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Experimental study and scale up of adsorption column for reclaiming lean methyl diethanolamine solvent from natural gas sweetening unit

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Foaming and solvent degradation is a major issue in natural gas sweetening unit. Currently, GASCO Company (Abu Dhabi) is using aqueous methyl diethanolamine (MDEA) to scrub H_2S/CO_2. Adsorption is mostly applied technology to regenerate MDEA. Polymeric/clay hybrid composite were used in continuous adsorption to remove contaminants using different column diameter and height. This study focusses on the removal of organic acid anions as major contaminant present in lean MDEA. Dimensional analysis has been carried out in order to identify the relevant dimensionless groups involved to provide scale up studies. The adsorption column bed diameter and bed height was changed from 1.5-2.6 cm and 10-45 cm, respectively. The columns with 2.6 cm diameter having 10, 23 and 45 cm height were filled with different weight of adsorbents. It was observed that with increasing bed diameter the breakthrough as well as bed saturation time was increased. The breakthrough curve for lower diameter column was observed to have a sharp slope and shortened mass transfer zone. The bed height of 10 cm had faster breakthrough as compared to 23 and 45 cm bed height. Thus, higher the bed height, higher is the breakthrough as more amount of lean MDEA can be treated. Thomas and Yoon-Nelson models were used for analyzing the experimental data. For the scale up studies, the concentration of the contaminants in the column was approximated into two zones: A large saturated zone and a smaller unused zone. Then assumptions were made for laboratory to pilot scale that when the column gets longer, the size of the saturated zone will change but the size of the unused zone remain constant. While, for industrial scale both the zones will increase accordingly. The findings of this research could contribute to the industrial scale up for the purification of lean MDEA.

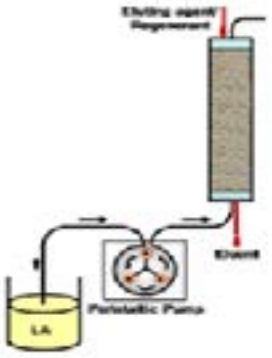

Fig.1: Column studies for the removal of total organic acid anions with polymeric/clay composite beads as adsorbents

Biography

Fawzi Banat is a Professor and Chair of Chemical Engineering Department at Khalifa University of Science and Technology, Petroleum Institute, UAE. He has obtained his PhD (Chemical Engineering) from McGill University, Canada, in 1995. Area of his research interests include gas and water treatment. He has received several research awards, published over 120 papers and holds a number of international patents.

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