Background
Consulting engineers, DLB Associates is well established in the data center industry. Providing design, commissioning and operations support services for a range of data center clients, it has worked on campuses totaling more than 4 gigawatts of critical IT power and 16 million square feet of raised floor technical space, including eight of the largest Google data center campuses worldwide.

It is a market that is forecast to see significant growth in coming years, due to increasing internet coverage and the growth in cloud computing. Cisco’s first Global Cloud Index published in December 2012, for example, forecasts that data center traffic will grow four-fold by 2016.

At the same time, however, the industry faces significant and ongoing challenges to increase energy efficiency by cutting the energy used for cooling servers.

In 2011, the Green Grid industry consortium developed the Power Usage Effectiveness (PUE) metric for calculating data centre energy efficiency. It represents the ratio of the total utility energy consumed by the data center to the energy portion used to power just the IT equipment, so that a facility with a total annual utility energy usage of 100,000MWh, with 50,000MWh to power the IT equipment, would have a PUE of 2.0.

In the US, the Environmental Protection Agency has identified a Best Practices PUE goal for data centers of 1.5. Many, however, continue to operate well above this.

Consequently, DLB set out to develop an automation solution using quality instrumentation and components that would enable facilities to drive down their PUE while retaining the reliability, and ease of operation its customers required. Working with Honeywell it developed a solution using Honeywell’s Experion Process Knowledge System (PKS).

Benefits
Using the solution developed with Honeywell, DLB has been able to offer an industry-first: a solution that adapts process industry technology to offer a highly secure, precise supervisory control interface for numerous systems throughout the data center in order to drive down energy use and increase reliability.

The return on investment for DLB customers is immediately attractive: a typical data center may have an operating cost of $10 million assuming a price of US$0.10/kWh. Reducing the PUE from 2.0 to 1.5, yields an annual operating cost saving of US$2.5 million; reduce it to 1.2 would and the saving is US$4 million.

Moreover, promoting a more stable environment for the servers also increases data centers efficiency.

“Servers will always have a limited life span, but a more stable, equalized environment increases server longevity and significantly reduces the risk of downtime due to hot spots,” explained a DLB spokesperson.

Challenge
Data centers have traditionally relied on standard commercial-grade cooling equipment for cooling IT equipment, simply adapting the technology used for the typical office. However, the average data center uses 10 to 100 times more energy per square foot than an office building.

Furthermore, data centers require cooling to be tightly managed and optimized to ensure the temperature is consistent and stable throughout the facility. Failure to do so can result in hot spots leading to equipment failures and downtime. This a critical consideration in an industry where best practice for uptime reliability is to exceed 99.999%, meaning downtime can only take place for approximately 5.25 minutes a year.

To ensure the required stability, any control system therefore required advanced control algorithms to maintain the temperature and respond rapidly to any process fluctuations. It also had to offer redundancy in a number of areas, such as communications, controller, and power supply.
The data center industry is awash with opinions on how to lower PUE through the greater use of economizers. However, DLB was convinced the best approach required a greater understanding of the impact of all variables so the correct trade-offs could be made in a holistic way.

DLB’s engineering team therefore wanted to create an automation solution employing a holistic approach to every facet of the system development. The design was to focus on reliability, repeatability, and ease of operation and maintenance.

Solution
Working with Honeywell, DLB looked at its experiences in other industries, and its field-hardened instrumentation that maintained accuracies and stability to tenths of a degree over the lifespan of “smart” instruments for everything from temperature and pressure to level and flow.

These “smart” units are characterized in the factory to ignore any fluctuations in the environment, and individually qualified, factory calibrated and tested, with virtually no need for re-calibration or maintenance interaction. Experion PKS, meanwhile, provides the precise control and monitoring to ensure rapid, stable control of the facility’s environment.

“We came to realize that the process industries had already achieved the levels of control and stability we were looking for in our solution,” said the DLB spokesperson.

Honeywell was able to provide a complete automation package, including sensors, control, reporting, control elements and fire safety. Using the system interface it was also able to build multiple screens to match processes that DLB created in the past. These were molded into processes that were added as the designs progressed.

Finally, Honeywell provided its OneWireless ISA100.11a system to enable the use of remote tools in the field to help configure the system for start-up and monitor the processes, boosting relia- bility. Operators can quickly move to a potential alarm or trouble area and diagnose the situation while having access to the system information on a handheld tablet. This wireless cloud also enables the use of moveable devices in the server farm to monitor temperature hot spots and humidity.

Perhaps most importantly, the system is extremely flexible. DLB is able to offer the solution for greenfield sites or to retrofit existing data centers. OneWireless also offers near endless scalability for future uses in the plant, including maintenance systems, location systems, security cameras and clipboard monitoring systems, as well as the ability to cope with the expansions that will no doubt be necessary as the industry continues its rapid growth.