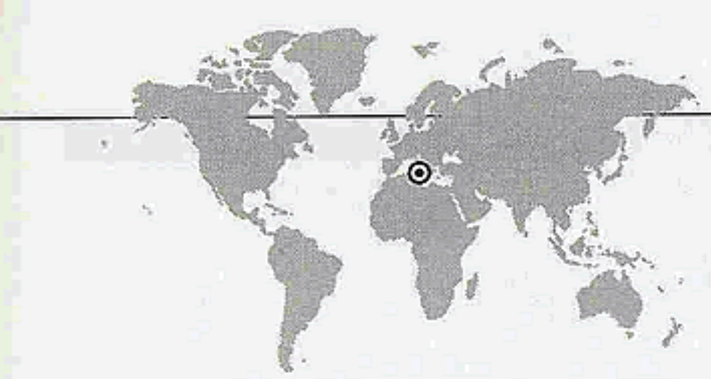

Greece

Treating Liquid Manure At The American Farm School

Experiences in processing effluent from cows, pigs and chickens provide data on alternative methods for controlling odors and sludge accumulation.

David Willis and Nikolas Nikolaidis

TWENTY years ago in 1984, Roland Plocher from Germany launched an environmental management system to maintain the aerobic process in a liquid manure tank or polluted water without introducing oxygen. Instead, he used "catalysts" which could be quartz or calcium carbonate powders in minimal amounts. His approach became known as the Plocher Energy System (PES), and it was tried at a number of sites.

As observed by Dr. Carlo Grunow, the oxygen uptake rate (OUR) of an activated sludge sample treated with PES could be as high as 17 mg/L min compared to 0.6 mg/L min in the untreated portion. The European Union funded a three year testing program on pig manure in Belgium which reported that PES effects on the liquid pig manure were: Reduction of the anaerobic and increase of the aerobic microflora; Significant reduction of smells; Elimination of surface crusts; and Suppression of pathogens through microbial antagonism.

The American Farm School of Thessaloniki, Greece operates a sizeable educational farm with 120 cows, 100 calves, 85 pigs and 16,000 chickens. Animal waste is produced in both solid and liquid form. The liquid animal waste treatment line includes mixing, solids separation, a 20.000 m^3 concrete treatment lagoon and a final 40.000 m^3 earth lagoon. Treated effluent mixed with surface runoff is stored during the wet season in the earth lagoon and used in the summer for crop irrigation. Crops from the Farm School fields are used as food for its animals. In 1996, the Plocher Energy System was selected for the aerobic treatment of the AFS lagoons based on its simplicity, environmental compatibility, material safety, zero energy consumption and lower overall costs.

Main problems of the concrete lagoon were odors and sludge accumulation in the bottom. In the earth lagoon, a surface growth of duckweed (*Lemna* sp.) created problems in the pumping equipment and odors in late summer. Unless harvested, dead plants sink to the bottom and decompose anaerobically.

Concrete And Earth Lagoon

The lagoon has a round shape, an average surface area of 3,500 m^2 and a depth of 6 m. This lagoon besides the liquid animal waste accepts: Secondary treated effluent of the AFS campus sewage; Waste sludge from the AFS sewage treatment plant; Pretreated effluent from the AFS turkey slaughterhouse; and Surface runoff from the AFS barns and campus.

BOD levels in the lagoon before introducing the PES were fluctuating around the year reaching occasionally 1,200 mg/L. The objectives in applying the PES in this lagoon were to: Keep the pollutant levels as low as possible; Keep the lagoon free of odors; and Reduce the sludge accumulation in the lagoon bottom.

Results were quite satisfactory according to AFS staff and the Government regulating authorities. Neighbor's complaints regarding odors were reduced from a high level to a negligible level. Bottom sludge levels were reduced from about 3m depth to a desirable 1 m depth. Monitoring of the pollutant levels in the lagoon showed a significant reduction over time.

The earth lagoon has a rectangular shape, an average surface area of 9.000 m^2 and a depth of 4.5 m. This lagoon is the final stage of the liquid waste treatment process which accepts the supernatant from the concrete lagoon plus rainwater runoff. A pumping station is in place taking treated water for farm field irrigation. The thick mat of duckweed on the surface of this lagoon helped greatly in reducing the organic pollutants in the water. On the other hand, it created operational problems.

The application of PES in the earth lagoon started in 1997 to keep the lagoon free of any surface growth for undisturbed pumping; and to keep the nutrients in the water and return them to the soil (surface water plants consume nutrients in the water). Overall results indicated that the lagoon remains free of any surface growth up to the present.

In average, a total of 60 kg of quartz and calcium carbonate in powder form has been applied to the lagoons on a yearly basis. Its cost was 1,800 EUR ($2,250 U.S.). ■

David Willis, now retired, is former Operations Manager at the American Farm School. Nikolas Nikolaidis M.Eng., is an environmental engineer working with the Plocher Energy System in Greece.

Condition of the last lagoon at the American Farm School Thessaloniki, Greece

Condition July 1997 before PLOCHER treatment

Condition May 1998 after less than 1 year of PLOCHER treatment

Condition June 2005