

WASTEWATER treatment at Walt Disney World in Orlando, Florida is accomplished in a 15-mgd facility operated by Reedy Creek Energy Services (RCES). Commissioned in 1993, the treatment facility consists of four identical process trains. Preceded by eight primary clarifiers, each process train is a series of cascading, continuously stirred tank reactors. Eight secondary clarifiers, deep bed filtration, and disinfection finish the treatment process. Gravity belts and belt filter presses are used for solids processing prior to composting. About 50 wet tons of biosolids are produced per day.

The aerated static pile facility generates compost from biosolids, wood chips and landscape trimmings for use at Disney World.



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Biosolids Compost Utilization At Disney World

Composting restarted at Disney World in 1999 and improved product quality has led to use of the compost by the entertainment park's horticultural operations.

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For the next several years, RCES expanded the composting site to capture all of the biosolids produced at the wastewater treatment facility, and experimented with mixes and processes. Compost remained on-site until needed by a broker, who in turn resold the product to orange growers. In-house research determined that the compost was inadequately cured and contained excessive organic acids and soluble salts phytotoxic to annual plants. As a result of this phytotoxicity, and temporal inconsistency in compost quality, Walt Disney World Horticulture was unwilling to use RCES compost. Instead, the horticulture division elected to purchase compost from an outside vendor for use as a soil amendment in annual plant beds.

Odor emanating from the composting facility in 1998 forced the suspension of operations. Biosolids and food residuals were directed to landfills for disposal. A committee formed to address the issue determined that composting remained the most cost-effective option for biosolids stabilization and management. In addition, the committee wished to develop a maturation process that would produce compost acceptable for horticultural use in the park's annual beds and on turf grass. Walt Disney World Horticulture

could then use all of the compost produced, negating RCES's need to store product until requested by the broker.

New Composting Approach

Composting operations — handling biosolids mixed with wood chips — were reestablished in 1999. Historically, the wood chips were purchased from an outside vendor. Presently, grinding pruned tree limbs and palettes, in combination with chip recovery, produces an adequate volume of wood chips for the mix. Food residuals, the cause of

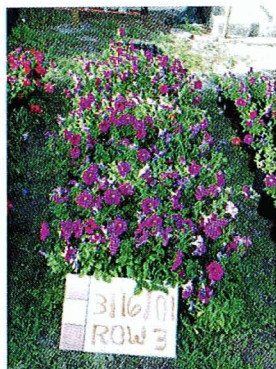
previous odor problems, continued to be directed to a landfill. Stabilization is accomplished using a negatively aerated static pile and biofilter, and takes about 28 days. The mix then is formed into windrows for maturation and the piles are turned once per day with a Scarab windrow turner. Target oxygen and temperature ranges for the maturation windrows are five to 15 percent (ideally eight to 12 percent) and 35° to 60°C respectively. The combination of negatively aerated static piles, a biofilter, and mechanically-aerated maturation windrows was immedi-

ately effective in minimizing odors.

Remaining to be determined was how effective the process was for producing a horticulture-grade end product. The composting facility is capable of producing 15 tons/day of compost, all of which could be used by Walt Disney World Horticulture. Bioassays were identified as the best approach for determining if the revised process was successfully producing high quality compost, and for determining the necessary length of the maturation process. Hence, bioassays were established for both annual plants and turf grass.

Annual Plant Bioassay

Potted petunias (*Petunia hybrida*) were used to conduct the annual plant bioassays. Treatments included a potting soil control, potting soil mixed with vendor compost (in-vessel, biosolids-based), and potting soil mixed with RCES compost. The potting soil is analogous to the typical annual bedding plant/soil mix-



ture used at Walt Disney World and consists of 50 percent peat moss, ten percent green pine bark and 40 percent sand with an average pH of 6.5. Experimental treatments were constructed by applying one inch of compost to the top of each pot and mixing with a hand rake. This approach was intended to mimic application of compost to existing annual plant beds. Each treatment was replicated ten times. The study was repeated for four different age RCES composts — zero, 28, 56 and 84 days after stabilization.


As part of a series of tests to evaluate compost quality, potted petunias were grown in an assortment of soil mixtures.

Individual survival, condition, color (Munsell color chart), size (height by width) and number of blossoms were monitored at the beginning of the experiment and every two weeks thereafter for 12 weeks. In addition, we assessed compost odor before and after mixing with the potting soil.

Plant survival was good throughout the study. Only three plants, one from each treatment, died. In addition, the condition of the petunias was generally good to excellent and was comparable across treatments. Both the RCES compost and the vendor compost produced larger plants and more blossoms than the potting soil. RCES compost matured 56 days produced the greatest number of blossoms. Plants grown in RCES compost aged 84 days were noticeably greener during the first two weeks, but not thereafter. Neither the potting soil or the vendor's compost produced noticeable offensive odors. By itself, the RCES compost had a noticeable and offensive odor if matured zero, 28 or 56 days, but not 84 days. The odor was not noticeable when mixed with potting soil when the compost was matured for 56 or 84 days.

Turf Grass Bioassay

Preliminary studies indicated that RCES compost was not harmful to turf grass. Bioassays were established to determine if the application rate had an effect on response, and if the odor was a prohibitive factor. Three treatments were established on irrigated and nonirrigated



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Bahia grass (*Paspalum notatum*) — a control, 3 kg/m² of turf and 6 kg/m² of turf — five replicates per treatment. The experiment was repeated for compost matured zero, 28, 56 and 84 days after stabilization. General condition was monitored at the beginning of the experiment and every two weeks thereafter for 12 weeks. In addition, we assessed compost odor before and after application to the turf, and during each monitoring event.

Turf condition was largely indistinguishable among treatments for the nonirrigated plots, perhaps in

part because of an extended drought. For the irrigated plots, turf condition was better for those that received compost than for the control plots. There were no apparent differences between the 3 and 6 kg/m² plots. A slightly offensive odor was noticeable for compost matured zero, 28 and 56 days before and after application. The odor persisted for



Turf treatment experiments were conducted with compost matured zero, 28, 56 and 84 days after stabilization.

about one week after application. No offensive odor was detected before or after application for compost matured 84 days.

Conclusions

RCES has significantly reduced biosolids disposal costs by developing an effective in-house composting operation. All of the biosolids produced at the wastewater treatment facility now can be transferred to the composting facility for stabilization and maturation. Moreover, the operation produces horticulture-grade compost. The compost is appropriate for use in planting beds when matured for 56 days, and for application to turf when matured for 84 days. Production of horticulture-grade compost provides RCES with a reliable end user in Walt Disney World Horticulture. Alternatively, RCES is now positioned to sell its product at a price greater than it previously sold immature compost to the broker if production exceeds what the horticulture division needs.

Walt Disney World Horticulture benefits from RCES's compost operation by accessing compost of equal or better value than it previously obtained from outside vendors at a lower cost. Eventually, the compost will be used as a peat substitute when annual plant beds are replaced. Horticulture may achieve additional cost reductions if compost used in planting beds reduces soil replacement rates, watering requirements and fertilizer application. ■

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