Municipal and Industrial Landfill

Rehabilitation of a landfill, valorisation of landfill Gas

Project Details

Belgium

Client:
Confidential

Project Budget:
Confidential

Key Staff:
Piet Wens
Paul Verkaeren
Uda Pannizzo
Luis Hens

Duration:
1996 - ongoing

Provided services

- Study on the Optimization of the Landfill Gas Valorization
- Conceptual Design of the Degassing System
- Detail Design of the Degassing System
- Design of an alternative biogas filter
- Supervision of the capping works

Introduction

The Client operates a landfill in the north part of Belgium. The landfill stretches out over 130 ha and is divided in 4 areas. In two areas (area B, 30ha and area C, 90ha), municipal waste and industrial hazardous waste have been landfilled since the seventies.

Global objectives

The global objective of the project was to remediate the landfill in a way that the landfill operations could continue in conformity with the Flemish legislation.

.Rehabilitation of the landfill: the rehabilitation works included:

- Installation of 120 groundwater monitoring wells in 3 aquifer depths all around the landfill.
- Installation of 40 leachate and biogas extraction wells in diameter 1100 mm in the waste body
- Reshaping of the active landfill (zone C) in order to minimize water infiltration and biogas emissions; more than 500,000 m³ of waste were moved in order to reach a stable waste body.
- Installation of a biological leachate water treatment plant with a capacity of 40 m³/h based on nitrification and denitrification

- Installation of a biogas extraction and valorisation plant, with four gas engines (1 MWatt each) and a gas cleaning facility (removal of H_2S and siloxanes).
- Rehabilitation of different areas with excavation, treatment and relocation of hazardous waste and sludge in a new landfill cell with immobilized and neutralized hazardous waste.
- Construction of a new landfill on top of the rehabilitated landfill zone.
- Design of an alternative capping system for the active landfill.
- Capping of the active landfill.

Alternative capping layer

An alternative mineral barrier was utilised in the capping of the zones B and C. This alternative is called Hydrostab ®, a mix of a sludge fraction (municipal sludge), a sand fraction (rest fraction of the sorting and sieving of industrial waste sand), fly ash of the municipal incinerators and a natrium silicate. This material is characterised by a very low permeability (range of 10-9 to 10-11 m/s) and is very easy to transport, spread out and compact. An Hydrostab facility was installed on the site.

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Project Details

Antwerp, Belgium

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Project Budget:
Confidential

Key Staff:
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Luis Hens

Duration:
1996 - ongoing

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Delivered Services by Pollux Consulting

Pollux Consulting delivers the following services to the Client:

1. Drawing up the Master Plan for the remediation of the whole site and the further operation of the active landfill, including the operational plans for waste acceptance, construction and closure, landfill operation, health and Safety, monitoring, maintenance, communication, final landscaping, aftercare and leachate and biogas management. All plans were implemented on the site.
2. Working out of the feasibility, conceptual design, basic design and tender procedures for the 9 rehabilitation projects.
3. Supervision of the 9 rehabilitation projects.
4. Supervision of the capping works.
5. Dratfing of the aftercare plans and supervision of the aftercare monitoring activities.
6. Design of the biogas extraction and valorization system.

Design of the biogas extraction and collection system

The design of the final biogas extraction and collection system was carried out in three steps:

1. Study on the optimization of the Landfill Gas (LFG) valorization:
    a. Evaluation of the overall LFG production, using a stoichiometric model generating the biochemical landfill gas potential, and a kinetic model, describing the evolution of the LFG production;
    b. Evaluation of the LFG shafts quality;
    c. Evaluation of the extraction network including software simulation in Pipeflow® Software;
    d. Evaluation of the detailed LFG production of the landfill, using the 3D-Model;
    e. Evaluation of the vertical settlements
    f. Evaluation of the leachate and sulfate household.
2. Conceptual design of the degassing system:
    a. Phase 1: Pollux Consulting applied a multi-criterai analysis on several scenario's in serie and in parallel;
    b. Phase 2: conceptual design of the selected scenario, performed with the Pipeflow® Software.
3. Detailed design of the piping, clusters and manifolds, including the Bill of Quantity and Cost Estimates.

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