ABSTRACT

A crystallization process has been used to efficiently recover *para*-xylene from the mixed xylene by taking advantage of the large freezing point difference between the *para*-xylene and the remaining components in the mixture. In order to minimize the negative environmental impact, more energy efficient crystallization process is necessary. It is therefore of great interest to improve the efficiency of refrigeration system for the *para*-xylene crystallization process.

Both vapor-compression cycle and absorption cycle have been employed in refrigeration system for many years. Although vapor compression system is the most common type of the refrigeration system, the absorption refrigeration cycle has recently attracted much attention because of the possibility of using waste thermal energy or renewable energies as the power source, thus reducing the demand for electricity supply. Both propylene vapor compression refrigeration and ammonia-water absorption refrigeration are investigated for the *para*-xylene crystallization process.

The propylene vapor-compression refrigeration has a much higher coefficient of performance (COP_R) and requires lower operating cost than the ammonia-water absorption refrigeration. Therefore, the vapor-compression cycle will be generally the first choice refrigeration system for the para-xylene crystallization process.

However, when the ammonia-water absorption refrigeration utilizes waste heat or low temperature heat available from inexpensive sources, it becomes a cost-effective promising refrigeration system to replace the propylene vapor compression refrigeration. The operating cost of the ammonia-water refrigeration sensitively depends on the utilization of waste heat available at low cost.