Think twice before installing borehole pumps in dams and rivers

The current trend of installing submersible pumps designed for boreholes in either dams or rivers is often perceived as a cost saving, but can have serious financial implications if not done correctly, according to Franklin Electric SA.

It is generally not recommended to use borehole submersible pumps in a river or dam instead of a standard centrifugal pump and motor, but they can be used in certain instances as borehole submersible pumps do not get water damage unlike standard electric motors if flooded. Should a borehole pump be used in either a dam or river, however, several criteria should be considered.

When a borehole pump is used in a borehole, it should pump clean water, stand vertical in the borehole, almost automatically have an immediate pressure against the pump caused from the depth of the borehole, and have a certain velocity of water moving past the motor to ensure cooling of the motor. This does not occur automatically in a dam, reservoir or river. If using a borehole pump in one of these installations, it is necessary to simulate a borehole to prevent the pump or motor from being damaged.

Excessive sand and vegetative matter is often present in ground dams and rivers and although sand is present in some boreholes, it will cause damage. Sand must always be prevented from entering the pump.

A borehole pump is normally installed vertically at a certain depth under the ground, with the water level also at a certain depth under the ground. An additional rise of pressure will occur in order to get the water through the pipe and into the tank or wherever the water is being pumped to. A back pressure (mass of water pushing back on the pump) will almost immediately surge onto the pump which is very important to prevent the motor from going into 'up-thrust' position. Up-thrust is a dangerous condition where the entire rotating assembly of the pump pushes up due to over-pumping and will cause the thrust bearing in the motor to fail.

On start-up, the pump must first fill the pipeline to the sprinklers before there is a back pressure onto the pump. Until the water reaches the sprinkler nozzles and the system is pressurised, the pump will be over-pumping and will be operating in an up-thrust position. Often if the motor is in an up-thrust position long enough, it does not revert to a down-thrust position once the system is under pressure. If this situation is severe enough or continues long enough, the thrust bearing at the bottom of the motor will fail causing the shaft height to drop, which will also cause the pump shaft to drop. The damage will be mainly to the motor, but can also damage the pump.

To prevent this, the pump should immediately be throttled on start-up either with a valve or preferably with an orifice plate, an obstruction that is installed in the pipeline that immediately restricts the flow of water in the pipeline at start-up ensuring immediate back pressure onto the pump. The orifice plate must be calculated by a qualified person and installed close to the pump discharge. A submersible pump does not need to be vertical if the support of the pump as well as the back pressure onto the pump is properly calculated.

A centrifugal pump, or impeller-type pump (including borehole submersibles), should be started against an almost closed valve, immediately thereafter opening the discharge valve slowly allowing the water to start flowing evenly without shocks to the system.

Even when used vertically in a borehole, it is necessary to have water flowing over the motor to ensure that it is cooled adequately. This can be achieved if the walls of the borehole are close to the motor; alternatively a flow inducer sleeve is installed over the pump and motor to force the water to flow over the motor en-route to the pump.

The standard motor protection, such as an overload on the starter or even the Blac Box motor protection system do not necessarily eliminate these problems, although they will greatly assist if the motor starts showing signs of stress. However, at the point where they do trip the motor, the damage would have already occurred.

It is imperative to simulate a borehole to evaluate the motor bearings as well as the motor cooling which is not always known by the end user or the installer. In addition, sand or organic matter must be prevented from entering the pump which can cause damage or blockages.

Beer making guzzling hundreds of litres of water

How much water is contained in one beer? According to a new report quite a lot actually. Every litre of beer enjoyed by thirsty South Africans takes about 155 ℓ to make, according to a report published by SABMiller in association with WWF. More than 98% of the water used is associated with crop cultivation, both local and imported.

The report, *Water footprinting: Identifying and addressing water risks in the value chain*, evaluated the water footprints – a way of understanding water use through the whole value chain – of the major brewer's beers produced in South Africa and the Czech Republic. This is reportedly the first ever corporate water footprint study to be undertaken. The report shows that SABMiller's South African beer brands, such as Castle and Black Label, require more water than their Czech counterparts, mainly due to a greater reliance on irrigation in South Africa and the proportion and origin of imported crops.

In comparison with other beverages, beer's water footprint is relatively small, with a recent Pacific Institute study finding that coffee, wine and apple juice all have water footprints more than three times that of beer. However, the water footprint itself does not give the whole picture. More important is the context – where the water is used, what proportion of the area's total water resource it represents, and whether water scarcity creates risks to the environment, communities and businesses now or in the future.

