

Reference list landfill gas projects

NV Afvalzorg Holding

Afvalzorg landfill Nauerna 80 ha (NL)

- Design, installation and operation of landfill gas recovery system (vertical and horizontal wells).
- Installation and operation 2 MW flare station.
- Installation and operation landfill gas utilisation; two boilers with a capacity of 1.5 MW.
- Design, installation and operation heat distribution system (4 km) for landfill gas utilisation. Heat supply to leachate treatment plant, head office Afvalzorg and a greenhouse complex (distance 1.8 km).
- Landfill gas generation, recovery and emission modelling and research.



Afvalzorg landfill Wieringermeer 40 ha (NL)

- Design, installation and operation of landfill gas recovery system (vertical wells).
- Installation and operation 2 MW flarestation.
- Design and implementation landfill gas utilisation; heat supply for a digester system.
- Installation of a high temperature flare (2.5 MW) and low calorific high temperature flare.
- Methane oxidation research in top cover systems together with University of Hamburg
- Landfill gas generation, recovery and emission modelling and research.



Afvalzorg landfill Braambergen 46 ha (NL)

- Design, installation and operation of landfill gas recovery system (vertical wells).
- Design and operation of a small size CHP (85 kWe) with on-site heat utilisation in office.
- Installation of high temperature flare (2.5 MW).
- Feasibility study landfill gas utilisation to supply heat via heat distribution system to monkey rescue centre AAP.
- Landfill gas generation, recovery and emission modelling and research.



Afvalzorg landfill Zeeasterweg 59 ha (NL)

- Design, installation and operation of landfill gas recovery system (vertical wells).
- Installation of high temperature flare (2.75 MW).
- Landfill gas generation, recovery and emission modelling and research.



**Afvalzorg
landfill
Hollandse Brug
28 ha (NL)**

- Design, installation and operation of landfill gas recovery system (horizontal and vertical wells).
- Installation of high temperature flare (2 MW).
- Feasibility study landfill gas utilisation for heat supply to a wellness centre.
- Landfill gas generation, recovery and emission modelling and research.



**Afvalzorg
landfill
Schoteroog
22 ha (NL)**

- Design, installation and operation of landfill gas recovery system (horizontal and vertical wells).
- Installation of low calorific high temperature flare (3 MW).
- Project development landfill gas utilisation (LNG/CNG production from landfill gas).
- Landfill gas generation, recovery and emission modelling and research.



**Vlagheide
landfill
Schijndel
45 ha (NL)**

- Design and operation of landfill gas recovery system (vertical and horizontal wells).
- Revision landfill gas station.
- Landfill gas utilisation in 4x 312 kWe CHP's.
- Installation and operation of 1.8 MW flare.
- Feasibility study landfill gas utilisation project for direct use of gas in MARS factory (distance 4.5 km).
- Landfill gas generation, recovery and emission modelling and research.



**Diemerzeedijk
landfill
Amsterdam
50 ha (NL)**

- Revision and operation of landfill gas recovery system.
- Design new landfill gas flare station including heat utilisation.
- Installation and operation of new 250 kW low calorific flare station including heat utilisation in nearby buildings.



**Avri
landfill
Geldermalsen
18 ha (NL)**

- Design and revision landfill gas recovery system (vertical and horizontal wells).
- Supervision of installation of new landfill gas recovery system.
- Pre-feasibility of landfill gas utilisation.



**Crayestein
West
landfill
7.5 ha (NL)**

- Landfill gas generation, recovery and emission modelling.
- Design and construction landfill gas recovery system.
- Design and construction of integrated methane oxidation windows in the top cover of landfill.



AFVALZORG Landfill Gas Calculation Models

Afvalzorg has extensive experience in landfill gas modelling. Landfill gas models are used to calculate methane generation, recovery, utilisation and emissions at landfills. Modelling results are the essential basis for deciding on landfill gas management options, emission control and pre-feasibility of landfill gas recovery and utilisation projects.

Afvalzorg has developed two landfill gas models which are based on IPCC standards and mathematics and are easy to use. The models can be downloaded from our website (www.afvalzorg.com). Our models are being used in more than 50 countries worldwide.

Fiji Nabora landfill 5.5 ha

- Landfill gas emission research and quantification of CH₄ emissions.
- Methane oxidation research in collaboration with The University of the South Pacific (USP).
- Feasibility study landfill gas recovery and utilisation CHP's.
- Preliminary design landfill gas recovery system.



Indonesia various landfills

- Assessment of CDM potentials and technical feasibility of landfill projects on landfills in Bekasi, Mataram, Palembang, Serang and Tangerang.
- Capacity building project on waste management at the University of Malang and co-author of syllabus "Waste management in Indonesia".
- Pre-engineering for three landfill gas recovery projects under CDM in Palu, Samarinda and Mataram.



Georgia various landfills

- Technical assistance for the development and improvement of landfill gas management at Solid Waste Management Company Georgia.
- Landfill gas modelling for various landfills and preliminary design landfill gas management Poti landfill (methane oxidation) and Rustavi landfill (recovery system).
- Pre-feasibility landfill gas utilisation at Rustavi landfill.



