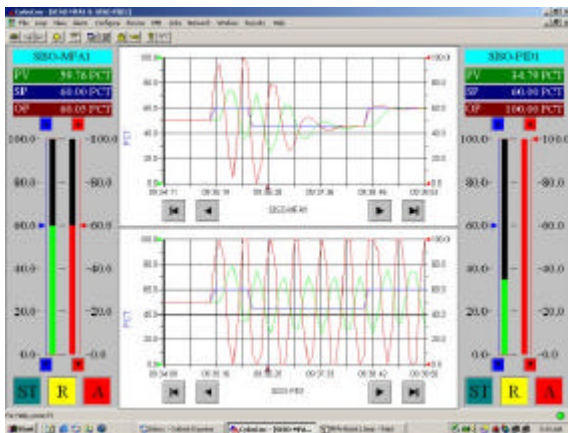


Model-Free Adaptive Control for Building Control Industry

<p>Air Handling Unit</p> <p>A special MFA controller delivers a fully coordinated split-range adaptive temperature control system. This MFA is able to manipulate damper, heating, or cooling to tightly control supply air (SA) temperature. Highly robust and adaptive, the MFA can handle the control problems caused by changes in operating modes, seasons, loads, and environment. Once installed, no manual tuning is required. Standard MFA can tightly control Mixed Air Temp, humidity, flow, and pressure loops.</p>	<p>Zone Control</p> <p>Using MFA, zone temperature can be tightly controlled even when there are large variations in load, coupling factors in multiple zones, process nonlinearity caused by wrong actuator sizing, changing seasons and environment.</p> <p>Lab Control</p> <p>MFA controllers are ideal to provide tight control of all critical variables for semiconductor HVAC systems, clean rooms, pharmaceutical and industrial laboratories and any environment that must be stringently controlled.</p>	<p>MFA Benefits</p> <ul style="list-style-type: none"> • Easy startup and elimination of manual tuning of controllers saves technician time and expense, • Better control with no oscillation yields energy savings, • Reduced wear and tear on actuators lengthens equipment life, • Tighter control increases user comfort levels and allows Building Control suppliers to address more stringent user demands, and • Direct PID replacement with easily embedded MFAs.
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The Inside of Model-Free Adaptive (MFA) Control

MFA Features	MFA Inside Story	Key Points	Description
Controls complex systems		Adaptive	Adaptive weighting factors are updated in every sample interval to minimize error $e(t)$.
Requires no precise process models		Robust	Provides a wider robust range than PID and many other controllers.
Requires no process identification		Speed	No time consuming model training; controls process immediately.
Requires no controller design		Stability	Guarantees closed-loop stability for passive processes.
Requires no complicated manual tuning		Ease of Use	Easy to configure, launch, and maintain.



Left: When MFA (top) and PID (bottom) start from the same oscillating control condition, PID will continue to oscillate while the MFA will quickly adapt to an excellent control condition.

Item	PID	Model-Based	MFA Control
General-purpose	Yes	No	Yes
Needs Models	No	Yes	No
Needs controller design	No	Yes	No
Manual tuning	Yes	No	No
Controls complex systems	No	Yes	Yes