Smell-Well System

Technical Description

The IUT Group

Member of the DP CleanTech Group

DP CleanTech

Creating value from waste

Landfills – Problems and Opportunities

Until the relatively recent past, landfills were the primary solution for large scale waste disposal in most countries. Whilst this is no longer always the case, old landfills often contain waste materials that have not been properly sorted or treated prior to deposition. In addition, such landfill sites may be improperly managed. These factors combined frequently lead to environmental problems:

- Odours and gaseous emissions (mainly methane)
- Groundwater contamination

Eliminating these problems is increasingly seen as a priority for environmental reasons. In parallel, the pressures of urbanization are also driving the need for the remediation of landfill sites. For existing landfill, there are various options for landfill owners to consider:

- Capping the landfill (or dumping site) to reduce rainwater infiltration (leachate formation) and emissions to the atmosphere
- Mine and excavate the landfill to reduce mass, recover recyclables, extract combustible materials and extend life-span of landfill operation
- Mine and excavate the landfill to reduce mass, recover recyclables and rehabilitate the land for alternative use
- In-situ treatment to permanently stabilize the landfill and avoid future emissions (without excavation or mining)

The generation of methane and other minor (mostly odiferous) compounds is caused primarily by the existence of anaerobic conditions within the landfill body, which can continue for decades. Anaerobisation begins almost as soon as waste is deposited. The gaseous compounds are released into the atmosphere and can continue even after landfill closure.

The most sustainable solution to prevent gaseous emissions is to convert the biological conditions inside the landfill body from anaerobic to aerobic - this conversion is key to enable any temporary or permanent landfill activity to take place. Using a forced aeration process, the gas emissions and leachate contaminant can be significantly and rapidly reduced. The Smell-Well system (developed originally by IUT GmbH) is the most effective solution available in the market for this purpose. IUT Smell-Well technology and knowhow was acquired by DP and now forms a key part of DP's Waste Management portfolio.

Principles and Process of The Smell-Well System

Smell-Well system applications:

1. **For aeration prior to excavation and mining -**
   A rapid and practical intervention to support short term activities

2. **For total in-situ aerobisation -**
   A long-term process for permanent landfill stabilisation

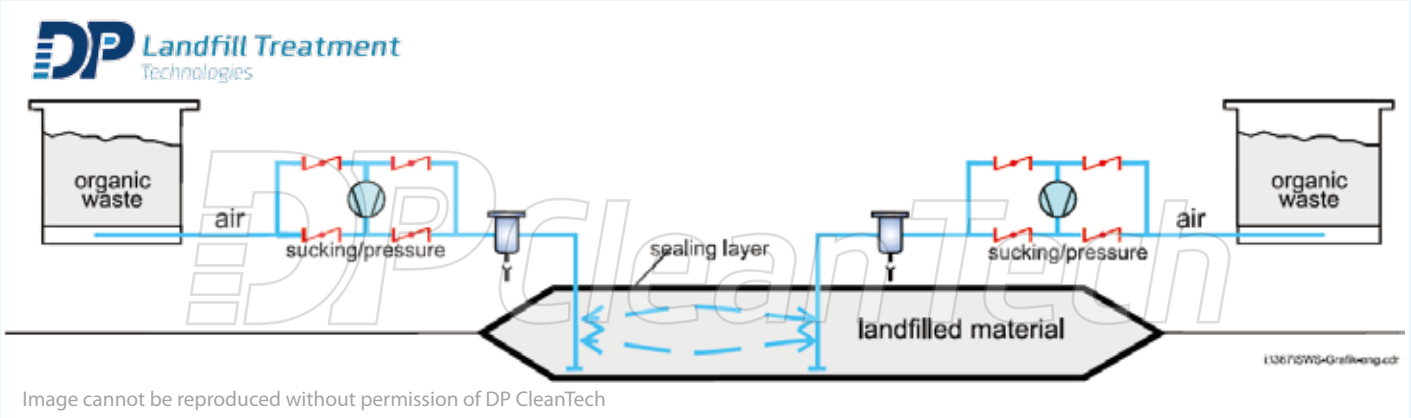
“Anaerobic” to “Aerobic”

For both applications, the absolute priority is to stop the anaerobic activity. To do this, air is forced into the landfill body through steel lances, usually through a grid (the standard distance lance-lance is 5-6m, but can be up to 10m depending on the landfill conditions). Supply air from the surrounding environment is forced through a wet biofilter where it is heated and enriched with aerobic bacteria before being blown into the landfill through the lances. The foul mixture of gas and air is simultaneously captured and cleaned in a parallel biofilter.

