November '07 Volume 4.11

# The Wastewater Insight

Environmental Leverage INC.

## AMMONIA TOXICITY- METH LABS

### Ammonia problems in Wastewater Treatment plants- Midnight dumping

Your plant typically runs like clockwork, and you rarely have problems with nitrification. All of a sudden you have having weird spikes in ammonia and your nitrifiers are having problems or you wind up with other strange reading on your influent. What is going on?

We have seen this happen lately and were surprised at what we found out. Clandestine methamphetamine laboratories have been a growing problem throughout Colorado and across the United States. In Colorado alone, the number of meth lab busts reported by the Colorado Bureau of Investigation has increased dramatically over the past few years. More than 12 million Americans are believed to have tried it, and 1.5 million are regular users. Nearly 10,000 clandestine labs that produce it were discovered in one year alone. High-quality meth that is cooked to 90 percent or higher purity can run $5,500 a pound.

Methamphetamine or "meth" is a powerful, highly toxic, addictive drug that is illegally "cooked" in underground or hidden homemade labs. Meth is considered the most dangerous drug in the world. Meth labs have dramatically increased over the past several years because meth recipes are more readily available, it is relatively easy and cheap for anyone to make, and the resulting "high" lasts longer, about 2 to 14 hours versus only 15 minutes for someone with a cocaine high. A meth high produces an intense euphoric sensation called a "rush," described as an extremely pleasurable high of hyper-alertness, extreme energy, and confidence. Users become addicted quickly and use it with increasing frequency and in increasingly large doses. Meth simulates the body's natural pleasure chemical Dopamine. The body typically produces 150 units, vs. use of meth produces 1200 units, and at a very long sustainable time. This is extremely addictive to the body, but also highly damaging.

Meth labs may be set up at campgrounds, rest areas, rental homes, motel rooms, abandoned cars, garages, storage sheds, and vacant buildings. A typical meth lab looks like a collection of chemical bottles, glassware, hoses, and pressurized cylinders. The cylinders can take many forms, including modified propane tanks, fire extinguishers, scuba tanks and soda dispensers. The tanks usually contain anhydrous ammonia or hydrochloric acid – both highly poisonous and corrosive.
Meth lab equipment is frequently abandoned after use and the potentially explosive and very toxic chemicals and waste products are left behind. These materials are commonly abandoned alongside the road, in a convenient dumpster or left in a motel room, often in boxes or duffel bags. Abandoned chemicals may also be dumped on the ground in the woods or along roads, or may be dumped in a small pit and set on fire.

Consider this: for every pound of cooked meth produced, it is estimated that five to seven pounds of hazardous chemical waste are also produced. Cooking generates a long list of noxious solvents and gases, such as hydrogen chloride, phosphine, and meth itself. Much of the waste is dumped down the drain.

### What are some of the common meth lab chemicals and equipment?

Common chemicals and equipment found at meth labs include: Chemicals often used in meth production include: iodine crystal, hydrogen chloride, acetone, lithium metal, drain cleaner, battery acid, antifreeze, red phosphorus, ether, lye, alcohol, and Freon®.

**Chemicals commonly used**

· Ephedrine or pseudoepherine tablets
· Acetone, toluene, alcohol or paint thinner
· Iodine
· Red phosphorous (matches, fireworks)
· Anhydrous ammonia (in propane tanks or coolers)
· Camp stove fuel (naphtha)
· Starter fluid (ethyl ether)
· Lithium batteries
· Sulfuric acid, muriatic acid, phosphoric acid
· Sodium hydroxide (lye)
· Hydrogen peroxide
· Rock or table salt
Toluene (break cleaner)
Ether (Engine starter)
Methanol (gas additives)

## MYSTERY BUG OF THE MONTH

We started this month out with a new

**Mystery Bug of the month!**

Check out our website for more photos of our new mystery bug!!!! WWW.EnvironmentalLeverage.com

## INSIDE

Trichloroethane (gun scrubber)
Kerosene
Gasoline
Muriatic acid (driveway cleaner)
Paint Thinner

### Household Equipment used

· Glass containers (all cook ware such as Pyrex or Corning ware)
· Plastic or rubber tubing
· Funnels
· Propane tanks (with corroded, bent or tampered valves)
· Coffee filters (with red stains or ephedrine residues)
· Some type of power source or camp stoves or hot plates
· Rubber gloves
· Drain cleaner
· Empty cans of toluene, alcohol or paint thinner
· Starter fluid
· Iodized salt
· Hydrogen peroxide
· Empty pill bottles, boxes or blister packs
Measuring cups, turkey baster,
Hot plate, tape, strainer, aluminum foil,
Blender or coffee g rinder

The most common chemicals used to start the meth-making process are over-the-counter cold and asthma medications that contain ephedrine or pseudoepherine as decongestants or stimulants. The two most common methods using these chemicals are primary ingredients are the Red Phosphorous and Birch methods. These chemicals are present in many common over-the-counter cold and asthma medications.

