



Newsletter Volume 14  
July 1, 2004

## pH System Design Basics

Should your wastewater stream treatment style be Continuous, Batch, or Continuous-Batch? Should your control mode be Feedforward or Feedback? How you lay out your treatment schematic depends entirely on what you have to work with. That includes the nature of your water and your working environment, of course, but there are other considerations such as your available physical space, the degree of treatment you need, how much design flexibility you want, and not the least, how much money you have available to do the job.

**Continuous Treatment:** With this type of system design, the wastewater is treated during its single pass through the system, between the common collection point and the discharge. This design is the one most commonly used.

**Batch Treatment:** Here, the wastewater flow is collected in a tank or sump, and then usually treated as a fixed volume after it is gathered. Having enough back-up storage capacity is a factor for this kind of application.

**Continuous-Batch Treatment:** As the term implies, this is a combination of the two basic treatment approaches and generally employs two tanks, with one filling while the other is treating and then discharging. With enough surge capability, this can be a nearly fail-safe design.

**Feedforward Control:** This is a pH treatment method where the pH adjustment chemical is injected into the water downstream, or after, the pH sensor. This is the generally preferred style of treatment, which also allows the raw water pH load to be read on the monitor.

**Feedback Control:** This method puts the chemical upstream, or before, the pH sensor. When used with a single control, the monitor reads the treated rather than raw pH. This type of control is often used in close quarters, and is usually most successful for a second or third control point in a system, where a final pH trim adjustment is desired.

To help understand how to apply these basic design elements, here are a couple of examples. The least expensive, and least equipment intensive package, is a single controller and pump combination used in a feedback mode. This is also the system with potentially the most variable treatment results, and is not recommended for treating water with a fluctuating pH. A recorder hooked up to a system like this would show treatment spikes rather than stable results. This same equipment could also be used in a feedforward mode. If the pH is relatively stable, this set-up lets you read the raw pH, but requires a tester to verify the treatment result, and a lockout timer to prevent the accidental overfeeding of chemical.

My favorite system has two controllers and two pumps, with the first pump feeding forward and the second pump feeding back. With this combination, you can virtually eliminate treatment spikes even with a variable pH. The result on a recorder is more like a sine wave. It is the most effective combination for both results and economy. In a more extreme case, adding a third controller and pump can treat pH so completely that you get a nearly flat line on a recorder. It often comes down to a trade-off between money and pressure from the controlling authority, so be sure to get the treatment goal clearly defined.

Batch and Continuous-Batch systems are almost always special application cases. They are used fairly frequently, but in places where treatment space is limited, the volume to be treated is small, a high degree of treatment is called for, the local authorities are especially stringent, or other exceptional circumstances. The best advice might be to gather all the information about your treatment system and requirements that you can, and then consult with a professional who has experience with pH systems.