Biosol

Remediation of TNT-contaminated soils by using Biosol and compost

In co-operation with :
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State of the art for remediation of TNT-polluted soils is a treatment of the contaminated soil with compost under anaerobic conditions. Under those conditions, the TNT will form complexes, which adsorb to the humus matrix. Thus they become bound and no longer toxic to the environment.

The use of Biosol in addition of compost has successfully been demonstrated in a study in co-operation with DEC (DEME Environmental Contractors) and OVAM (Openbare Vlaamse Afvalstoffenmaatschappij). 13C-analysis showed that the use of Biosol resulted in the formation of a specific type of complex, more precisely the Meisenheimer complex, which is very stable and able to bind the TNT-molecules irreversible to the humus matrix.

The test was carried out on aliquots of 100 ton. Three treatments were tested : (a) the control, without any additives; (b) state of the art, which contained 20% of compost and (c) addition of 2% Biosol and 20% compost. The anaerobic period of treatment was 8 weeks. This anaerobic phase was followed by an aerobic phase of three weeks and finally the soils were seeded with Italian ryegrass. During this period, the concentration of total TNT and the water extractable fraction TNT were monitored, together with several physico-chemical parameters. Afterwards, an ecotoxicological study was carried out.

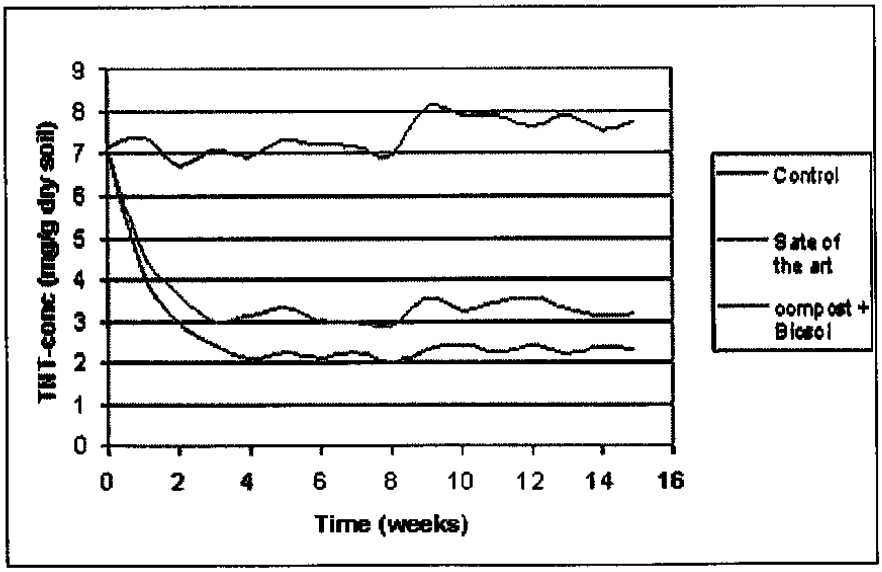

Figure 1. Evolution of the total amount of TNT during 16 weeks of treatment for (a) untreated soil; (b) state of the art treatment and (c) addition of 2% Biosol to state of the art.

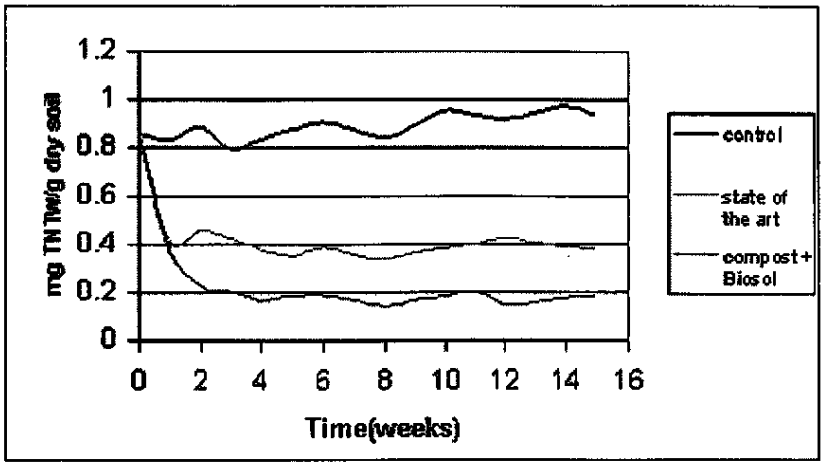

Figure 2. Evolution of the water extractable amount of TNT during 16 weeks of treatment for (a) untreated soil; (b) state of the art treatment and (c) addition of 2% Biosol to state of the art.

Conclusions of the study :
(1) The state of the art i.e. application of compost, resulted in a decrease of 59% and 60% for respectively the total amount of TNT and the water extractable amount of TNT. The final concentrations were respectively (2,893 ± 0,683) and (0,342 ± 0,071) mg TNT/g dry soil.
(2) Application of compost supplemented with 2% Biosol resulted in a decrease of 72% and 83% for respectively the total amount of TNT and the water extractable amount of TNT. The final concentrations were respectively (2,011 ± 0,519) and (0,144 ± 0,034) mg TNT/g dry soil.
(3) Ecotoxicological tests showed that Italian ryegrass was able to grow on the treated soil and that the microbial activity of the soil organisms, inclusive earth worms, was restored.
(4) The overall stability of the soil was improved.

The full report of this study will be available on the website of OVAM (www.ovam.be).