An efficient brew – sustainable development within a brewery

By J Harris, SAB Alrode Brewery

Corporations around the world are increasingly taking responsibility for the impact of their operations on the environment and communities within which they operate. The author gives some insight into how SAB has reduced energy consumption and improved efficiency in the beer-making process.

Concerns about the future of the planet are well founded: there are physical limits to the impact of the consumption habits of six billion people on the availability of food to eat, water to drink and clean air to breathe. Scientists are confirming our fears about issues such as climate change, declining biodiversity and the shrinking of rain forests and polar ice caps.

This reality underpins the efforts of many global and South African companies, including the South African Breweries Limited (SAB), over the past decade to demonstrate more responsible corporate citizenship. The annual reports of most leading corporations show they are concerned about their impact on local communities, are working hard to reduce the energy they consume and the CO_2 they emit into the atmosphere, and are taking care about environmental damage.

SAB has a legacy of being deeply rooted in the realities of the country and has a track record of social responsibility but is also keeping track of the rapidly evolving sustainability agenda.

SAB's Alrode Brewery in the south of Johannesburg, a plant with more than 8 million hectolitres' capacity per year, is one of two local SAB Limited breweries identified as having the capability to spearhead efforts in some of the SABMiller group's key sustainable development priorities, namely those focusing on water and energy reduction.

Making more beer using less water

There is growing recognition of water shortages in South Africa, a semi-arid, water scarce country. Analysts believe the growth in world population, accelerated urbanisation and the pollution of water sources will combine to become a major threat to the quality and quantity of water available to industry and people.

The existing supply of water is under growing threat with more than 49 million South Africans dependent on it for not only their survival but for everyday household needs. Industries are unable to function without it, agricultural uses and the needs of the ecological reserve ie water needed by natural systems such as rivers. Not to mention the added pressure placed on these natural systems by invasive species sapping thousands of tonnes of water each day, pollution and climate change. As a significant consumer of water, SAB is doing its part to ensure South Africa's dwindling water resource is sustainable and available to future generations to come, as well as to the business, whose continuity is reliant on it.

More than 15 years ago Alrode Brewery ran at a water ratio of close to five litres of water to one litre of beer. Through a continuous process of improvement and innovation, this water ratio has been reduced to the current budgeted ratio of 3,9.

A number of innovations have been implemented at the brewery to optimise and reduce water usage. Through these, Alrode expects to further reduce its water to beer ratio to 3,5 within the next three years. Additionally, Alrode's Project Oasis, led by a multi-disciplinary team, is aimed at beating the water budget targets.

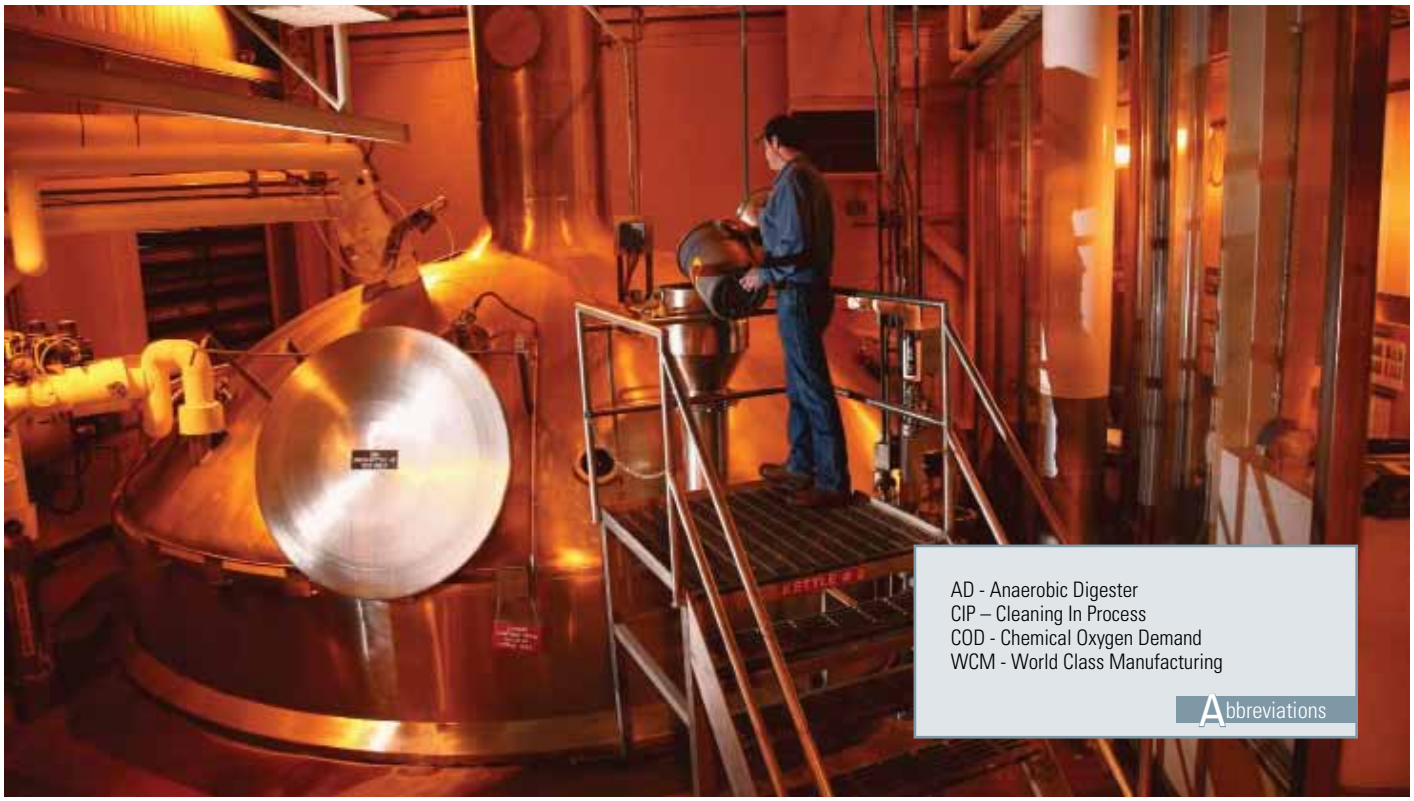
Cascading water from one process to the next is an example of these innovations. Bottle washer final rinse water and vacuum pump cooling water is cascaded into a dissolved air filtration plant on site where the water is cleaned and filtered to an acceptable standard to be re-used for floor and crate washing.

