

What We Find

OHIO EPA DIVISION OF SURFACE WATER
COMPLIANCE ASSISTANCE UNIT

PREPARED FOR:

OTCO Procrastinators Workshop 2017



About 20 minutes



Good Parameters

- Ammonia drops from influent to less than 1.0 mg/l at outfall
- Alkalinity above 120 mg/l at clarifier
- Nitrates above 35 mg/l at clarifier if timers not used
- Spins between 2% and 4% in aeration tank
- Settleometer below 800 in 5 minutes
- Coretaker in clarifier 20% or less of total depth

Typical Plant

- Trash trap
- Aeration tank
- Double-hopper clarifier
- Dosing tank
- Two sand filters
- Chlorination and de-chlor
- Outfall to stream

Typical Visit

- Influent ammonia 40 mg/l reduced to 10 mg/l
- Alkalinity 350 influent 80 mg/l in clarifier
- Nitrates 14 mg/l in clarifier
- Aeration tank dissolved oxygen 0.8 mg/L
- Spin 6%
- Settleometer 950 after 5 minutes
- 5' of sludge in an 8' clarifier
- One sand filter plugged and the other starting to flood

Where do we start?

Ammonia is high so let's look at the troubleshooting page first

5 - Things Needed for Nitrification

Ammonia Troubleshooting Guide

1. Do you have enough air (O₂)?
 - a. You should have over **2 mg/L** in aeration tank.
 - b. Diffusers need cleaned?
 - c. Air leaks?
 - d. Air blower timer programming off?
 - e. Power outage?

2. Do you have enough bacteria?
 - a. Over wasting sludge...
 - b. Susceptible to rain event – wash outs?
 - c. Sand filters covered in sludge?
 - d. Sand filter dosing tank – check the dosing tank with a core sampler...
 - e. Aeration tanks look very light brown in color?
 - f. RAS pump plugged – check the clarifier with a core sampler...

3. Do you have enough Alkalinity?
 - a. It should be \geq **120** total alkalinity...
 - b. High raw Ammonia (>40 mg/L) can indicate a potential shortage.
 - c. Raw NH₃ X 10 should be greater than Raw Alkalinity.
 - d. Softened water, low flow toilets, tight collection system, mostly urine (ex: schools, Highway rest stops, stores)...

4. Temperature
 - a. Should be \geq **10°C**.
 - b. Game over as you approach **5°C**.
 - c. Insulated grates will correct this issue – 1” thick blue board.

5. Detention Time
 - a. Periodic high flows slugging the plant (EQ pumps, influent pump station, I&I).
 - b. If you have an EQ tank, compare gpm from flow control box with design flow in gpm.
 - c. Compare average daily flow with design flow

Where to start?

- Low DO, and low alkalinity.
- Alkalinity is 80 mg/l in the clarifier and ammonia is still 10 mg/l.
- Lower than expected nitrates confirms low DO.
We have a reading of 14 mg/l instead of over 35 mg/l

