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world water

Stormwater Reuse
delivers new water supply

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Figure 1. A comparison of aeration on 2 identical plants using RTC and conventional fixed DO control

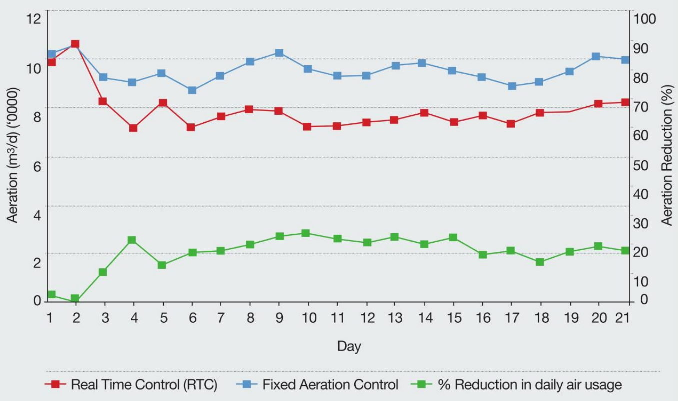
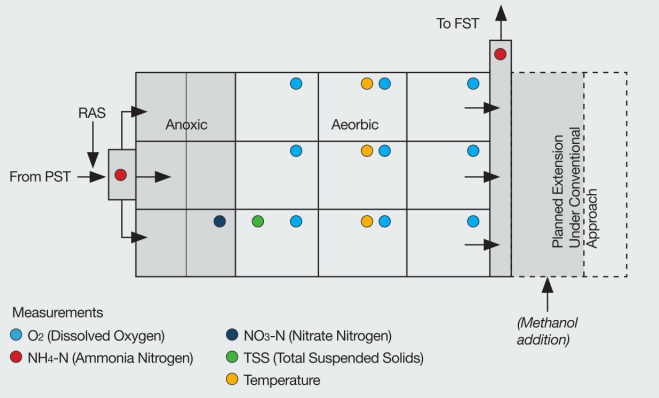


Figure 2. MLE process at site showing proposed extension to 4-stage Bardenpho and RTC instrumentation.



Capital outlay can decrease by up to 95 percent when using RTC instead of the conventional approach of expanding the treatment plant.

needs on a more advanced level by using instrumentation to measure the parameter being treated for in real time and by applying the required treatment in terms of either aeration or chemical. This advanced function gives operators the confidence to move away from the standard approach so that in times of low load or concentration significantly less power or chemical can be applied to meet the required output. As a result, operating costs can be greatly reduced with minimal capital investment. For example, typical savings in aeration can reach 15 to 25 percent in a well-operated plant.

Advanced process control offers additional advantages. More often than not, process optimization is thought to come with an element of consent failure risk. However, nothing could be further from the truth. Increased process visibility, achieved by the ability to measure and take action in real time, enables the treatment facility to react to abnormal conditions, which are often the reason for failure.

RTC provides wastewater treatment facilities the capability for tighter control, so its implementation can often offset the requirement for civil upgrades in instances of tightening consents or population increase. A growing number of projects have reflected this trend. Capital outlay can decrease by up to 95 percent when using RTC instead of the conventional approach of expanding the treatment plant. For example, a Modified Ludzack Ettinger wastewater treatment plant under consideration for expansion was faced with the need to meet new discharge consent levels. The plant, located on the south coast of the United Kingdom, was configured with 3 lanes to meet a total nitrogen (TN) consent of 15 milligrams per liter (mg/l). The

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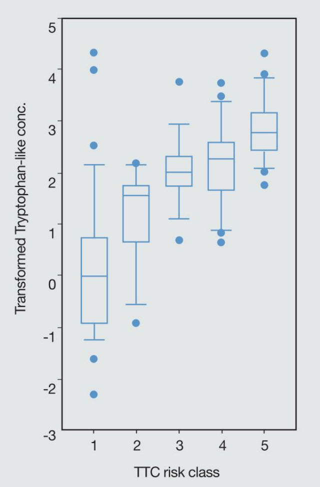
Field-based tryptophan sensor maps drinking water quality

A research team developed a new way to measure faecal pollution in groundwater by using Chelsea Technologies' UviLux field sensor that measures the protein tryptophan. Dan Lapworth of the British Geological Survey reports on recent research in Zambia that shows for the first time the sensor can be used in the field to rapidly assess the biological quality of drinking water.

Many types of bacteria found in wastewater and sewage cause diarrhoeal diseases and cholera, which kill 1.8 million people every year, 90 percent of whom are children under 5, according to the World Health Organization (WHO). Waterborne pathogens are typically inferred from the presence of surrogate indicator organisms such as thermo-tolerant coliforms. Their time-consuming analysis requires suitable laboratories and specialist-trained personnel, which can limit sampling resolution, particularly during critical pollution events. However, a quick, cheap, and accurate method of measuring this type of pollution is urgently needed in order to help efforts to provide safe drinking water.

A solution may now be available for Kabwe, Zambia and for water supplies throughout the world. A British Geological Survey team led by the author, along with colleagues Daniel Nkhuwa from the University of Zambia, Steve Pedley of the University of Surrey, and the Lukanga Water & Sewerage Company Limited in Zambia have collaborated to develop a new way to measure groundwater pollution by using a field sensor that measures a protein called tryptophan, an indicator of wastewater sources. Recent research published by this team (Sorensen et al., 2015) has shown for the first time that this sensor can be used in the field to rapidly assess the biological quality in drinking water sources.



Kabwe is a transport hub and an old mining town in central Zambia. Many of the townspeople cannot afford water bills, and the lack of investment led the municipal water system into a spiral of decline. This situation is mirrored across many towns in sub-Saharan Africa. Today, the town continues to grow in a haphazard manner, and sanitation is poor, with only 11 percent of low-income households having access to a latrine or toilet. Most of the poorer residents rely on water from shallow wells, and richer households have access to their own deeper boreholes provided by the unreliable municipal water system. But are these self-supply water sources safe? Does the risk change between the wet season and the dry? These are just a few questions that local government staff need to answer urgently, but they cannot obtain enough monitoring data from wells and boreholes during the year.

In Kabwe, the research team found that the amount of tryptophan measured by the probe corresponded very closely with bacteriological contamination in both the wells and boreholes. It confirmed that most of the shallow

The tryptophan sensor is quick, reagentless, and cheap, so it can enable rapid surveys of dozens of wells and boreholes across the town.

Left: The research team samples ground-water from shallow wells in Kabwe, Zambia.

Opposite left: Relationship between sensor (centered on tryptophan peak), tryptophan-like concentration, and thermo-tolerant coliform risk class (TTC). WHO risk classes are defined using thermo-tolerant colony forming unit counts/100mL as <2 (class 1, no risk), 2 to <10 (class 2, low risk), 10 to <100 (class 3, intermediate risk), 100 to <1000 (class 4, high risk), >1000 (class 5, very high risk).

Opposite right: Chelsea Technologies Group tryptophan sensor used to carry out the research.

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