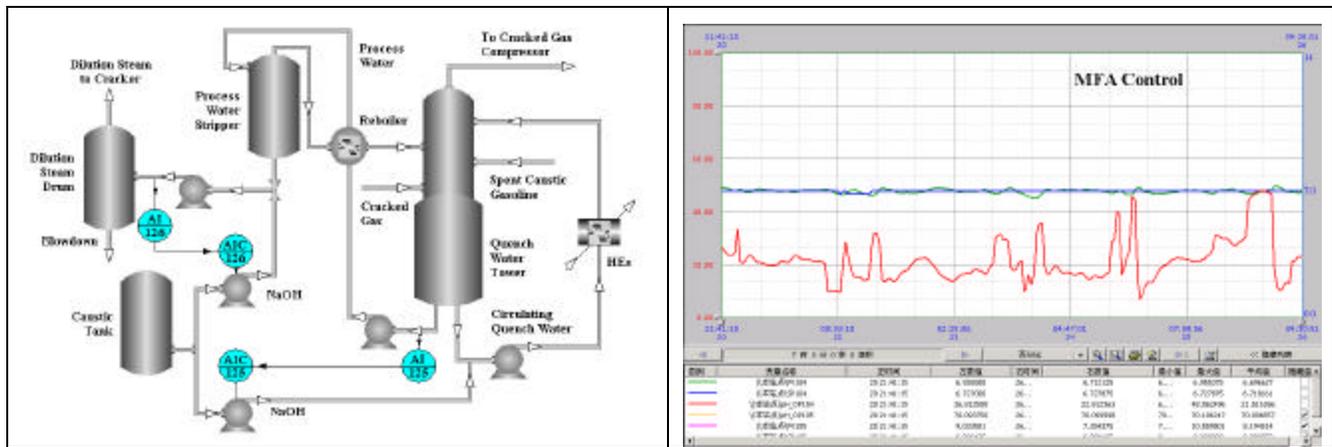


Model-Free Adaptive Control of Ethylene Quench Water pH

Use of MFA Control	Benefits
Tightly controls ethylene quench water pH by using Anti-delay MFA pH Controller to deal with large and varying time delays.	Prevention of quench water emulsion and fouling.
Easy configuration and launch of MFA controllers.	Smoother and safer plant operations.
Sharply reduced chemical reagent consumption, equipment corrosion, and maintenance cost.	Return on investment (ROI) achieved within a few weeks.



CyboSoft's MFA Control Solution for Ethylene Quench Water pH Control

Process: In an ethylene plant, hydrocarbon feed stock is cracked to produce ethylene and py-gas as a by-product. In a quench water tower, py-gas is cooled by direct contact with the quench water.

Challenges: The py-gas in the contaminated quench water can cause emulsion making the separation more difficult, in addition to fouling of the dilution steam system and associated components. Effective quench water pH control is critical. Since these pH loops are very nonlinear and also have large and varying time delays, most quench water pH loops are left in manual control resulting in lower efficiency, wasted chemical reagent, and higher maintenance cost due to equipment corrosion.

Solution: MFA pH controller and Anti-delay MFA pH controller are effective and simple solutions for pH control problems.

Application Story: Fu-Shun Petrochemical Complex of Petro-China has deployed multiple MFA control systems including quench water pH control in its ethylene plant. Quench water needs to be controlled at $pH=7\pm0.5$. Since the water is acidic, caustic water is added at the bottom of the Quench Water Tower to the circulating quench water, and at the bottom of the Process Water Stripper and Dilution Steam Drum. (See above diagram).

Manual Control: Under manual control, quench water pH varies between 5.77 and 7.47 (Variation Range = 1.7).

MFA Control: Under MFA control, the variation of quench water pH is sharply reduced to 6.9-7.18 (Variation Range=0.28). The MFA control performance can be seen by investigating the above control trends, which records about 12 hours of data. The setpoint (blue) of the pH is set at 7.0. The MFA controller (red) has its operating range of 0% to 100% and produces control signals in the range of 7% to 50%. This means that it makes a significant adjustment to the caustic flow in order to keep the pH (green) under control with only 0.28 variation range.

MFA Benefits: Implementing an MFA control system is a low-risk and high-reward business practice. MFA enables industries to achieve flexible production, Six Sigma quality, pollution control, and energy and cost savings.