

## **BIOLOGICAL TREATMENT OF SLUDGE CONTAINING RESIDUES OF EXPLOSIVES AND PHARMACEUTICALS**

Lillemor Gustavsson, Sofie Jönsson and Bert van Bavel  
Örebro University, SE-701 82 Örebro, Sweden

### **ABSTRACT**

Sweden has many wastewater treatment plants that store the process sludge at deposition sites. From the year 2005, there will be restrictions concerning the depositing of any organic waste. This legislation thus calls for the development of new methods or improvement of established techniques for sludge management. This study describes established methods for sludge treatment, degradation of the sludge under different oxygen concentrations, and toxicity of recalcitrant nitro-substituted compounds and their degradation products.

We have examined the sludge produced in a wastewater treatment facility at Cambrex AB, Karlskoga. This facility receives wastewater from a pharmaceutical and an ammunition plant. The sludge contains large amounts of nitro-substituted compounds, which are cytotoxic, mutagenic, and even carcinogenic.

The aim of the study was to use aerobic composting, anaerobic digestion, and constructed wetlands to follow the degradation of nitrosubstituted compounds and changes in toxicity during treatment. The sludge is examined before and after treatment with both chemical analyses and bioassays.

Chemical analysis such as HPLC and GC shows that the concentration of some substances decrease while others increase during the treatment. RDX and HMX were degraded below their detection limits, and all TNT and DNT isomers were reduced during both anaerobic and aerobic treatment. The toxicity tests showed different results depending on which test and species were at hand, and between different treatments. The toxicity tests applied in the study were Microtox, dioxin-like activity, and growth of plants.

In the future, the above-mentioned three biological treatment methods will be evaluated and compared according to degradation and mineralisation potential, and to possible detoxification to find the most suitable method for this particular sludge.