

Operator Self-monitoring Can Lower Costs

Wastewater represents a cost to business. In the following article, HACH LANGE's Emma Brown explains how correct monitoring procedures can help reduce these costs and even boost profit.

The Environment Agency of England and Wales (EA) and the Scottish Environmental Protection Agency (SEPA) are responsible for environmental protection and improvement. Much of the environmental legislation that these organisations enforce is derived from European Directives such as the Urban Waste Water

Treatment Directive and the Water Framework Directive.

Process operators are regulated through permits, authorisations and consents which specify compliance requirements to protect the environment and monitoring is required to ensure compliance with consents.

When is a trade effluent consent required?

- Waste from toilet flushing, hand wash basins, showers and canteens does not require a consent
- Minimal discharges (a few litres per day) may not need a formal consent as long as they are non-hazardous
- Discharges above 1m³ per day require full consent
- Short-term discharges (e.g. one week) need to gain prior authorisation from the water company

Polluter pays

There are a number of ways in which discharges incur costs. For example, if the discharge is treated at a water company treatment works, the water company will impose a fee.

Water companies calculate wastewater charges (in pence per m³) using the Mogden formula which combines operational costs that are specific to the water company with various measures of the wastewater 'strength'. These include Chemical Oxygen Demand (COD) and suspended solids.

If a process operator is responsible for a discharge to surface water (river, stream, estuary or the sea), or to groundwater (including via an infiltration system) the EA will apply a charge based on the category of waste (eg. higher rates for metals or pesticides), the volume of the discharge and the type of receiving water. If the operator fails to comply with the conditions of the discharge consent, the company may be fined in the courts and clean-up costs may apply. Furthermore, such activity can seriously affect the public perception of a company, significantly damaging the brand.

Operator Self Monitoring (OSM)

The EA has moved to a more risk-based approach to monitoring, which has resulted in a move to OSM. Under OSM, water companies and other businesses will monitor their own discharges and report the results to the EA. These results will determine how well the operator complies with its consent conditions. The frequency of monitoring will be dictated by the risk posed by the discharge and the operator's performance. The EA will



Portable electrochemistry meter/probes

check that operators comply with the monitoring requirements through site inspections and audits, and the Agency will continue to monitor the quality of receiving waters and assess the impact of discharge quality upon them.



Emma Brown



Portable LDO™ meter



Online monitor

To test, or not to test?

Clearly, OSM presents responsible operators with an opportunity to reduce costs. However, it is also important to note that wastewater charges are often based on an infrequent spot check which may not accurately represent the true value. So, operators have a choice; they can either hope that the spot checks are accurate, or they can conduct their own monitoring to make sure that it is.

Self-monitoring can deliver much more than an accurate charge for wastewater; it can create a better understanding of a process and thereby improve efficiency and reduce the risk of discharge consent failure.



Test strips, comparators and spectrophotometer reagents

Testing options

In order to demonstrate compliance with a discharge consent, it is normally necessary to send a small number of samples to a UKAS certified laboratory. However, most operators also conduct their own testing and monitoring to ensure that the process remains within consent and to help manage the process efficiently.

Process operators that measure flow continuously are able to provide their wastewater treatment provider with accurate data from which the treatment charge can be calculated. A further advantage of flow measurement is the cost saving opportunities that it provides. For example, an operator may discover that certain parts of the process generate high levels of discharge, such as wash down, so that the process can be adjusted to reduce discharge costs.

A wide range of flow monitors are available, employing a number of technologies to suit a variety of applications. The choice of technology is often dictated by the application or physical constraints.

Qualitative measurements can be performed on collected samples or alternatively, continuous water quality monitors can be installed. A wide range of options exist for qualitative measurements and these are summarised in the table below. HACH LANGE manufactures all of these instruments and the company's technical staff are able to offer advice on the best solution for every application.

Sampling

Samples can be collected from the waste stream either manually or automatically. However, manual sampling is generally less favoured for a number of reasons. Firstly, manual samples do not usually provide a representative sample because they are taken at one moment in (usually day) time – a spot check. Secondly, manual sampling may suffer from sampling errors of sampling variability between staff and finally, manual sampling represents an ongoing operational cost.

Water quality testing options	Advantages	Disadvantages
Pocket comparators/ test strips	Low cost	Spot check. Less accurate
Portable meters	More accurate	Spot check
Portable photometers	More accurate	Spot check
Laboratory spectrophotometers	Highly accurate	More expensive
Online analysers	Continuous, highly accurate	More expensive
Automatic samplers	Create representative samples	Semi-continuous or non-continuous

Automatic samplers are able to take samples at various times throughout the process cycle in order to deliver a representative sample. The collected samples can even be refrigerated so that they do not change prior to analysis. However, some samplers offer more

sophisticated options. For example, they can monitor flow rates and adjust the sampling frequency accordingly. Alternatively, some samplers are able to monitor water quality in the waste stream and take samples when readings reach specified limits or alarm levels.

Qualitative measurements

BS 1427 describes methods for the analysis of industrial and other waters. These methods can be undertaken outside of the laboratory, for example on-site tests. This guide is for testing when the purpose of the test is to characterise the water under test for quality or process control purposes. A range of options exist for analysis on-site.

Simple colorimetric tests (test strips, sticks or comparators) provide quick, low-cost results albeit with limited accuracy and resolution. Alternatively portable photometers can provide much better levels of accuracy and remove many of the causes of error.

Portable test kits can be used by non-chemists and offer a number of advantages. They enable simple, rapid results, so the frequency of testing can increase; no chemical preparation is required and waste chemicals are recycled by responsible providers (such as HACH LANGE). It is important to note however, that analysis by test kit is simply indicative and does not match the level of accuracy and reliability that can be achieved in a UKAS certified laboratory.

Portable photometers are available for individual parameters or multiple parameters. The main advantage of photometers is that, following the addition of the reagents, they measure the colour of the solution digitally and are able to remove the effects of background colour. Multiple parameter analysis is made possible through the employment of multiple filters, which in some units, are selected automatically.

Laboratory photometers add even further levels of sophistication. Standard methods are pre-programmed into the units and they are able to recognise specific cuvettes that are supplied with exactly the correct quantities of reagents for specific tests. Results can be stored on these photometers or exported to a printer or PC.

Continuous monitors log recorded data and provide constant access to live readings. This enables the rapid detection of alarm conditions and the easy identification of process trends. Continuous monitors can also be connected to controllers that are able to feedback into the wastewater treatment system in order to optimise the treatment process. For example, HACH LANGE has been involved in numerous trials that have demonstrated substantial cost savings in the energy costs of wastewater treatment through the continuous monitoring of dissolved oxygen and ammonium.

Summary

Wastewater monitoring can deliver substantial savings for a number of reasons: it can ensure that a process complies with its discharge consent; it can ensure that treatment charges are accurate; it enables rapid response to pollution incidents; it identifies abnormal concentrations and peaks and provides an accurate picture of the process so that efficiency opportunities can be identified, such as reduced waste and recycling.



Spectrophotometer with tube reagents



Automatic sampler

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