ZeeWeed* MBR system for agricultural wastewater in Sardinia
Selco Carni Sarde, Italy

background
Pig slurry treatment and manure handling system for water reuse.

Capacity
- 79,300 GPD (300 m³/d) average flow
- 92,500 (350 m³/d) peak flow

Commissioning Date
December 2004

Location
Isili, Sardinia, Italy

challenge
The decision to implement state-of-the-art treatment technology at Selco Carni Sarde’s new facility in Sardinia was, in part, in response to the increasingly stringent effluent quality regulations introduced by the regional water authority. The plant is being constructed to treat the manure generated from approximately 40,000 hogs.

solution
When completed, the Carni Sarde plant in Sardinia will be the most advanced facility treating zootechnical wastewater in the world within its flow range. Its comprehensive industrial technologies include wastewater treatment for reuse, energy recovery, and production of a high quality compost product.

Selco’s SELCO-ECOpurín* process was first selected to treat pig slurry from the Carni Sarde facility in 2001. This process was developed by Selco MC, a Spanish engineering company specialized in treatment systems for swine manure and other livestock waste products. Engineering design for the plant was undertaken in the first quarter of 2001, and construction was initiated in the second half of 2001.

An integral component of the process is the ZeeWeed MBR [membrane bioreactor] system supplied by SUEZ, which improves the ultimate effluent quality exiting the plant. The ZeeWeed membrane fiber has a nominal pore size of 0.04µm, which provides an absolute barrier to biomass, bacteria and viruses, retaining them in the process tank.

Without the need for chemicals, the ZeeWeed ultrafiltration (UF) membrane can handle extreme variances in feed water, and can operate in high MLSS concentrations of up to 20,000 mg/L.
Solids from the SELCO-ECOpurín process are used for composting, while the majority of treated water from the ZeeWeed MBR process will be re-used as cleaning water for the pig houses. Treated water quality is expected to exceed design values, based on SELCO’s recent experiences with plants using this technology.

**results**

Manure arrives from the farm and enters a pre-concentration unit. The concentrated manure is pumped to an anaerobic digestor (a 2-stage CSTR system), where energy is recovered. Solids from the digested effluent are further separated in the SELCO-ECOpurín process, and are then sent to a composting facility where they are converted to high-quality compost. Liquids are biologically treated (denitrification / nitrification / post-nitrification), then filtered with ZeeWeed UF membranes. Sludge recirculation is controlled with electrovalves and frequency inverters to improve nitrification and denitrification efficiency.

The final treatment stage (following membrane filtration) involves chemical phosphorus removal, but only operates when the treated effluent is sent to the downstream municipal wastewater treatment facility. This ensures that regulated phosphorus levels are met [effluent phosphorus levels are not a problem for water reuse].

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Outlet (design basis)</th>
<th>Outlet (expected)</th>
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</thead>
<tbody>
<tr>
<td>COD (mg/L)</td>
<td>&lt;800</td>
<td>&lt;600</td>
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<tr>
<td>BOD₅ (mg/L)</td>
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<tr>
<td>NH₄⁺ (mg/L)</td>
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<td>TP (mg/L)</td>
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<tr>
<td>TSS (mg/L)</td>
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