



Rhodes Remediation Projects

Direct Thermal Desorption (DTD)

Plant Stack Emission Testing

Direct thermal desorption (DTD) is being used on the former Allied Feeds site to remove industrial contaminants found in the soil. DTD is also being used to treat contaminated soil from the former Lednez/Union Carbide site, situated next door, and sediment from Homebush Bay. Once remediated, both land sites will be suitable for residential use.

Soil fed into the on-site DTD plants is directly heated in a rotary drum to desorb, or separate, the contaminants from it. The contaminant gas stream is then heated at higher temperatures to convert it into carbon dioxide and water. Treatment of the associated vapour stream prevents contaminants from reforming before it is released to the atmosphere. Regular emissions testing measures minor amounts of particulate, gases or residues which may remain. After DTD processing, the soil can be reinstated on site.

The soil and sediment is primarily contaminated with organochlorine compounds including chlorobenzenes, chlorophenols, organochlorine pesticides and dioxins/furans. There is also contamination from petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Although all of these contaminants can be hazardous, dioxin is the principal contaminant of concern. After treatment by DTD, dioxin levels in the soil can be reduced to less than one part per billion.

Dust and emissions from contaminated soil excavations constitute the greatest air emission risks during soil remediation projects. Stack emissions from DTD plants generally constitute less than 1% of risks. The DTD plants emit gases resulting from the combustion of natural gas as well as traces of chemical residues in their steam plumes. The emissions are regularly tested to ensure that they meet licence criteria set by the NSW Department of Environment and Climate Change (DECC). These criteria are based on internationally recognised standards and are conservatively set to safeguard community health (see Table 1 below).



Table 1	
Stack Emission Parameter	DECC Limit/Criteria*
Total Particulates (mg/m ³)	25
Total Fluoride (mg/m ³)	45
Sulphuric Acid Mist (mg/m ³)	90
Volatile Organic Compounds (ppm)	9
Nitrogen Dioxide (mg/m ³)	450
Carbon Monoxide (ppm)	90
Hazardous Substances ¹ (mg/m ³)	0.5
Cadmium (mg/m ³)	0.1
Mercury (mg/m ³)	0.1
Hydrogen Chloride (mg/m ³)	90
Chlorine (mg/m ³)	180
Dioxins and Furans ² (ng/m ³)	0.1

* Concentration at 11% Oxygen

¹ Hazardous Substances: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Manganese, Mercury, Nickel, Selenium, Tin, Vanadium.

² Dioxins and Furans reported at WHO₀₅ – TEQ, dry, 273K, 101.3 kPa.

Stack Emission Testing during the Commissioning/'Proof of Performance' Phase

During the commissioning of a DTD plant, before fully licensed operations commence, a series of tests are conducted on the plant. These tests are designed to demonstrate to the government regulator, the DECC, the performance of the DTD system for decontaminating soil and controlling air emissions.



Sequential tests at different soil treatment temperatures (eg. 400°C, 425°C, 450°C etc.) determine the DTD plant's *optimal* treatment temperature. Tests with increasing, or worst case, feed material contaminant concentrations (average, high and maximum) demonstrate compliance with the stack emission criteria. The stack gases are tested during this phase for the full suite of emission parameters presented in Table 1.

As long as the DTD plant operates at its optimal temperature and there is no accumulation of residual contaminants inside the plant, stack emissions should remain below the set limits. If pressures, temperatures or flows fall outside a predetermined range, an alarm is activated, alerting the operator to the situation. Corrective action must be undertaken or the plant's soil feed stops automatically. The operator is not able to recommence feeding soil to the plant until the conditions which caused the problem have been corrected.

Stack Emission Testing during Fully Licensed Operations

Once the DECC is satisfied that the DTD plant is operating correctly and it will comply with their air emission criteria, a licence to commence full operations is granted. During this phase, stack emission testing continues and results are reported to the DECC each month.

Certain emission parameters such as nitrogen oxides, carbon monoxide, carbon dioxide and oxygen can be monitored continuously. Other emission parameters must be monitored periodically, with an external stack testing consultant taking the samples, and the samples analysed later at a laboratory.

In the event that one stack emission parameter exceeds its limit, the DTD plant will cease operations and a corrective plan will be formulated. The plan must be approved by the DECC before being implemented.

Thiess Services contracts an independent environmental consultancy with significant experience in stack emission sampling procedures to undertake its monitoring program. Samples are analysed at NATA-accredited laboratories.

Test results from the program are provided on this website.