Some of the warning signs of a suspected meth lab include:

| | |
|---|---|
| Strong or unusual odors (solvents, ammonia, ether-like, vinegar-like, pungent, acrid or sour) | Residences with windows blacked out |
| Discoloration of structures, pavement and soil | Renters who pay landlords in cash |
| Increased activity, especially at night | Excessive trash |
| Unusual security systems or other devices | Unusual structures |

Meth labs are considered hazardous waste sites and should only be entered by trained and properly equipped professionals (i.e., first responder Hazardous Material (hazmat) Teams). Never handle materials you suspect were used for making meth, such as contaminated glassware or needles. Skin contact can result in burns or poisoning. Handling items can also cause some of the chemicals to ignite or explode on contact with water or air.

DO NOT ENTER a site that you think may be used for cooking meth. Immediately call your local police department. Meth labs present extreme dangers from fire, explosions and exposure to hazardous chemicals. Breathing chemical fumes or handling unknown substances can cause injury and even death.

**What are the typical chemicals that may wind up in the sewer and down to your wastewater plant?**

The most common types of contaminants expected to be discharged in septic systems associated
with meth labs are: solvents (e.g., toluene, xylene, alcohol, acetone); petroleum distillates (e.g., paint thinner, camp stove fuel); liquid corrosives (e.g. sulfuric acid, muriatic acid, sodium hydroxide solutions), and mixtures with residual ephedrine, methamphetamine, iodine or red phosphorous.

Cyanide is a byproduct of meth production and can significantly impact a wastewater plant if in high enough concentrations. Some other chemicals that might wind up in the drains include Iodine compounds, Chloropseudoephedrine, Phosphine gas (produced from overheating), Yellow or white phosphorous, Various used acids (hydriodic and phosphoric acid gas), Meth residues and Residual unused chemicals. VOC's from meth labs have been knows to reach over 10,000 ppm!

One material believed to cause wastewater problems -- toluene -- can be used in the production of methamphetamine. But it's also used in materials found in a variety of other places, including auto body shops and beauty salons. The three chemicals having the biggest impact on the environment are acetone, ether, and white gasoline

**What are the sings you have a meth lab in your community-**

Weird spikes in loading, sudden upset conditions in your plant, brown effluent, loss of nitrification, influent high TOC, high amine levels

The problem can be exacerbated by the fact that these dumps typically occur at night, when wastewater flows are minimal and there is less water to dilute the problem chemicals.

**What should you do about it?**

If you suspect dumping, the authorities must be involved. Tracking upstream in the lift stations for point source narrowing down may be a way to come close geographically to the source. Then leave it up to the Federal Authority and police.
Next thing is to focus on the health of your wastewater treatment plant.
If just minor chemicals have been spilled that are impacting your plant such as ammonia and amines, make sure to check alkalinity in your plant. Sometimes just increasing that will help your plant handle the extra loading. pH adjustment may be needed if you have caustics or acids dumped down.

Sometimes bioaugmentation can be used to help if you plant is impacted. Bioaugmentation can help break down some of the toxic chemicals, help with upset recovery, help with nitirification reseeding or to just handle the additional loading.

http://www.methresources.gov/
More information on Meth problems, how to identify and what to do as well as local resources and links

http://www.state.sd.us/denr/DES/WasteMgn/HWaste/MethLabCleanup.pdf
Guidelines for meth lab clean up reduction in waste

http://www.popcenter.org/Problems/Supplemental_Material/drug_labs/MN_CG_2003.pdf
Drug labs clean up guidelines

http://www.p2pays.org/ref/04/03259.pdf
Guidelines for Hospitals and medical facilities

Sometimes it is not illegal labs, but hospital, dental or doctors offices. Check to see what is being discharged into your facility and how it can impact your wastewater treatment plant.

# Industrial Facilities- Cooling Tower Blowdown and Boiler Blowdown

Where does your Cooling tower and Boiler blowdown discharge to?

The primary use of large, industrial cooling tower systems is to remove the heat absorbed in the circulating cooling water systems used in power plants, petroleum refineries, petrochemical and chemical plants, natural gas processing plants and other industrial facilities. The absorbed heat is rejected to the atmosphere by the evaporation of some of the cooling water in mechanical forced-draft or induced draft towers. More than 90 percent of all the water used by industry and about two-thirds of the total wastewater generated by U.S. manufacturing plants is the result of cooling operations.

The circulation rate of cooling water in a typical 700 MW coal-fired power plant with a cooling tower amounts to about 71,600 cubic meters an hour (315,000 U.S. gallons per minute)[1] and the circulating water requires a supply water make-up rate of perhaps 5 percent (i.e., 3,600 cubic meters an hour).

