

## Semiconductor Machine Monitoring

A semiconductor machine manufacturer offers a machine that uses a deionized water slurry to polish the wafer. They must control the temperature of the slurry and the flowrate. Accuracy is very important. The space taken by measurement and control modules is also an important consideration. The temperatures are in the range acceptable for a 100  $\Omega$  Pt RTD, which also provides better accuracy than a thermocouple in the operating temperature range. The flowrate frequency is less than 1 kHz. Operation of the machine is simple enough to be controlled by a micro-PLC. A step of the machine manufacturing is to test the functioning and monitor from a central location. The data acquisition system is capable of Modbus protocol.



The solution that was sought was to put in place a system to do the following:

1. Monitor the slurry temperature in two locations.
2. Warn the operator if the water temperature was out of specification.
3. Maintain the flowrate of the slurry within 2 Hz.
4. Control the process.
5. Acquire the test data.

The first four items above were accomplished with two devices permanently installed in the machine. The LogiPro Series modules: LGPRO-PL101 and LGPRO-DAIO. The LogiPro modules have a connector that provides faster processing of the IO. The DAIO has the RTD inputs for temperature monitoring. It also has a digital input that can be used for frequency monitoring up to 1 kHz. The DAIO has 3 other digital inputs and 2 digital outputs to control the pumps and motors along with an analog output that controls the flowrate of the slurry with feedback from the digital input. The PL101 is the micro-PLC that is programmed to control the process. The test data was acquired through the use of two IOPRO-WDL-900s. One is installed in the machine just for the test. The unit under test is wirelessly connected to a station with a graphical operator interface terminal that logs the temperature and frequency data, displays on screen trends, and allows PC access for data archive and further quality control analysis.



New machines are designed and built frequently. The reliable wireless communications cut wiring costs and saves set-up time for each machine under test. The ioPro WDL robust 1 Watt, 900 MHz Frequency Hopping Spread Spectrum (FHSS) radio communications link proved to be immune to the electrically noisy facility, and provides reliable communications between the unit under test and the test control/data acquisition station.