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Yahoo takes roost in power efficient data center
By David Geer

Someone is always trying to build a better mousetrap, or chicken coop, or data center for that matter. Yahoo is no exception with their future Lockport, NY-based facility, which they designed with inspiration from chicken coops. According to Scott Noteboom, Yahoo director, data center engineering operations, the search engine provider designed a lot of the new center, which takes advantage of outside air and the natural thermodynamics of rising heat, on a thorough study of modern chicken coops!

"People in the advanced chicken farming industry have put a lot of homework into designing their coops," Noteboom says, citing the use of optimal temperatures for increased egg production. Noteboom and Yahoo are putting that ingenuity to good use. In fact, in a June 30th Yahoo corporate blog post (http://ycorpblog.com/2009/06/30/serving-up-greener-data-centers/), chief Yahoo David Filo credited the custom coop design for enabling the new data center with an expected 100-percent outside air cooling capability.

According to Noteboom, the higher-pitched central roof sections on each of five connected server-housing structures (see accompanying image) are actually encapsulated hot aisles into which hot air rises. That heat can exist through exhausts on both sides of those higher-pitched peeks.

The building design includes control dampers to close one side of the data center and open up the other side to take advantage of the horsepower of the winds that come in off of an adjacent lake to help move the hot air out of the structure. If the wind is blowing from one side, they can turn off the damper on that side and the wind velocity helps draw the air out of the building on the other side, according to Noteboom.

In addition to coop designs and free cooling, the search company is using clean energy to achieve a record PUE (Power Usage Effectiveness) metric. Yahoo has negotiated with the local utility to allocate 100-percent of its power consumption from generation by nearby Niagara Falls, according to Noteboom. As first published in Filo's aforementioned blog post, the company plans to achieve an annualized average PUE of 1.1 or better.

Data center engineers calculate the PUE (more data available at www.energystar.gov) by dividing the total facility power by the IT equipment power draw. A facility with a PUE of 2.0, for example, uses half its power to drive IT equipment and half for cooling and power distribution. According to search competitor Google's own data (http://www.google.com/corporate/green/datacenters/measuring.html), their trailing twelve-month, energy-weighted average PUE through Q2, 2009 was 1.19. Yahoo plans to best that figure.

[End Page One]

With broader temperature boundaries and additional cooling techniques, they may just pull it off. The company will use servers warrantied to run at 90-degrees or above. Most of the year, they intend to stabilize the temperatures entering those servers at 70-degrees using only outside air and internal server fans. When that temperature rises above 80-degrees, which in the Lockport area (near Buffalo) occurs about 200-hours a year, the data center will activate an evaporative cooling system to keep it in check. When the heat passes 90-degrees, which happens about 35-hours a year, an advanced sprayer technology kicks in.

Yahoo broke ground on the first of two phases of the Computing Coop's construction in August. They will cover approximately 100,000 square feet in that first phase, which includes a central, administrative area for both phases. The completed data center will cover approximately 30-acres.