\$10 to \$16 per 50# bag

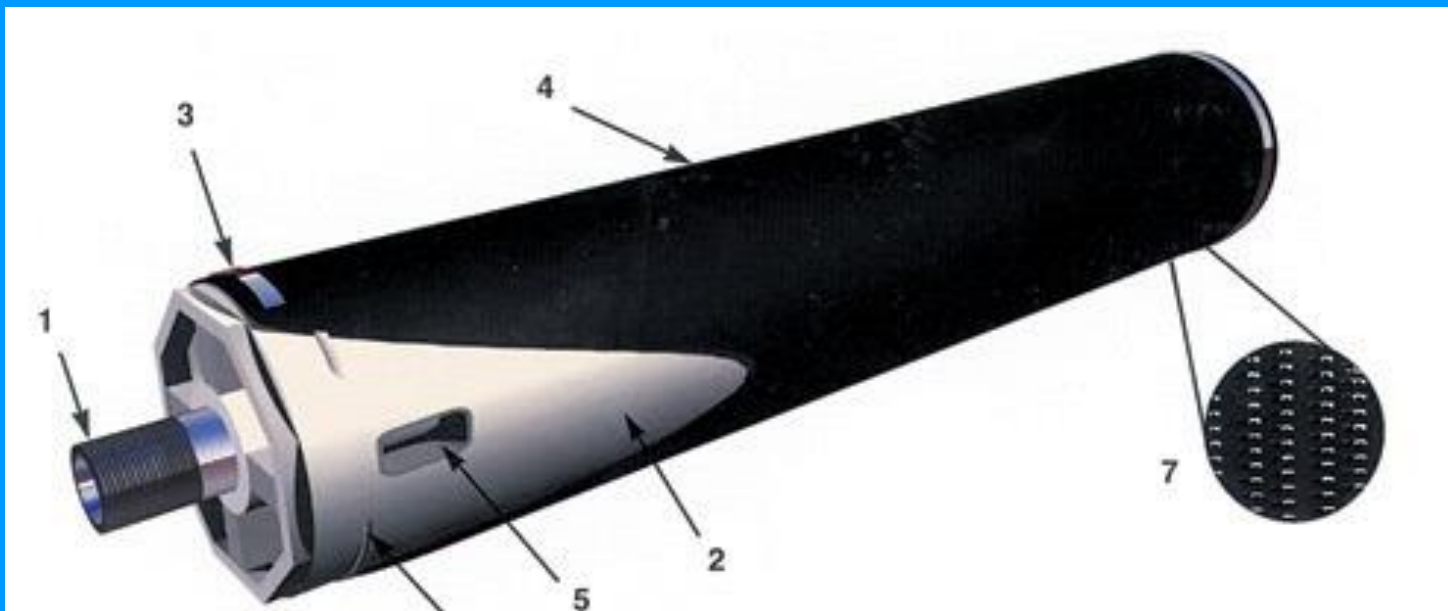
PH between 6.8 and
8.6

Min. 120 mg/l alkalinity IF
ammonia is less than 1.0



- Low DO?

- Denitrification



Blower analysis

Determine the pressure by multiplying the water depth over the diffusers by .433 to get PSI.

Determine the speed by multiplying the motor speed by the motor pulley diameter, then divide that number by the blower pulley diameter to get rpms of the blower.

Look up the CFMs produced using the curve provided by the manufacturer and available on the internet.

The diffusers we recommended have a happy place between 2 and 9 cfm each, with a maximum of 15 cfm.

A 3" airlift pump consumes about 10 cfm.

Don't forget other air uses like post-air or digesters.



2% to 4% works!!!!

Find out what your plant likes best

Don't grow filaments by keeping too many bugs in your plant

.....Unless you really like foam and poor settling



As a general rule:

Less than 800 in 5 minutes

Less than 400 in 30 minutes

Untreated sewage won't settle

If your effluent ammonia is still less than 1.0 mg/l,

Try between 250 and 500 in 5 minutes.

It's all dependent on the organic load incoming!!!!!!



If you have EQ, pump clear water back to the EQ to speed drying times



Check the sludge amounts in the dosing tank several times per year and clean it when needed, especially if the sand filters have just been covered with solids.

Inspect the chlorine contact tank several times per year.

Cleaning out the sand dust and grass clippings will save chlorine.



If you have found your problems and corrected them, then you can clean the sand filters and expect them to stay clean.

Dirty sand filters are only a symptom of a problem.

Questions?????????



Someone has finally managed to
photograph the pot
at the end of the rainbow

Any More Questions??????????



Maintenance Basics

Course one

“Is Efficient Operation of WWTPs Possible?”

OHIO EPA –

COMPLIANCE ASSISTANCE UNIT

OTCO Procrastinators Workshop 2017

“12% of all power generated in the USA is consumed by water and wastewater treatment plants.”

New information suggests that the correct figure is closer to 4%





Pounds of pollutants received at the WWTP;

$$0.051 \text{ mgd} * 8.34 * 200 \text{ mg/l cbod5} =$$

$$85.1 \# \text{ per day} * 1.1 \# \text{ O2} = \quad \quad \quad 94 \# \text{ O2 demand}$$

$$0.051 \text{ mgd} * 8.34 * 42 \text{ mg/l nh3n} =$$

$$17.9 \# \text{ per day} * 4.6 \# \text{ O2} = \quad \quad \quad \underline{82.3 \# \text{ O2 demand}}$$

Total Demand 176.3#

Total Demand 176.3#

The electric cost averages \$42.03 per day

\$0.24 per pound

Supplying $633,600 \text{ CFD} * 0.0173 \# \text{O}_2 / \text{CF} = 10,961 \# \text{O}_2$

Only 1.6% of the oxygen is being used.

