CASE STUDY –

DRANCO ANAEROBIC DIGESTION PLANT IN HENGELO, NL

Integration of AD with existing composting, RDF facility

Biocycle – October 29-31, 2012

NORMA MCDONALD
OWS, INC
THE COMPANY

- DRANCO DRY DIGESTION TECHNOLOGY FOR MSW DEVELOPED IN 1980-1985 AT U-GHENT
- OWS CREATED IN 1988: MORE THAN 25 YEARS EXPERIENCE IN ANAEROBIC DIGESTION OF SOLID AND SEMISOLID ORGANICS
- 70+ PEOPLE (SUBSIDIARIES OWS INC IN OHIO, USA; BES GMBH IN GERMANY)
THE COMPANY

ACTIVITIES

1) DESIGN & CONSTRUCTION OF ANAEROBIC DIGESTION PLANTS FOR SOLID AND SEMISOLID ORGANICS

2) BIOGAS CONSULTANCY & SUPPORT

3) BIODEGRADATION TESTING AND WASTE MANAGEMENT CONSULTANCY
<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>Capacity (tpy)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brecht I (B)</td>
<td>1992</td>
<td>20,000</td>
<td>Biowaste / paper</td>
</tr>
<tr>
<td>Salzbourg (A)</td>
<td>1993</td>
<td>20,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Bassum (D)</td>
<td>1997</td>
<td>105,000</td>
<td>Residual waste</td>
</tr>
<tr>
<td>Aarberg (CH)</td>
<td>1998</td>
<td>11,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Kaiserslautern (D)</td>
<td>1999</td>
<td>25,000</td>
<td>Residual waste</td>
</tr>
<tr>
<td>Villeneuve (CH)</td>
<td>1999</td>
<td>10,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Brecht II (B)</td>
<td>2000</td>
<td>50,000</td>
<td>Biowaste / paper</td>
</tr>
<tr>
<td>Rome (I)</td>
<td>2003</td>
<td>40,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Leonberg (D)</td>
<td>2004</td>
<td>30,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Hille (D)</td>
<td>2005</td>
<td>100,000</td>
<td>Residual waste + sludge</td>
</tr>
<tr>
<td>Pusan (S-K)</td>
<td>2005</td>
<td>70,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Münster (D)</td>
<td>2005</td>
<td>80,000</td>
<td>Residual waste</td>
</tr>
<tr>
<td>Terrassa (E)</td>
<td>2006</td>
<td>25,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Vitoria (E)</td>
<td>2007</td>
<td>120,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Alicante (E)</td>
<td>2008</td>
<td>180,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Hotaka (J)</td>
<td>2008</td>
<td>3,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Tenneville (B)</td>
<td>2008</td>
<td>39,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Kempten (D)</td>
<td>2008</td>
<td>18,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Séoul (S-K)</td>
<td>2009</td>
<td>30,000</td>
<td>Biowaste / paper</td>
</tr>
<tr>
<td>Leszno (PL)</td>
<td>2010</td>
<td>50,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Bourg-en-Bresse (F)</td>
<td>2011</td>
<td>90,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Hengelo (NL)</td>
<td>2011</td>
<td>50,000</td>
<td>Biowaste</td>
</tr>
<tr>
<td>Mirandela (P)</td>
<td>2011</td>
<td>55,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Wijster (NL)</td>
<td>2012</td>
<td>55,000</td>
<td>Mixed waste</td>
</tr>
<tr>
<td>Nüstedt (D)</td>
<td>2006</td>
<td>18,000</td>
<td>Energy crops</td>
</tr>
</tbody>
</table>
THE DRANCO TECHNOLOGY
DRANCO PROCESS

DIAGRAM:

- **WASTE < 40 mm** flows into the **MIXER**.
- **STEAM** is added to the **MIXER**.
- The **DIGESTATE** is directed to post-treatment.
- **BIOGAS** is utilized.

