PID Integration Using Thermocouple Instead of RTD

Tools: PLC, PID Function Block, Type-K Thermocouple

Overview: Modified existing PID control system to use thermocouple input instead of RTD for temperature regulation, optimizing for faster response and higher range.

Objectives

• Replace RTD with thermocouple sensor.
• Retune PID parameters for stability.
• Ensure compatibility with existing PLC logic.

Technical Approach

• Added signal conditioning for thermocouple voltage.
• Used PID FB for closed-loop control.
• Tuned gains using Ziegler-Nichols method.
• Logged step-response data for comparison.

Challenges & Solutions

Challenge: Thermocouple noise
Solution: Used averaging filters and cold-junction compensation.

Challenge: PID overshoot
Solution: Reduced proportional gain and adjusted integral time.

Results

Improved control stability within ±1.5°C and reduced settling time by 20%.

Future Enhancements

Implement adaptive PID tuning.