First SWS plant in Ludwigsburg 1992

The air flow is reversed frequently to prevent channeling inside the landfill body and to facilitate continuous aeration. This reversion also avoids problems of water condensing in the piping system.

Throughout the process, it is important to keep the biofilter wet and maintain reasonable moisture levels in the landfill. The Smell-Well System has been specifically designed to do this easily and to regulate the process. Water is extracted from the landfill, is evaporated in the biofilter and is transported back as steam to the landfill. Excess water is collected in a special collection system. This method maintains the constant and appropriate level of moisture in both landfill and biofilter and eliminates the need for additional water during operation.



The Smell-Well System (developed by IUT GmbH) has been operating successfully since 1993 and is proven to be one of the most efficient and cost-effective systems available in the market. It has been approved for use by several authorities and has been patented.

Designed to the Highest Technical Standards

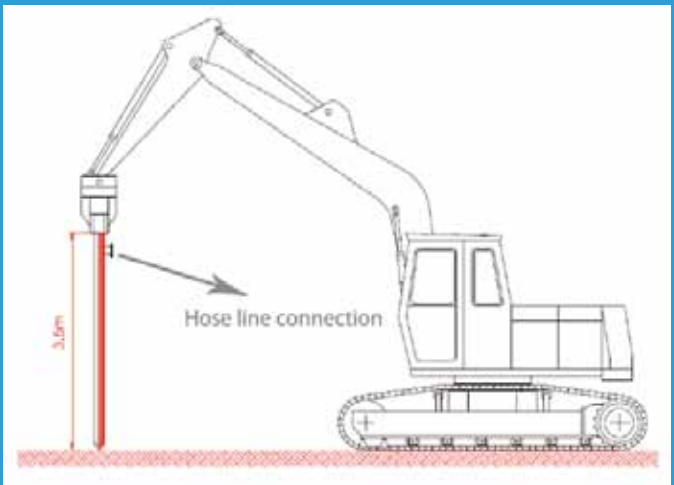
- TÜV (Technischer Überwachungsverein) approved
- Meets German ”GUV 17.4“ Safety Regulations for Landfills
- Acknowledged by the German “Berufsgenossenschaft” (Employers Liability Insurance Association)
- Worldwide patents

DP Waste Management

Installation and Operation

Installation

'Standard' (3.5m) or 'flexible' (1-15m) length lances are forced into the landfill with a vibration ram. The complete installation takes approximately 5 to 15 minutes per lance. Each lance has holes for air distribution. Lances are connected to each other and to the biofilter/compressor with steel pipes, equipped with quick-use couplings. All the pipes are inclined towards the lances so that any excess condensed water can run back to the landfill. After the installation of all lances and pipes, the aeration process can begin.



