

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Thermal Desorption Process

Developed by Nelson Environmental Remediation Ltd.
Acheson, Alberta, Canada

Registration: **GPS-ETV_VR2019-08-31**

In accordance with

ISO 14034:2016

**Environmental Management —
Environmental Technology Verification (ETV)**



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August 31, 2019
Vancouver, BC, Canada



Verification Body
GLOBE Performance Solutions
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Performance claim(s)

Nelson Environmental Remediation Ltd.'s Thermal Desorption Process, when operated in accordance with the vendor's specifications and with performance testing and reprocessing as components of the permitted operation, will remediate petroleum hydrocarbon contaminated soil. The processed soil has residual levels of hydrocarbons that meet CCME Tier I Guidelines¹ for surface soil for all land use applications.

During operations, the atmospheric emissions meet the CCME Guidelines² for release of dioxins and furans. The emissions also meet

CCME Guidelines³ for mercury content when the mercury content of the untreated feed is less than 0.6 mg/kg.

1. Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Endorsed by CCME 2001.

2. Canadian Council of Ministers of the Environment, Canada-Wide Standards for Dioxins and Furans, Endorsed by CCME 2001.

3. Canadian Council of Ministers of the Environment, Canada-Wide Standards for Mercury Emissions, Endorsed by CCME 2000.

Performance conditions

An Operating Permit specifies procedures that are likely to achieve desired results in a safe and predictable manner. It outlines design considerations such as process feed capacity, processing time, temperature in secondary chamber and minimum gas retention time for gas in the secondary chamber. The operating conditions include the feed that may be processed, the requirement that processing be restricted to hydrocarbon contaminated waste, maximum halogenated organic content (halogenated aromatic compounds are not to be incinerated), maximum sulphur content of feed and maximum mercury content of feed. The guidelines for emissions during operation include the minimum temperatures achieved, maximum concentration of gas particulates, maximum visible emissions (opacity) and maximum carbon dioxide emissions. The permit also specifies a continuous measurement and recording procedure to accompany operation and guidelines for the commissioning of the system. The operator of the Thermal Desorption Process adopts these operating conditions and applies them as part of the process.

The technology achieves the goals of governing standards and guidelines. Three standards apply:

1. Alberta operating permit (as described above)
2. CCME guidelines for mobile incinerators - focusing on atmospheric emissions
3. Canada Wide Standards for Petroleum Hydrocarbons in Soil (adopted by CCME in 2001) - focuses on allowed hydrocarbon content of solid waste. These are dependent on the type of soil, site conditions and expected use.

Technology description and application

Nelson Environmental Remediation Ltd. operates a thermal desorption unit to remediate soil contaminated by petroleum hydrocarbons.

Contaminated soil is loaded into a screening device which feeds soil over a weigh scale and into the rotary desorber. This scale provides soil feed rates and tonnage to the unit's control room. Volatile organic compounds and moisture in the soil are vaporized by heat supplied from a direct-firing burner. Soil temperatures can reach as high as 650°C (1200°F) during this stage. The heated and now clean soil is then fed through the auger quench system where a multiple nozzle water spray system cools and rehydrates the clean soil as it exits the system. The gases then flow through a bag house filtration system, capturing dust particulate and reintroducing it to the rotary kiln. The remaining gases flow into a thermal oxidizer where total destruction occurs at temperatures over 870°C (1600°F). Treated Off-Gases include nitrogen, water vapor, oxygen and carbon dioxide.

Verification

This verification was first completed in March 2004 and has been considered valid for subsequent renewal periods every three (3) years thereafter. The original verification was completed by Komex International Limited (Calgary, Alberta) using the Canadian ETV Program's General Verification Protocol (March 2000). The verification was based on the following data and information provided by Nelson Environmental Remediation Ltd. to support the performance claim:

1. Results of a detailed performance appraisal conducted by Saskatchewan Research Council in 1994-95 near Kindersley, Saskatchewan
2. Performance control test results from clean up of hydrocarbon contaminated soil at two sites in Alberta.
3. Performance control tests from processing hydrocarbon contaminated soil at five representative sites (4 in Alberta and 1 in Saskatchewan)

The ETV renewal of this verification is issued by GLOBE Performance Solutions and is considered to meet the equivalency of an ETV verification completed using the International Standard **ISO 14034:2016 Environmental management – Environmental technology verification (ETV)**.

What is ISO 14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV) and was developed and published by the International Organization for Standardization (ISO). The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Thermal Desorption Process please contact:

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Limitation of verification - Registration: GPS-ETV_VR2019-08-31

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