

INNOVATIVE FUNDAMENTALS TRIGGER COMBUSTION CONDITIONS PROVIDING SOOT AND PARTICULATE REDUCTION IN FUMES

M. Malavasi*, A. Bassignano**

Malavasi.itea@ansaldoboiler.it; Alvise.Bassignano@sofinter.it

* ITEA SpA, Via Milano Km 1.6, Gioia del Colle (BA)

** ITEA SpA, Largo Buffoni, 3, Gallarate (VA)

ISOTHERM PWR[®] is an innovative combustion technology, patented by Itea S.p.A., for the combustion of solid and liquid fuels, which features higher energy recovery yield and far lower environmental impact, in comparison with standard combustion technologies.

Isotherm establishes a set of combustion parameters in the pressurized reactor which create unique oxy-combustion process conditions, totally different from any combustor of the art.

Thus, some orders of magnitude reduction of particulate in fumes is provided. Experimental characterizations have constantly demonstrated that high temperature, high residence time and high irradiative heat exchange in the Isotherm combustor produce an unusual population of fine particles. In fact, extensive characterizations with probes picture out small spherical droplets, of size comprised between 1 and 10 micron, carbon free. These liquid particles, because of their particular shape and the molten state, they coalesce in the combustor and undergo segregation from fumes by simple gravity settling. They are conveyed as liquefied slags and, at the very end, they are quenched into a water bath to provide carbon free, 100% amorphous, vitrified pearls, free from any leaching problems (both pyrolyzed species and heavy metals).

To visualize the substantial change provided by Isotherm technology, we take the comparison, as reported by prof. D'Alessio in a technical report (December 2006), between standard furnace and Isotherm combustor, both firing the same low sulphur heavy oil. In traditional furnaces, fumes particulate characterization shows high concentration of carbon, and Si, Na, P. Isotherm fumes particles composition is characterized by negligible carbon (no soot – cenospheres and plerospheres- detectable), while the inorganic components are mainly alkaline sulphates.

These results allow ISOTHERM PWR[®] perform a pressurized oxy-combustion of a full spectrum of fuels, ranging from wastes to low ranking fuels, to standard combustible and biomass, without corrosion and erosion problems, with high energy recovery and with a quantum leap reduction in integral emissions.