Xcelbio enhanced bioremediation of Coke Oven PAH contaminated soils.

Summary

150,000 cubic meters of PAH contaminated soil from a decommissioned steel factory coke oven effluent lagoon have been successfully bio-remediated in situ utilising Xcelbio rapidly to below target levels.

Over many years tar containing effluent from a coke oven and byproducts plant were directed via holding lagoons. The tars settled out resulting in accumulation in the sediments at the bottom of the lagoon. After decommissioning and drying out of the lagoon various options were considered to safely eliminate the environmental hazard including incineration, removal to hazardous landfill and bio-remediation. Cost studies indicated that bioremediation followed by stabilisation of inorganics and establishment of vegetation was by far the cheapest option.

Earlier tests had shown that Xcelbio was effective in breaking down gelatinous sludge from the bottom of the lagoon and was included in the bioremediation protocol to ensure effective breakdown of the contaminants.

Coke Oven Tar

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Introduction.

Coke oven effluent contains significant amounts of polycyclic aromatic hydrocarbons (PAH's) along with more soluble components such as cyanide, phenols and ammonia. For many years the effluent from this steel factory's coke and byproducts plant was discharged into a maturation lagoon, prior to recycle for process needs elsewhere on site. The insoluble PAH containing tars settled out and built up at the bottom of the lagoon. Very little biodegradation took place in the bottom sludges and the organics accumulated over the years. After dewatering extensive areas appeared as tar pools

Changes in environmental policy and concern over accumulated priority pollutants resulted in the effluent handling process being changed and the lagoon being decommissioned. Disposal/ destruction of the settled sludge and contaminated soil became a priority and various methods were investigated. 150,000 cubic meters of sludge and soil was identified for clean-up.

Bioremediation in situ was by far the most cost effective option. Landfill was not a valid option because of the limited capacity of available hazardous material facilities to absorb the amount of PAH contamination in a reasonable period of time. (The disposal of PAH's to landfills is restricted according to carrying capacity).

Before

After

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MIXING WINDROWS BY MACHINE DISPENCING XCELBIO

Before Xcelbio Treatment

Methodology

Composite samples of the prepared windrows were taken by taking core samples from each side along the length of the windrows. The cores were blended and samples submitted for analysis of EPA PAH priority pollutants known to be present in coke oven effluent. The EPA has identified 32 PAH compounds as priority pollutants which are, or may be toxic or carcinogenic.

At the time 25 litres of Xcelbio at an 8% solution with 0.05% surfactant was sprayed per cubic meter of soil. The windrows were turned periodically (circa four to six weekly) and additional applications of Xcelbio at an 8% solution with 0.05% surfactant were made at 25 litres per cubic meter of soil.

After four to six months there was no visible tarry material in the windrows and analysis showed that priority PAH pollutants had been reduced in volume by at least 95%. PAH's eliminated to less than 0.05% of original volumes were Benzo(a)anthracene, Flouranthene and Phenanthrene, whilst the lowest remaining volume percentage of a PAH was Benzo(pyrene) at 11.3%.

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