Water is used in the brewery's carbon dioxide (CO_2) washing column and cascaded to CO_2 foam trap collection vessels.

Final rinse water is recovered for use as a pre-flush in brewery cleaning regimes. There are four elements needed for cleaning, known as CIP in the food industry - these are heating, a reagent, scouring action turbulence and time. For example, when cleaning a pipeline, water is used as a pre-flush before the addition of a detergent such as caustic or acid which does the actual cleaning. A second rinse is completed, a final sterilisation and a final flush. This final flush water is clean and collected for pre-rinse - a method of using water twice before discarding it.

The original equipment suppliers generally use cascading principles in the brewery machinery. An example of this is in bottle washers, the final rinse is cascaded to maintain adequate water levels in the rest of the unit. Where equipment is replaced, the weighting of sustainable development factors has been increased to ensure water and energy efficient units are always specified.

It is of critical importance that all processes implemented are measured in order to manage them effectively. The technology em-



AD - Anaerobic Digester
CIP – Cleaning In Process
COD - Chemical Oxygen Demand
WCM - World Class Manufacturing

Abbreviations

ployed for water cascading and improved machinery is combined with a process of intensive metering and short interval control measures. The WCM (World Class Manufacturing) system within the brewery is aimed at shop floor short interval measurement and control. This, coupled with quick-fix routines, ensures that water wastage is identified and corrected in the shortest time possible. A process of input and output monitoring sheets monitor the water used every hour in the bottle washer. If the water usage level increases, this is an indication that water is being lost within the system. A troubleshooting and quick fix process is then engaged. If the shift operator fails to identify the problem area, it is escalated to the next level where an artisan attempts to resolve it or refers it to an engineer.

Of every litre of water purchased by Alrode, approximately 56% is returned to the municipal system after passing through the brewery's anaerobic digester (AD) which treats the water to reduce the load being placed on the Municipal treatment works. The brewery's projected water use for 2011 is three million kilolitres which equates to 8 300 kilolitres of water per day.

Reducing energy and carbon footprint

Climate change is an issue of global concern and could affect many aspects of SAB's business, including the availability of water and crops, essential ingredients of the brewing process.

Current efforts at the Alrode brewery to reduce energy consumption are aligned to SABMiller's global drive to reduce carbon emissions by 50% by 2020.

Although SAB's breweries are some of the most efficient in the world, the company is working at further improvements with a number of key initiatives.

In order to halve Alrode's carbon footprint, there is a need to drastically reduce electricity and steam consumption. Historically, Alrode Brewery discharged its waste water directly to the municipal waste water treatment works. However, with the drive for more sustainable development and reduction in costs, it became more economically viable to install an Anaerobic Digester to reduce the Chemical Oxygen Demand (COD) of the waste water leaving the site.

A biogas recovery system and boiler was introduced to reduce the traditional dependence on coal for steam generation. The biological load in the 5 000 kl of waste water treated daily in the AD plant is reduced by 90% prior to discharge. This process generates biogas with an 85% methane content. This is used to fuel a gas boiler producing 3 tonnes of steam per hour which is used in the brewing process.

Alrode uses roughly 7,6 MW of electricity mainly for refrigeration and compressed air generation. The brewery's refrigeration system has been optimised over time to reduce electrical consumption. For example, the compressor suction and discharge pressures have been optimised and are continuously monitored. Variable speed drives on the condenser cooling tower fans allow for fine control.

Some further initiatives to reduce energy consumption and improve efficiency over the following three years include installation of flash pasteurisers, bottle and crate washer optimisation and improvement of the boiler set-up and efficiencies through the installation of oxygen meters to reduce excess air.

Conclusion

As a proudly South African company, SAB is working hard to demonstrate the level of societal leadership that will ensure that the company will continue to be a trusted corporate citizen. We are also aware that the country will only succeed through the efforts of all South Africans. Water and Energy is a shared resource with all dependent on it, and its sustainability must be considered by all as a shared responsibility.

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About the author