Operation

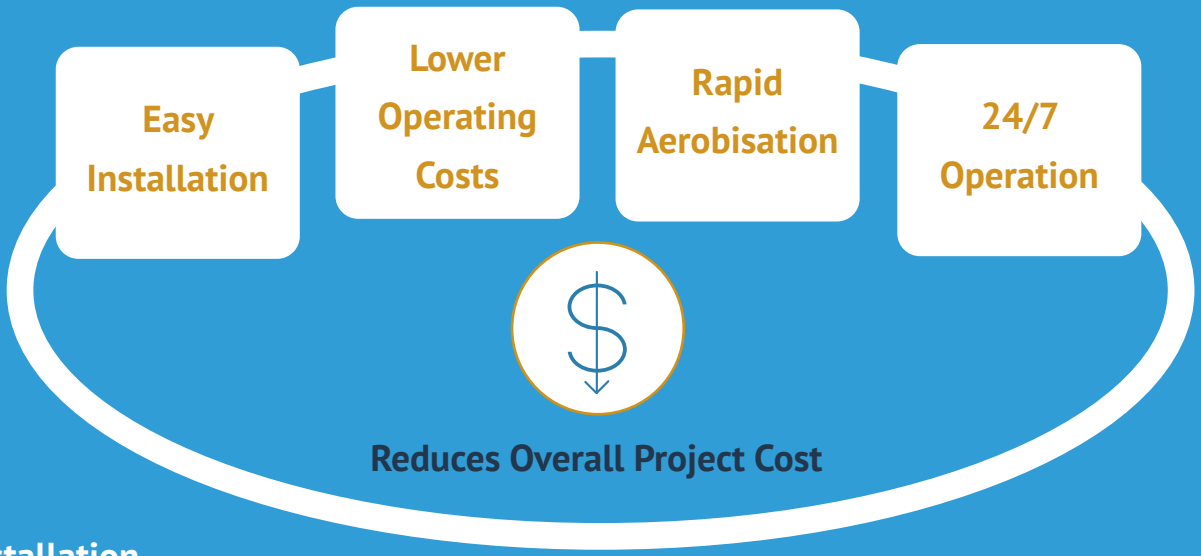
When the aeration process begins, the methane concentration is constantly measured. After 24/48 hours, the landfill status is fully changed from anaerobic to aerobic and the level of methane has decreased dramatically.

Aeration prior to excavation: The designated area is aerated for 5-7 days to further reduce the easily degradable organic pollutants and the water content. This facilitates later treatment of the excavated material and prolongs the aerobic condition up to approximately 6 weeks, which is sufficient time for excavation and mining. Although the landfill is aerated to a depth of 3.5 m (for this scope only standard lances are used), only 3 meters of waste are excavated after the aeration. This guarantees that the "new" landfill surface is aerobic, thus avoiding odour emission.

In-situ total aerobisation: 6-24 months are needed for total reduction of the organic content, depending on the quality and the age of the landfill material. The lances stay inside the landfill body for the whole duration of the aerobisation period. The lances also facilitate the ongoing monitoring of the landfill condition.

Key Benefits

Compared to other processes, Smell-Well has several major advantages which makes it more efficient and cost effective.



Easy Installation

The Smell-Well lances are installed using only a standard vibration ram. The installation leaves no gaps, therefore costly filling and sealing of the surface around the lances are not required. The holes in the lances are opened and cleaned using compressed air which is simple, cost effective and protects employees from toxic emissions.

Lower Operating Costs

The Smell-Well system uses fresh air for the aeration process, which is cheaper than oxygen and reduces the risk of explosion. This is a particularly significant cost benefit for long term in-situ landfill aerobisation, which can take from 2 to 24 months.

Rapid Aerobisation

Aerobisation is very rapid. After 3 hours, conditions are already fully aerobic, and methane concentrations in the exhaust air is less than 1%. This enables excavation works to commence quickly without explosive risk or odours.

24/7 Operation

The Smell-Well system prevents “channeling” which can disrupt the efficiency of the operation. Channeling can occur when the air flows are constantly routed through the same single opening, creating pathways through the waste rather than dispersing and penetrating the landfill body. This prevents full aerobisation and perpetuates the explosion risks and odour contamination. Smell-Well continually aerates and ventilates the landfill by switching the air direction. This prevents channeling whilst maintaining a stable moisture level and allowing work to continue uninterrupted 24/7.

Technical Data

1. Pressure and Exhaust Supply	
Installed power	2 x 30 kW up to 2x 55 kW, depending on the excavation capacity
Aeration capacity	For excavation - from 500 to 2,500 m^3/day For total aerobisation - up to 50,000 m^2
Aeration period	Excavation - between 5 - 7 days Total aerobisation from 6 to 24 months
Number of lances	Dependent on the area to be treated Lances always work in pairs to blow in and draw off air
Noise level	75 dB(A) per compressor (other figures on demand)
Composition	To meet GUV 17.4 standards
2. Lances for Aeration and Ventilation	
Distance between lances	5 - 6 m (up to 10 m)
Length of lances	3.5 m standard lance 1 - 15 m flexible lance
Lance material	Steel
3. Biofilter	
Number of biofilters	4 to 8 filter containers, depending on the quantity of the excavation
Sewage disposal	Any sewage which accumulates on the bottom of the filter container can be drained as required
Filter materials	Multi-level composition – based on proprietary know-how
4. Pressure Pipe Network	
Material	Pressure pipes are made of fire-galvanised steel and equipped with a quick fastening coupling. Distributors are made of fire-galvanised steel, PE-EL pipes res. Rubber tank lorry pipes, electrical transmission possible
Nominal pressure	10 bar
Rupture pressure	22 bar

The pressure and absorption net meet all security regulations, and can be moved quickly to different places within the landfill area. It is easily and quickly connected to the pressure pipes without the use of heavy tools.

