BURNERS, COMBUSTION AND HEAT TRANSFER

(682) - (*) - NUMERICAL INVESTIGATION OF AN INNOVATIVE FURNACE CONCEPT FOR COIL COATING PROCESS

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Draft Paper

In this work, the thermal engineering performance of an innovative furnace concept developed for continuous drying and curing of paint-coated metal sheets (coil coating process) is investigated through advanced modeling and numerical simulation techniques. Unlike the traditional and wide-spread drying/curing furnaces applied for coil coating – which operate according to the so-called convective air-drying technology –, the present furnace concept developed within the Project ECCO relies on IR radiative heat as the main heat transfer mechanism to drive solvent evaporation and curing reactions. The radiative heat source is provided by the operation of porous radiant burners which utilize evaporated solvents as fuel. The ECCO-furnace consists of two main chambers – the radiant burner section and the curing oven section. To utilize the solvent loaded atmosphere from the curing oven section as fuel, an innovative inertization concept shielding the curing oven from ambience is considered. The current furnace concept aims at improving process intensification and promoting energy efficiency.

Numerical simulation results, for the current coil coating furnace concept, support a suitable and competitive performance for drying the applied coatings in comparison with the traditional approach. At the same time, a safe operation is predicted, without solvent leakage from the furnace and without oxygen entrainment from the surrounding ambient. These safety conditions are satisfied demonstrating a safe and efficient operation of the ECCO furnace.

Palavras-chave : Coil coating, innovative furnace, solvents, radiant porous burners, evaporation