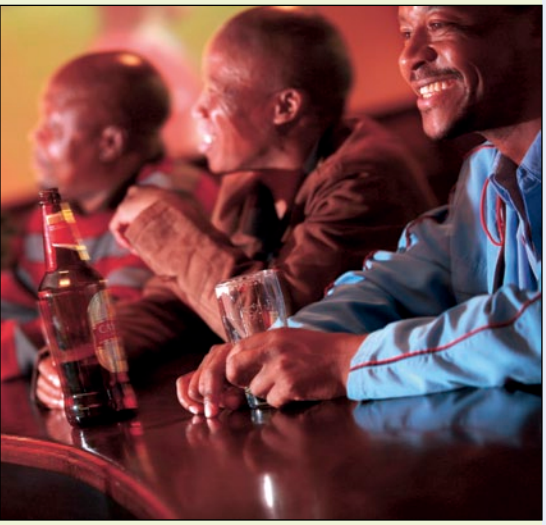
"The water footprints of SABMiller's beers in South Africa and the Czech Republic are the first detailed corporate water footprints to be published

WATER DIARY (continued)

WATER TREATMENT
FEBRUARY 8-11
The University of Stellenbosch is hosting a short course on Water and Wastewater Treatment in Cape Town. *Enquiries: Elmien Lovell; Tel: (021) 808-4352; E-mail: elmienl@sun.ac.za*

WATER & SANITATION
MARCH 15-18
The International African Water and Sanitation Congress and Exhibition will take place in Kampala, Uganda. The event is organised by the African Water Association and the National Water and Sewerage Corporation of Uganda. *E-mail: info@afwa-hq.org or afwacongress2010@nwsc.co.ug*

WATER & SANITATION
APRIL 18-22
The WISA Biennial 2010 conference is taking place at the International Conference Centre in Durban. *Visit: www.wisa2010.org.za*



and are progressive in the way they examine the impact of water use within these countries," reported Stuart Orr, WWF's freshwater footprint manager. "Most important is that this information is now used to ensure that their business partners – particularly farmers – are encouraged to use water more efficiently."

In South Africa, SAB Ltd is working with barley farmers to improve irrigation and yields, and with WWF the company is now considering how to develop this further to protect the watersheds within which it operates.

Impact study shows WRC's commitment to groundwater

The Water Research Commission (WRC) has been the most significant contributor to research and capacity building in the South African groundwater sector over the past decades, a recent study has found.

The WRC launched the impact study last year to evaluate the impression of its commitment to the groundwater sector.

According to Eberhard Braune, Extraordinary Professor at the University of the Western Cape, the WRC has invested steadily in the groundwater sector for over 35 years, with groundwater research projects making up an average 9% of the Commission's research budget every year. In 2008, R7,4-million was spent on groundwater projects.

"The impact of this research investment is significant in terms of the knowledge created and transferred as well as the institutional capacity building for groundwater research and education," he says. The Commission's inputs also directly influenced the establishment of the country's main academic centres for groundwater, such as the Institute for Groundwater Studies at the University of the Free State.

Prof Braune reports that the groundwater sector has experienced a serious decline in capacity, particularly in government and academic circles in the last few years. "It is imperative that the WRC's investment into research and capacity building continues and is made even more effective and efficient."

The study will be published early next year.

Main beneficiaries of WRC research funding 1974-2008

	No of institutions	No of projects	Value of projects
Academic institutions	10	67	R40-m
Science Councils	3	60	R21-m
Consultants	19	59	R29-m

Crunching the numbers to reduce industrial effluent

The University of Pretoria, under the leadership of Prof Thokozani Majozi, is undertaking a new project aimed at reducing wastewater produced during the pharmaceutical manufacturing process.

Currently, the pharmaceutical industry dispenses more than 500 t of product a year as effluent. This translates to more than R7-million in lost revenue. The new project, funded by the Water Research Commission (WRC), aims to develop a zero-effluent optimisation method for multipurpose batch plants and develop a tool that can be used by the pharmaceutical and related industries, regulators and the Department of Water Affairs in assessing and improving the efficiency and environmental performance of batch plants.

In a previous WRC project Dr Majozi, twice recipient of the National Research Foundation President's Award, and his team successfully completed a process integration framework for wastewater minimisation in multipurpose batch plants using a rigorous mathematical optimisation framework. The results of this development were tested successfully in a multinational pharmaceutical facility in East London where freshwater and effluent savings of more than 20% have already been realised. Investigations are currently underway to reduce freshwater intake and effluent generated by the facility by another 10%.

The overall cost savings, derived mainly from reduced effluent discharge costs is estimated to be around R500 000 a year. "In addition to this benefit the developed mathematical techniques promise to streamline the facility's production scheduling activities, since they take time dependence of operations into account," explains Dr Majozi.

He is confident that a mathematical technique can be derived that could lead to almost zero-effluent operation.