

***Not Enforcement, Reinforcement
Caution! You're about to enter a No-
Swim Zone ☺***



New Wastewater Operators Newsletter

Volume 1, Issue 12, February 2011

Dear Ladies and Gentlemen:

My email victims list is now 187 strong and growing weekly. Last month it was 180. Getting better. ☺

Monthly, I'll share some great ideas I see or hear of, at plants around Eastern and Central Washington, and elsewhere. If you have an idea you'd like to share, let me know.

Yikes! It's March already! Sorry for the delay.

Recent Retirees! ☺

Yeah, these guys have likely been on the job since 1976±. When they started, the hand-held digital electronic calculator had only been around about 10 years. There was no Internet. Seagate didn't release the first hard disk drive for microcomputers until 1980 (a 5 MB monster). The Federal Water Pollution Control Act of 1948 experienced sweeping amendments in 1972 and 1977, becoming commonly known as the Clean Water Act (CWA).

Gentlemen, thank you for your long-time public service. A big dam Saaaaalute! to you all. I wish you happiness in your new "careers".

- ★ Roy Carlson, Manager of the City of Richland, WA facility.**
- ★ Richard (Dick) Leishman, Moses Lake Wastewater Division Supervisor.**
- ★ Bill Fullner, City of Mount Vernon, WA Wastewater Manager.**

**Hach Application Seminars for Water and Wastewater
in Redmond, Washington March 22-23, 2011**

Seminars are free, with free breakfast and lunch. Very informative. Link below has details, registration. No CEU's (yet).

<http://www.cvent.com/events/hach-2011-application-seminars-seattle-wa/event-summary-7b2de15062ed416eb39e017002717d.aspx>

Cool idea of the month, February 2011:

Well, this isn't so much a cool idea as it is a historical account of a new plant startup. The design is cool, though. We travel to the Town of Wilbur, WA.



We arrive in mid-December, 2010. Most of the construction is done, but today they're grouting the circular clarifier. The plant is an Aeromod™ style, having a central clarifier with concentric aeration basin and anoxic basin. Kinda looks like a donut with a bridge on it.

Grouting: The cement truck dumps its load (slowly) into a grout pumper unit. The grout flows through a hose up and then down into the clarifier.



Grouting boards have been added to the clarifier plows.



Cool idea of the month, February 2011, cont:

A worker on the bridge starts and stops the clarifier mechanism, while four others direct the grout onto the clarifier floor and smooth it out with grouting floats. A space heater is suspended over the work to aid curing. This particular clarifier has a radius-wide scum trough—bet you wish you had one too.



Now we fast-forward to January 31, 2010...the first day of startup. Influent is screened and degritted at the headworks, and flows into the anoxic basin.



Cool idea of the month, February 2011, cont:

RAS is pumped off the clarifier bottom into the anoxic basin. Notice there isn't much sludge yet.



Typical of plant startups, the aeration basin shows white billowing foam. You might also see this if a plant receives a biomass-killing toxic slug, or detergent, fire retardant chemicals, etc. Very thin sludge here.



Cool idea of the month, February 2011, cont:

A view from the clarifier bridge. One of the lagoon cells will be retained.



Plant effluent will be disinfected by UV.

Congratulations to the Town of Wilbur, Jim Pope (Utility Foreman), Tony Goodlake (Operator) and others on their new treatment plant.

Engineering: Wilson Engineering, LLC.

Construction: Boss Construction, Inc.

Startup Operations provided by: Casie Monge of AAA Lab (Cheney)

A big dam Saaaalute! to all involved.

This month's Tech Tip: North Central Laboratories' web (<http://www.nclabs.com/htmldocs/technical.html>) (a.k.a. NCL). Thanks to Jerry Cooke for giving me permission to use it. Author: Mike Raynovic, Head Chemist for North Central Laboratories.
[If you don't have a lab, you can skip this article—seriously]

NCL Technical Tips

MDL - Method Detection Limit

The minimum concentration of an analyte that can be measured and reported within 99% confidence that the concentration of the analyte is greater than zero. The MDL is defined as the (standard deviation) times the (students "t" value). The students "t" value is determined only by the number of replicates you run; the minimum number of replicates is seven.

