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Construction Engineering Research Laboratory

Fact Sheet

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WASTEWATER TREATMENT PLANT SLUDGE (BIOSOLIDS) MANAGEMENT STRATEGY

The Problem

Effective sludge management can be a difficult task for Army wastewater treatment plant (WWTP) operators. As sludge regulations become more stringent and as more landfills are closed, many Army WWTPs are consequently forced to develop new and more effective sludge management strategies. Over the past 10 years, Publicly Owned Treatment Works (POTW) have significantly improved sludge management strategies. In contrast, many Army WWTP sludge management plants have not changed their antiquated facilities and processes. Army WWTP sludge management system components generally include thickening, stabilization, dewatering/drying, and disposal/beneficial use. Most Army WWTPs digest sludge in anaerobic digesters, dewater the sludge on sand-drying beds, and then dispose of it at landfills. Sand-drying beds often clog with small particles and require long dewatering/drying times. In addition, most of the Army's small, aging WWTPs rarely implement the beneficial reuse of sludge.

The Technology

The best solution for sludge management varies by region, and even by individual WWTP. Key factors affecting the success of good sludge management for a WWTP include, but are not limited to: the regulatory framework and attitude of State and local governments; available technologies and "know-how", economical feasibility and available resources; and public awareness and acceptance. Therefore, sludge management strategies must be developed to match each individual WWTP's unique circumstances.

The four sludge management technologies most promising for Army WWTPs are: (1) wedgewater bed and (2) reed bed systems (for dewatering /drying), (3) composting, and (4) alkaline stabilization (for beneficial use of biosolids):

1. With the wedgewater bed system, the sludge is mixed with polymers, drained through wedge-shaped, 0.25 mm-wide slots, and air-dried. Since the system only needs 2 or 3 days to complete the drying process (compared to several weeks for sand-drying beds), the wedgewater bed can require as little as one-tenth the area of a sand-drying bed.
2. The reed bed system uses a modified sand-drying bed planted with the common reed Phragmites. Under normal weather conditions, the reeds can grow to their full height of 8 ft in 1 year. These reeds help the dewatering process in several ways. The reeds themselves help dewater sludge by evapotranspiration. The microorganisms on the reeds and sludge help to further destruct organics. Dewatering and biological destruction substantially reduce sludge volume so that the sludge can be

stored for 10 years in the reed bed until the stabilized sludge in the reed bed can be "harvested" and reused as a soil amendment.

3. Composting stabilizes sludge to a humus-like soil amendment. Since Army WWTPs are small, constructing in-vessel composting systems may prove costly. However, "windrow" or "aerated static pile" composting methods may be economically feasible for Army use. Furthermore, developing a sludge management strategy with adjacent POTWs can be considered.
4. Since the regulations on the beneficial use of sludge were implemented, many patented alkaline stabilization processes have become commercially available. A drawback to this method is that ammonia gas is often generated in alkaline stabilization. However, the initial investment is affordable for Army WWTPs, and the final product is of an exceptional quality, well suited for direct application to land without many restrictions.

Benefits/Savings

The Army could save substantial operation and maintenance costs, while fully complying with environmental regulations, by adopting appropriate technologies tailored for use at individual WWTPs. Cost savings have been documented at a reed bed demonstration at Fort Campbell, KY and at a "beneficial use of biosolids" demonstration at West Point Military Academy, NY.

Compared to sand-drying beds, reed beds have shown a greater ability to reduce sludge handling, transportation, and disposal costs. Reed beds dispense with the need for manual removal of sludge. The final products of the reed bed process can be used as a soil supplement. Finally, the estimated payback period for the reed bed conversion from sand-drying beds is less than 3 years.

West Point Military Academy currently disposes of sludge at a municipal landfill, which will close within a few years. Based on the U.S. Army Construction Engineering Research Laboratory's (CERL's) recommendations, West Point decided to compost its sludge at Rockland County Solids Waste Management Authority's (RCSWMA's) central composting facility (to be completed in May 1999). The biosolids generated by the process will be reused as a soil amendment for landscaping at the Academy. A cost analysis showed that West Point would be able to save approximately $50K per year—in addition to achieving reliable compliance with environmental laws and regulations.

Status

CERL continues to provide technical assistance to Army and DOD installations in developing sludge management strategies. The CERL-developed strategies have enjoyed a solid record of success. The Fort Campbell reed beds are still in operation. After CERL's 2-year start-up service for West Point's sludge composting at RCSWMA composting facility, West Point will continue the beneficial use of biosolids. In an engineering study, CERL recommended reed bed sludge dewatering at Camp Humphreys WWTP, Eighth U.S. Army in Korea.

More information is available in CERL's Technical Reports (TR) and Engineering Technical Letter (ETL): TR N-92/02, *Performance Evaluation of Existing Wedgewater and Vacuum-Assisted Bed Dewatering System* (January 1992); TR EP-93/109, *An Evaluation of Reed Bed Technology To Dewater Army Wastewater Treatment Plant Sludge*, (September 1993); ETL 1110-3-477, CEMP-ET, *Alternative Sludge Dewatering Techniques for Wastewater Treatment Facilities* (30 April 1996); TR 97/109, *Development of Wastewater Treatment Plant Sludge (Biosolids) Management Strategy–West Point Military Academy, NY* (July 1997); and TR97/143, *Development of a Biosolids Management Strategy for U.S. Forces, Korea Installations* (November 1997).

Point of Contact

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