Faculty of Engineering
Tokushima University

Optimization and control of energy-saving distillation systems

Assistant professor Alcantara-Avila J. R.

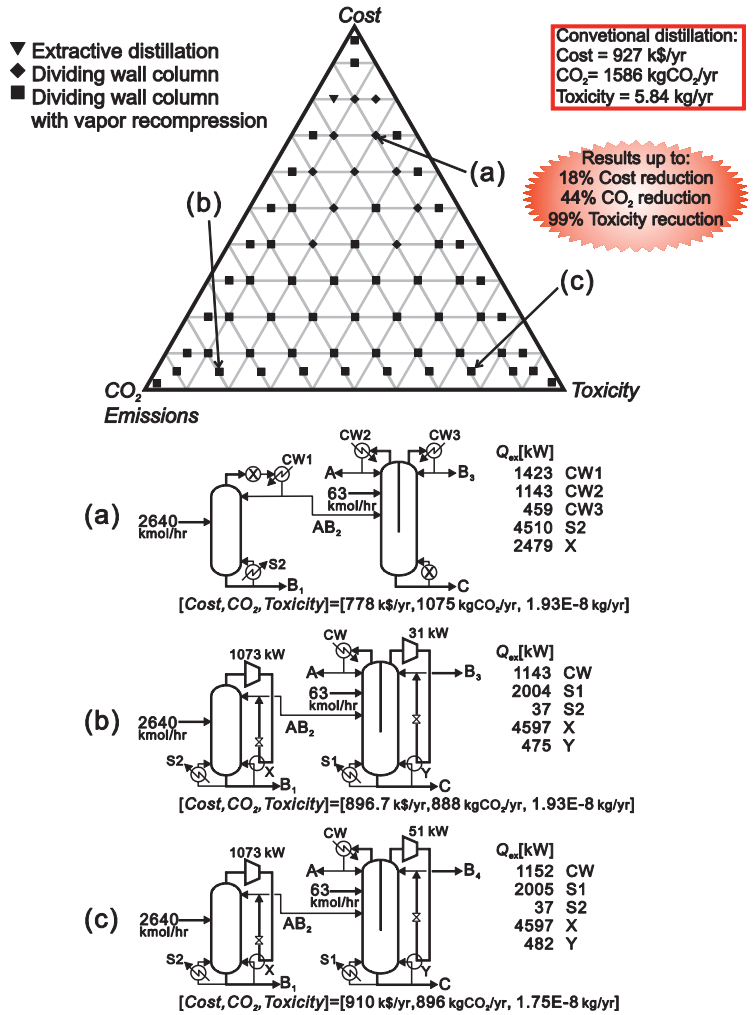

Fig 1. Set of optimal solutions with minimum cost, CO_2 emissions and toxicity to humans

Content:

Distillation is widely used in the Chemical and Petrochemical Industry to separate liquid mixtures, however, it inherently entails high energy consumption.

Process intensification by means of heat integration and energy reuse are been researched by our group to find sustainable and reliable distillation systems with low energy consumption, CO_2 emissions, environmental impact, and cost. These criteria oppose each other in most cases, therefore, we propose multi-objective optimization procedures to find the set of optimal solutions to assess the trade-off between conflicting criteria.

Fig. 1 shows a set of Pareto-optimal solutions with low cost, CO_2 emissions, and toxicity to humans when glycerin, which is an environmental friendly solvent, is used to obtain fuel grade ethanol in a bioethanol plant. In the figure, CW means cooling water, S1 and S2 mean steam at different pressure, X and Y mean heat integration. The results shows that heat integration and vapor recompression are appealing alternatives.

Keywords : Optimization, Process Intensification, Multi-objective Optimization, Multivariate Control

E-mail: alcantara@chem.tokushima-u.ac.jp
Tel. +81-88-656-7425
Fax: +81-88-656-7425