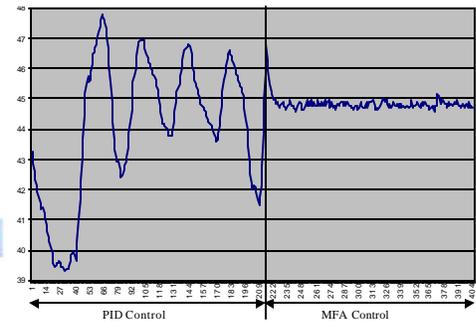
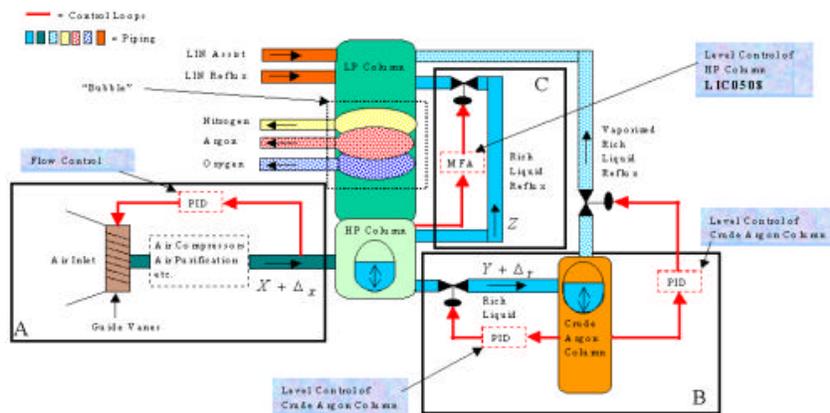


Model-Free Adaptive Control on Air Separation Units

Use of MFA Control	Benefits
Tightly controls key process variables under various feed rate changes, operating conditions, and plant upsets.	Process stability and smooth operations are achieved.
Maximizes product recovery from air feed.	Increases product yield on oxygen, argon, etc.
Maintains operation with equipment constraints and minimizes transient disturbances.	Greater process stability speeds shift over to new feed or product targets.
Improves feed throughput and reduces process oscillation.	Production efficiency and energy savings are achieved.
Improves efficiency & productivity.	Full investment is returned in weeks if not sooner.



MFA (right) controls the key process variable much more tightly than PID (left).

Case History: New Advanced Control Comes On-Line in Hours, Immediately Sets Production Records at Air Liquide America, reported in Control Magazine

Air Liquide America, a global provider of industrial, electronic and healthcare gases, has standardized on Model-Free Adaptive control for advanced regulatory control applications after successful MFA installation on two Air Separation Units (ASU's).

The main goal of operating an ASU is to maximize yields of gases and maintain the operation in as steady a state as possible.

The specific goal of the initial application was to control the Rich Liquid (RL) reflux level in the high pressure (HP) cryogenic column so that it would remain as constant as possible, even during plant ramping and upsets. The RL reflux flow to the low-pressure (LP)

cryogenic column is used to manipulate the HP column RL reflux level.

It is difficult to properly tune a PID controller for optimal control under all conditions on an ASU due to the variable rates of the HP column inflows/outflows.

Overly tight control will result in large oscillations in the reflux flow, which causes a lower product yield. PID control is usually detuned to allow the level to fluctuate to minimize variations.

This may result in safety problems during a plant upset, and oscillations can cause the process to swing, which also results in a lower yield.

The new MFA controller immediately starting to set production records as soon as it came on line. Improvements were evident in all controlled variables using

MFA control. The return-on-investment (ROI) was so high that the payback period could be measured weeks.

MFA control proved quite easy to install on ASU's: Air Liquide staff engineers performed the entire installation and commissioning at their McMinnville, OR plant within a single day. Since its installation, virtually no maintenance or re-tuning has been required.

According to Dave Seiver, Air Liquide's Advanced Control Manager, by using Model-Free Adaptive control, Air Liquide achieved benefits in the areas of product yield, quality control and, most importantly, operational stability. Specific benefits included:

- Improved product quality,
- Maximized product yield,
- Process stabilization, and
- Maximized feed throughput.