Impact of Nutrient Loading on Industrial Wastewater Pretreatment and Municipal Wastewater Treatment Systems

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• Clean Water Act
• Federal Grants Program
• Sewer Use Ordinances
• Pretreatment Standards
Reasons for Pretreatment

- Protection of Investment
- Protection of Treatment Performance
- Cost Effective Sludge Disposal
Potential Nutrient Standards

- Driven by US EPA action
  - US and Illinois EPA have been sued by various environmental groups
    - P and N lead to algae and bacteria overgrowth, “dead zones,” fish kills, beach closures, loss of recreational and property value, human health risks / drinking water contamination
  - Failure of States to establish numeric standards
  - Mounting pressure
  - Deadlines have expired without resolution
    - States point out that a “one size fits all” standard is almost unachievable and that the Clean Water Act does not assure reductions from non-point sources
• Qualitative Nutrient Standard
  – Based on unnatural growth of algae.
  – Anyone can argue if the standard is met.
  – Most cases have resulted in dischargers and the IEPA giving up and implementing nutrient controls.

• Interim P limit 1.0 mg/l for expansions and new POTWs
• Illinois EPA Standing
  – More concerned about P than N
  – May not push N limits, unless required by US EPA
  – The Agency is proposing a definition of “Cultural Eutrophication” that will trigger treatment limits

“The goal is to affect a state plan to get nutrient reductions from all sources that includes accountability by all.”

www.epa.state.il.us/water/nutrient
Impact on Municipal Plants

• P Removal
  – Biological Treatment Option
    ▪ Is long term cost effective but requires capital improvements
    ▪ Only works in activated sludge plants
    ▪ Can meet some limits some of the time
    ▪ Is best at removing a percentage of influent P
    ▪ Causes a slight increase in sludge production
    ▪ Chemical Feed System backups are required by IEPA

  – Chemical Treatment Option
    ▪ Low capital but high operating costs
    ▪ Is best at removing a percentage of P
    ▪ Causes a much greater increase in sludge production
    ▪ Additional capital costs for higher degree of solids removal may be required
• N Removal
  – Biological removal is the only option
  – Nitrates are generated through the biological digestion of ammonia
  – Complements the Biological Phosphorus Removal process
  – Capital improvements required
    ▪Magnitude depends on existing facilities and the effluent standard
  – Removing more than 2/3 of the N requires a different process that is more expensive to construct and operate
  – Operating costs range from break even to a significant increase
Municipalities MAY decide to limit P and N
The US EPA is pushing for these standards, and if they provide funds they may require pretreatment limits
Right now, Illinois is only looking to implement P limits
Possible Ways of Setting Industrial Pretreatment Requirements

- Some limits are set for maintaining metals limits in sludge
  - P shouldn’t impact sludge disposal
  - N is already a limiting factor but would decrease in sludge so should not be a problem

- Some limits are set at a “typical residential strength” such as BOD$_5$ of 200 mg/l
  - P limits could *possibly* be set in the 3.0 to 5.0 mg/l range
  - Total N limits could *possibly* be set in the 20 to 30 mg/l range
Possible Pretreatment
Standard Details

- Pollutants can have firm limits that cannot be exceeded
  - Typical for metals

- Pollutants can have soft limits that establish fees for higher levels
  - Typical for $\text{BOD}_5$ and TSS
  - Provides flexibility for planning of pretreatment operations
Extra Strength Charges

- In 2007, 11 agencies had industrial extra strength charges up to $10/lb for Total P*
- By 2010, an additional 6 began charging up to $12.90/lb for industrial strength Total P**

*according to the 2008 NACWA Financial Survey
**draft copy of the 2011 NACWA Financing and Management Survey
• Phosphorus
  – Probable use of chemical treatment
  – Biological treatment could be considered if already using an activated sludge process

• Nitrogen
  – Biological treatment will most likely be required
  – Modifications may be needed if you already treat biologically
What You Can Do NOW

• Find out how much Total P and Total N is in your pretreatment effluent

• Keep informed on US EPA and IL EPA developments
  – www.epa.state.il.us/water/nutrient
  – water.epa.gov/scitech/swguidance/standards/criteria/nutrients

• Talk to the community you discharge to and find out what they intend to do
  – Some communities already do some nutrient removal so the new State Standards may not have any impact on pretreatment
  – If the community is considering developing additional pretreatment standards, then get involved with the process
  – Try to get the community to consider standards that allow for exceeding a target at a fee, especially for N