

AREA III:

**PROCESS MONITORING AND
CONTROL**

III-1. WASHINGTON UNIVERSITY REACTOR AND PLANT PROCESS CONTROL (Gregory K. McMillan, Retired Solutia Senior Fellow)

A HYSYS plant dynamic model of the reactor and control system has been installed and is available for simulation of desired processes. Automated Pseudo Random Binary Sequence (PRBS) tests are conducted to determine the dynamic relationships between key measurements and model parameters such as heat transfer and reaction rate coefficients. The experimental models from the PRBS tests are used by a Model Predictive Controller to adapt HYSYS model parameters so that HYSYS model outputs match plant data. The adapted dynamic HYSYS model becomes part of a virtual plant that has a complete working copy of the basic control system. Built-in tools in the virtual plant for automatic controller tuning and performance monitoring are then used to benchmark and improve the performance of the basic control system. Once this foundation is set, advanced control tools for property estimators and model predictive control are prototyped and layered on top. Equations are developed to calculate the benefits online for improvements made for reactor control. The HYSYS model is also used for Real Time Optimization. The result is a live “before” and “after” evaluation of basic and advanced control systems for various conditions and objectives.

Additional improvements to our virtual and actual control laboratory via introduction of Emerson Delta-V Pro systems will soon be described to interested sponsors.