

# **WATER MANAGEMENT IN REFINERIES**

**M. COLIN ARNOLD AND JOSHI SAMUEL**

## **EXECUTIVE SUMMARY**

Industrial use of water has a long history of maximum use of fresh water input and maximum discharge. Utilizing mathematical algorithms in the GAMS interface, it was shown that a piping network designed for water reuse can be optimized that reduces this fresh water input to a global minimum. Similar studies were first being investigated in the early 1980s; at the same time, industries began focusing on reusing water as a means to increase profit. This study verifies the appropriateness of the use of models in an interface such as GAMS in furthering endeavors to minimize fresh water consumption. This topic recently has become of great interest because of water shortages. In addition, the fresh water purchase costs have led the industries to re-evaluate their strategies. Furthermore, stricter EPA (Environmental Protection Agency) regulations have forced them to optimize their water usage and treatment networks.

The mathematical algorithms used in the GAMS interface optimize the water network for a refinery which operates six water using units. Values are assigned to the units as inherent parameters. These parameters include the maximum inlet and outlet concentrations in the water stream, and the process mass loads of the contaminants. Four different algorithms were investigated in the study. Results are compared to values presented in a previous study and these results indicate a wide range of use for the algorithms. An algorithm is written to verify the basic use of the models, two are written to incorporate a minimum flow rate standard, and a last model is written to incorporate regeneration into the system. Finally, robustness studies are carried out to verify the models' flexibility.