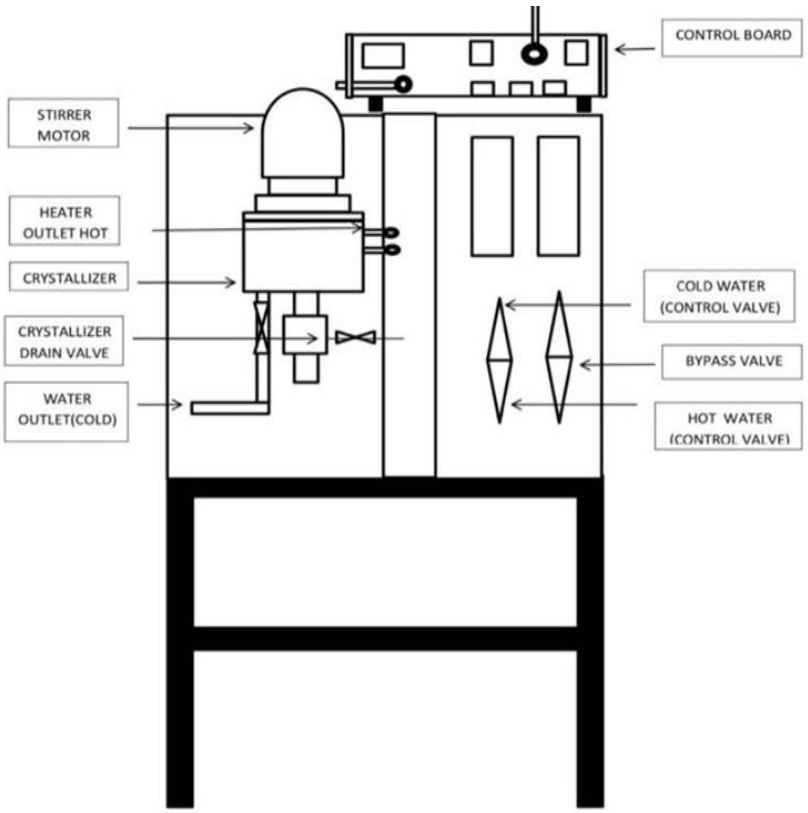
INTRODUCTION

In the chemical industry, crystallization has evolved into one of the most essential unit operations. The desire to shorten the time between product invention and market introduction is a natural concern. The product quality characteristics must be met in order for the product to be considered acceptable .It is necessary to optimize the engineering experimentation process. Crystallization is the formation of solid particles in a homogeneous phase. Its widespread use stems from two factors: a crystal formed from an impure solution is a substance in a suitable state for packing and storing, and a crystal formed from an impure solution is a substance in a suitable state for packing and storing. Once the crystal weight is established as the primary performance feature (quality indicator).



AIM

To calculate The efficiency of Crystallizer

Description

This cooling type agitated batch crystallizer set up consists of an open jacketed stirred vessel provided with water heating &cooling arrangement .the feed is prepared in the crystallizer itself with hot water and stirrer .Heater is provided to heat the solution. Rotameter is provided to measure the flow of cooling water .Pump is for circulation of water. Temperature sensor is provided to measure the sensor .Receiving Tank is for collect the product.

EXPERIMENTAL PROCEDURE:

- Prepare a saturated of K2so4 or NaHso4 in water at 70 C by dissolving 200 gm K2SO4 in 1L distilled water .
- Fill the crystallizer with saturated solution.
- Simultaneously start the cold water supply by open the vave and adjust the flow rate at some valve.
- Put 3 gm K2SO4 in the crystallizer when the temperature reaches to near 50 ,for seeding .
- After two hours ,stop the cooling water supply.
- The crystal shall be collected on mesh and liquid in the tank.
- Collected all the crystal from the mesh on filter paper and weight.
- Drying the crystal and then weight it .Note down the weight.

OBSERVATIONS & CALCULATIONS:

The following from industry suggests crystallization: given a saturated solution where a known weight of the powder of the substance to be crystallized is suspended for a known screen analysis, suppose this solution to be cooled under known conditions

Calculate the solubility of K_2SO_4 at different temperature from solubility data (initial and final soluble temperature).

$$\mathbf{W_{theoretical} = X-Y} \qquad \textbf{Eq.(1)}$$

Where $W_{theoretical}$ represent theoretical weight of crystal, X represent the solubility of K_2SO_4 at initial saturated temperature and Y represent the solubility of K_2SO_4 at final crystal temperature.

$$\mathbf{W_4=W_1-W_2} \qquad \textbf{Eq.(2)}$$

$$\eta = \frac{\mathbf{W4}}{\mathbf{Wtheoretical}} * 100 \qquad \textbf{Eq.(3)}$$

Where η represent the efficiency of crystallization process.

Discussion

1-How does Batch crystallization?

2-How do you increase the efficiency of crystallization process?

3-Where are batch crystallization used ?

4- What is the difference between continuous crystal and batch crystal?

Result Of experiment Lap.

morning study(K_2SO_4)

S=200 gm

W_1=43

W_2=36

Evening study ($NaHSO_4$)

S=140 gm

W_1=31

W_2=27