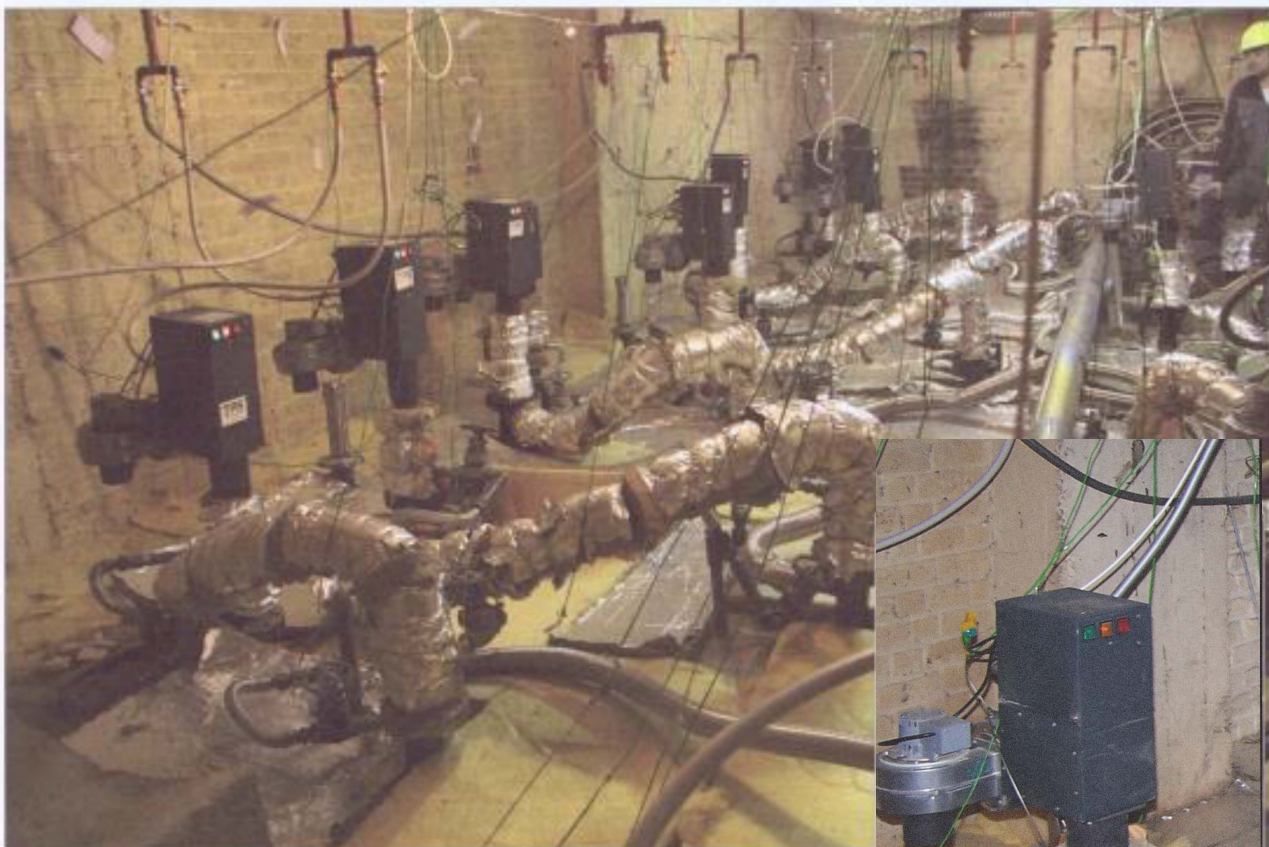


From Brussels with love

Marten Klingmans of TPS Technologies introduces a new, award winning technology for thermal soil remediation *in-situ* and on-site, known as NSR[®], a patent of the Belgian company.



Above: Showing NSR[®] City *in-situ*; Inset: The NSR[®] system: heating tube, burner, fan

All important innovations start with people that are driven by their expertise, visions and ambitions. This is certainly true for the people of TPS: they have many years of experience in (thermal) soil remediation (they have treated millions of tons).

