# CyboSoft's MFA technology delivers In-Situ Run-to-Run Control
"Why model when you can MFA?"

Semiconductor Apps	MFA Controller Types	MFA Benefits
• CMP – Thickness control • RTP – Multi-zone Temp control • Wafer furnace – Temp control • Deposition – Pressure, flow, quality variable control • Doping Chamber – Vacuum pressure control • Etching – Chemical composition and flow control • Water treatment – pH control.	• SISO MFA to replace PID • Anti-delay MFA to control processes with large time delays • Feedforward MFA to deal with measurable disturbances • MFA pH to control pH processes • Nonlinear MFA to control extremely nonlinear processes • MIMO MFA for multivariable processes like RTP.	• Using no process models delivers lower development costs and faster time to market • More robust control of process delivers higher production yields • No manual tuning delivers lower operating costs and higher up time • Minimal calibration and conditioning results in more efficient use of process tools.

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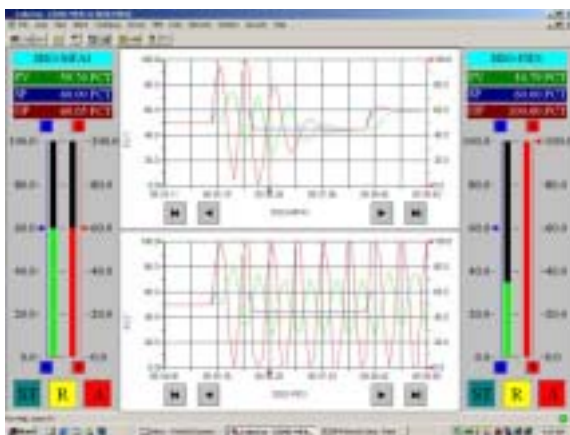
Left: When MFA (top) and PID (bottom) start from the same oscillating control condition, PID will continue to oscillate while the MFA will quickly adapt to an excellent control condition.

Item	Model-Based Control	MFA Control
Run-to-Run Control	Ex Situ R2R control	In Situ automatic R2R control
Need Models	Yes	No
Need Accurate Recipes	Yes	No
Conditioning	Yes	Minimal