Waste-2-Energy: Building capacity and gaining public acceptance in Amsterdam

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Orlando, May 23, 2005
Outline

- City of Amsterdam - Waste and Energy Company
- Dutch policy on waste management
- Amsterdam vision
- Future
- City of Amsterdam - Waste and Energy Company
  a public utility company

- The city of Amsterdam - 100% shareholder

- The plant - a success since start up
  - in economics
  - technology
  - environmental performance
Performance 2004

- Incinerated > 850,000 ton
- Turnover US dollars 130 million
- Energy efficiency 24%
- Recycling of non combustibles 100%
- Emissions less than 20% of permit
- Lowest costs and tariffs in the Netherlands
Result of 12.5 years operations
Waste-to-Energy Plant (June 1, 2005)

- Waste processed 10,000,000 tonnes
- Biogenic content 50%
- Electricity to grid 6,000,000 MWh<sub>e</sub>
- (Non) ferro & precious metals 250,000 tonnes
- Construction materials 2,000,000 tonnes

Savings in oil equivalent of 7,000,000 barrels
Mission Afval Energie Bedrijf

Maximise the use of waste

Strategic aims

- Lowest costs for the citizen
- Optimal environmental performance
- Innovations
Society and environment

air to air

water to water

raw materials to land

society

solid urban waste

in

out
Dutch waste policy

Orlando, May 23, 2005
Waste history in the Netherlands

- Uncontrolled dumping
- Hygiene and environmental problem (end 19th century)
- Waste management (begin 20th century)
  - collection
  - landfill
  - incineration
- Change of waste management (1960/1970)
Preference order of waste management

1. Prevention
2. Reuse and recycling
3. Incineration/energy production
4. Landfill
Dutch waste policy

- Regulations on landfill
- Ban on landfill and landfill tax for combustable waste
- Legislation
  - stringent emission limits incineration
  - directives and covenants
- Financial incentives
Result of Dutch policy on landfill

<table>
<thead>
<tr>
<th>Year</th>
<th>Recycling %</th>
<th>Total Landfill costs (€/ton)</th>
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<tbody>
<tr>
<td>1960</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>2005</td>
<td>75</td>
<td>100</td>
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Waste-to-energy: public acceptance is key

- Communicate open and clear from the start
- Allow sufficient time to establish community relations
- Create a dialogue
- Act crystal-clear
The quality of the total process...
...provides the licence to operate

- Emissions
- Energy
- Building materials
Amsterdam vision
Amsterdam history

- Prevention and reuse of waste
- Mechanical separation of urban waste
- 100 years of incineration of waste, production of clean renewable energy and products from waste
The objective is closing the loop
Closing the loop

society

in

out

air to air
water to water
raw materials to land
solid urban waste
The route to the new plant

Evaluation of available technologies 1998

Robust grate technique
   = Best Available Technology (BAT)

Improve
   - electrical efficiency from 22% to 30%
   - building materials to A1 quality
Result

The first high efficiency waste-2-energy plant called Waste Fired Power Plant®

Clean technology based on company-owned patents
High yield concept for recovery
Building materials

Iron, non ferrous- and precious metals

Limestone bricks

Concrete
Energy recovery

- Highest attainable electrical efficiency from waste
- Core-innovation: reheater
- Increased steam parameters
Outline steam reheating

Steam drum
Superheater
HP turbine
Reheater
Boiler evaporators

Superheated steam 440°C
Steam pressure 125-130 bar
Steam reheating between HP- and LP-turbine
Closing the loop
WFPP® potential for North America (per year)

- Inhabitants 300,000,000 persons
- Combustible urban waste 200,000,000 tonnes
- Sustainable (biogenic origin) 50%

- Baseload electricity to grid at 30% efficiency:
  - 20,000 MW<sub>e</sub>
  - 160,000,000 MWh<sub>e</sub>
- (Non) ferro & precious metals 5,000,000 tonnes
- Construction materials 40,000,000 tonnes

Savings in oil equivalent of 190,000,000 barrels
Future: sustainable industrial complex

Eco-port®
Concept of Eco-port® sustainable industrial complex

- WFPP®: powerhouse for series of activities related to recycling and production of energy from waste

- Priorities are sustainability and environment

- Synergy among a variety of industries
First step: synergy with municipal sewage treatment works
start up 2005

Sewage treatment plant

Waste-to-Energy plant

- Sludge
- Biogas
- Heat
- Electricity

Energy and building materials
Conclusion:

Waste is the directly available raw material for clean renewable energy and high quality building materials.

Let’s explore together world’s most valuable mineral.
Nothing is waste!

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