



In-House Water Sampling Contributes to huge Cost Savings in Today's Industry

Water analysis is about more than health & safety or regulatory compliance, this article explains how regular monitoring contributes to a healthier cost balance in today's market.

Never has regular sampling and monitoring of water been so important. In the United Kingdom, the industry is strictly governed by regulations imposed by the Drinking Water Inspectorate, Environment Agency and the Urban Wastewater Treatment Directive. Whether the treatment works are scheduled daily, monthly or annually; whether the tests are carried out via spot sampling or at the final discharge point, failure to meet the trade effluent consent limits can result in heavy fines.

These mandatory assessments are carried out by utility companies and the Environment Agency. It is up to individual companies, however, to determine how, when and where to test between audits. Regular monitoring ensures, of course, no unexpected, unwanted un-pleasantries. Moreover, it can considerably reduce the overhead and cost of the unnecessary dosing of treatment chemicals.

Self Service or Outsourcing?

Typically, companies are charged for discharging effluent based on the Mogden formula. This takes into account, amongst other things, the amount of COD (Chemical Oxygen Demand), Suspended Solids and Discharge Volume of the waste water. Monitoring these on a regular basis saves money in the long run and also enables companies to plan for future discharge costs.

One way of doing this is to send samples to an independent laboratory or engage an external consultant to test on-site. Many companies opt for one of these solutions in the belief that carrying out the tests internally is cumbersome, costly and time consuming and difficult: altogether a daunting experience.

Realistically, however, analysis can be carried out in-house on a regular basis without the need for a large investment in infrastructure or training of personnel. Easy-to-use equipment is now available at a very competitive price and, once the equipment is in place, the cost of reagents for on-going tests is minimal to business.

Furthermore, there is no need to start with expensive, complicated equipment. Users can start small, easily adding upgrades and new tests as experience grows. During this time, there is no reason why the user might not opt for a mix and match process – in-house testing and external monitoring.

There are also two further significant benefits. In-house monitoring can also be varied according to the company's production rates. As rates increase, it is may be beneficial to sample more frequently to ensure limits are not breached. Furthermore, in-house testing can provide confidence to outsourced results.

Testing Methods

Test strips provide an entry level monitoring method. They are easy-to-use and very portable. Since most manufacturers offer 3-4 parameters in a small, pocket-sized case, users can keep a set on-hand for quick, impulsive measurements. Of course, the visual results are subjective and, once opened, the strips are subjected to reaction against environmental influences.

Visual comparators are also quick and easy-to-use and very portable. They provide more accurate readings than test strips but the results are still subjective and user dependant. The main benefit of the comparators is that the reagents used are supplied in blister packets which are air-tight and typically enjoy a shelf-life of up to 10 years. A further benefit is that the instruments can be supplied with light sources to provide consistent conditions in less well-lit areas.

Automatic kits come in various forms but the most popular are the photometers or larger, bench-top spectrophotometers. Photometers based on the colorimetric principal provide readings resultant from the colour change induced by adding a reagent to the sample. Uninfluenced by the operator, the readings are objective and very precise. Furthermore, memory data storage enables the saving of results for review and historic reporting. Most photometers can also be battery operated so still appropriate for in situ use and any lighting environment.

Larger bench-top instruments can be more accurate since they use various sources of light for different wavelength measurements. This comes, naturally, at a cost – not only physically but also the lack of portability. With new technology constantly being introduced, it is generally perceived that handheld instruments are as good now as some of the more encumbered systems. Generally, photometers are considered 'fit-for-purpose' and are very popular.

Some tests will require a heating element to initiate the chemical reaction such as COD digestion. By default, these are typically bench-top, laboratory units not only since a constant power source is required but also due to the fact that some of the vials and tablets might also be hazardous. Modern heating units have a fitted protective cover to reduce the risk of exposure and eliminate the need for large fume cabinets.

Whichever option is selected, adequate instruction manuals and ease of servicing should be considered. Manufacturers should also advise on reagent selection and disposal services.

Equipment Maintenance

With the exception of test strips which are, naturally, disposable, there are several easy-to-follow guidelines to maintain the analysis equipment, irrespective of which your company selects.

- Equipment should be cleaned regularly, including the light sources. Dust covers or lids should be closed for storage to prevent dust entering. It is also a good idea also to keep an empty sample vial in the sample chamber to stop dirt gathering.
- Gently wipe any liquid or solids from the instrument with a non-abrasive cloth
- Always use clean glassware and sample tiles, cells, measuring cylinders and stirring/crushing rods
- Wipe sides of vials before analysis to ensure no light refraction
- Ensure no particulates are obstructing the light beam. This can cause erroneous results

- Hold vials / cells at the side avoiding the point of light entry
- A Photometer should ideally be serviced on an annual basis to ensure it is within calibration
- Comparator discs should be checked and cleaned regularly. Discs with glass colour standards do not fade, but printed comparator discs can fade over time so may need to be changed periodically

Good Sampling Practice

For water analysis, there are two types of sampling processes: Spot Sampling, where the sample is taken at a particular point in time but ideally from the same sample point; Composite Sampling, where samples are taken over a set period of time, still from the same sample point. Composite Sampling enables a more accurate trend analysis and a better idea of the overall process but does require more instrumentation and is more time consuming.

Whichever process is implemented, there are a few simple rules that should be considered to ensure accuracy:

- Unless using a pre-treated bottle, be sure that the sample bottle is clean or rinse the sample bottle with the sample before collecting the sample
- Always use the correct sample bottle for the specific analysis: Plastic for inorganic; Glass for organic, or pre-treated if necessary
- When using pre-treated bottles, always ensure the right preservative is used as different tests require different preservatives
- If the sample point is from a tap or standing points, run the water first to ensure no stagnant water is left in the pipe or tap
- Ensure samples are always taken from the same sample point. This maintains consistency of procedures and allows for accurate result comparisons to be made
- Take enough sample for all analysis to be carried out to ensure result consistency
- If parameters are volatile, be sure not to leave any head space in the bottle. Volatile analytes such as Chlorine may escape from liquid and give false low results on later analysis
- Clearly label the sample bottle and keep a record of information e.g. date and time of sample, where the sample was taken, who took the sample, any recorded readings at the time of sampling, number of samples taken
- Store and transport samples in suitable packaging and at the correct temperature depending on the analysis
- If samples are being split or sub-sampled for further analysis, ensure they are representative of the original e.g. mixing / homogenising / shaking / stirring

Remember, sampling and analysis is just the start. Remember the 3 R's. **Read, Record and React.**

Following these simple guidelines will make in-house sampling and monitoring of water easy and accurate, saving time and operational expense. Ultimately, it is your responsibility to make sure that any water returned to the environment is in-line with health & safety requirements and regulatory compliance. The buck stops with you.