How WTE is contributing to solve the waste management crisis in Naples, Italy

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A2A spa
Brescia - Italy
NEAPLES, Plebiscito square
CAPRI

faraglioni

piazzetta

Tiberio emperor villa
(27-37 a.C.)
POMPEI (Vesuvio eruption 79 a.C.)
waste crisis 2007
CAMPANIA: MSW DAILY PRODUCTION (tons)

- Napoli city: 1,350 t/d
- CAMPANIA region: 7,000 t/d
CAMPANIA MUNICIPAL WASTE SYSTEM

• COLLECTION (with recyclables source separation)

• PRETREATMENT IN 7 “S.T.I.R” PLANTS

• WASTE TO ENERGY (ACERRA) OF DRY FRACTION

• STABILIZATION & LANDFILLING OF WET FRACTION
SHORT HISTORY OF CAMPANIA WASTE EMERGENCY

• 2/1994    extraordinary Commissioner to waste emergency
• 7/1997    Campania waste management plan (BioMechanical Treatment + RDF + WTE + landfill)
• 1999      Starting of construction of 7 “CDR” (Refuse Derived Fuel) plants
• 2000-2001 starting production of RDF “ecoballs” (7 Mtons accumulated at 2010)
• 2004      starting construction of Acerra WTE
• 2004-2008 many problems arise (legal, technical, public opinion, etc.)
• 13/11/08  15 years contract for Acerra WTE O&M signed with A2A
• 18/3/09   1st waste firing
• 12/5/09   1st electric power generation
• Jan-Feb 2010  WTE acceptance tests
• 1/3/2010  starting of Partenope Ambiente (A2A group) WTE industrial operation
CAIVANO waste pre-treatment plant
CAIVANO waste pre-treatment plant: process diagram
“Ecoballs” storage
CAIVANO waste pre-treatment plant
WASTE TO ENERGY  A2A GROUP

BRESCIA (800.000 t/y)

MILANO (500.000 t/y)
## ACERRA WTE PLANT: TECHNICAL DATA

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Boiler Units</td>
<td>3</td>
</tr>
<tr>
<td>Total Waste Combustion Capacity (ton/d)</td>
<td>1,950</td>
</tr>
<tr>
<td></td>
<td>600,000 (ton/y)</td>
</tr>
<tr>
<td>Total Combustion Thermal Power (PCI = 15,000 kJ/kg)</td>
<td>340</td>
</tr>
<tr>
<td>Total Steam Production (500°C, 90 bar)</td>
<td>380</td>
</tr>
<tr>
<td>Gross electric power (100% MCR)</td>
<td>107,5</td>
</tr>
<tr>
<td>Net electric power (100% MCR)</td>
<td>91,8</td>
</tr>
</tbody>
</table>

This information was prepared by A2A and it is not to be relied on by any 3rd party without A2A’s prior written consent.
Impianto di Termovalorizzazione di Acerra (NA)
Progetto Architettonico
Simulazione 3D – Vista n° 3

Stack
DeNOx SCR
Reactor
Fabric filter
Grate & boiler
Bunker
ACC
Machine hall
Control room
Electric station
Demi water plant
Trafo
ACERRA WTE PLANT: FUNCTIONAL SECTION

- Boiler
- Spray dryer
- Double fabric filters
- deNOx
- Stack
- Grate
- Turbine

GAS CLEANING
ACERRA Gas Cleaning

Activated Carbon & Hydrated Lime → Lime → Process water

Flue gas from boiler → Spray absorber → Fabric Filter 1

Activated Carbon → Activated Carbon Silo

Lime Slaker → Lime Milk Suspension

Lime Silo → AC & Ca(OH)2 Mixture Silo

Residue to Disposal

Fabric Filter 2 → Residue Recirculation → Residue Silo

Natural Gas → SCR

NH4OH → Stack

ID Fan → Cooling Water

Stack

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WTE ACERRA

*Highlights:*

1. LARGE POWER GENERATION: 107.5 MWel
2. HIGH STEAM DATA
   - 90 bar
   - 500 °C
3. HIGH NET ELECTRIC EFFICIENCY 27%
4. DOUBLE FABRIC FILTER GAS CLEANING
5. FULL BOTTOM ASH RECYCLING
WTE ACERRA

OPERATION DATA 2010

at sept. 30th:

