

# CPO software for true energy savings

Russell Hattingh, engineering manager for Johnson Controls Systems & Service in South Africa, talks about Central Plant Optimisation (CPO) software, which, he argues, offers better energy savings than any building management system (BMS) alone.

BMS systems tend to be set up to switch on and off the different systems in a facility. "They operate according to schedules so that the lights and air conditioning are switched off when nobody is about and on when they start to arrive," Hattingh explains, pointing out that one or two unnecessary hours of chilling every day can amount to massive energy costs in the longer term.

"While tied to a building management system, for buildings, manufacturing plants and data centre chilling and environmental management systems, CPO offers much more," says Hattingh.

"More than 35% of the power required to run a building is consumed in one place - the central chilled water plant, and while there is value in connecting the building management system (BMS) to schedule plant run time, very little beats central plant optimisation (CPO) software for true energy savings because it can optimise the performance of all components in the system," he continues.

Not only does CPO switch main systems on and off, the key is to optimise the output of each system's operating point to continuously match the changing needs of the facility. CPO

balances the heating, cooling, lighting and other building systems while keeping all the operating points stable and matching the minute by minute heat loads, temperature and lighting needs, he says.

Citing a chiller system as an example, he says that the role of all chillers is to make water cold. "But how cold must the water be? How fast must it be pumped around the chiller circuit and how much air must be blown across the chilled water coils to maintain the room temperature required? Optimising even a single chiller system can quickly become complicated and a large plant might have several chillers connected to a variety of different rooms or applications with different requirements," he notes.

"The CPO looks to see if it is possible to make the water less cold; if the water can be circulated through the system more slowly or to different areas at different speeds, and to determine which of the air handling fans can



be slowed down or turned off in the different parts of the building. The idea is to help companies to optimise their energy use so as to reduce energy and operating costs, which are key to financial success in lean economic times," Hattingh says.

Citing a recent local success at a data centre, he says that following the installation of a state-of-the-art York chiller, the client was initially disappointed with the

savings achieved. Although this is the highest specification chiller available, before being optimised to match the exact requirements, efficiency savings were modest and could hardly be seen.

"Once connected to the CPO, however, and managed according to a plant-wide optimisation strategy, significant savings immediately became apparent - in excess of 30% on energy consumption alone. Also, reliability is key in these applications; a data centre can lose a lot of money very quickly if the chiller plant goes down," Hattingh adds.

In addition, the CPO offers transparency of performance and energy use. At a hotel, for example, the manager will wish to know about any chiller plant issues before customers start to complain so that they can react in the fastest possible time to minimise the inconvenience and reputational damage. This is achieved via online visibility, he explains.

He describes another success at a pharmaceutical company where both the office space and the manufacturing area had to be conditioned. "Because the company was handling medicines, the temperature throughout the manufacturing cold chain had to be very well regulated and monitored. This was less critical for the office buildings, and CPO was able to provide different regulation strategies to optimally meet the conflicting requirements of both areas," he says.

While CPO solutions have been available for some time, organisations often assume that a BMS performs the same function, so having both is an unnecessary duplication. While a BMS can apply general rules such as scheduling outputs according to occupancy levels, it is CPO software, with its ability to constantly and consistently maximise the efficiency and performance of the entire plant, that is delivering true breakthrough benefits.

## Is CPO important in SA?

South African organisations must lower energy consumption to address the country's twin challenges of insufficient energy capacity and rising costs. Budgets are under pressure, but, at the same time, organisations are being compelled to reduce their carbon footprints.

Many are taking the common-sense approach of replacing old plant equipment and systems with high-efficiency systems, such as variable speed drives and BMS technology. "While both offer benefits, they are discovering that it is CPO technology that takes optimisation to the next level," Hattingh argues.

The hands-free relational control technology embedded in CPO solutions takes into consideration every component part, including the chillers, pumps and cooling towers as unique variables. In addition, it factors in primary as well as secondary and tertiary circuit components in large installations, aligning



CPO collects, analyses and reports on plant operating data, enabling the organisation to view operating efficiency in real time, as well as see both short and long-term trends.

them with demand and site priorities and optimising performance and outputs.

CPO software takes multiple variables into consideration, pinging plant components for information but also tapping into the BMS and big data where relevant. Variables may include the combination of equipment on the site, its configuration, equipment conditions and availability, occupancy levels, ambient environment, operating conditions, the weather forecast and more. "CPO also takes note of configured site priorities - some sites, such as pharmaceutical manufacturers or ICT hosting facilities, may require always-on environmental control; others will happily shut plant equipment down when the building empties," he says.

Because there is now so much information available and the cost of getting it wrong is so high, manual central plant management, which is exposed to human error, has become almost irresponsible. Consider the annual cost of running a plant at even 30% higher capacity than is necessary for a year, or the cost of shutting chillers down even just two hours later than is needed every day.

The benefits of CPO include:

- Cost effective optimisation based on proven best practices for any system type/configuration (24 standard chiller plant profiles or custom configuration).
- The system is configured on-site with no disruption to operations.
- CPO is compatible with most building automation systems.
- Real-time dashboards are used to view operating efficiency and trends.

"The more you know about your plant performance, the more energy you can save. CPO gives organisations immediate access to criti-

cal information, giving them the visibility they need to manage energy and operating costs and significantly improve the performance potential of their plant for years to come," Hattingh says.

CPO's web-based, real-time measurement, verification and management dashboards make equipment performance more visible. The software will continuously collect, analyse and report on plant operating data, enabling the organisation to view operating efficiency in real time, as well as see both short and long-term trends.

"CPO is going to become critical to maximise the operational efficiency of chiller plants and lower energy usage and cost. Just take a look at the CPO solution we have deployed at Stanford University. Similar implementations are already happening locally, with great results.

"There is, as always, a capital cost involved in installing CPO, but this is small in comparison to the ongoing running costs. With the IIoT our doorstep, cloud computing, data analytics and machine learning are becoming available as a way to further optimise system-wide performance. As in all of our implementations, though, the local operational strategy needs to make sense first. Once we have achieved good efficiencies, uptime and reliability via a CPO installation, then further improvements via machine learning and data analytics can easily follow," Hattingh says.

"CPO is not limited to chillers, either. We can save money at almost any facility, not only by making our equipment look good, but by taking a system-wide holistic look at optimising the energy use of ordinary equipment such as pumps, air handling fans and rooftop condensing systems," he concludes. □



A CPO power production, consumption and dispatch screenshot, which makes plant performance and energy use transparent so that optimisation can be more easily achieved.