Their vision is that thermal desorption has major advantages over other approaches and their ambition is to create more value for site owners. These were the main drivers to invest in the development of a new thermal desorption technology NSR[®], which is now successfully introduced in various customer projects. TPS has won the Dutch Innovation Award 2011 for the environment with NSR[®].

Drivers for the new technology

TPS' starting point is the site owner, who is faced with the problem of contaminated soil. Basically, he can take two directions to solve his problem: he can choose to

make the pollution manageable, with the objective to comply with the current law and regulations, while accepting he remains liable in case laws change and get stricter, but this is not really a sustainable approach. The contamination may be reduced and, for the time being, under control, but is still present.

The other option is to completely eliminate the pollution, bring the site back to its natural state, while the owner is released of any (future) liability. TPS prefers the last option and strives to offer technologies which make it an economically and ecologically attractive one.

Thermal desorption is a very effective way to decontaminate soil from all organic pollutants. It is fast and final, resulting in re-usable clean soil. However, the conventional thermal technology, the so-called rotating kiln, has some disadvantages: the soil has to be excavated and transported to the

installation and the costs are considerable, mainly due to high energy consumption, substantial investments and maintenance costs.

With the NSR[®] technologies TPS offer, on top of the general advantages of thermal desorption, the treatment of the soil *in-situ* or on site after excavation, with a substantial reduction of the use of energy as the calorific contaminants are used as a secondary source of energy. The technology is like all thermal desorption systems based on heating the soil up to a level that the organic contaminants



Above: NSR© Industry; Inset: Creosote contaminated soil

vaporise; these vapours are extracted and the contaminants are oxidised at a high temperature.

The basis of any NSR© installation is the heating element: two coaxial tubes that are put into the polluted soil, equipped with a burner on top and connected to a ventilator. The burner heats the air that is running through the inner pipe and returns through the outer pipe. The soil is heated by conduction, which is the best method of heat transfer as it is insensitive of soil type: it works equally well in clay as in sandy or other soils.

This is a major difference in effectiveness compared with steam injection systems. The organic contaminants in the heated soil will evaporate and are extracted through a perforated pipe and led to the burner where they are destroyed.

This design offers great flexibility and scalability: in fact the pipe plus burner is the thermal system. The size of the contaminated site determines how many pipes and burners will be needed.

NSR© City case study

An example of the strengths of the system is an *in-situ* remediation executed by TPS under an office building in the center of Brussels. The pollution (oil tanks were overfilled in the past) was at level - 3 in the cellar, which could only be reached by a small staircase.

The contamination was up to 15,000 mg/kg dm, at a depth of seven meters. Excavation was no option, bioremediation neither as that would take long and with great uncertainty of results.

Results had to be guaranteed and treatment to be done in four months, a requirement of the real estate company that intended to buy the building.

TPS installed 31 heating elements and 15 burners (in this case one burner for two tubes was used, the extracted gases were used for heating the pipe without burner and in the last phase burners were replaced).

Mobilisation and installation took two weeks, treatment took three and a half weeks and demobilisation took one week. The treatment target was 300 ppm, the analyses showed results below 50 ppm.

A great advantage of the system is that it gives no nuisance to the neighbourhood: there are no roads blocked, there is no noise and no smell. It is probable that people did not even notice remediation works were being undertaken in this crowded street.

Other configurations and applications

The flexibility of the system allows unique configurations to face difficult located pollutions. Currently a project is in preparation in which the tubes will be put horizontally, crossing underground a two-

way road to treat the neighbouring area, while traffic continues.

In another project TPS plans the treatment of a spot in a shopping mall, while shops remain open.

If for any reason the soil is excavated, a treatment with NSR© remains a valuable option. The soil is put in a pile, in which the tubes are laid down horizontally. This on-site treatment saves the costs for transportation to an off-site facility and the CO₂ impact thereof.

TPS will continue its R&D activities, aimed at improving the technology further, as well as opening other applications. For example, tests were recently performed to treat LNAPL (floating layer), which showed great results.

TPS will execute projects itself in Belgium and work with local partners (license holders) in other countries. In France, the Netherlands, Italy and Spain agreements have been signed.

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