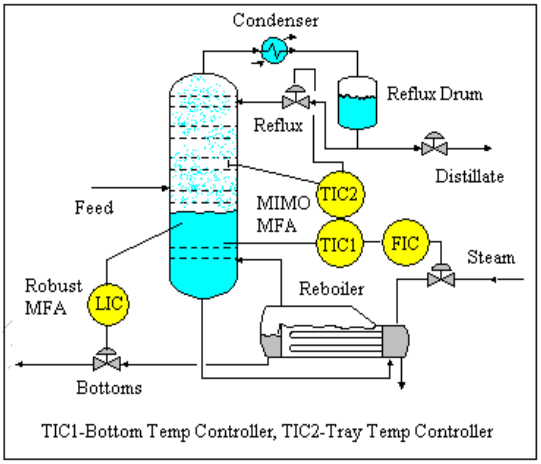
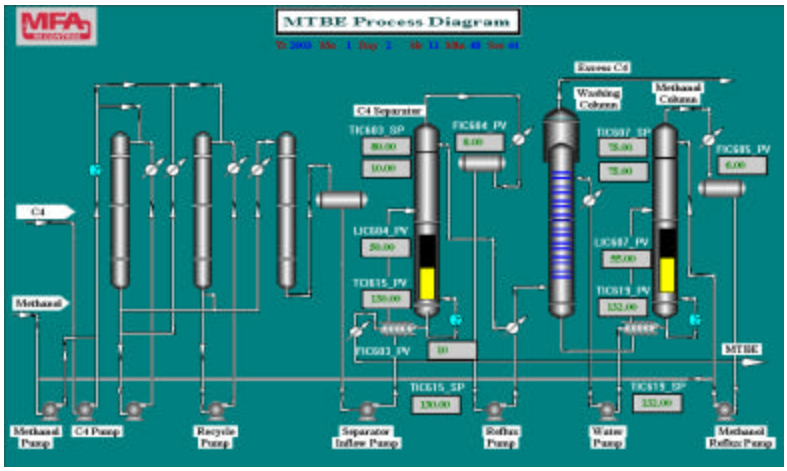
MFA Control and Optimization on Distillation Columns

Use of MFA Control	*Benefits*
Tightly controls key process variables during various feed rate changes, operating conditions, and plant upsets.	Process stability, smoother operations, and higher yield are achieved.
Decouples loop interactions and minimizes chain reactions among the columns.	Avoids potential vicious cycles, plant upsets, and accidents.
Improves feed throughput and achieves higher product quality.	Return on investment within a few months.





CyboSoft's Distillation Column MFA Control and Optimization Solution

Process: Distillation column chains are used to separate a liquid or vapor mixture of two or more substances into component fractions of desired purity. A reboiler brings the liquid at the bottom to the boiling point where the component with a lower boiling point will evaporate. Trays or plates inside the column shell enhance the separation. A condenser cools and condenses the vapor leaving the top. A reflux drum holds the condensed vapor and sends a portion back for recycling and improving the material and energy balance.

Goals: Distillation columns consume so much energy that it contributes to more than 50% of plant operating costs. It is desirable to tightly control bottom and tray temperatures to optimize separation, avoid flooding, minimize steam consumption, and maximize yield.

Challenges: Since it is a multiphase and multivariable process with complex operating conditions, control of critical temperature, pressure, and level loops can be very difficult.

Solution: CyboSoft offers effective Model-Free Adaptive (MFA) control solutions for controlling critical process variables without the need to build column process models and retune controller parameters.

Column Level Control: Use a Robust MFA controller to smoothly control the level and minimize outlet flow variation to reduce potential vicious cycles in the column chains. User-selectable higher and lower bounds on level PV protect the level from running too high or too low during plant upsets.

Column Temperatures: Use a Multivariable MFA controller to manipulate the boiler flow and reflux flow setpoints to control the bottom and tray temperatures. Interactions between the bottom and tray temperatures are decoupled. Anti-delay MFA features may be enabled to handle the large time delays in these loops.

Application Story: Lanzhou Petrochemical Complex of PetroChina has deployed MFA controllers on 4 distillation columns in its MTBE production processes and achieved great results:

- Bottom and tray temperatures are controlled within +/- 3 deg C;
- Reduced reflux flow to achieve higher yield;
- Much smoother level control and plant operations;
- Improved production safety, separation efficiency, and productivity.

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