Microbial Degradation of Explosives in a Bioreactor - a research project

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BIOREX

- Biological Remediation of Explosives
Research at the Department of Public Technology

- Energy Management & Load Control
- Process & Sensor Development
- Process Efficiency Improvement
- Sustainable Management & Communication
Objectives with BIOREX

- Develop a method for microbial degradation of explosives
- Remediate sludge and soil contaminated with explosives
- Characterization of the degradation process
Project partners

• Mälardalen University
• Nammo Demil Division
• Cesium Innovation Company
• Eurencos Bofors
• Bofors Test Center
• Swedish Defense Research Agency
• KCEM (Competence Centre for Energetic Material)
Explosives in Sweden

- Demilitarization
- Ammunition factories
- Explosives factories
- Testing sites
- Closed down military sites
- Mining industries
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Contaminated
- Soil
- Water
- Waste (e.g. sludge)
Nammo Demil Division

Incoming material 10,000 tons

Recycling ~ 95%

Explosives

Metals

Plastic Wood etc.

Sludge
• 80% TNT
• Organic material
• Metals

TNT sludge
Explosives are toxic

• Microorganisms
• Plants
• Animals
• Humans
TNT (Trinitrotoluene)
TNT (Trinitrotoluene)
RDX and HMX
RDX and HMX

Chemical structures of RDX and HMX are shown in the image.
The large-scale bioreactor

- Mobile
- On-site
- Cost-effective
- Simple to operate
Project idea

TNT sludge

Bacterial culture
Substrate

Bioslurry

Organic material
Water
CO₂
A laboratory bioreactor
Promising results

Experiment 1

Experiment 2
Future plans

• Use the bioreactor for degradation of other pollutants (oil, petrol, creosote etc.)
• Using filter techniques for treatment of polluted water (explosives, metals etc.)
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