Industrializing Data Centers to Reach PUE Benchmark 1.2

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Honeywell has helped many data centers achieve the optimum Power Usage Effectiveness (PUE) ratio by improving their current control design with industrialized high accuracy instruments and controls that can dynamically monitor hotspots throughout the facility.

Data centers need to improve their energy and consumption and sustain 100% reliability (or greater reliability than five 9s - 99.999%) of the servers while lowering operating costs of HVAC energy usage. There are seven main issues or obstacles that plague data centers;

**First issue:** In data centers, 50% of the energy cost is related to cooling the server area or server farm down to a manageable level. For every 1°F (0.56°C) that the center has to cool consumes approximately 4% of the energy costs for the facility. This means accurate temperature control is critical to controlling costs.

Servers generate mass amounts of heat from their processors. The faster the processors are, the more heat they generate. If one server overheats, it typically has a cascade effect on the other local servers and could possibly shut down an entire server farm or network. This crash can cost the data center owner millions of dollars in lost productivity and literally be catastrophic to the connecting businesses.

**Second Issue:** There is also growing concern about minimizing our carbon footprint and maintaining a low power usage effectiveness (PUE). The below link demonstrates what a server farm can achieve when using more advance process control with high accuracy instrumentation. The average PUE is 2.5 for most farms. (U.S. Calculator to View Costs – www.42u.com/measurement/pue-dcie.htm ), In a mega data center of 100,000 square feet and 2,500 servers, that could mean $28.5 million (at $0.13 per kWh). By reducing that to 1.5 PUE the savings is over $11 million dollar per year.

$$ PUE= \text{Ratio of Server IT Load =1 over total facility usage. For example: IT Load = 10,000kW ~ Entire facility Energy Usage = 15,000 kW then PUE e= 1.5, so the equation is Total Facility Energy/IT Energy = PUE} $$

**Third issue:** Moisture is another issue facing data centers - the humidity in the server farm must be tightly controlled. Since cooling will dry out the air in the server room, data centers must manage static electricity and arcing in the servers. Conversely, if the humidity becomes too damp, moisture build-up from condensate can damage electronic devices.

**Fourth Issue:** Hot spots always occur within a data center so air distribution is critical. The hot spots are often discovered by using Infrared (IR) detecting cameras to map out the spots in the facility. However, not all hot spots are consistent as server usage varies in a facility. Wireless networking technology offers the ability to perform dynamic monitoring in the plant by moving and monitoring warm spots suspected in the farm.

**Fifth Issue:** Water quality, usage and control are also growing concerns. Due to the aggressive cooling processes, water quality must be maintained to a balanced level if it is used in a closed loop cooling system. Or it must be monitored for natural resource issues before the affluent is returned to the water source or city waste system.

**Sixth Issue:** Cooling system controls must not fail. Control redundancy mitigates this risk but can be lacking in many data centers today. Some facilities will go to a huge expense to build back-up cooling systems due to a control failure on their current system. Honeywell’s solutions offer the ability to build redundancy in the control system, sensor system, communication system, power supplies and field devices. The advanced Experion system can even collect redundant data from the field systems so that historical data is never compromised.
**Seventh Issue:** The “Human Comfort Control System” has random instability in controlling temperature. Between the sensors and control system, the room can vary 3 to 4 degrees. Most HVAC systems and associated sensors and control elements were designed for human comfort. A data center utilizing the same square footage will consume up to 100 times more energy for that same area. The HVAC sensors were designed for ‘ball parking’ the temperature to maintain simple control and simple comfort. They are sold in a commodity market that requires very aggressive pricing. They were never designed to control an environment to 1°F on a repeatable manner or less.

**Honeywell Offers a Complete Solution**

Honeywell’s control solutions are designed to protect and control processes that are worth millions of dollars and that can not tolerate reliability issues. Our advanced control dynamic algorithms maintain environmental stability. Our smart sensors are characterized to maintain optimal performance and have 100% characterization for each device sold and environment correction factors to assure that the sensors will not deviate and offer a lifetime stability of +/-0.01% per year.

Whether your facility is 10,000 square feet to 750,000 square feet, Honeywell can provide a solution that will assure the five nines of reliability related to cooling control. Honeywell has been providing this reliability to the oil and gas and refining industries since 1975 and we offer that same capability to keeping your data centers operating reliably and efficiently.

Honeywell has been the keystone behind helping some data centers achieve greater than the EPA’s bench marked 1.3 PUE for ‘best practices’ desired goal. That is what you can achieve by using an innovative control solution to achieve greener results.

**More Information**
For more information, visit [www.honeywell.com/ps](http://www.honeywell.com/ps) or contact your Honeywell account manager.

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