5. Installation of the Lances

- The lances are installed using vibration rams. There is no need for additional drilling
- Landfill gases cannot escape and there is no need to seal the lances
- Holes in the lances are opened using compressed air
- Inspection of safety standards using a 4-gaseous instrument

6. Measuring Techniques

Continuous measurements of the exhaust gases: CH_4, O_2 and CO_2

General limits for safe excavation:

CH_4: < 1 Vol%

CO_2: < 0.5 Vol%

O_2: >17.0 Vol%

General limits for total landfill stabilisation completion:

CH_4: < 0.1 Vol%

CO_2: < 0.3 Vol%

O_2: >19.0 Vol%

The release of the aerated field is diligently monitored and documented. All measurements are conducted using portable gas measuring devices.

7. Control and Security Instruments

The safety control and alarm system ensures that the plant will be shut down automatically if temperatures exceed 60-70°C and if the internal pressure exceeds certain limits. In the unlikely event of an explosion, the explosion and any fire are contained firstly by flame arrestors (installed in front of the blowers) and secondly by reducing the pressure in the biofilters. The piping system is dimensioned to stand an explosion pressure of 7.5 bar and a maximal pressure of 22 bar.

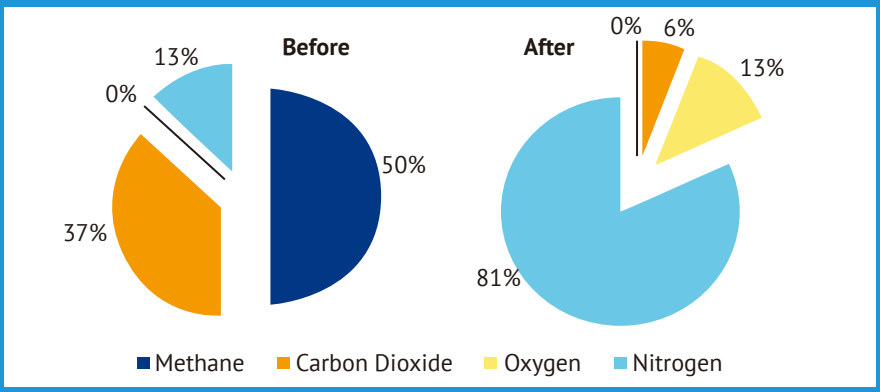
There have never been any explosions in the long history of Smell-Well system operation.

8. Smell-Well System Effectiveness

The Sharjah landfill remediation project in 2005 was the largest undertaking in the world at the time. The average readings from more than 120 gas measurements taken from the project are highlighted below. This clearly shows the elimination of methane gases, the significant reduction in carbon dioxide and a corresponding increase in oxygen and nitrogen.

Aeration time: 5 days

Lance grid distance: 8 m.



From "Report of the Sharjah Landfill Remediation Project", K.Koch, University of Dresden,2005

Contact Us

DP has 9 offices around the world in 8 countries – Austria, China, Czech Republic, Denmark, Poland, Thailand, UAE and UK.

To ensure that we can address your needs appropriately, please email **info@dpcleantech.com** for enquiries or further information.

About DP CleanTech

- ✓ Founded in 2004, DP CleanTech Group designs, engineers, manufactures and commissions biomass and waste to energy power plants, providing complete solutions for turning waste materials into clean energy.
- ✓ DP's core technologies originate in Europe and are behind over 300 biomass and waste projects around the world.
- ✓ DP built the first biomass power plant in China and has ~30% of the market.
- ✓ DP has facilities and multiple references across Europe and Asia; and has projects under development in Africa and South America.
- ✓ DP's pioneering tradition continues with an expanded portfolio of innovative waste-to-energy and environmental management technologies with which to lead the advancement of renewable energy and environmental protection.

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