Number of Replicates	Student "t" values for 99%
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
12	2.718
16	2.602
61	2.390

LOD-Limit of Detection: The lowest concentration level that can be determined to be statistically different from a blank. The LOQ is usually defined as 3 times the standard deviation. It is approximately equal to the MDL.

LOQ-Limit of Quantification: The concentration above which quantitative results may be obtained with a specific degree of confidence. This is usually defined as 10 times the standard deviation.

Conc/MDL: The (concentration of the standard used to run this test) DIVIDED BY the MDL, (which you will calculate). This must be between 1 and 5. In practice, you should shoot for 3 to 5, because if it ends up to be 1, you will be at the MDL, which will cause you a great of deal problems. If it ends up at less than 1, you will have to run the entire test over at a higher concentration.

% Recovery: (Individual result) x 100%/True Value. These should all be between 80% and 120%.

Mean % Recovery: (Mean result) x 100%/True value. This should be between 80% and 120%.

Signal to Noise ratio: Mean divided by standard deviation. Should be approximately 2.5 to 10.

This month's Tech Tip, cont.

WHY DO I HAVE TO DO ALL THIS STUFF?

The first reason is that, with lower and lower effluent limits, there is a need to ensure that the method and technique used in each lab is sufficiently accurate to guarantee that the reported results are meaningful, at least as low as the effluent limit for each analyte. The second reason is that your regulator told you to do so.

Is this hard to do?

Not at all. The actual testing isn't much more than you do on a daily basis. The only difference is that you will need to run **AT LEAST** seven replicates. The calculations take a little time, but are not difficult. All you need is a calculator that adds, subtracts, multiplies, divides, squares, and takes square roots. You actually run the test only once, and the rest is merely calculations with the data you recorded for the replicates.

WHICH ANALYTES DO I NEED TO DO THIS FOR?

According to the information we have, most states **DO NOT** require these determinations for D.O., B.O.D., T.S.S., pH, or Fecals. You will probably need to do this determination for all other analytes on your permit. In most cases, this means ISE probe methods, spectrophotometric procedures, and titrations. Check with your State Regulators to be sure.

General Notes:

A minimum of seven replicates of a standard are required. We recommend that you run nine or ten. It is worth your time, in case of bad data points (outliers), spillage, etc. If you only run seven and one is bad, you will need to run the entire test over, because seven points are required.

"Outliers" are data points that are so far removed from the rest of the points that you are allowed to discard them purely on a mathematical basis. Two acceptable outlier tests are the "Dixon Outlier Test" and "Grubbs Outlier Test". Consult a Statistics reference for these. The explanations and examples are somewhat lengthy, and if we take the time to do this here, we may never get this web page done. Run the tests carefully, and with a little luck, you will not need to test for "outliers".

Starting Points:

Ammonia Probes: Standardize your probe with standards of 0.1 ppm, 1.0 ppm, and 10.0 ppm. Prepare one liter (1000 ml) of 0.05 ppm. This will give you enough standard to run ten 100 ml samples. Record the results of each individual sample.

Chlorine Probes: Same as ammonia probes, using chlorine standards and reagents, of course.

Phosphorus (by spectrophotometer): Prepare at least six standards and a blank. Measure the Absorbance of each standard and use a linear regression to calculate your curve. If necessary, consult "Phosphorus" and "Linear Regression" in the "Technical Tips" section of this website. Prepare one liter of 0.05 ppm standard. Divide into 10 separate samples. Run each sample through the entire procedure. Measure and record the Absorbance of each sample. Using your linear regression equation, calculate the ppm of each standard.

DPD Chlorine (by spectrophotometer): Same as phosphorus, using chlorine standards and reagents, of course.

This month's Tech Tip, cont.

Once you get the data points, the calculations are the same for all tests. For brevity, the following example uses only 8 data points. You can use as many as you want, but not less than seven.

CALCULATIONS

First, list the individual results. Then add them up. Then divide by the number of samples. This is the "mean" (same as average).

Sample#	Reading (ppm)
1	0.0624
2	0.0491
3	0.0486
4	0.0482
5	0.0485
6	0.0491
7	0.0507
8	0.0505
Total	0.4071

The mean is 0.4071 divided by 8, or 0.0509

Now, we expand the above table. In the third column, we list the mean, which of course will be the same for each sample. In the 4th column, we subtract each individual result from the mean. In the 5th column, we take the number in the 4th column and square it (multiply each number by itself) and record that result in the 5th column. Note that any negative number squared becomes a positive number. Then add up the numbers in the 5th column.

