

In Situ Thermal Soil Remediation

– A matter of clean soil



KRÜGER  VEOLIA

Proven high remediation efficiency: Concentration reductions of >99.9 %

References

We have a perfect track record on our projects, meeting clean up goals within time and budget. Case studies can be provided for a lot of different chemicals, geological and infrastructural settings.

Costs

Costs are of course relative and do depend on objects like contaminants, infrastructure, deadlines etc. ISTR is actually often cheaper than excavation followed by landfilling.

Duration

A thermal project is often concluded within a year after signing contract, and the period of heating is typically between three to six months.

What we do

Krüger's Soil Remediation department has worked with soil investigation and remediation for more than 30 years. Since 2006, we have been working focused on In Situ Thermal Remediation (ISTR), employing primarily the heating technologies known as Thermal Conductive Heating (TCH) and Steam Enhanced Extraction (SEE). We do not sell equipment or plants. We sell a service – a clean site.

How it works

By heating the subsurface, we can evaporate the contaminants and make them accessible for extraction even when located in extremely tight formations like clay or rock. Some contaminants destruct in the subsurface by reactions like hydrolysis, pyrolysis, oxidation etc. Target temperatures depend on contaminants and clean up goals. We distinguish between the easy to moderate contaminants that are treated at the boiling point of water, and the harder to treat contaminants that have to be heated to temperatures above the boiling point of water. Only a fraction of the pore water is boiled off, when sites are treated at the boiling point of water. The high temperature approach dries out the site.

What can be treated?

Basically all organic compounds can be either destroyed or vaporized and removed using subsurface heating technologies. It all depends on temperatures.

Easy	Moderate	Harder
Gasoline	Diesel	PCB
Benzene	Naphtalene	Dioxin
Vinyl Chloride	MonoChloroBenzene	Mercury
TCE	DiChloroBenzene	Creosote
DCE	PAH	PFAS
PCE		PAH

Heating technologies

We have chosen to work with two heating technologies that individually are very strong in its own field and in combination really make the most robust and predictable approach.

Steam injection (SEE): Requires the subsurface to be permeable in order to inject the steam - so typically gravel and sand. It is the cheapest of the heating technologies. It is limited to the boiling point of water and hence the treatment of volatile compounds.

Thermal conductive heating (TCH): Heats the subsurface by introducing a temperature gradient. The heat is spread primarily by thermal conduction which only varies a factor 3 – 5, thus ensuring the most uniform heating in all types of geologies from sand, clay to rock. This technology can treat almost any kind of organic compounds. We have experiences ranging from chlorinated solvents, chloro-benzenes, oil, PCP, PCB, Dioxin and Mercury.

When to use & sweet spots

Cleaning contaminated sites today is either done by excavation or by In Situ Remediation Technologies. ISTR is only one of the In Situ technologies and is primarily used when stringent cleanup levels or timeframes disqualify the other technologies. Moreover ISTR is often used when excavation is difficult or expensive. Most traditional In Situ remediations are going on for many years, and therefore ISTR may be the sustainable and cost-effective choice because it does reach the cleanup criteria within a short time frame (months).

A typical situation where ISTR is applicable is when contamination is deeply spread, below buildings or where a lot of mass is present as free phase product. Using ISTR it is possible to remove the contaminants without getting in any kind of contact with it which is often preferable.

Together we are stronger

We are happy to look at your options. With fairly few information, we are able to provide a conceptual design and cost estimate for the thermal remedy. We are also able to work with you in a broader perspective on the contaminated soil and groundwater approach, and are happy to help your team to develop a more comprehensive solution.



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