

Adsorptive Separation of Benzene -Toluene-Xylene (BTX) from Fluid Catalytic Cracking Unit Effluent.

Ozemoyah, P. O.

M.Sc. Chemical Engineering

Department of Chemical Engineering
Obafemi Awolowo University, Ile Ife, Nigeria

1986.

Abstract:

The separation of mixtures of industrial benzene, toluene and mixed xylenes was carried out using the pulse test technique. Three adsorbent types - silica gel, fuller's earth, and a combination of the two were used. Three groups of solvents - alkylhalides, alcohols, and ketones - were employed as the desorbents. Liquid effluent from Fluid Catalytic Cracking (FCC) unit of the Warri Refinery was treated in a manner similar to that for the industrial BTX mixtures. Diethyl ether and mixed xylenes were, in addition to the ones mentioned above, used as desorbents.

The silica gel-xylene combination of adsorbent-desorbent gave pure aromatic hydrocarbon from the FCC gasoline, but could not wholly separate the BTX. In order to enhance good BTX separation the FCC gasoline was fractionated.

The FCC gasoline was fractionated into four cuts. The aromatic content of the four fractions and that of the original FCC gasoline were determined using the Fluorescent Indicator Adsorption (FIA) equipment. The only fraction containing all the required components of benzene, toluene and xylene was subjected to adsorption/desorption process in a column using silica gel as adsorbent and trichloromethane as desorbent. BTX of about 90 percent purity was obtained. Fixed-bed adsorption columns were then designed for the process using silica gel as the packing material. Columns of 6m high and 1.3m diameter were obtained. The gel inventory for each column was about 6,000kg and the total pressure drop expected for the designed domed end column is less than 4500 N/m². The gel capacity for the BTX at its concentration in the BTX "heart cut" (80-120°C) was found to be about 0.185 ml/g in n-hexane.

Keywords: Benzene-Toluene-Xylene/ Fluid Catalytic Cracking (FCC)/ adsorbent/ desorbents

Supervisor: S. A. Sanni and S. O. Fasesan

186p