

**TERRECO: YOUR CHOICE FOR ASSURANCE AND QUALITY**

**Leaders in soil remediation**

*Over the last few years, a number of organisations have witnessed the effectiveness of Terreco's in-situ remediation technology. Using PuriSoil® technology, a large number of small and large soil remediation projects have been successfully carried out within a relatively short period and in an economically justifiable manner. Clients know that their production process will not be interrupted, and that they will be able to continue operating during the remediation process. This cutting-edge technology is not however the only reason why clients choose Terreco.*

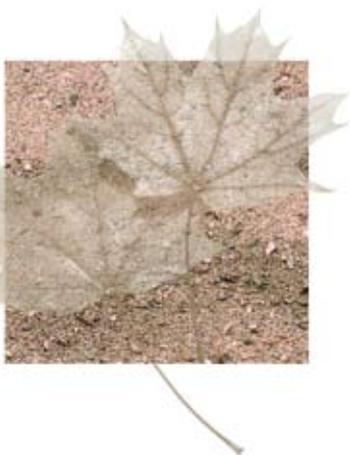


**Flexible organisation**

The technology developed by Terreco may be used in a variety of ways, which ensures an effective soil remediation solution. This success is partially a result of Terreco's short line horizontal organisational structure, guaranteeing greater flexibility. Clients are assured that every project has a clearly outlined project roadmap, as well as one permanent point of contact. Other assets include the fact that we always honour our agreements and pricing. Clear targets are determined for all soil remediation projects, including a fixed budget. This provides clients with a fixed price and result guarantee.

**Knowledge and experience**

Soil remediation is a knowledge-intensive field. Terreco specialists all have academic degrees in a technical (environmental) domain, or have completed higher vocational education (bachelor's degree), supplemented by extensive experience in the chemical, petrochemical or environmental engineering sector. The company was formed by the Research & Development department (section: Environment, Safety and Health) of DSM, a global science-based company active in health, nutrition and materials. In the nineties, the Terreco founders initiated technological development enabling safe and effective soil remediation. PuriSoil® does not disrupt a site's daily operations. Terreco has also built up an excellent safety, health and environmental service record. This reputation has led to a large number of international assignments for (petro)chemical companies, industry, governments and SMEs.



**Leading through innovation**

Terreco has a high performance laboratory that conducts feasibility studies for the application of remediation technology. These facilities and the company's technological expertise enable the elaboration of a suitable contamination project in complex situations, which sometimes incorporate extraordinary "out-of-the-box" solutions.

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EDITORIAL

Soil remediation under an operating barge terminal. Terreco has once again demonstrated that soil remediation using PuriSoil® is possible even in these circumstances. Such a project is of course only possible if all parties involved work closely together. In this case, the partners are Wessem Port Services, SABIC Europe and Terreco. Read more about this extraordinary project in the port of Stein on page 2. This newsletter also contains an article on the official start of a soil remediation project with Emerald Kalama Chemical Rotterdam. Finally, an update of completed and new projects. All projects quoted an initial fixed price. All of the completed remediation projects fulfil the client's agreed targets and, in a number of cases, even exceed these targets.

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Terreco has been awarded several prizes for its innovation, which confirms its position as a leader in the field of soil remediation techniques.



## SOIL REMEDIATION EMERALD KALAMA CHEMICAL ROTTERDAM

### Careful fine-tuning for a trouble-free start

*Emerald Kalama Chemical is a division of Emerald Performance Materials LLC. Emerald produces and sells technologically advanced chemicals for the food industry and other industrial applications. This US company has four business units, eight manufacturing plants and approximately 700 employees. Its European head office is in Geleen, and its production plant is in Rotterdam-Botlek.*

With its take-over of DSM Special Products in 2010, Emerald implemented its plans for further expansion, including a location in Europe. The activities of DSM Special Products were a good fit for Emerald's ambitions. In 2007, DSM had indicated that it wanted to concentrate on Life Sciences and Material Sciences. A number of its activities, including those of DSM Special Products, no longer fitted with the company's corporate strategy and so the DSM Special Products division became a suitable take-over candidate.

