Micrel Uses Wireless Technology to Reduce Costs for Industrial Gas Cylinder Management

**Benefits**
In 2007, Micrel installed 50 wireless gauge readers to monitor its most critical process gases, along with a gateway, which sends data to Micrel’s existing network and operator stations. Each data point required between 10 and 30 minutes to install, and did not involve breaking any pressure seals or any process downtime. Additionally, future integration of the data with existing operator software is possible via industry standard OPC and/or BACnet protocols. Within the first two months of operation, the following benefits were identified:

- Reduce manpower devoted to making gas rounds by half full-time equivalent technician, who could then be redeployed to other tasks.
- Decrease gas consumption by approximately 10 percent annually by using more gas in each cylinder before change out.
- Minimize unplanned downtime. (e.g. the system detected loss of gas pressure/gas condensation due to unseasonably cold weather – situation which can now be anticipated and avoided in the future).

The combined operational savings are estimated to be $108,000 per year, including labor savings, gas usage savings and reduced downtime. The resulting investment payback period is seven months for the $62,500 installed cost.

**Challenge**
Although many new semiconductor fabrication plants (fabs) are being built globally, there are still hundreds of fabs worldwide that are more than 20 years old, producing millions of chips for a huge array of electronics. While many newer fabs have automation features built in to enable peak efficiency and performance, older fabs seek new solutions to increase productivity, reduce downtime and decrease operating costs.

Micrel owns a 150mm fab that was constructed in the 1980s. At this facility, which has a capacity of 30,000 wafer starts per month and houses 500 semiconductor manufacturing tools, wafer production requires hundreds of process recipes that use various combinations of gases to produce the desired chips. It is critical that the required gases are provided for each wafer process step or the output will be unusable and system downtime will occur as a result. Essentially, successful semiconductor production hinges on the availability of these gases, so no chances can be taken. The gases themselves, supplied by about 300 different cylinders, range from $800 to $17,000 per cylinder.

**Background**
Based in San Jose, California, Micrel is a leading integrated circuit (IC) solutions manufacturer for the analog, Ethernet and high bandwidth markets. The company manufactures high performance analog, power, advanced mixed-signal and radio frequency semiconductors for cell phones, portable and enterprise computing, enterprise and home networking, wide area and metropolitan area networks, and industrial equipment.

Founded in 1978, Micrel has regional sales and support offices, distributors and technology design centers throughout the Americas, Europe and Asia.
Like many older fabs, monitoring gas cylinder levels has been a manual process at Micrel. Once every 12-hour shift, an employee went to each gas cylinder to manually check the pressure regulator gauges. This process took about two hours each time or about four labor hours per day. By 2001, a barcode system was employed to identify each gas cylinder, but an employee was still required to manually read and record each data point so the process was labor-intensive and error-prone.

To further reduce risk of low or empty cylinders, gases were typically replaced on a regular schedule which meant a given cylinder might be changed out even if it was a quarter or even a third full. Despite these precautions, gas supply disruptions periodically occurred due to unforeseen circumstances and were not discovered with the manual rounds (e.g. cold weather impacts which can condense a gas). Such disruptions often resulted in lost yield and process downtime, which translated into additional operational expense.

These labor, gas and downtime related expenditures continued to add up and needed to be addressed to keep the fab competitive. Operations management sought new ways to better utilize manpower, ensure gases were expended before replacing bottles, and proactively detect situations which cause downtime.

Micrel considered replacing manual gauges with new transducer based gas panels, which would automate the monitoring of gas levels. However, making this change would require Micrel to stop the affected production line for up to a few days or even weeks while it reconfigures gas piping and retests for leaks and safety. This can also involve a rework of the entire wiring system to conform to the latest safety and fire codes when a legacy subsystem is significantly modified.

Micrel chose not to implement this solution due to the prohibitive cost of the equipment, the installation and rework labor, and most of all, the associated downtime and lost production. The cost of this approach was estimated at $4,000 per gas cylinder or more than $400,000 to instrument 100 cylinders.

**Solution**

Micrel installed wireless gauge readers which provide automated gas cylinder monitoring without the high cost and disruption of installing traditional transducer based panels. The gauge reader is a wireless sensor that non-invasively clips on to existing gauges and costs 70 percent less than using traditional transducers. It transmits the reading wirelessly to a central server where preset alarms of low gas levels may be programmed to alert operator stations.

Micrel decided to implement the wireless gauge reader solution because it incurred no process downtime, required minimal installation labor and training, and did not need retesting and revalidation for leaks. The installed cost at $1,250 per point is just 35 percent of the cost of traditional transducer panels, resulting in annual savings of $108,000 and an investment payback period of just seven months.

**More Information**

For more information on Honeywell's industrial wireless solutions, visit [www.honeywell.com/ps/wireless](http://www.honeywell.com/ps/wireless) or contact your Honeywell account manager.

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