Heat-desorption System of Oil-contaminated Soil and Gravel by Indirect Irradiation of Microwave

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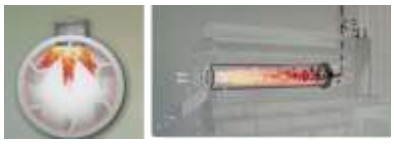
[Railroad Site]

[Oil manufacturing(drilling) facilities]

[Oil storage facilities]

[Former military base]



[Existing heat-desorption technology (Direct irradiation)]

[Heat-desorption technology of Microwave (Indirect irradiation)]

Background of Technology Development

- In many regions of Korea, oil-related soil pollution is emerging as an important environmental problem due to aging oil storage facilities and leakage of transportation pipes, and as a solution, demand for thermal desorption technology, which shows high purification efficiency, is gradually increasing.
- This technology can be used not only to clean up railway sites contaminated by oil or organic matter, but also to clean up contaminated soil in transportation-related facility areas, waste landfills, oil manufacturing and storage facilities, mines, industrial complexes, and military units.

Technology Overview

- Soil and ballast contaminated with various oils and organic waste are purified using indirect heating microwave desorption technology.

Technology Realization

- Heat-desorption Technology by Indirect Irradiation of Microwave

- This technology is a technology that purifies adsorbed pollutants using volatilization and desorption methods by heating oil-contaminated soil and ballast (600 to 700° C) using the principle of heating food in a microwave oven.
- By constructing a microwave absorption heating element on the outer surface of the inner cylinder and irradiating microwaves to the microwave absorption heating element, contaminated soils and ballast in the inner cylinder are thermally desorbed.

Characteristics of the Technology Developed

The limitation of existing technologies

- The disadvantage of the existing burner heating type
  - The risk of explosion or/and fire due to direct contact (direct fire method) between oil and organic matter in contaminated soil and heat sources.
  - Energy costs are high and economic feasibility is low because of the use of fossil fuels.
  - Inefficient purification treatment due to uneven temperature distribution in the rotary furnace
  - Secondary pollutants are generated because emissions are generated by the use of fossil fuels.
  - Stability and economic problems during high temperature treatment (scale of inner wall, condensation, soot, etc.)

▼

Characteristics of the technology developed

- It is possible to adjust the residence time in the equipment of oil, organic contaminated soil and ballast.
- Safe operation is possible because direct contact between oil, organic matter, and heat sources is fundamentally blocked during purification.
- Because electricity is used as an energy source, it is eco-friendly, and the capacity of the rear part of purification facility can be reduced compared to the existing one.

Technology Readiness Level

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Basic principles and experiment	Technology concept formulated	Experimental proof of concept	Component and/or system validation in lab	Performance test of trial manufactured goods	Performance test of pilot-level prototype	Reliability evaluation of pilot-level prototype	Certification and standardization of prototype	Commercialization

※ TRL 7 : Reliability evaluation of pilot-level prototype

Application Fields of Technology

Purification of oil-contaminated soil and ballast at railroad sites, and other contaminated soil sites and facilities.

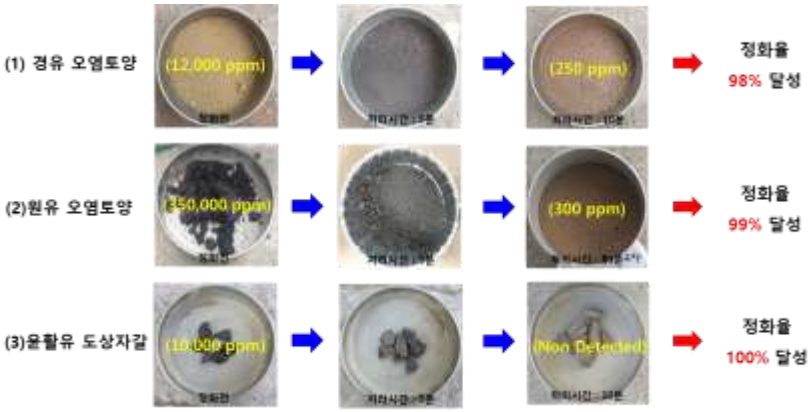
Main Drawings and Photos (Indirect Irradiation Type Heat-desorption System of Microwave)

[Lab-scale]

[Pilot-scale]

[Real-scale element]

[Real-scale]



Current State of Intellectual Property Rights

No	Patent Name	Date of Application	Patent No
1	Thermal desorption system and method for oil-contaminated soil and gravel using microwave indirect irradiation	2018-02-06	US 10,518,303 B2
2	Heat-desorption system of oil-contaminated soil and gravel by indirect irradiation of microwave with prevention device of microwave release and pre-heating device of contaminated soil and gravel using waste heat and heat-desorption method using the same	2017-02-20	10-1820112
3	Heat-desorption system of contaminated soil and gravel by indirect irradiation of microwave and heat-desorption method of contaminated soil and gravel using the same	2015-05-18	10-1678593
4	Heat-desorption system of contaminated soil and gravel by indirect irradiation of microwave and heat-desorption method of contaminated soil and gravel using the same	2015-05-18	10-1727197
5	Heat-desorption system of oil-contaminated soil by direct irradiation of microwave and heat-desorption method using the same	2015-01-27	10-1608020