

Understanding Wastewater Permits and Testing Procedures



Wastewater sampling equipment is considered an important tool in monitoring discharges to receiving waters. Composite samples of effluent collected and averaged over an extended period of time provide the only verifiable indication of treatment plant performance. This photo shows a probe for dissolved oxygen (DO) in these samplings for Biochemical Oxygen Demand (BOD).



This photo shows the filter for a Total Suspended Solids (TSS) test after the sample was drawn through it. Both photos were taken in the city of Sabetha's wastewater treatment plant.

As there are many new wastewater operators in Kansas, I thought it might be helpful to explain how some of the tests are performed and when samples need to be taken.

First, it's important that all operators have a complete copy of the system's permit; the complete copy will include Standard Conditions. The permit is sometimes referred to as the NPDES permit. NPDES is an acronym for National Pollutant Discharge Elimination System. Let's review this permit.

The system's permit number is stated in the upper right hand corner of the first page; the number has a total of nine letters and numbers. One of the important parts for smaller systems is the last four characters of the permit number. If this begins with an "N", then the system is designed as non-overflowing or more commonly referred to as non-discharging. The permit number may appear, e.g., M-KSxx-Nxxx. Below that number may be a Federal Permit number or there may be no second number if the system is non-discharging. If the permit number is M-KSxx-xxxx, that represents a discharging system and there will be a federal permit number below the Kansas permit number.

The next information is that of the system ownership. The owner will most likely be a city or county, but it can also be a trailer court or other private business required to have a permit. It will include the owner's address, facility name and the location of the treatment facility and receiving stream if the system discharges. Then will be short paragraph that includes permit issue and expiration dates. Below that will be description of the type of treatment the system is utilizing and a description of the facility.

Section “A” is **Effluent Limits And Monitoring Requirements**, for discharging systems only. The initial reporting period date will be listed as will the reporting periods (quarterly or monthly). When the monitoring periods are quarterly, the discharge monitoring report (DMR) needs to be submitted by the 28th of the month following the end of the quarter. That is to say the quarter which is January, February, March, the DMR is required to be into the state by April 28. When it is monthly monitoring, the DMR is to be in by the 28th of the following month, such as January is due by the 28th of February. The system should have a separate DMR sheet, and operators should make sure that the permit number on the DMR is the same as the permit number.

If the system does not discharge in a reporting period, whether the system is on monthly or quarterly monitoring, the DMR still needs to be submitted. Some of the newer DMRs have a space to mark “no discharge”; on others, the operator can make a diagonal line across the permit and write “no discharge” if there was no sampling during the reporting period. **DO NOT** send the DMR in before the end of the reporting period even when you are certain there will be no discharge. The DMR can be submitted before the deadline if results of a test are available. All DMRs must be submitted by the deadline or the system will be in violation of its permit.



Mike Bitterman Operator, at the city of Sabetha, prepares samples for the BOD test.

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Section “A” provides the authorization for the effluent limits and monitoring requirements. The system will need to monitor the effluent Biochemical Oxygen Demand 5-day (BOD5) and Total Suspended Solids (TSS). The Effluent limits or monitoring requirements will be shown. These will most likely include BOD5, TSS, pH, Ammonia and E. coli. The permit could also include water depths, and metals such as copper and lead. In some areas, there may be requirements to monitor for other metals, and organic or inorganic compounds. This will be determined by the environmental impact on the receiving stream.



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Commonly Used Testing Methods

The most common method for testing BOD is the dilution method. In this test, the dissolved oxygen (DO) reading is taken after diluting the sample with oxygen saturated dilution water and adding a fixed amount of micro-organism seed, and then sealing sample bottle to prevent more oxygen to dissolve into the sample. This sample is then kept in an incubator at 20 Celsius for five days. Then the DO is measured again; the difference is the BOD. This how the formula would appear: ((initial DO minus final DO) minus BOD of seed) x dilution factor.

Analysis for TSS (Total Suspended Solids) is performed by filtering a well-mixed sample through a clean, dry standard glass-fiber filter that has previously been weighed using an analytical scale. A vacuum is applied to hasten the filtering process. The filter and any collected residue are then dried in an oven at 103-105 degrees C for 1 hour. The increase in weight of the filter represents the Total Suspended Solids of that sample in milligrams/liter. The formula used to calculate TSS is as follows:

$$\text{TSS (mg/L)} = \frac{\text{Weight of filter + dried residue (in mg)} - \text{Weight of clean, dry filter (in mg)} \times 1000}{\text{Sample Volume (in mL)}}$$

For more information, I encourage checking the AWWA's Standard Methods for Examination of Water and Wastewater for additional information on how to properly run this test.

To perform the E. coli test by membrane filtration, a water sample is filtered through a membrane that retains the bacteria. It is then placed on selective and differential medium, mTECH, incubated at 35 degrees Celsius for two hours to resuscitate injured or stressed bacteria and then the sample is incubated for 22 hours at 44.5 degrees Celsius. The filter is then transferred to a filter pad saturated with urea substrate. After 15 minutes, yellow, yellow green or yellow brown colonies are counted with the aid of florescent lamp and magnifying lens.

For more detailed description, use the Standard Methods procedures for water and wastewater. As few small systems have their own certified lab, this hopefully helps provide basic information about the BOD, TSS and E. coli testing procedures.

The next part of the wastewater permit is Section "B", **Standard Conditions**.

This is usually a separate 4-page document that describes 24 aspects. These include definitions, test procedures, records retention, facilities operations and immediate reporting required. This is a very important part of the permit and should be read by the operator and those involved with the wastewater system. I believe it would also be helpful to those operators who are taking an operator's certification exam as some questions may relate to this and others parts of the permit.

Section "C" of the permit is the **Schedule of Compliance**. There may be a schedule of compliance if the system has failed to meet DMR requirements. These may include requests such as a date to hire a Kansas-certified engineering consultant, a date for a Draft Faculty Plan that tells how the system plans to meet permit requirements and a final date when the system must meet discharge permit requirements.

The final section is Section "D", **Supplemental Conditions**. This section may cover sludge application rules through EPA 503 regulations and other conditions such as part of pH test procedures.

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Annual conference & exhibition

I encourage you to attend the upcoming annual conference & exhibition for water and wastewater systems. The program is reprinted in this issue; a program was also mailed to operators and others in early January. The KRWA conference is truly one of a kind. Numerous break-out sessions addressing wastewater issues will be presented.

Look for these two full-day preconference sessions on Tuesday, March 27:

- ❖ Wastewater Collection And Treatment;
- ❖ Activated Sludge – From Process To Troubleshooting.

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Brian McDonnell, of Water Products, Inc., McPherson, KS explains "How to fix it" concerning components used in water systems. The training was attended by 61 water system operators and managers representing 30 cities and rural water districts.

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Kent Culbertson of AVK Valve, Roy Oliver of the city of White City and Greg Quidachay of the city of Grandview Plaza visit about valve maintenance at a training session in December 2011.



Bob Henning of Municipal Pipe at Hastings, NE and Brian McDowell instruct on line tapping at a 2010 session.

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