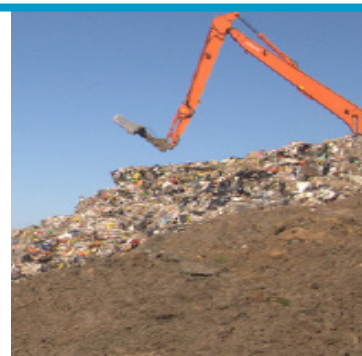
Turkey various landfills

- Author of "Practical guidance document landfill methane reduction" for the Turkish Ministry of Environment.
- Training course on landfill gas management for the Turkish Ministry of Environment and Turkish municipalities.
- Feasibility studies on landfill gas recovery and utilisation projects on landfills in a.o. Sakarya, Zonguldak, Kirikkale, Inegol and Edirne Exploration of business opportunities for landfill gas projects on many other landfills in Turkey.



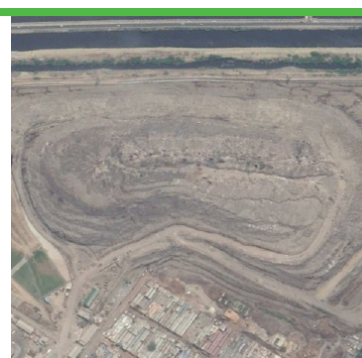
Iceland various landfills

- Technical assistance to the Government of Iceland on compliance of landfill gas management with the EU landfill Directive.
- TAIEX Regional Training Program “Landfill gas management” and “Landfill methane oxidation in practice”.



India Gahzipur landfill

- Feasibility study on landfill gas recovery and utilisation project.
- Technical assistance in landfill gas recovery system design.
- Technical input on landfill gas to LNG project.



Slovakia Stitnik landfill

- Feasibility study on landfill gas recovery and utilisation project.



Spain Irun landfill 4,5 ha

- Several landfill gas emission research campaigns.
- Quantification of CH₄ emissions.
- Methane oxidation research landfill top cover.
- Design landfill gas recovery system and treatment.
- Cost-effectiveness calculations on landfill gas management options.
- Design and implementation integrated methane oxidation fields in the top cover.



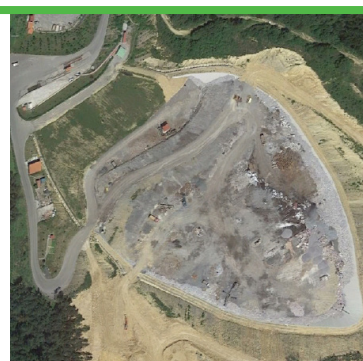
**Spain
Orkonera
landfill
8 ha**

- Several landfill gas emission research campaigns.
- Design landfill gas recovery system and treatment.
- Cost-effectiveness calculations on landfill gas management options.
- On-site assistance during installation of new landfill gas recovery system.
- Extensive recovery test with low calorific flare.
- Design integrated methane oxidation fields in the top cover.



**Spain
Eibar
landfill
4.5 ha**

- Landfill gas generation, recovery and emission modelling and research.
- Yearly landfill gas emission research campaigns.
- Design landfill gas recovery system (horizontal and vertical) and treatment.
- Cost-effectiveness calculations on landfill gas management options.



**Spain
Elgoibar
landfill
4.5 ha**

- Landfill gas generation, recovery and emission modelling and research.
- Feasibility study on landfill gas recovery and utilization project.
- Design and operation landfill gas recovery system (vertical wells) and biofilter.



**Spain
Jata
landfill
7 ha**

- Research on malfunctioning existing landfill gas recovery system.
- Quantification of CH₄ emissions.
- Drafting a landfill gas control plan.
- Preliminary design rehabilitated landfill gas recovery system and flare.



**Spain
Arbizu
landfill
6 ha**

- Landfill gas control plan including cost-effectiveness calculations for landfill gas management.
- Design landfill gas collection system.
- Preliminary design methane oxidation window integrated in top cover.



**Spain
Artigas
landfill
cell 3.5 ha
(total 29 ha)**

- Design landfill gas recovery system on 3.5 hectare cell.
- Integration of new recovery system into the existing landfill gas recovery system.



**Spain
Urteta
landfill
8 ha**

- Research on malfunctioning existing landfill gas recovery system.
- Advise on improvement of landfill.
- TDL500 CH₄ emission research and quantification of CH₄ emissions.
- Advise on rehabilitation and optimisation of landfill gas recovery system and flare.
- Pre-feasibility of landfill gas utilisation.



**Spain
Basque
government**

Author of "Practical Guidance document for methane emission reduction on landfills" for the Basque Government (IHOB). The goal of the guidance document is threefold:

- to transfer knowledge on landfill gas generation and technology for landfill gas recovery to landfill operators and competent authorities and utilisation and to give guidance to project development;
- to define and explain state-of-the-art methods and technology, which results in minimisation of methane emissions from landfills.
- to promote compliance with EU and Basque guidelines/regulations with regard to emission reduction from landfills.