Most of the rest is wasted!!!



1/2" holes = 182 sq ft

2 mm holes = 1829 sq ft

10 times the surface area!

Same Mixing when solids are less than 3%



Carbonaceous consumed before nitrogenous

Follow the ammonia !

Change diffusers – Lower MLSS – Track Ammonia

Centrifuge to quantify bug volume

Follow the ammonia !



Follow the ammonia !

Once ammonia is stable at lower MLSS,

Start turning off the blower.

1 or 2 hour blocks daytime

Longer blocks at night



MULT BY

REG K PI RATIO PROG ID

20.57
MAX W



GE Electronic Meter

Reg Type M-90AE



General Electric Company Springfield N H USA

TYPE EV-5 FM15S

CL200
240V
4W
△

R.O.C. CAT.NO. 716X15
66086



UAD09373 68366086

93 731 683

9937214-1



AEP
6513856

To reduce demand

Add a VFD !

Program it as a Soft-Start



To be more versatile, Add a PLC or SCADA



WWW.gridsmartohio.com

Let them pay some !

They paid half of the \$8325.50 experiment.

Fill out the paperwork first !

Thanks Dan!

21% less bill than 2009 average

41% Projected

55% ?

Why?

Inability to waste sludge

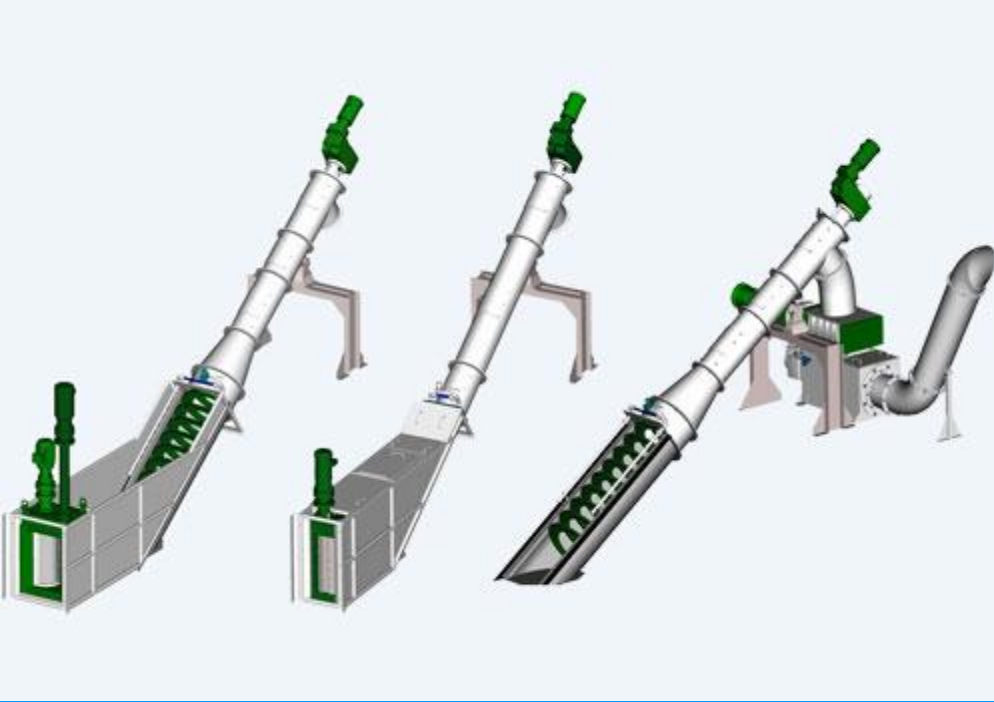
Mechanical Failures



52757

S ECT
Transportation, Inc.
661-0404

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www.govdeals.com





Grounding ring

39% savings over the 2009 average

41% Projected

55% Targeted

“Wastewater treatment is easy. Dealing with people is the hard part.”

