LANDFILL GAS TO ENERGY PROJECTS IN POLAND

Piotr Klimek
Instytut Nafty i Gazu (Oil & Gas Institute)
Overview

• Description of Instytut Nafty i Gazu (Oil & Gas Institute)
• Landfills in Poland
• LFG to Energy Projects in Poland
• Challenges
• Summary
The Institute's research scope comprises all stages of natural gas fuel chain, prospecting for and mining oil, environmental protection and renewable energy in particular:

• assessment of exploration prospects in various regions of the country;
• assessment of geological, mineable and industrial deposits of oil and natural gas;
• drilling technology;
• management and mining of natural gas and oil deposits;
• evaluation of plastic materials used in gas industry;
• technical evaluation of gas pipe fittings and gas metering systems;
• evaluation and quality control of hydrocarbon fuels;
• new technologies of gas use;
• environmental protection issues in the oil and gas industry;
• technical assistance in landfill gas capture and utilization (Renewable Energy Technology Department)
Renewable Energy Technology Department

- Designs landfill gas capture and utilization systems
- Performs landfill gas modeling and gas pump tests for verification of gas production
- Performs cost assessments of landfill site construction projects and degasification of municipal landfills (pre-feasibility studies)
- Provides technical assistance for operational LFGE projects
- Participates in international landfill gas and biogas project

Contact:
Instytut Nafty i Gazu
ul. Lubicz 25A
31-503 Krakow,
Poland
Landfills in Poland

Landfills conditions:
• Landfills in Poland are well managed.
• According to Polish Law every landfill is required to have leachate and LFG collection systems. Ground water contamination monitoring and landfill gas emissions are also required.

Landfill sizes:
• Many landfills but small and medium size. Larger landfills exist only in major urban areas (main cities or capitals of voivodeships).
LFG to Energy Projects in Poland

• Electricity generation from LFG is dominant technology in Poland (more than 90% of LFGE projects)

• There are only a few CHP installations (heat is sold to end users)

• The most commonly used LFG electricity generation technology is internal combustion engines

• Most installations are located at large municipal landfills
LFG to Electricity Projects in Poland

Number of projects and its capacity

<table>
<thead>
<tr>
<th>Voivodeship</th>
<th>Project quantity</th>
<th>Capacity [MWₜ]</th>
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</thead>
<tbody>
<tr>
<td>dolnośląskie</td>
<td>5</td>
<td>4.345</td>
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<tr>
<td>kujawsko-pomorskie</td>
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<td>zachodniopomorskie</td>
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<td>2.394</td>
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<td><strong>Total</strong></td>
<td><strong>81</strong></td>
<td><strong>48.073</strong></td>
</tr>
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</table>

Source: Energy Regulatory Office, updated: 31.03.2011
LFG to Electricity Projects in Poland

LFG Electricity Projects in 2002 – 2011

LFG Projects Capacity:

Year 2002* – 15 MW
Year 2003* – 15 MW
Year 2004* – 17 MW

………..

October 2011# – 48 MW

* source: Obwieszczenie Ministra Gospodarki w sprawie ogłoszenia raportu zawierającego analizę realizacji celów ilościowych i osiągniętych wyników w zakresie wytwarzania energii elektrycznej w odnawialnych źródłach energii (M.P.06.31.343)

# source: http://www.ure.gov.pl/uremapoze/mapa.html
Possible reasons for increase in LFG energy installations

- Subsidies for construction of a installation (UE resources)
- Energy Certification - availability of “Green Certificates”. Additional revenue source.
- Increased investor interest in landfill gas
Revenue sources

- Conventional electricity market price is established by The Energy Regulatory Office – 195 PLN/MWh*
- „Green certificates” – 280 PLN/MWh* (additional amount to conventional electricity price)

* October 2011
LFG to Electricity Projects in Poland

Barycz Landfill, Krakow

Project description:
• Capacity: 1,340 MWe (average output 1,0 MWe)  
  (249 kWe + 249 kWe + 373 kWe + 469 kWe)

• Pump station output: max 1000 m³/h of LFG

• Average LFG composition:
  CH₄  60% [v/v]
  CO₂  37% [v/v]
  O₂   0,0% [v/v]
  N₂   2,85% [v/v]
  rest 0,15% [v/v] pollutants like (H₂S, CO etc.)
LFG to Electricity Projects in Poland

Barycz Landfill
LFG to Electricity Projects in Poland

Barycz Landfill
Challenges

• Increasing of waste heat utilizing. Waste heat is rarely utilized because of lack of onsite or adjacent thermal demand.

• Captured LFG should be sent through a cleaning (treatment) system before use. When raw gas is used, it causes problems in energy installations (engines).

• In Poland, landfills are relatively small. LFG captured from these landfills is low (50 m³/h).
Summary

• Landfill gas in Poland is utilized for energy at larger landfills (electricity generation)
• Small and medium sized landfills typically flare gas without utilization
• Regulatory limit of amount of organic matter in landfills will cause reduction of gas generation
• Landfill gas needs to be minimally treated before use in internal combustion engines
• Improved landfill management will allow landfills with low gas production to still utilize gas for energy projects