12 MWe FLUIDIZED BED POWER PLANT
USING REFUSE-DERIVED FUEL (RDF)

Outotec’s bubbling fluidized bed technology is ideally-suited to meet stringent, European Union emissions regulations. CCT / EuroEnergy Group, Srl. selected Outotec to provide the core waste-to-energy technology for its state-of-the-art municipal waste facility. The Appea Energy facility receives the municipal waste from the community of Massafra, processes the waste to remove the recyclable and non-combustible fraction, and sizes the balance for conversion to energy in the Outotec fluidized bed system. The energy system converts 94,000 tonnes/year of RDF into 133,400 lbs/hr (60,5 tph) of superheated steam, which is used to produce a gross 12.25 MWe of power in a steam turbine-generator set.

Outotec’s patented fluidized bed technology was selected because of the excellent operating characteristics and superior emissions performance when burning waste fuels. Outotec’s patented fluidized bed technology was selected because of the excellent operating characteristics and superior emissions performance when burning waste fuels. Outotec’s unique solution for thermal oxidation of RDF combines in-vessel heat transfer tubes with a proprietary bed material cleaning and recirculation system thus ensuring reliable operation with heterogeneous fuels, like RDF. The Outotec energy system is a key component in meeting the stringent air emissions requirements established by Appea Energy’s operating permit.

CHALLENGES
• Variable fuel quality
• High operating efficiency requirements
• High amount of inert materials accompanying fuel
• Strict emissions limits

SOLUTION
• Outotec Bubbling Fluidized Bed with in-vessel tubes for highly-efficient heat transfer
• Outotec Proprietary bed cleaning and recycling system

BENEFITS
• Stable, efficient operation with varying fuel quality
• Bed cleaning and recycling system ensure removal of the high volume of inert material
• Optimum environment for inherently low NOx production and emissions abatement
Initial heat for starting up the renewable energy system is typically provided by startup burners fired with natural gas. Air from the forced-draft fan fluidizes the bed media such that it bubbles like a boiling pot of water. Processed fuel is then delivered to a dual-screw metering bin located adjacent to and elevated above the fluidized-bed combustor. Upon discharge from the bin, the metered fuel gravity-flows to the inlet of an airswept spreader. Pulsating sweep air disperses the fuel across the 20-foot span of the combustor.

Fuel entering this hot, bubbling bed area, first releases its moisture, then combusts at a low, controlled temperature, helping prevent ash from the fuel from melting and coating the boiler tubes. Limestone is also added into the bed in order to improve ash eutectics and capture oxides of sulfur (SOx).

Nitrous Oxides (NOx) abatement occurs inside the main vessel’s upper vapor space via nozzles that spray ammonia into the 1700°F [927°C] flue gas, which then reacts with nitrous oxides to form nitrogen, carbon-dioxide and water.

Any remaining inert fuel contaminants, such as metal or rock are removed from the bed automatically during normal operation via Outotec’s proprietary bed material cleaning, handling, and storage system.

Flue gas cleanup is completed via dry sorbent injection into the flue gas which then enters a pulse-jet fabric filter baghouse. Remaining particulate matter in the flue gas is removed in the baghouse with over 99% efficiency. The flue gas is then ducted into a wet-scrubber for additional treatment to complete acid-gas removal. Lastly, an induced-draft (ID) fan pulls the clean flue gas from the wet-scrubber and disperses it via the stack. Emissions are monitored via a continuous, emissions-monitoring system (CEMS) which measures carbon monoxide, oxygen, nitrogen oxides, and acid gases.

**Scope of Supply:**
Outotec supplied the fluidized bed thermal oxidation system, NOx abatement system, bed additive system, bed recycle and storage system, and the process design for the entire boiler island. Outotec expert advisors were also provided during construction and commissioning.

**BFB PLANT FACTS:**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Refuse-derived Fuel (RDF)</th>
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</thead>
<tbody>
<tr>
<td>Fuel consumption</td>
<td>≈ 27,630 lb/hr [300 tonnes/day]</td>
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<tr>
<td>Flow</td>
<td>133,400 lb/hr [60.5 tonnes/hr]</td>
</tr>
<tr>
<td>Temperature</td>
<td>752 °F [400 °C]</td>
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<tr>
<td>Pressure</td>
<td>667 psia [46 bara]</td>
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<tr>
<td>Air quality control system (typical)</td>
<td>Limestone injection for SOx removal  Selective non-catalytic reduction (SNCR) NOx abatement system  Dry Scrubber  Pulse-jet fabric filter  Wet Scrubber</td>
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<td>Completion</td>
<td>2003</td>
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