\$42.03 per day * 30 days = \$1261 per month * 39% = \$492 per month savings.

Project cost \$4163 / \$492 per month = 8.5 months payback

- Diffuser efficiency-

Replace if low or old

- Waste until the ammonia goes up

Track with fish kit and centrifuge

- Turn off blower

1~2 hours during the day, longer at night

- VFD or SCADA to be more versatile

8.5 months payback to save 39%

If the plant is running a BIO-P process-----

Shutting off air doesn't work because the bugs dump phosphorus

Use VFD to drop blower speed to match air volume to what is needed by the bugs

Anoxic first tank is needed

- **Further experimentation.....**

- **Treat between 9PM and 7 AM**

 - Take advantage of reduced rates at night

 - Use the EQ tank for day storage

 - I&I may be a problem during rains

Don't forget about the EQ tank blower!

It's purpose is to poison anaerobes and to provide mixing.

Turn it off with timers.

If odors are an issue, add more time on.

- **Further experimentation.....**

- **Take half the plant off-line**

Apply for plant re-rating to 125,000 GPD

**\$8000 per tap times new excess capacity= additional
\$888,000 collateral**

Just for running the plant efficiently

- **Further experimentation.....**

Use ORP and PLC to control blowers



Side Benefits.....

Works for any size plant

The Perfect F/M ratio

Reduce Growth of Filaments

Denitrification

Questions?