Petroleum refineries also have very large cooling tower systems. In many refineries, makeup water to the cooling tower can account for up to 50% of the total demand for fresh water. A typical large refinery processing 40,000 metric tons of crude oil per day (300,000 barrels per day) circulates about 80,000 cubic meters of water per hour through its cooling tower system.

Some plants have pretty clean boiler and cooling tower blowdown except for dissolved salts. BOD's typically range from 2-5 ppm. This is relatively clean water. If you are discharging to a local POTW, and you have a pretreatment system, your best bet is to add the boiler and cooling tower blowdown flows downsteam of your wastewater plant to allow for more time in your wastewater plant for critical loading from the process side. Hydraulic overload during huge spikes of flow from a cooling tower can significantly impact plant efficiency.

**Discharge to POTW**-Here is a perfect example of a plant- 4 gpm was from the boiler blowdown, and cycles of 18 up to 100 gpm came from the cooling tower. The process side only had 5 gpm of concentrated wastewater with a very high BOD.
If you take out the cooling tower flow, with a BOD of 2-4 ppm, and just run your concentrated wastewater through your system, you now allow for more time to degrade the organics in your system. The addition of the cooling tower and boiler water at the back end will still be added to your flow, but the extra time in the wastewater plant for the concentrated waste now should significantly increase the amount of treatment capabilities, and lower the final effluent. Since you are discharging to a POTW,

**Table I**
**Characteristics of effluents from cooling tower**

| Sl. no | Parameter | Value |
|---|---|---|
| 1. | pH | 7 |
| 2. | Conductivity (μs/cm) | 3350 |
| 3. | Total hardness | 351 |
| 4. | Calcium hardness | 256 |
| 5. | Total dissolved solids | 2500 |
| 6. | Total suspended solids (TSS) | 50 |
| 7. | Chloride | 713 |
| 8. | Sodium | 678 |
| 9. | Potassium | 54 |
| 10. | Sulphate | 233 |

Note: Except for pH and conductivity, all other parameters are in mg/l.

you should not have to worry about occasional spills if you monitor and control your boiler and cooling tower sufficiently.

Cooling tower blowdown can contain zinc and chromates, which must be removed prior to discharge into the environment. High levels of zinc have been known to impact nitrification, so check to see what type of chemistry you are using in your cooling tower.

High sulfates or phosphates may be present depending upon the type of chemical treatment used. High Sulfates can impact oxygen efficiency in the wastewater plant.

**Typical Oxygen requirements in a wastewater plant**
- 5 lbs. oxygen oxidizes 1 lb. nitrogen
- 3 lbs. oxygen oxidizes 1 lb. carbon
- 1-1.5 lbs. oxygen oxidizes 1 lb. B.O.D.
- 1 lb. oxygen oxidizes 1 lb. hydrogen sulfide
- .67 lb. oxygen oxidizes 1 lb. manganese
- .4 lb. oxygen oxidizes 1 lb. Iron

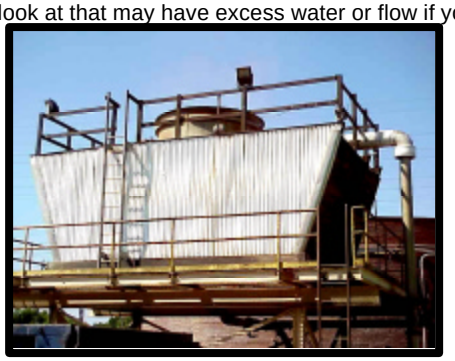
Most cooling tower applications utilize 6-12 cycles of concentration. That is an optimum range considering the cost of chemicals and blowdown requirements. The cost of cooling tower chemicals increases greatly when you decrease the cycles of concentration. The cost of the raw water and disposal of water have to be addressed.

Treatment alternatives include chemical reduction, ion exchange, and electrochemical reduction. A novel process involves lime softening with recycle of the treated water to the cooling water system. The best technology to utilize is a function of cooling-water quality. If makeup water is high in hardness, lime softening may be most appropriate.

All systems require a chemical treatment program that addresses four areas:
-Scale
-Corrosion
-Fouling
-Microbiological growth
Scale and corrosion inhibitors are typically injected into the system by positive displacement pumps that meter precise dosages.

Check to see what types of chemical treatment you are using, whether you are using phosphate treatments, toxic chemicals to your bacteria, or you have relatively clean blowdown from either your cooling tower or boilers. It can make a big difference in where this water is sent through your wastewater treatment plant.