#### Decision

For many years, DSM Special Products' Rotterdam site had been the production site for a number of successful products. At some stage in the past, this production process contaminated the soil. Emerald wanted to decontaminate the contaminated area as soon as possible after its take-over. In order to carry this out, a number of soil remediation companies were asked to draft a proposal.

#### Proven results

The proposals included two suitable candidates, one of which was Terreco. After a careful comparison of prices and guarantees, Terreco seemed to offer the best deal. An important factor in the selection process was its proven service record and excellent results. In 1999, Terreco had already carried out very successful soil remediation works on the site.

#### Business as usual

At the end of 2011, Terreco started the soil remediation works. This was not a simple task. The remediation area is located along a through road on the site. Moreover, the factory needed to continue operating and logistical processes could not be disrupted during the remediation process. Terreco, however, is used to such requirements. Effective coordination between Emerald and Terreco ensured a safe remediation area layout and a trouble-free start. On 18 January, 2012, the remediation project was opened by Brenda Abke (Emerald Performance Materials

HSE&S Director), under the supervision of Brian Denison (Emerald Kalama Chemical President), Huber Claassen (Rotterdam Site Director) and other Emerald and Terreco delegates. Terreco expects to deliver a clean site by the end of 2014.

### Good coordination will ensure a smooth start

FACTS

#### The technical data of the remediation project...

Main components:	aromatics, mainly benzene
Initial concentrations:	very high (LNAPL)
Contaminated surface area:	3,700 m <sup>2</sup>
Groundwater level:	2 m bgl
Contamination depth:	10 m bgl
Soil:	sand and clay



## SABIC IN GELEEN CHOOSES TERRECO

### Choosing an active approach

SABIC Europe is an international petrochemical company whose European head office is located in Sittard. Its production locations are Geleen (Chemelot), Gelsenkirchen (Germany) and Teesside (UK). SABIC employs approximately 40,000 people worldwide, 2,000 of which are in Limburg. SABIC manufactures raw materials for producing different types of plastics on the basis of hydrocarbons from refined petroleum.

Wessem Port Services Group (WPS Group) is a Wessem Holding BV subsidiary. WPS Group core business consists of port operation and logistics. The corporation operates in several fields, including the chemical industry, (road) construction, paper industry, recycling, ceramics, agricultural industry and containers.



In 2004, there was a pyrolysis gasoline contamination at SABIC. Due to a quick and appropriate reaction that included addressing the primary as well as secondary contamination source, the company managed to prevent the contamination from spreading via the groundwater in the direction of the river Meuse. Terreco was then awarded the contract to decontaminate the source, including the installation of PuriSoil® groundwater sanitation screen to protect the Meuse. The secondary source, located under the Wessem Port Services grounds, was addressed by SABIC itself. A network of groundwater extraction wells were installed alongside the Juliana canal.

#### Study

This last measure appeared to lose its effectiveness after a number of years. That is why SABIC decided to appoint an independent environmental agency to investigate the necessity for a further solution for the secondary source and to identify the technologies that would guarantee a successful rehabilitation. The investigation showed that a different active solution was not necessary. The spread of the contamination was too small and Terreco still maintained the "PuriSoil® - screen" between the secondary source and the Meuse. Also, the installation of an alternative remediation system did not appear possible from a technical point of view due to the presence of the railway network in the remediation area.

#### Rehabilitation

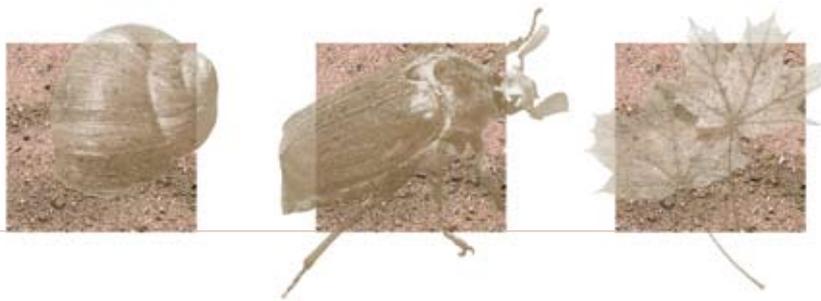
At the end of 2011, Wessem Port Services decided to rehabilitate its location. A large part of the railway network would be removed. These new circumstances provided Terreco with an opportunity to tackle the secondary source with its PuriSoil® technology. After consulting SABIC as well as Wessem Port Services, the latter appeared willing