Design vs Real-life

- 200 mg/l CBOD5
- 25 mg/l Ammonia
- MGD vs GPM

Dan Kopec



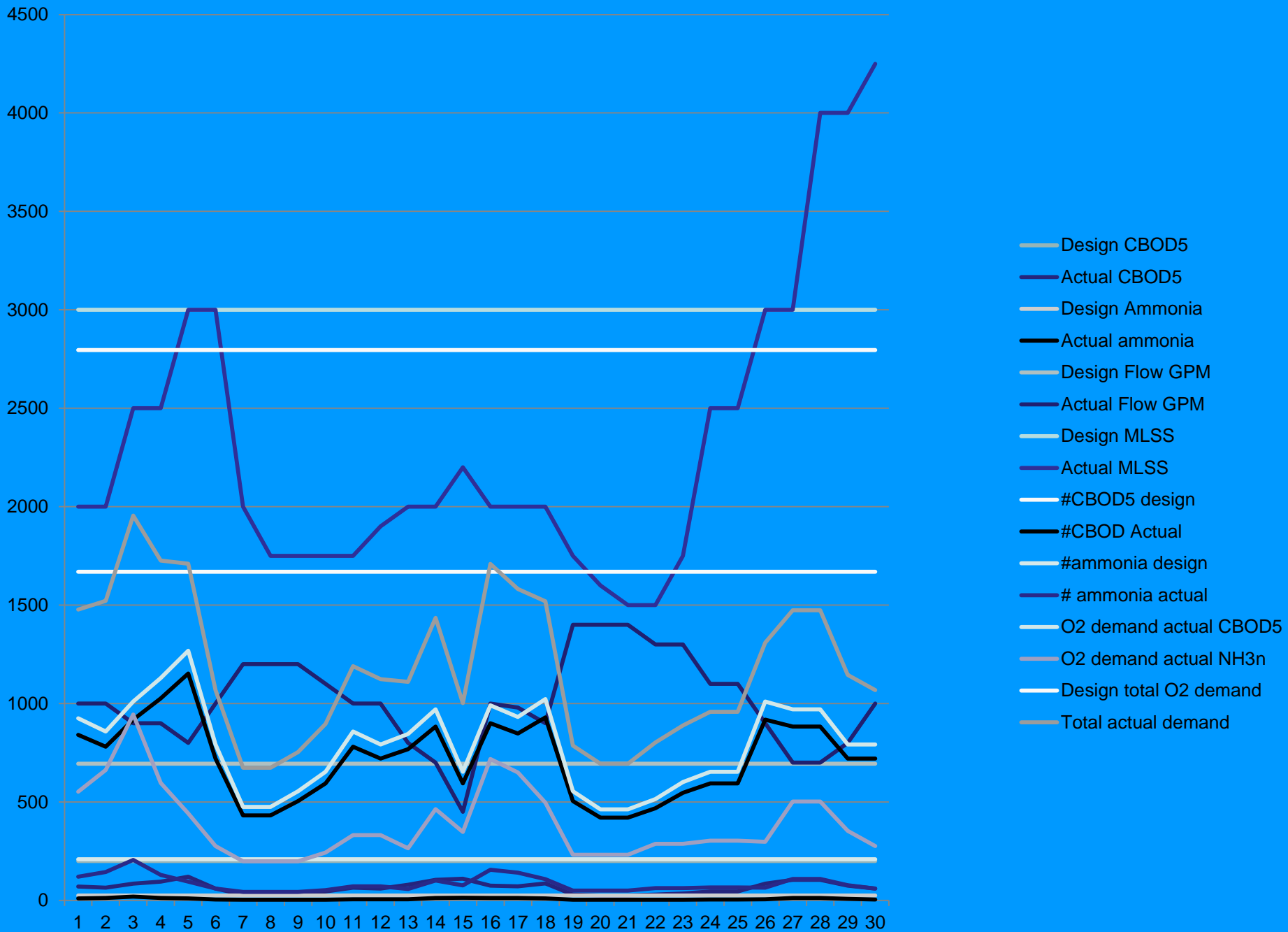
DANGER
AUTHORIZED
PERSONNEL
ONLY

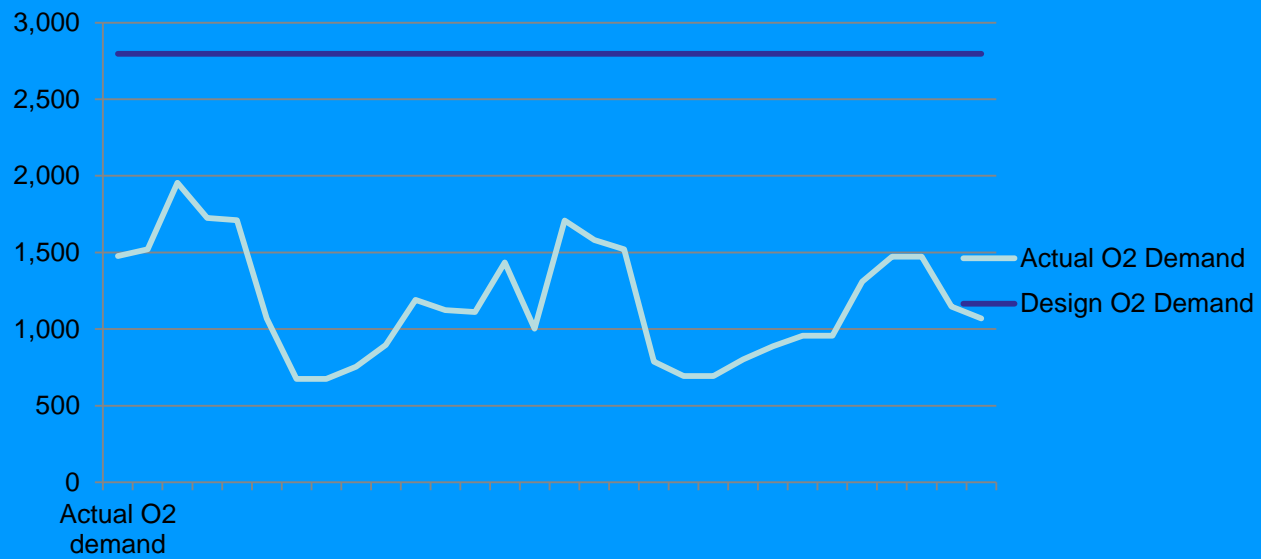
Dan Gill



Vic











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Geobags

130
Tests

The accurate way to
test aquarium water quality

API
Aquarium Pharmaceuticals

AMMONIA

$\text{NH}_3/\text{NH}_4^+$
TEST KIT

FRESH WATER / SALT WATER
EAU DOUCE / EAU DE MER

Monitor ammonia
to help prevent
fish loss

Surveillez
le taux
d'ammoniaque
pour éviter la perte
de poissons