This month's Tech Tip, cont.

Sample Number	Reading (ppm)	The Mean	Difference from Mean	Difference Squared
1	0.0624	0.0509	0.0115	0.0001322
2	0.0491	0.0509	-0.0018	0.0000032
3	0.0486	0.0509	-0.0023	0.0000053
4	0.0482	0.0509	-0.0027	0.0000073
5	0.0485	0.0509	-0.0024	0.0000058
6	0.0491	0.0509	-0.0018	0.0000032
7	0.0507	0.0509	-0.0020	0.0000040
8	0.0505	0.0509	-0.0004	0.0000002
Total	0.4071			0.0001612

Now divide the total of column 5 by (n-1) where "n" is the number of samples. In this example, there are eight replicates, so n-1 = 8-1, or 7.

0.0001612 divided by 7 = 0.0000230

Now, using your calculator, take the square root of that number. The square root of 0.000230 is 0.0047988, or rounding off, 0.0048. THIS IS THE STANDARD DEVIATION

Now, going back to the definitions at the top of this page:
MDL = (standard deviation) times (students t value for 8 replicates)
MDL = 0.0048 x 2.998 = 0.014 ppm

LOD = 3 times (standard deviation)
LOD = 3 x 0.0048 = 0.014 ppm

LOQ = 10 times (standard deviation)
LOQ = 10 x 0.0048 = 0.048 ppm

Conc/MDL = 0.05 ppm/0.014 ppm = 3.57.
Is this number between 1 and 5? Yes.

% Recovery (individual) = (individual result) x 100%/true value.

This month's Tech Tip, cont.

Sample#	Reading (ppm)	True Value	% Recovery
1	0.0624	0.0500	124.8
2	0.0491	0.0500	98.2
3	0.0486	0.0500	97.2
4	0.0482	0.0500	96.4
5	0.0485	0.0500	97.0
6	0.0491	0.0500	98.2
7	0.0507	0.0500	101.4
8	0.0505	0.0500	101.0

Mean % Recovery = (mean) x 100%/true value
Mean % Recovery = 0.0509 x 100%/0.0500 = 101.8%

Signal to noise ratio = mean/standard deviation
Signal to noise ratio = 0.0509/0.0048 = 10.6

This should be approximately 2.5 to 10.0. The fact that this one is 10.6 is not a problem. It simply means that we could have chosen a standard with a lower concentration to run this test.

In Conclusion:

The results of this test meet all requirements and therefore could be reported.

These are results of one procedure with our equipment, personnel, standards, and procedure. Feel free to use our calculations as a guide, and our concentrations as a starting point. However, you **MUST** determine your own MDL's, LOD's, LOQ's, etc., for your lab and your circumstances.

Tip of the month:

Last month I announced that an Annual Wasteload Report spreadsheet is available in Excel™. About a dozen operators asked for a copy. Dr. Mahbub Alam of Ecology’s Southwest Regional Office is the author. If you’d like a copy (and the instruction sheet), please let me know.

Dr. Alam also authored a great I&I (Infiltration and Inflow) spreadsheet too. Just ask if you want a copy of that and the associated instruction sheet.

I’ll send these to you via email on request. 😊

Below: Crescent Lake in Grand Coulee, Jan. 14, 2011. BlackBerry photo. At far right is where the old Grand Coulee trickling filter WWTP discharged half treated sewage for 25 years. On good days, they had 50% removal of TSS and BOD. I calculated that about 750 dry tons of sludge lie at the bottom of the lake. After the new plant was started up in 1986, fresh Columbia River water was added, along with a surface aerator. Since then, I’ve seen nesting geese, a river otter, beavers and other wildlife move into the area. Locally named “Poop Lagoon”, especially when thermal turnover brings H2S smells to the surface.



Fog bank near the middle of the Grand Coulee (looking south), December 2010. Digitally enhanced.



**All the best,
Darrel Fleischman**

P.S. If you want off this list for any reason, just let me know. And thanks for any feedback—I appreciate you and your opinions.

P.P.S. All previous newsletters are available on request, via email.