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Operation and Performance of a Fluidized Bed Boiler Firing Municipal Refuse Derived Fuel in Ravenna, Italy

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ABSTRACT

In early 1998, the City of Ravenna, Italy, commissioned a fluid bed boiler/waste-to-energy system to combust approximately 50,000 tonnes per year of processed municipal waste and generate electrical power. Much of the fuel preparation and processing equipment was already in place and the primary focus of this project was to implement an environmentally acceptable energy conversion process compatible with the 6.0 tonnes per hour of fuel being processed. The fluid bed boiler system being provided incorporates state of the art environmental controls for abatement of all pollutants, including products of incomplete combustion (PIC's), NOx, acid gases, and particulates. The project delivers an average of 70,000 pounds per hour of steam to generate approximately 7 MW of electricity.

FLUIDIZED BED TECHNOLOGY

To date, only a handful of fluid beds, either BFB or CFB, utilize RDF as a feed stock and only a portion of these systems feed 100 percent RDF fuel. The cause lies not so much in the fluid bed technology itself, but more so from the difficulties encountered in generating a manageable, homogeneous fuel mixture from a widely varying source and supply as typifies most municipal waste streams.

Fluid bed technology provides some well documented and widely recognized advantages to the combustion of solid fuels, especially lower quality, higher moisture fuels. In a bubbling fluid bed, a layer of sand, usually around one and one-half to two feet in depth, is suspended in place by an upward flowing stream of fluidizing air.

At velocities of five to seven feet per second, this air/gas velocity creates a boiling/bubbling turbulence within the bed, causing it to behave in much the same manner as a pot of boiling water. Once this sand is heated to an optimum temperature, solid fuel introduced into it will almost immediately combust and burn to completion. The turbulence of the bed creates an enhanced combustion environment where the fuel particle is completely consumed in a matter of minutes. As the fuel particle burns, the abrasive action of the sand etches away any layer of ash from the surface, thereby exposing fresh fuel to the surrounding combustion air.