



Modeling and Simulation of Distillation + Pervaporation Hybrid Unit: Study of IPA - Water Separation

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Abstract : The chemical industry consumes large amount of energy sources to process raw materials. With rising energy prices and increased focus on efficiency, the development of alternative separation processes to conventional separation processes is essential. Although distillation has widespread use in the chemical industry, separations involving close boiling or azeotropic compositions are not feasible in conventional units. Azeotropic distillation with entrainer is a commonly used technique for separation of the mixture isopropanol/water. The separation is not feasible with conventional distillation due to presence of an azeotrope. In this paper, the design of hybrid process consisting of distillation and pervaporation is elaborated as an alternative for the separation and evaluated from energy point of view. Separation of isopropanol/water mixture is carried out by Distillation-Pervaporation (D + PV) hybrid unit. The results clearly reveal the advantage of using a hybrid unit in place of conventional distillation unit. Separation of dilute solutions by pervaporation is not economic due to large membrane surface requirement. At low feed isopropanol concentrations, hybrid separation is more attractive compared to only pervaporation.

Key Words : Hybrid Separation, Distillation, Pervaporation.