Other areas to look at that may have excess water or flow if you did a water balance in your plant- Sand filter backwash, carbon filter drinking water backwash, steam trap condensate, sample lines that are kept open, meters, Water softener, make up water, RO filtrate, condensates, holding tanks, wet wells, pits, storm water. Boiler Blowdown: The use of boiler blowdown as cooling tower makeup is another reuse scheme that has been employed at a number of locations.



Storm water is a big one. Storm water should be relatively clean, and should not be running through your wastewater treatment plant. It can significantly cause hydraulic overload.

Do a walkthrough of your plants system, check to see where all the water flows wind up. You would be surprised at the sources and total water balance if you give it a double check. If you need help with this, let us know.

**Table 7 – Typical Quality Guidelines for Chemically Treated Circulating Water**

| Property of Water | Recommended Level |
|---|---|
| pH | 6.5 to 9.0* |
| Hardness as CaCO3 | 30 to 750 ppm2 |
| Alkalinity as CaCO3 | 500 ppm maximum2 |
| Total Dissolved Solids | 1500 ppm maximum |
| Conductivity | 2400 micromhos3 |
| Chlorides | 250 ppm maximum as Cl 410 ppm maximum as NaCl |
| Sulfates | 250 ppm maximum |
| Silica | 150 ppm maximum |

**Examples of a typical Plants:**
A Refinery circulating 150,000 gpm
+Evaporates about 4.3 million gal/day
+Discharges about 1.0 million gal/day
+Makeup of 5.3 million gal/day

A large Power Plant circulates 400,000
+Evaporates about 11.5 million gal/day
+Discharges about 2.5 million gal/day
+Makeup of 14 million gal/day

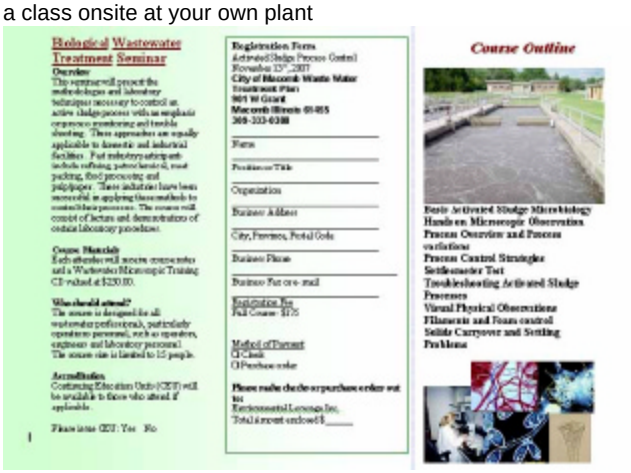
Depending upon where you live, the cost of fresh water ($1.00 to $2.00/1,000 gal or
$0.26 to $0.52/m3). Now add the cost of additional treatment to reach discharge limits ($2.00 to $4.00/1,000 gal or $0.52 to $1.04/m3)

You can see why performing a total water balance in your plant, and considering all the options you have can make a big difference in operating costs as well as efficiency.

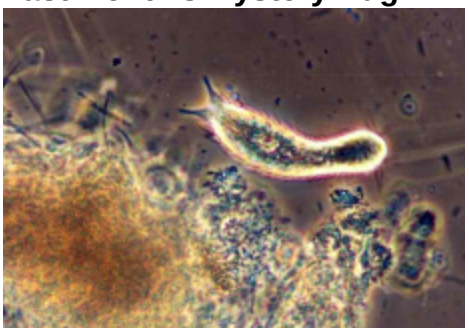
## Training Classes

We have had many people ask when we are going to hold our next training class. This will be a one day general wastewater class with hands on microscopy.
Activated Sludge Process Control

**November 13th, 2007**
**City of Macomb Waste Water Treatment Plant**
901 W Grant
Macomb Illinois 61455
309-333-0388
Please let us know if you are interested in attending or in hosting a class onsite at your own plant




## Last Month's Mystery Bug



Last month we had Gastrotrich as our Mystery Bug. These are macroinvertebrates. These are typically found in a very old sludge, with low F/M conditions. There are numerous photos of these on our website. Every Bug of the month we have in our newsletter is posted on it's own separate page with more critical information on the species type, the environment found, and what it indicates about the conditions present in your wastewater treatment plant.

## Misc. websites

**Environmental Leverage Inc. offers consulting services, beneficial reuse, training and bioaugmentation programs that can help reduce your surcharges.**

**Contact our office today to find out how your can start saving money and become more efficient at your plant!!!**
Many times we have suggested articles for the next months issues. Sometimes we change what we will be featuring based upon critical issues that surface during our contacts with our customers. We hope this does not inconvenience you. If you have a specific topic you are interested and do not want to wait to see if it shows up in our newsletters, call us direct. We do have over 20 gigabytes of information on file on every subject around on water and waste issues.

**COMING IN THE NEXT MONTHS . . . . .**

**Membrane Equipment**