to cooperate in integrating the remediation system within the site's infrastructure and logistical processes. As Bob Joosten, the Wessem Port Services' General Director, explains: "Of course, this was the moment for all parties to thoroughly address the contamination. By adopting a flexible stance, we were able to include the project within the larger rehabilitation project of our location and unloading quays, railway terminal and loading/unloading facilities. This did imply a delay in our planning and it took a lot of improvisation in order to prevent disruption of our logistical processes."

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### The was the ideal moment to fully address the remediation

FACTS	<b>The technical data of the remediation project...</b>
	Main components: aromatics (BTEX)
	Initial concentrations: very high (LNAPL)
	Contaminated surface area: 5,000 m <sup>2</sup>
	Groundwater level: 10 m bgl
	Contamination depth: 15 m bgl
	Soil: löss, sand and gravel



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### Active remediation

SABIC was interested in an active approach, but wanted to first review the situation and discuss it with the authorities. Within a few weeks, a decision was made and SABIC agreed to actively decontaminate the secondary source, without being compelled to do so by the authorities. SABIC had good experiences with the PuriSoil® technology, in particular in decontaminating aromatics (BTEX). A

previous confirmation by the authorities had awarded PuriSoil® the "Best Available Technology" (BAT) label. Soon afterwards, Terreco was awarded the contract, which was again based on an initial fixed price and corresponding quality warranty. In early April 2012, construction work started and actual remediation works started in mid-July. Terreco expects to be able to deliver a clean location in 2017.

## Project update

### North Brabant

The styrene remediation at a chemical company in North Brabant has been completed. The styrene can no longer be detected in the soil (below detection limit).

### Maarheeze

Soil remediation of a naphtha pipeline has been completed. The agreed targets for mineral oils and BTEX (target value in soil and groundwater) have been reached.

### Geleen

The soil under a former factory that produced artificial sweeteners has been cleaned. The agreed targets have largely been reached.

### Roermond

Soil remediation in a residential area in Roermond, which was commissioned by a housing corporation, is going according to plan. The domestic fuel oil concentration levels (mineral oil/BTEX) are quickly decreasing and there is no disruption for the neighbourhood.

### Veendam

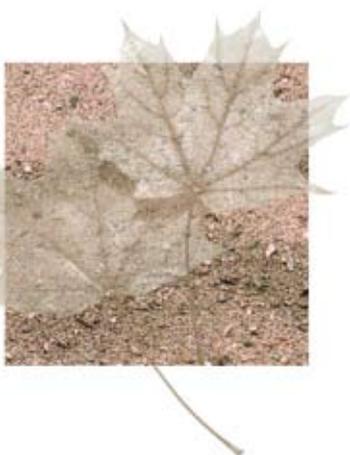
The remediation, which started last year, is going very well. More than 90% of the contamination (mineral oil/BTEX) has been removed over a 14-month period. We expect the remediation to be completed in 2013.

### Poland

Remediation under a paint factory in Central Poland is going well. The extensive LNAPL (approximately 23,000 m<sup>2</sup>) has disappeared after a two-year remediation period and groundwater concentrations are swiftly decreasing.

### Willebroek

The remediation of a mineral oil contamination under a factory production hall in Willebroek is going well. After a two-year remediation period, over 98% of the contamination has been removed.



## News in Brief

### Brussel

Terreco has once again been awarded an extensive remediation assignment by NATO.

### Duitsland

Our previous newsletter mentioned Terreco's expansion in Eastern Europe. In the meantime, Terreco has become active closer to home with an assignment in Germany. Considering the German market's interest in the PuriSoil® technology – there have been several applications – this project may lead to further assignments.

**COLOPHON**



Terreco BV offers customised environmental solutions and specialises in complete cleaning of contaminated soils. Terreco uses PuriSoil® technology, among others. Remediation projects are carried out for a fixed price and with a guarantee of results.

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