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NEW PROCESS ENVIRONMENTAL FRIENDLY CONCEPT FOR THE RECYCLING OF R/K E-FILTER DUST IN THE FERRONICKEL PRODUCTION

TH.V. TZEVELEKOU[1], I.E. ALEXOPOULOU[1], F. HOEFER[2], G. RENTIZELAS[3], J. GAITANOS[4] and D.C. PAPAMANTELLOS[1]

[1]Laboratory of Metallurgy, Department of Chemical Engineering, University of Patras, Rion 26504, Greece,
[2]Georgsmarienhuette GmbH, Postfach 12 80, D-49110 Georgsmarienhuette, Germany,
[3]MIRTEC, Industrial Region of Volos, 38500 Volos, Greece,
[4]G.M.M. S.A. LARCO, 20 Amalias Ave., Athens, 10557, Greece
E-mail: fani@chemeng.upatras.gr

EXTENDED ABSTRACT

Throughout the production of ferronickel in Greece in the metallurgical plant of LARCO at Larymna, the lateritic Nickelferrous iron ores are pre-reduced in 4 Rotary Kilns of maximum capacity of 2.5 million tons per year. During this pre-reduction, for an annual production of 100000t granulated ferronickel with 20% average nickel content, 160000-200000t of dust and sludge are collected in the gas cleaning systems of the Rotary Kilns, with 1.2-1.5% Ni and 4-5% carbon contents. In addition a stockpile of approximately 1 million tons of old R/K filter dust with nickel and carbon contents of 1.4-1.8% and 7-11% respectively, lies close to the plant and the community of Larymna, causing disturbance of the natural landscape and by strong winds, a black dust evolution and disposal in the vicinity of the dust stockpile.

The recycling of the pre-mentioned generated and stockpiled dust is of great environmental and economic interest. Different recycling processes such as briquetting (1975), pelletizing (1977) and submerged injection in the electric reduction furnace, ERF (1990) have been industrially tested. Furthermore the dust smelting by plasma was examined in technicum scale (1991) and its sintering in pilot Dwight-Lloyd sinterband installation, erected and operated in the Larymna plant with sinter capacity of 40t/day (1994). The pelletizing process has been industrially adapted since 1978. The sintering process although it was proved very successful (1994) and economically more interesting than the pelletizing one, since the dust-sinter is charged straight to the ERF bypassing the R/K, it was not industrially adapted due to lack of investment capital.

In the present study, a new one-stage process for the recycling of the aforementioned dust was developed. The new concept was the dust smelting without any pre-treatment in DC-arc furnace producing iron alloys and hydraulic slag suitable for special cement types production. The method was industrially adapted by test heat campaigns in 125t electric furnace at Georgsmarrienhuette steelwork in Germany, which was equipped with a rapid quench off-gas installation eliminating the production of toxic gases (dioxins). No dust losses were observed in the environment of the furnace during the trials and almost total nickel recovery (97%) was achieved in the metal bath. Thus, a zero residues fine metallurgical solid waste recycling process was demonstrated. Significant advantages for the employees in the plant of Larymna, the habitants of the homonym settlement and the urban environment, as well as economic benefits will result by the process adaptation in LARCO's production line.

Key words: ferronickel, dust recycling, nickel recovery, DC-arc furnace, metallurgical solid waste, composite Portland cement