Biogas and waste management in Norway

IEA Bioenergy workshop
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LinkedIn

Experience

Board member at European Compost Network ECN e.V:
February 2011 - Present (1 year 1 month)

Assistant Director at Avfall Norge
April 2003 - Present (8 years 11 months)
  - Producer responsibility
  - WEEE
  - Biological waste treatment/MBT
  - Biogas
  - Composting

Acting director at Avfall Norge
November 2011 - December 2011 (2 months)

Board member at Norsk Energigassforening
November 2008 - May 2010 (1 year 7 months)
  - Co-founder and deputy chairman.

Researcher and research manager at Jordforsk
July 1997 - April 2003 (5 years 10 months)

Education

Technische Universität Berlin
Diplomingeneur/MSc, Environmental engineering, 1990 - 1997
Content
• Who is…
• A view on waste treatment and biogas
• Biogas in Norway
  – Production
  – Use of biogas
  – Future perspective – some plans for biogas
Waste Management Norway (Avfall Norge)

- Interest organisation for the Waste sector in Norway, with main focus on the municipalities
- Founded in 1986 - 10 employees in administration + project engagements
- Covers 96% of the population through public members
- Organization:
  - Board, R&D board and 7 working groups
Members

- Approx. 100 municipalities and inter-municipal companies.
- Private companies within waste management, including research and development, consultancies
- Most treatment plants within waste-to-energy, composting, biogas treatment and landfilling are represented.
Norway 2008:
Material recovery  45 %
Incineration     30 %
Landfilling:    25 %
Household waste

- Waste per capita: 424 kg/a
- Source separation >50%
- Reduced landfilling since ban in 2009
Municipality structure and waste regulation

- Household waste is responsibility of municipality
  - System
  - Collection (tender)
  - Treatment (both)
- 433 Municipalities
  - Average size: 10 900
  - Intermunicipal cooperation through regional waste companies is the solution in many regions

- Commercial waste is responsibility of waste owner

<table>
<thead>
<tr>
<th>Number of inhabitants</th>
<th>Number of municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 2 499</td>
<td>129</td>
</tr>
<tr>
<td>2 500-4 999</td>
<td>106</td>
</tr>
<tr>
<td>5 000-9 999</td>
<td>91</td>
</tr>
<tr>
<td>10 000-24 999</td>
<td>69</td>
</tr>
<tr>
<td>25 000 and more</td>
<td>35</td>
</tr>
</tbody>
</table>
Biowaste treatment in Norway

• System predominating until 2009:
  Either
  – Source separation and composting OR
  – No biowaste sorting and incineration

• After landfill ban (7/2009)
  – Some rural districts: Stopping source separation to reach size for waste-to-energy plant
  – Climate focus: urban areas with incineration introduce source separation and AD – biogas utilisation as vehicle fuel

<table>
<thead>
<tr>
<th>Type</th>
<th>K tonnes (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composting</td>
<td>392</td>
</tr>
<tr>
<td>Biogas</td>
<td>62</td>
</tr>
<tr>
<td>Food waste</td>
<td>201</td>
</tr>
<tr>
<td>Sludge</td>
<td>149</td>
</tr>
<tr>
<td>Garden waste</td>
<td>85</td>
</tr>
</tbody>
</table>
Collected amounts

- **Norway statistics**
  - 172 000 t biowaste
  - 65 kg/inhab*year (that have source separation)

- **Survey**
  - Average 67 kg/inhab*year
  - More in regions where napkins and/or garden waste is included

<table>
<thead>
<tr>
<th>System</th>
<th>Average collected biowaste kg/inhab*year</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>67</td>
</tr>
<tr>
<td>With napkins</td>
<td>96</td>
</tr>
<tr>
<td>With garden waste</td>
<td>85</td>
</tr>
<tr>
<td>Only kitchen waste</td>
<td>50</td>
</tr>
</tbody>
</table>
Collection trends

- Expected to rise substantially since Oslo has started source separation and surrounding municipalities are planning the same.
Oslo-case: Coloured bags and optical sorting (food waste, plastics and paper/cardboard)
Other models for sorting:

