SPECIAL SECTION

Devising Wastewater Treatment Strategies

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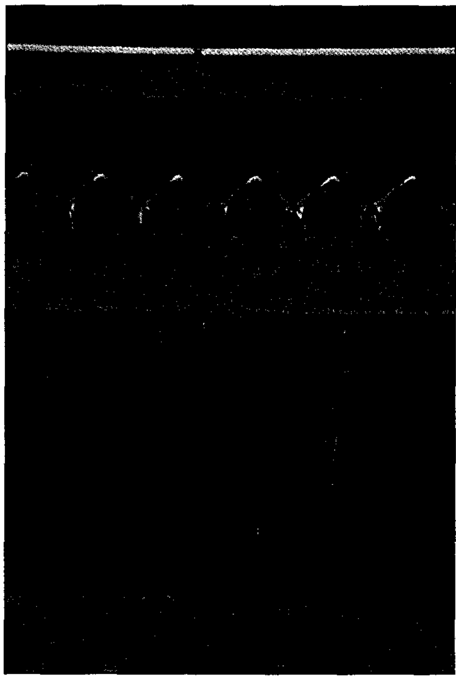

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Troubleshooting a wastewater treatment system need not be a frustrating experience. However, it does take some basic knowledge of how the wastewater treatment process is designed to work, some problem-solving tools and a few resources.

The wastewater treatment process has several integral steps that must be properly controlled within a specific sequential order to produce a quality finished product in a cost-efficient manner. The raw material for the process is polluted wastewater and the finished product is clean water. Typically, the wastewater treatment process contains one or more of three major components: primary, secondary and/or tertiary treatment.

Primary treatment includes those components that are designed to remove solids and oils from the waste stream. This could include bar screens, grit chambers, primary sedimentation tanks (clarifiers), oil/water separators and sludge digestion units (anaerobic or aerobic). When the wastewater stream leaves this treatment area, it is assumed that the wastewater is relatively free of solids and oils.

Secondary treatment is a biological process designed to remove soluble, biodegradable wastes from the water. This is typically composed of two parts. First the soluble wastes are degraded by feeding them to microbes, converting the wastes from a soluble "pollutant" biochemical oxygen demand (BOD) to a solid microbial BOD.

The second phase of treatment involves the removal of the solids by sedimentation in the secondary clarifier where they can be returned to the front end of the aeration basin to "seed" the incoming wastewater from the primary treatment area or moved to a sludge handling unit.

Tertiary wastewater treatment is used after the secondary units to "polish" the effluent wastewater prior to final discharge. This area of the process may include a separate nitrification unit, phosphate removal, further solids removal through sand beds, or even further reduction of recalcitrant organics through an activated carbon system.

Knowing what the process is designed to accomplish, the Seven Steps Program can be employed for troubleshooting:

1. Define the problem and the criteria for success.
2. Develop the situation analysis -survey the system.
3. Define the alternatives.
4. Fine-tune the assessment
5. Define the strategy and recommended program.
6. Implement the program.
7. Follow-up.

Defining the problem always sounds simple; however, the most common pitfall in troubleshooting is focusing on symptoms rather than on the real problem. For example, high ammonia (NH,) emissions that exceed the National Pollution Discharge Elimination System (NPDES) permit is a symptom, not a problem. The problem is that which is causing the ammonia to exceed the NPDES limit.

Next, a survey of the current system provides a benchmark against which troubleshooting success can be measured. Several questions to consider are:

- What is the current situation?
- What facilities and equipment are available?
- What is the current control strategy?
- What data are available?
- What are the results and do they provide the necessary information required for operational control?

lb help answer these questions, a comprehensive survey of the system should be taken. The survey should describe the system and include laboratory analysis. This data then will provide the basis for developing viable alternative solutions.

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Under normal circumstances, several alternatives can be defined as potential solutions to the wastewater treatment problem. Alternatives may include programs such as:

- Improved primary treatment, point source treatment, adjusting operational procedures and control (or operator training);
- Chemical augmentation for pH/alkalinity, polymer addition and antifoams, equipment repair, bioaugmentation;
- Expanding or updating the facility or constructing a new wastewater treatment facility; or
- Do nothing.

Very often operational control is a major issue at this point in the troubleshooting process. Operations control should be guided by a well-defined strategy that then is monitored by chemical and physical analysis coupled with operator experience and judgment. Without basic operational control, realistic alternatives may be very difficult to define.

After all of the alternatives have been defined, the list will need to be assessed for fit with the overall objectives of the corporation or facility (return of investment, availability of capital, manpower availability) and prioritized. The most promising alternatives then can be assessed and tested prior to implementation. Toxicity/inhibition testing, bench scale treatability studies and on-site pilot tests are all examples of methods commonly used to reduce risk in alternative selection. Also, when possible, talk to others who have had to tackle similar problems and take advantage of their experience.

Upon completion of steps 1 through 4, a recommended course of action can be constructed. Does the program fit the corporate/facility objectives? Will it adequately solve the problem defined in the first step? Are personnel available to properly execute the program? Can it be implemented on a timely basis?

Continuous quality improvement requires diligent followup with these questions in mind:

- How is the new program working?
- Does it provide the anticipated results?
- Are further modifications needed?
- How can the program be improved further?

A well-designed troubleshooting program should be comprehensive, thoroughly tested and constantly revisited to maintain a reliable and efficient wastewater treatment system. Such a method includes each of the integral components including biological, human, mechanical and chemical. This total systems approach can result in improved system operation and better bottom line results. (D

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