- waste treated: 400,000 t
- net electricity generated: 351 GWh

(yearly demand of 137,000 families)
# WTE ACERRA – emission limits

<table>
<thead>
<tr>
<th>Component</th>
<th>European Directive 2000/76/CE</th>
<th>guaranteed values</th>
<th>Reduction %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO\textsubscript{x}</td>
<td>50 mg/Nm\textsuperscript{3}</td>
<td>25</td>
<td>-50</td>
</tr>
<tr>
<td>HCl</td>
<td>10 mg/Nm\textsuperscript{3}</td>
<td>7</td>
<td>-30</td>
</tr>
<tr>
<td>HF</td>
<td>1 mg/Nm\textsuperscript{3}</td>
<td>0,3</td>
<td>-70</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>200 mg/Nm\textsuperscript{3}</td>
<td>85</td>
<td>-57,5</td>
</tr>
<tr>
<td>Dust</td>
<td>10 mg/Nm\textsuperscript{3}</td>
<td>3</td>
<td>-70</td>
</tr>
<tr>
<td>CO</td>
<td>50 mg/Nm\textsuperscript{3}</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>TOC</td>
<td>10 mg/Nm\textsuperscript{3}</td>
<td>5</td>
<td>-50</td>
</tr>
<tr>
<td>Cd+Tl \textsuperscript{(2)}</td>
<td>0,05 mg/Nm\textsuperscript{3}</td>
<td>0,02</td>
<td>-60</td>
</tr>
<tr>
<td>Hg \textsuperscript{(2)}</td>
<td>0,05 mg/Nm\textsuperscript{3}</td>
<td>0,02</td>
<td>-60</td>
</tr>
<tr>
<td>Heavy metals \textsuperscript{(2)} \textsuperscript{(3)}</td>
<td>0,5 mg/Nm\textsuperscript{3}</td>
<td>0,2</td>
<td>-60</td>
</tr>
<tr>
<td>I.P.A. (idrocarburi policiclici aromatici) \textsuperscript{(4)}</td>
<td>0,01 ng/Nm\textsuperscript{3}</td>
<td>0,01</td>
<td>-</td>
</tr>
<tr>
<td>PCDD+PCDF (teq) \textsuperscript{(4)}</td>
<td>0,1 ng/Nm\textsuperscript{3}</td>
<td>0,025</td>
<td>-75</td>
</tr>
</tbody>
</table>

(1) Daily averages, dry, O\textsubscript{2} = 11 % vol.
(2) Sampling: 1 hour
(3) Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + Sn
(4) Sampling: 8 hours
<table>
<thead>
<tr>
<th>Unità di misura</th>
<th>Linea 1</th>
<th>Linea 2</th>
<th>Linea 3</th>
<th>Limiti A.I.A.</th>
<th>Limite Direttiva Europea/ Dlgs 133/2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polveri totali</td>
<td>0.29</td>
<td>0.47</td>
<td>0.39</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Monossido di carbonio (CO)</td>
<td>12.4</td>
<td>14.6</td>
<td>28.1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Ossidi di zolfo (espressi come SO$_2$)</td>
<td>1.4</td>
<td>1.2</td>
<td>5.5</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Ossidi di azoto (espressi come NO$_2$)</td>
<td>56</td>
<td>32</td>
<td>49.6</td>
<td>85</td>
<td>200</td>
</tr>
<tr>
<td>Acido cloridrico (HCl)</td>
<td>0.7</td>
<td>1.3</td>
<td>4.1</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Acido fluoridrico (HF)</td>
<td>0.08</td>
<td>0.06</td>
<td>0.07</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>Carbonio Organico Totale (TOC)</td>
<td>0.7</td>
<td>0.4</td>
<td>0.8</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Mercurio e suoi composti (Hg)</td>
<td>0.001</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0002</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Cd + Tl</td>
<td>&lt; 0.002</td>
<td>&lt; 0.002</td>
<td>&lt; 0.002</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Metalli: Sb, As, Pb, Cr, Co, Cu, Mn, V, Ni</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Idrocarburi Policiclici Aromatici (IPA)</td>
<td>&lt;0.00001</td>
<td>&lt; 0.0002</td>
<td>&lt; 0.0002</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>PCDD + PCDF (TEq)</td>
<td>0.002</td>
<td>0.004</td>
<td>0.002</td>
<td>0.025</td>
<td>0.1</td>
</tr>
</tbody>
</table>
ACERRA WTE - BOTTOM ASH RECYCLING
BOTTOM ASH RECYCLING
BOTTOM ASH RECYCLING

iron – 1st screening

iron – 2nd screening

non ferrous metals:
alluminium, copper, zinc, lead
(0,5 - 2 %)

inert (85 - 95 %) to cement industry

iron (5 - 15 %)
Combustion cleans and separates metals and inerts from mixed waste, producing recyclable bottom ash.

Bottom ash amount to 15-25% of MSW.

WTE, in addition to recovery of energy from residual waste, is a tool to increase material recycling by further 15-25% of MSW.
MUNICIPAL SOLID WASTE IN CAMPANIA
(data 2008 – ISPRA report, march 2010)

what’s the future?

**MSW PRODUCED**
2,723,000 t/a

**SOURCE SEPARATION & RECYCLING (19%)**
518,000 t/a

**UNSORTED WASTE**
2,205,000 t/a

**WTE ACERRA**
600,000 t/a

**REMAINING TO BE DISPOSED**
1,602,000 t/a

(increased recycling and 2 further WTE plants needed)
25.2.10 ISWA working group Energy recovery at Neaples and Acerra