**DRANCO FERMENTER**
DRANCO DIGESTER WITH EQUIPMENT UNDER CONICAL OUTLET

- Feeding tubes
- Dosing screw
- Gas storage
- Feeding pump
- Hydraulic group of the pumps
- Extraction pump
THE DRANCO DIGESTER
ADVANTAGES OF THE DRANCO SYSTEM

• NO SCUM FORMATION, NO SETTLING IN TANK
• INTENSIVE AND RELIABLE DIGESTION
• HIGH FLEXIBILITY (15 TO 40%)
• NO MIXING INSIDE THE DIGESTER
• SIMPLE DIGESTER (CONICAL)
• AVOIDS OR MINIMIZES WASTEWATER PRODUCTION, NO NEED FOR ADDED WOODY STRUCTURAL MATERIAL
• OPTIMAL PAPER DEGRADATION
• REDUCED SURFACE AREA AND VESSEL CAPACITY REQUIREMENTS
INTEGRATION WITH EXISTING COMPOSTING PLANT
SYNERGY WITH EXISTING COMPOSTING SITES

• MANY COMPOSTING SITES IN US ARE CONSIDERING EXPANSION WITH INCREASED ORGANICS DIVERSION

• SOME SITES HAVE MORE WASTE AVAILABLE BUT HAVE NO ROOM FOR ADDITIONAL COMPOSTING AREA

• INSERTION OF PARTIAL STREAM DRY ANAEROBIC DIGESTION CAN INCREASE EXISTING CAPACITY BY UP TO 50% WITH MINIMAL SURFACE REQUIREMENT*

• WATER BALANCE IS CRUCIAL IN COMPOSTING: NO EXCESS WASTEWATER FOR DRY SYSTEMS

• THE DRIER THE DIGESTATE THE BETTER
STATE OF AD FOR OFMSW IN EUROPE

• Currently 244 plants with capacity of ~ 8 million tons organic treatment capacity
• AD now 25% of biological treatment in Europe
• Netherlands and Belgium to achieve 80% of AD integration with composting plants by 2015
• AD now recognized as the preferred treatment technology for MSW organics
• Key drivers are production of renewable energy and reduction of odor potential and surface area requirements
AEROBIC COMPOSTING PLANT

MSW OR YARD / FOOD WASTE

METALS
RDF

DRY SORTING

CO₂
WATER

AEROBIC COMPOSTING

WATER

DRYING

COMPOST OR LANDFILL
FULL STREAM DIGESTION

MSW OR YARD / FOOD WASTE

METALS RDF

DRY SORTING

BIOGAS

ANAEROBIC DIGESTION

PROCESS WATER

DEWATERING

WATER CO₂

AEROBIC COMPOSTING / DRYING

COMPOST OR LANDFILL
PARTIAL STREAM DIGESTION

MSW OR YARD / FOOD WASTE

Metals
RDF

Dry Sorting

Mixer

Anaerobic Digestion

Up to 70%

CO₂
Water

Aerobic Composting

Biogas

Water

Drying

Compost or Landfill
DRANCO-plant Hengelo (The Netherlands)
Biowaste treatment plant Twence (NL)

- Capacity = 50,000 mtpa
  - 40,000 mt biowaste
  - 5,000 mt expired products
  - 5,000 mt liquid waste products
- Digestate is mixed with fraction 2.4 to 6.3 inches
- No dewatering
- Gas engines: 2 x 1.2MW
- Heat of engines for used for industrial purposes
  >5km
- Started-up: 2011
RECENT COMPOST/RDF SITE INTEGRATION – HENGELO, NL

OPER. IMPACTS:

LABOR: +2 FTEs
SURFACE AREA: nil (within footprint, 0.2 AC)
MAINTENANCE $: +15%

EXPANDED THRUPUT:

TIPPED: + 67%
COMPOST: + 50%
NET ENERGY:
- 0.5MW TO +1.7MW
DRANCO PLANT HENGELO (The Netherlands)

Aerobic post-composting
Refining
Pre-treatment
Tunnel composting
Anaerobic digestion

= existing, old infrastructure
= new anaerobic digestion infrastructure
INTEGRATION OF AD SYSTEM HELPS MEET ENVIRONMENTAL AND ECONOMIC OBJECTIVES

- ORGANIC WASTE CONTAINMENT, REDUCED EMISSIONS (200 TIMES LESS ODORS THAN AEROBIC COMPOSTING) – fewer complaints, citations
- INCREASE DIVERSION OF ORGANICS BY ALLOWING BROADER RANGE OF SUBSTRATES – more tip fees
- BECOME NET ENERGY PRODUCER (2000 TO 5000 CU FT OF METHANE/TON) – potential for lower costs, greater revenue
- INCREASE COMPOST PRODUCTION ON SAME FOOTPRINT (20 TO 40% OF SURFACE AREA NEEDED FOR AEROBIC COMPOSTING) – increased ROR
THANK YOU FOR YOUR ATTENTION!

ANY QUESTIONS???