- **Material recovery**
- **Biogas**

New alternative: Food waste in separate bag, optical takeout in sorting plant
Waste quality
Biogas treatment today

- In total: about 35 plants
- 23 Waste water treatment plants
- 6 Waste treatment
- 5 Manure plants

- Production ca 200 GWh
Total potential for biogas: 6 TWh
Status biogas today

• Conditions less favourable than in neighbouring countries (DK/S)
• Upgrading is best economic option, but:
  – Large scale necessary
  – Co-digestion of waste, manure and sludge etc.
  – Need for fleet vehicles (buses, waste trucks etc.)
• Many plans for new capacity:
  – Oslo, Bergen, Trondheim, Drammen, Jevnaker, Tønsberg, Vestby, Rakkestad, Fredrikstad
Existing upgrading facilities

• Fredrikstad, FREVAR (sludge, 2002)
• Oslo, Bekkelaget (sludge, chemical sorption)
• Stavanger, IVAR (sludge, chemical sorption)
• ----
• Lillehammer, Glør (waste -membrane technology)
New plans – Oslo / Romerike

• capacity of 50,000 tons of food waste from the city of Oslo
  – Cambi technology with thermal hydrolisis
• 4.5 mills. Nm$^3$. The gas volume will drive 135 buses
  – Liquid biogas (LBG) on the market in 2013 (new technology)
• bio fertilizer will have the capacity to fertilize approx. 100 medium size Norwegian farms
Trondheim - Biokraft

- Situated at a paper mill.

<table>
<thead>
<tr>
<th>Sted</th>
<th>Fibortangen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projekt owner</td>
<td>Biokraft (Trønderenergi m.fl)</td>
</tr>
<tr>
<td>Input</td>
<td>Fish waste (kat 2), pulp &amp; paper waste, manuer</td>
</tr>
<tr>
<td>Mengder</td>
<td></td>
</tr>
<tr>
<td>Sikret</td>
<td></td>
</tr>
<tr>
<td>Produksjon</td>
<td>75 GWh</td>
</tr>
<tr>
<td>Oppstart</td>
<td>2013…</td>
</tr>
<tr>
<td>Biogass</td>
<td>Oppgradering (flytende) drivstoff</td>
</tr>
<tr>
<td>Biorest</td>
<td></td>
</tr>
<tr>
<td>Kontakt</td>
<td>Håvard Wollan</td>
</tr>
</tbody>
</table>
Lindum – biogas from sludge and waste

<table>
<thead>
<tr>
<th>Sted</th>
<th>Drammen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosjekt owner</td>
<td>Lindum AS</td>
</tr>
<tr>
<td>Råvarer</td>
<td>Avløpsslam</td>
</tr>
<tr>
<td>Mengder</td>
<td>25,000 t</td>
</tr>
<tr>
<td>Sikret</td>
<td>Langsiktige kontrakter</td>
</tr>
<tr>
<td>Produksjon</td>
<td>16 GWh</td>
</tr>
<tr>
<td>Teknologi</td>
<td>Cambi/Läckeby</td>
</tr>
<tr>
<td>Biogass</td>
<td>Flere muligheter</td>
</tr>
<tr>
<td>Biorest</td>
<td>Jordbruksformål/grøntanlegg</td>
</tr>
<tr>
<td>Kontakt</td>
<td>Jan Hammer</td>
</tr>
</tbody>
</table>

- Under construction, in operation mai 2012
- Biogass kan som nå leveres til lokal CHP med varmeleveranse til boligfelt
- Oppgradering til drivstoff vurderes
- Biorest avsettes gjennom eksisterende kanaler
White papers in the pipeline – and demands

- Broad paper on climate, expected before June 2012
- Waste treatment expected autumn 2012
- ”Biogassalliansen” demands a national biogas strategy (as in S)
- Avfall Norge suggests a national target to be set at 50 % collection of all food waste for biological treatment within 2020
Thank you

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Come visit the norwegian waste industry at the annual waste conference:
www.avfallskonferansen.no