

THERMO-CHEMICAL MULTI-PROCESSING OF SOLID WASTE MATERIALS FEATURING RECOVERY OF GAS, HEAT, METALS AND MINERALS WITH COMPLETE VOLUME REDUCTION AND RESIDUE STABILISATION

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EXTENDED ABSTRACT

This paper describes an advanced thermo-chemical process that offers safe and inert rendering - and almost entire volume reduction - of literally any waste material, except for nuclear.

A proprietary process designated PyroArc® combines pyrolysis, gasification and plasma cracking. Key elements are the *blast-air-shaft-furnace-gasifier* and the *plasma-augmented decomposition reactor*. All effluent streams are fully stabilised as no material can leave the process unless it has either been gasified or melted. Metals are tapped from the bottom of the shaft in molten phase jointly with inorganic minerals (i.e. bottom ash) stabilised by vitrification. Volatile metals like Hg, Pb, Cd and Zn leave the gasifier in gas phase, but are subsequently captured in the downstream gas loop and retrieved in the form of a slurry or filter cake. As no ashes are left - neither fly ash nor bottom ash, and gas and metals are recovered, a *complete-volume-reduction* is claimed.

The produced pyrolysis gas is fully dissociated in a *thermal plasma jet* upon entering the decomposition reactor where cracking takes place. Tests show that *no halogenated, chlorinated nor carcinogenic organic components survive*. All dioxin measurements are well below 1/10 of a nanogram per cubic meter - even with pure PCB oils, and no recording shows more than 30 ppm NO_x - even with nitrates. Hence, a harmless fuel gas is retrieved from the decomposition reactor. As this fuel gas is tar-free it is used to operate air-breathing engines.

Key words: Waste-to-energy, gasification, plasma cracking, multi-recovery, vitrification, volume reduction, fuel gas, CHP.