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WATER SAMPLING & PROPER PROCEDURES

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Introduction

Sampling allows for a "snap shot" of water quality to be taken at a specific time. If the water is being treated to improve water quality, samples should be taken before a change is made, whether it is an installation of new equipment or a process manipulation. This creates background data to compare to future data. Once a change has been made or technology been installed, another round of sampling would take place to document any changes to the water chemistry that may have occurred. These procedures can also be followed to satisfy regulatory requirements.

Sampling Procedures

In order to develop consistent and standardized techniques in Ontario, the provincial government prepared a sampling protocol: *Municipal/Industrial Strategy for Abatement (MISA) – Protocol for the sampling and analysis of industrial/municipal wastewater*. It outlines various procedures for different forms of sampling and promotes consistency for the field (Ontario, 2014). There are two types of samples, discrete and composite. A discrete sample is one sample taken from a single point; this type of sample is also called a 'grab' sample. A composite sample is collected by combining subsamples from similar sources, separated by either time intervals or space; for example, 12 samples collected over 6 hours at one point in the treatment process (BC Environment, 2001).

The HMGA Water Project

The Holland Marsh Growers' Association Water Project was initiated to evaluate the performance of various technologies with respect to nutrient and sediment removal.

As previously discussed, sampling takes place before and after changes/installations are implemented to evaluate the water quality as a result of the modification. In order to obtain water chemistry data, sampling days are split between daily discrete sampling (a grab sample taken from each sampling point through the treatment system) and intensive sampling (multiple composite samples, taken over regular intervals throughout one day from each sampling point through the treatment system). The grab samples provide a snap shot of a specific time during a production day, while intensive sampling provides a continuum of data averaged over a full production day. Sampling follows each consecutive treatment technology/process change, which quantifies any changes in water chemistry. Samples are then sent to an accredited lab to promote consistency and assurance that the water chemistry values are accurate.

Equipment

Various types of equipment are used in the field to assist and complement sampling:

The sampling pole, shown in Figure 1, allows the user to obtain a sample without the risk of falling into the water body, such as a

Figure 1: Sampling equipment include a telescopic sampling pole collecting water (left), combining samples into a bucket (centre), and an Auto-sampler (right)

settling pond or stream. It is made of a bottle attached to an extendable pole.

Buckets are used to obtain a large sample requiring multiple collections using the sampling pole (Figure 1). The water quality at an outlet/stream can change over the time it takes to take the sample. In some cases the sample required must be split into a number of different bottles, some containing preservatives. Each sample bottle will therefore contain a representative sample from the bucket. Other pieces of sampling equipment include Auto-samplers or composite samplers (Figure 1), which have an attached hose with a weighted strainer at the end. The weighted strainer is placed in the pond/stream. The unit is set up to draw a determined amount of sample, example: 500mL, at specific intervals, example: every 30 minutes. The water is collected into one large jug, making a composite sample. Some auto-samplers can deposit the collected water into a different bottle with each sample draw.

A flow meter is often used in conjunction with a sampling program. The meter records the amount of water travelling through a pipe, usually at the outflow. The flow data can be compared with the water chemistry data to give a value of mass loading, which relates to the total amount of a substance found in a volume of water. For example, if the concentration of phosphorus in a single discrete sample is 10mg/L, and the facility uses 100,000L of water in a full day's worth of production, it can be determined that there would be 1kg of phosphorus in a day's worth of process water.

Field readings are taken to supplement the water chemistry report from the lab. Various pieces of field hand-held equipment include; Multi-parameter meter which measures pH, conductivity, oxidation/reduction potential (ORP), temperature and dissolved oxygen. A turbidity meter is used to determine the "cloudiness", and a TDS meter which observes the total dissolved solids found in the water.

Process

Prior to sampling, equipment should be washed using phosphate-free detergent. This prevents contamination from site to site and promotes the integrity of the representative sample.

The following process is used when sampling as directed from the MISA guidelines (Ontario, 2014). First, the bottle attached to the sampling pole is submerged and rinsed 3 times. The bucket designated for the sampling point must also be rinsed (Figure 2). Using the water from the bucket, the sampling bottles (not including bottles containing preservative) also need to be rinsed 3 times.

Figure 2: Sampling Procedures include rinsing the bucket (left), decanting into a sample bottle (centre), and decanting into a secondary sample bottle (right)

Next, the bottles are filled to the neck of the bottle, making sure not to overfill – especially the bottle(s) containing preservative. The largest bottle is filled using the combined sample in the bucket, which is then used to fill the smaller bottles (Figure 2).

Samples must then be placed in a cooler and kept cold (4-10°C) for transport to laboratory. Keeping the samples cold prevents further chemical reactions or biological activity from taking place. A Chain of Custody form, documentation of a transfer of goods, is completed to accompany the samples.

Conclusion

Ultimately, sampling provides a snap shot in time of the water quality/chemistry before and after changes are made. It provides data that can be used to compare the performance of equipment and processes to current standards and objectives. It provides insight where processes or equipment can be optimized. Consistency is essential to comply with regulations and to promote reliable water chemistry data.

References

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BC Environment (2001). *Composite samples.* Retrieved March 30, 2015 from http://www.env.gov.bc.ca/epd/remediation/guidance/technical/pdf/12/gd10_all.pdf

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