Water

Wastewater

Client

Upper Occoquan Sewage Authority

Location

Centreville, Virginia, USA

Biosolids Drying System

Project Highlights

- Digested biosolids will be dewatered, pelletized, and sold or distributed locally as a soil amendment
- Chemical sludge will provide a substitute for agricultural lime

Project Description

In March 1996, CH2M HILL completed the design for the 54-mgd expansion of the Upper Occoquan Sewage Authority's (UOSA) WWTP, including new residuals handling facilities.

Prior to the design, CH2M HILL conducted a study on organic solids handling and disposal alternatives. Historically, the anaerobically digested organic solids at UOSA have been processed successfully by the aerated windrow composting method. However, expansion of residential housing in the vicinity of the plant resulted in concern over the potential for odor generation at the composting facility. The apparent cost and complexity of relocating and expanding the windrow composting facility with greatly increased odor-control requirements raised questions regarding the desirability of such an approach to organics solids management.

Six major alternatives for organic solids management were evaluated for this study. For each alternative, the process and the associated solids processing and odor-control measures required for the process were described, a cost opinion of construction and presentworth costs was given, and a discussion of advantages and disadvantages was presented. Following were the alternatives evaluated:

- Land application
- Incineration
- Aerated windrow composting
- Static-pile composting
- In-vessel composting
- Thermal drying

As a result of the evaluation, thermal drying with centrifuge dewatering was selected.

Part of the solids expansion design included the design of a new 30-ton-per-day dewatering and drying facility incorporating two trains of advanced rotary dryers and associated systems. The new dewatering and drying facility includes centrifuge dewatering and direct thermal rotary dryers. The new three-story, 90,584-square-foot building that houses the facility also includes final product conveyance and storage and a central vacuum system.

The dryer trains accept dewatered biosolids from highsolids centrifuges at 25 percent solids and evaporate the water to form a pelletized product with approximately five percent moisture. Prior to entering the dryer, the biosolids are mixed with recycled dry material in an agglomerator to preform the pellets and reduce dust generation.

The dryer trains are each designed for an evaporation rate of 7,200 pounds of water per hour. Normally, only one train will be required for processing biosolids while the second train serves as a standby system. The dryers incorporate a recirculating drying air stream that improves energy efficiency and reduces air emissions. A regenerative thermal oxidizer is provided for elimination of VOC emissions. The facility will include 30 days of storage of pelletized product in silos to provide UOSA with flexibility in managing the product. A dust control system is provided to minimize dust emission into the building and to provide for safe operating conditions. In addition, a nitrogen gas safety system is provided to make bins and silos inert in the event that any material spontaneously heats up. Liquid ring compressors are provided to compress the exhaust from the dryer system to diffuse the CO2-laden exhaust into basins for pH control.

UOSA reclaims and recycles several other resources as well. Methane, an anaerobic digestion by-product, is the primary fuel for the facilities boilers, which heat the plant's digesters and many onsite buildings. Stack gases from the boilers and the activated carbon regeneration furnace are the principal sources of carbon dioxide for recarbonation. UOSA's compost was widely used for turfgrass production by homeowners and commercial landscapers. Chemical solids provide a substitute for agricultural lime. Ammonia removed in the ion exchange system is recovered as ammonium sulfate, a basic ingredient of many agricultural fertilizers.