CASE STUDY

COOLING TOWER WATER AUDIT

Cryovac Rigid Packaging

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Cooling tower setup at Cryovac Rigid Packaging, Tullamarine

COOLING TOWER WATER AUDIT

Commitment delivers major water savings

A Tullamarine manufacturer has reduced its site water consumption by over 40% in just two years, largely due to its commitment to improve the water efficiency of its cooling towers following an audit which revealed losses which had remained hidden for years.

Cryovac Rigid Packaging is the subsidiary food packaging division of Sealed Air, a multi-national general packaging manufacturer celebrating its 50th year in 2010.

At Cryovac's main manufacturing facility in Tullamarine, the company makes and supplies plastic containers and lids to the dairy industry, as well as the vacuum-sealed meat trays so commonly found in supermarkets today.

The site, which employs 200 staff, consists of a 12,000 square metre factory, two-thirds of which houses the production facility while administration facilities and dispatch make up the remainder.

Due to the very nature of its production, which transforms plastic pellets into useful container forms, this site is particularly reliant on its cooling tower system, made up of three towers, to supply cooled water to the factory floor.

Cooled water is used via in-built heat exchangers to cool the production extruders, while the cooling towers also supply cooled water to air compressors and water chillers located in the factory plant room which maintain the temperature of the forming tools via a separate, closed loop. Thirdly, the cooling towers supply cooling water for administration area air conditioning.

Having used almost 27 megalitres in 2008, the site was identified as a large consumer of water. With a strong environmental policy, Cryovac willingly accepted an invitation to participate in a cooling tower water audit program being delivered by the Victorian Government.

The audit would measure the performance of the site's cooling towers relative to best practice standard and provide a score as well as recommendations on where water savings could be made in the system.

This invitation arrived at a valuable time, with Cryovac having already begun its own investigations into the operation and refurbishment of its cooling towers in a bid to better manage their increasing heat load.

"City West Water's Cleaner Production consultants tend to work with the main water users, and I'd been working with them over the past few years," said Blair Porteous, Capital Projects and Services Engineer at Cryovac.

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"During that time we had struggled with our cooling tower capacity and ended up doing a lot of work on documenting where we were actually using water and how much load was on each cooling tower. So at the time we were approached to be involved in the audit, we saw it as a great opportunity to see how bad it really was, and create an official baseline before we began to make improvements."

Having already engaged the company's water treatment service provider (WTSP) and refrigeration engineering consultant to improve the existing, 20 year-old cooling towers, Porteous had learned that the system was inefficient in its water use.

Still, he says it came as a surprise when the initial audit, carried out by Sven Denton of AquaKlar Analytical Services in early 2009, scored the site as "poor".

"You know you're bad, but you don't know how bad you are. So when someone comes along and says 'you're not just below average, you're poor', well that's a nice eye opener," Porteous said.

The initial audit revealed that along with a host of issues related to the inefficient setup and operation of the cooling tower system, it was using 3.52 megalitres more water than it should; or 44% excess over best practice.

Among the recommendations to improve water efficiency was that the multi-tower system be re-balanced, which resulted later in the towers being configured so that they shared a common basin to avoid constant make-up. Furthermore, it was recommended that the load be distributed evenly across all towers, because an overloaded tower invariably uses more water.

A faulty make-up ball valve was also identified as causing makeup water to be constantly added. Combined with this was a drainage valve which was leaking around 100 litres an hour, which had gone unnoticed due to the constant stream of make-up water.

> The second audit revealed that excess water had been dramatically reduced to 0.217 megalitres, a reduction of 94%, and now within 4% of best practice.

"These were all small problems and caused a lot of water to be consumed, but they were not hard to fix," said Porteous.

"That's probably the shock – how simple some of the fixes are. But if you're not in the habit of looking for them, especially during shutdowns when you are not using as much, you end up not seeing them."

Along with fixing these issues, variable speed drives were also installed on the fans to prevent them running 100% of the time, as had previously been the case with the factory operating around the clock, seven days a week.

"On winter mornings when you get that crisp air and you see a plume of water vapour just disappearing off – well that's water that probably didn't need to go because the ambient temperature is 8°C and the tank is probably down to 15°C."

A new PLC was also added to the system to control fan speed and maintain water at a more consistent temperature to avoid such losses, as well as to improve the reliability of the pumps and provide automatic change-over to keep the redundant pump operational in the event of another failure.

An air-cooled chiller supplying chilled water to the factory floor was also installed adjacent to the factory plant room to take further load off the cooling towers. As a result, one cooling tower is unlikely to be required during cooler months; and this will also allow maintenance to be conducted during normal hours without the need for total system shut downs.

As a consequence of the system upgrade, a substantial increase in total dissolved solids (TDS) levels was able to be achieved. Prior to the works, the cooling towers had very low cycles of concentration due to the large amount of water working through the system, however since the works the TDS levels have been maintained around 960ppm with a set point of 1500ppm, thus saving water while maintaining a good microbial control regime.

Following the works, a secondary audit was carried out approximately six months after the first. Remarkably, the difference between the first and second audits was stark, with the second audit at Cryovac's Tullamarine site recording an 'excellent' rating.

"It was nice to get that opportunity to redeem yourself, so when the report came back with excellent, it was nice to know that we'd actually improved that much," said Porteous.

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Porteous says the changes to the cooling towers have helped contribute to an 'across the site' saving of 10 megalitres annually, and further savings are now being sought by the installation of variable speed drives to a number of pumps and other water saving initiatives in line with the company's environmental policies.

He says the exercise has proven to be a great eye-opener for him and the company, highlighting not only how much water cooling towers use, but also revealing where the company could make substantial water savings.

"(Prior to the audits) I knew the cooling towers use a large proportion of the site's water, but I didn't realize, until I started monitoring it, exactly how much water they were using, what percentage. As it stands, over half our water is on the cooling towers."

"I guess the biggest eye-opener has been how much the savings had been. I didn't expect that we'd be able to cut our water consumption by that much, just by fixing up our cooling towers. I knew there was waste, but nowhere near as much as what's been saved!"

"Some water savings are relatively straight forward, but they can have huge implications."

The company has ambitions to reduce the site's water consumption further, and estimates 2010 water consumption to be below 16 megalitres – quite a reduction on the 27 megalitres consumed in 2008.

1 Cycles of concentration (referred here as chemical concentrations) refers to the ratio of mineral concentration in the cooling system to that in the water supply.

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