Pre-feasibility study of a Solid Recovered Fuel (SRF) WTE Power Plant in North Greece

Presentation by Dr. Efstratios Kalogirou,

5 PM Friday, February 15, Mudd 918

Research Associate, Earth Engineering Center (EEC) of Columbia University and Chair of WTERT-Greece / SYNERGIA

A pre-feasibility study will be presented of a state-of-the-art WTE power plant based on moving grate technology and fueled with Solid Recovered Fuel (SRF), produced by an adjacent unit of Mechanical Biological Treatment (MBT) of municipal solid wastes (MSW). The required capacity has been set at 104,000 tons/year which, at an estimated plant availability of 8000 hours/year (about 90%), corresponds to one furnace unit of hourly capacity of 13 tons per hour. The average Lower Calorific Value of the SRF fuel has been projected to 15.25 MJ/kg.

For the above specifications, the thermal energy released in the combustion chamber is 13000 x 15.25 = 198 MJ,th/3600 == 55 MW,th. The steam generated in the boiler of the WTE plant is used in a steam turbine to generate electricity. Some of this electriciy is used within the plant and an estimated 14.2 MW,el is exported to the local electricity grid. Therefore the net thermal efficiency of the plant is 14.2 MW,el/55 MW,th= 25.8%; the total produced gross electricity is projected at 14.2 x 8000 = 114 GWh per year.

On basis of existing plants, the required land area is estimated at 4 hectares (250m x 170m) of which about 1 hectare is the buildings surface area, including 0.3 hectares of covered area for the on-site treatment of bottom and fly ash.

The mass & energy balances are analyzed (total needs of reagents, secondary utilities, emissions, Air Pollution Control (APC) system. Also, the economic feasibility (CAPEX and OPEX with estimated Internal Rate of Return (IRR) as well as the R1 Plant Efficiency Factor, according to EU Directive 2008/98 are calculated.

The most important criteria to be met by theproposed conducting the SRF combustion technology are: To be environmentally and socially acceptable and compatible with current European and Greek national legislation; prior wide application (proven technology, able to treat urban waste and all produced RDF / SRF of northern Greece region; to be flexible in co-processing other types of waste, such as sludge of wastewater treatment , agro-residues , etc., and generate the minimum possible volume of ash for landfilling (less than 10%) , in accordance with the requirements of European legislation; and, finally, to be economically viable, with as low as possible gate fee per ton of material processed; to require a relatively small land surface area; and for the building to be esthetically pleasing.

A very important parameter is the ability to produce electrical or thermal energy of low enthalpy (in the form of heating or cooling)& improving the balance o CO2 emissions of Grerece while contributing to the production of energy from RES due to the large biodegradable fraction of SRF (EU Directive 20-20-20).

The role of WTERT-Greece (SYNERGIA) in advancing sustainable waste management in Greece and the Balcan region::

The Waste-to-Energy Research and Technology Council of Greece was established in July 2008 by the Center of Environmental Engineering (Earth Engineering Center) of Columbia University, New York, by members of the Laboratory of Thermodynamics and Transport Phenomena of the School of Chemical Engineering of the National Technical University of Athens (NTUA), and members of the Laboratory of Heat Transfer and Environmental Engineering of the Department of Mechanical Engineering of the Aristotle University of Thessaloniki (AUTh). Other members of SYNERGIA include professors from all universities of Greece, as well as foreign universities. WTERT Greece is now an Academic Partner of the European Confederation of Waste-to-Energy Plants / CEWEP. The main idea of the Council is that a close collaboration between academics, researchers, as well as public and industry stakeholders, will help Greece develop Waste-to-Energy and preserve the Greek land for future generations.

Contact: Dr. Efstratios Kalogirou, President of WTERT Greece
Tel:+30 210-6682711
Web: www.wtert.gr
E-mail: synergia@synergia.com.gr