NJECTIS
In situ soil remediation

Small machine for small biological in situ treatment

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Context

This remediation project takes place as part of the sale of a former service station in Wallonia. The site is affected by a typical petroleum hydrocarbon contamination, (diesel + gasoline with BTEX compounds). Soil concentrations reach up to 1.500 mg/kg dry matter for TPH (C5–C16), and 20 mg/kg for benzene, xylenes, and ethylbenzene. Groundwater, located at approximately 2 m-bgl, shows TPH levels around 5.000 µg/L. The contamination extends over roughly 100 m², mainly beneath the building, which has a basement accessible only by stairs and with a ceiling height of 2 m. Due to the sealed nature of the dispenser area, direct injections in that zone are not possible. Therefore, the treatment strategy will rely on targeted injections carried out from the basement with our **SPIN® manual technology** aiming to cover the entire impacted zone from below.

Reaction

Although petroleum hydrocarbons are treated using the oxidation pathway, and often the chemical oxidation (ISCO), but this method presents significant risks in this case. Injecting chemical oxidants near underground structures—such as tanks and pipelines, often metallic in older stations—could damage them and potentially worsen the contamination. Instead, the presence of BTEX in the subsurface offers a natural advantage: these compounds serve as readily available carbon sources for native soil bacteria, which can initiate biodegradation. This biological activity rapidly consumes available oxygen through aerobic respiration, quickly shifting conditions toward anaerobic Sulfate-reducing conditions, which are favorable for further biodegradation. Given these factors, the selected remediation strategy is to support the site's natural attenuation capacity by enhancing **anaerobic biological oxidation** (ABO).

In ISCO treatment, chemical reaction and hence physical contact is the key parameter to guarantee successful remediation results. In addition to using the SPIN® Injection Technology, the remediation company opted for electrical tomography measurements to verify the quality of the reagent distribution.

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Reagent

A commonly used reagent that combines chemical and biological treatment mechanisms is sodium persulfate. As a strong oxidant, it initiates a chemical oxidation (ISCO) process that breaks down hydrocarbons, while simultaneously releasing sulfates into the subsurface. These sulfate ions serve as electron acceptors for sulfate-reducing bacteria in anaerobic conditions. These bacteria can then biologically degrade hydrocarbons through anaerobic oxidation. This dual action makes sodium persulfate a preferred reagent for many petroleum hydrocarbon remediation projects.

However, due to the risk of oxidant-induced corrosion near underground infrastructure (e.g., metallic tanks and pipes), a soft alternative approach was chosen for this project. Instead of using an oxidant, **magnesium sulfate** was selected. This compound is not an oxidant but a salt that effectively stimulates sulfate-reducing bacteria, enhancing the anaerobic biodegradation of hydrocarbons. It offers a safe, cost-effective, and efficient biological alternative, particularly well-suited for sensitive or confined site conditions like those encountered here.

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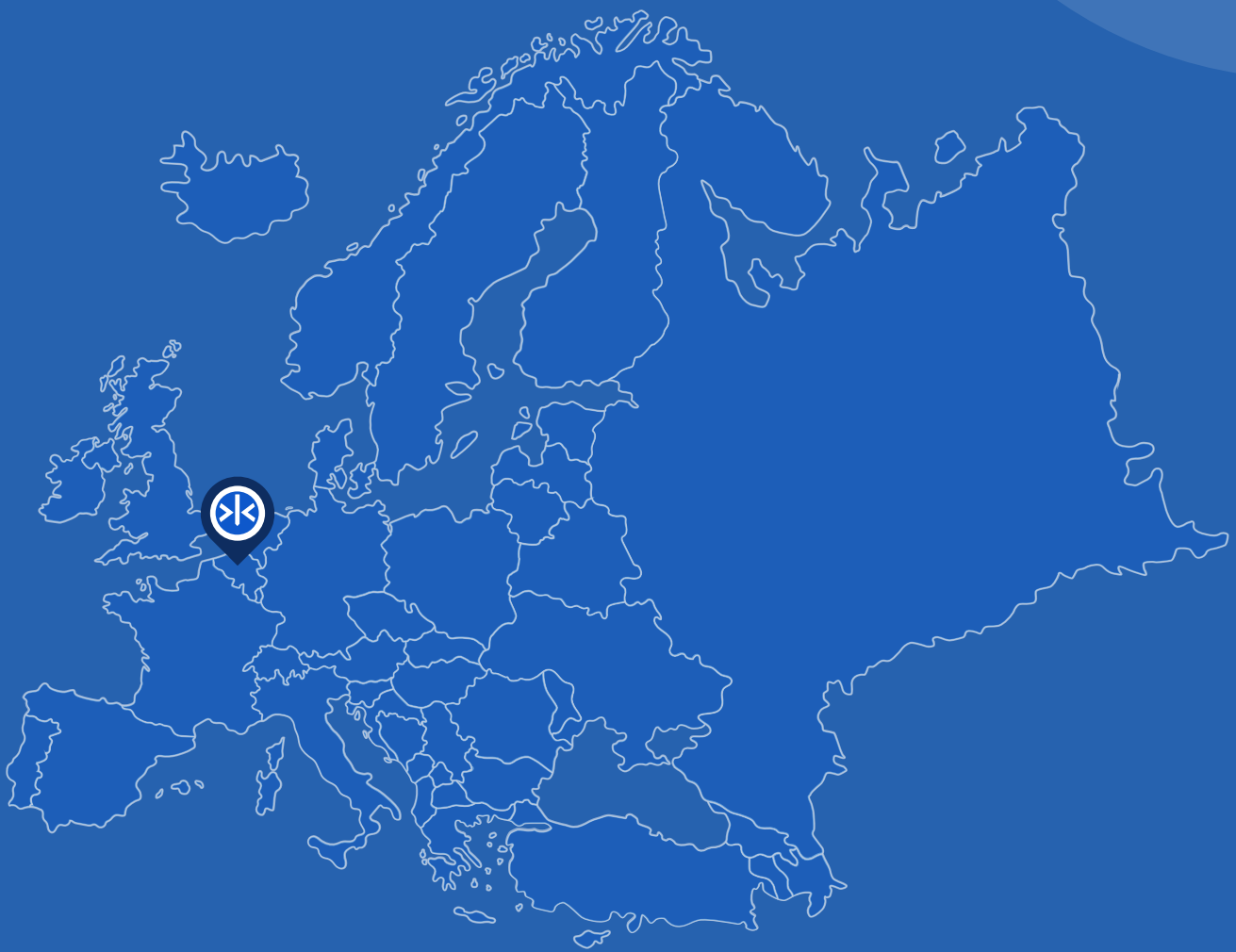
Location:	Wallonia, Belgium
Geology:	red silt
Pollutant(s):	HCT C5-C16 (5.000 µg/l) and BTEX (Σ : 250 µg/l). HCT : 2.500 mg.kg.ms
Reaction:	Anaerobic Biological Oxidation (ABO)
Reagent(s):	Magnesium sulfate
Application type:	Grid application
Surface/length:	100 m^2
Number of points:	6
Depth interval:	2,5 – 5,0 m-bgl
Dosage:	100 l/m

Injectis, your specialist partner for in situ soil remediation

Innovative techniques for cleaning and restoring contaminated soil in its original location.



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