



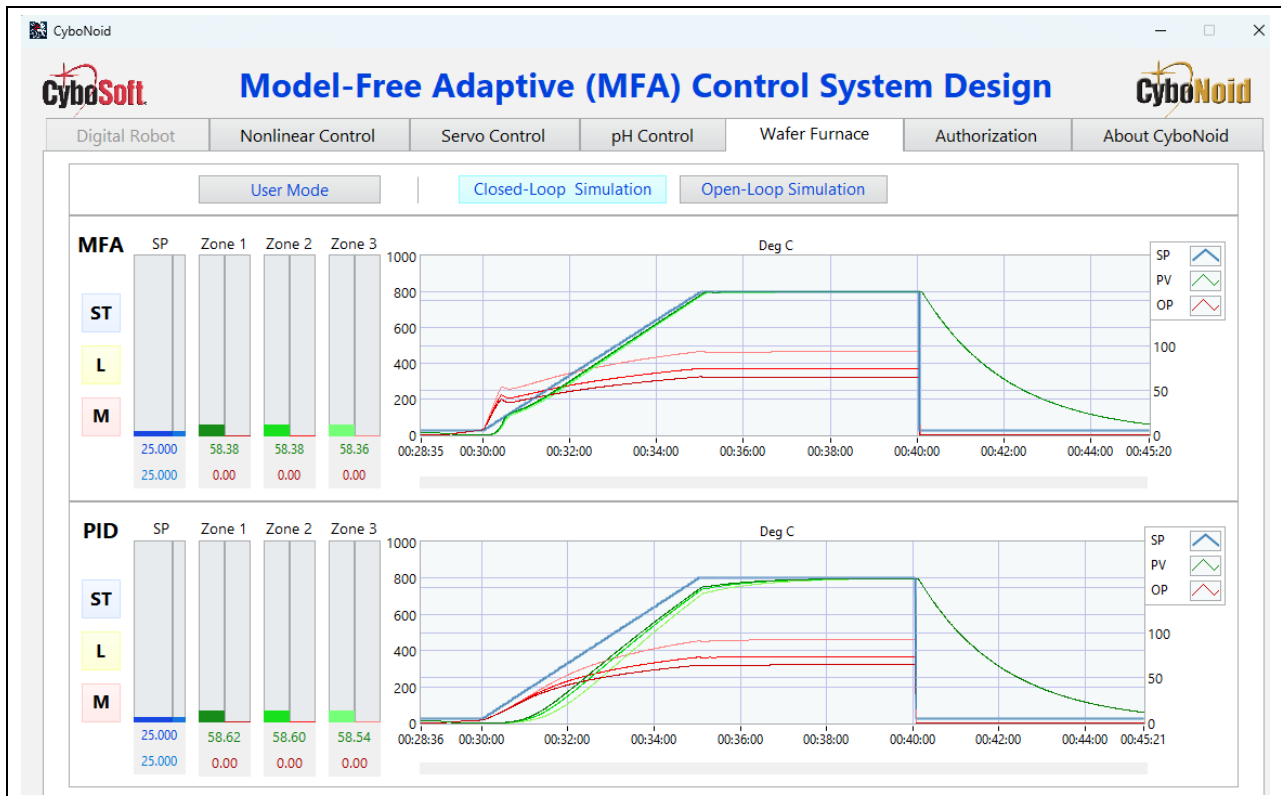
## News Release

### CyboSoft Releases Time-Optimal MFA Controller for Wafer Furnace Control

January 16, 2025 – CyboSoft (Rancho Cordova, California), the developer of Model-Free Adaptive (MFA) control technology and products, announced today that it has released a new Time-Optimal MFA controller well suited for semiconductor wafer furnace control that can handle nonlinearity, coupling, delays, and disturbances, while ensuring uniform and reliable results.

CyboSoft CEO Dr. George Cheng stated, “Generative AI relies on a massive amount of computing power delivered by GPUs, CPUs, and other semiconductor chips. As feature sizes continue to shrink to the nanometer scale, semiconductor manufacturing processes and equipment face increasing challenges in maintaining uniformity and preventing defects. CyboSoft’s Time-Optimal MFA Controller provides precise and robust control of wafer furnaces, resulting in higher yields, improved device performance, and reduced production costs for both current and future semiconductor chips.”

The performance of the Time-Optimal MFA controller is demonstrated in the following control trends in CyboSoft’s CyboNoid control system design and real-time simulation software. The top trend shows 3 Time-Optimal MFA controllers controlling 3 temperature zones of a wafer furnace. It is seen that three temperature process variables (PV) in different shades of green are tightly tracking the Setpoint in blue. The PID control trends at the bottom show large control error following the ramping setpoint.





Wafer furnaces are difficult to control due to their inherently nonlinear and dynamic behavior, as well as the high precision required for semiconductor manufacturing. 1. A wafer furnace must maintain a tightly controlled temperature profile across multiple zones to ensure uniform processing. Even small variations can cause defects, reducing yield and product quality. 2. The temperature in one zone can affect adjacent zones, creating complex interactions. 3. The thermal mass of the furnace and the wafers introduces significant time lags. 4. Many furnaces have no active cooling mechanism, meaning once the temperature overshoots the setpoint, it takes a long time to cool down. 5. Load changes, variations in power supply, or environmental fluctuations can disrupt the process.

The Time-Optimal MFA Controller can control the furnace temperature tightly along its ramping setpoint, achieving the target temperature quickly with no overshoot, and effectively dealing with process nonlinear behavior, large time lags and delays, and disturbances.

In semiconductor fabs, robust and precision control is critical for yield optimization, especially in etching, deposition, and chemical treatments. Variations in temperature, pressure, flow, and chemical concentration can lead to wafer defects and yield loss. MFA control is well suited in applications such as: (1) Wafer Furnace – Tight multi-zone temperature control with time-optimal performance; (2) Deposition - Tight vacuum, gas flow, and pressure control; (3) Etching – Consistent chemical composition, pH, and flow control; (4) CMP – Robust slurry flow control; (5) RTP – High-speed multi-zone temperature control; and (6) Motion – High-speed adaptive and persistent motion control.

CyboSoft introduced the CyboCon MFA Control Software at the ISA (International Society of Automation) Show in 1997. The artificial neural network (ANN) based MFA control is an AI technology. Thus, CyboSoft can be considered an AI pioneer. Due to its smart and general-purpose nature, MFA can make major contributions in the 4th Industrial Revolution, where smart sensors and controllers are needed for lights-out factories and smart equipment, machines, and devices. The Time-Optimal MFA controller is available in CyboCon MFA Control Software, MFA Control Toolset for LabVIEW Software, and embedded MFA control software for customer's control systems.

## **About CyboSoft**

CyboSoft is the leader in control technology serving the worldwide process control, building control, and equipment control markets. CyboSoft's patented Model-Free Adaptive (MFA) control technology for automatically controlling physical processes is a major breakthrough. No other comparable technology possesses all the attributes of MFA. CyboSoft received the 2007 Frost & Sullivan "North America Technology Leadership Award" in the field of Industrial Automation. MFA is the only commercially successful smart controller that does not require mathematical models.

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