'If a Package Stinks, It Belongs to Me'

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John Novak, Virginia Tech's Nick Prillaman Professor of Civil and Environmental Engineering, works to identify better processes for the destruction of organic solids and the elimination of disease causing organisms in biosolids. (Virginia Tech Photo)

The county of Los Angeles may not like this distinction, but Virginia Tech environmental engineer John Novak says the sludge from this area of California has the “worst odor of any I have ever tested.” A walk inside his laboratory, sealed-off from other testing facilities on the Virginia Tech campus, produces instant agreement.

“This county can haul its sludge hundreds of miles into the desert, and it still gets complaints,” Novak smiles.

On the East Coast, a $400 million sludge handling system, slated to be built along the Potomac River by the Washington D.C. Water and Sewer

Authority by 2010, may not be able to completely thwart the odor problems if it uses current technology.

Novak, the Nick Prillaman Professor of Civil and Environmental Engineering, is working with both localities, as well as others, to identify better processes for the destruction of organic solids and the elimination of disease causing organisms in biosolids.

Any time a treatment plant works with water or wastewater, sludge is generated. And twice a week, Novak's lab receives two shipments of the processed solids from the sewage. Novak laughingly admits that if "a package stinks, it belongs to me."

"Biosolids management is one of the most important aspects of wastewater treatment because of economic and health and safety issues," Novak says. "The cost of biosolid treatment and hauling is a major expenditure for wastewater treatment utilities. Pathogens and odor problems may restrict the biosolid disposal options and affect hauling costs."

Biosolids applied to land in the form of fertilizer can also impact ground water quality, primarily through nitrogen contamination.

Novak's approach to reduce the volatility of waste and to remove nitrogen from the process differs from some of the previously tried techniques. His work is based in part on some successful treatments of wastewater where a sequential anaerobic and aerobic digestion, called a dual-digestion process, is used.

"Recent studies suggest that some solids in sludge are degraded only during the anaerobic digestion and some only during the aerobic digestion treatments," Novak explains. "Therefore, a dual digestion, using both anaerobic and aerobic treatments would be expected to

provide a reduction in the volatile solids beyond that achieved when using only one of the processes."

His initial studies indicate that his theory is correct. The dual treatment achieved up to a 65 percent volatile solids reduction, compared to 46 and 52 percent when using one of the single anaerobic digestion processes. His studies also showed that more than 50 percent of the nitrogen and 80 percent of the ammonia can be removed from anaerobic effluent after digesting it aerobically.

He reported his findings at the 2006 Residuals and Biosolids Management Conference in Cincinnati, Ohio.

Novak has also investigated the role that two specific metals, iron and aluminum, play in odor coming from sludge treated anaerobically. Working with researchers from Carollo Engineers and CH2M-Hill, they used a centrifuge simulation method developed at Virginia Tech to anaerobically digest a blend of primary and waste activated sludge from 12 different wastewater treatment plants.

Their findings indicated that aluminum reduced the odor potential for sludges that were high in iron.

The Water and Environmental Research Foundation has supported Novak's research on odors from sludges since 2000, As he conducted his studies, the 35-year veteran of water, sludge, solid and hazardous waste treatments, has learned that some new technologies are partially responsible for an increase in odors.

"In recent years, companies started selling sludge dewatering systems that consist of new centrifuges that reduce the amount of water in the process, thus reducing costs," Novak says. However, the odor increases. A $600,000 facility in Charlotte, N.C., with the more recently developed

centrifuge technology is an example of a new plant hearing complaints about its foul aroma.

“The production of odors from sludges is a complex biochemical process,” Novak says. “Odors, primarily from organic sulphur compounds, can be produced from anaerobically digested dewatered sludge cakes, especially when high solids centrifuges are used for dewatering. Even when digestion is effective, centrifugation can generate headspace concentrations of total volatile organic sulphur that are quite high and likely to cause odor problems.”

If odors remain a problem, the dewatering process may need to be changed, Novak asserts.

Source: Virginia Tech