A field study on the optimum structure of cleanable Media for along their service life challenged with periodically-produced high-concentration populations of ultrafine metallic particles

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Flue gas flows from Electric Arc Furnace (EAF) steelmaking meltshops require large multi-compartment filtration units. For meltshops are frequently located near urban areas, stringent policies regulate Pb and Zn (Choel et al., 2006), so an efficient filtration is a critical issue. This flue gas is the result of mixing the stream coming out the EAF with the meltshop evacuation through the canopy. Each stream has its own dynamic characteristics. The furnace gas coming out through the 4thhole carries initially a high content of metallic vapours (1975 ºC) leading to a high number concentration of metallic ultrafine particles as the gas cools down. For the EAF steelmaking is a batch process (heats of 50 min) the raw aerosol coming out has a characteristics strongly dependent on process dynamics. The canopy flow mainly consists of coarse particles entrained from the meltshop atmosphere.

The nominal flow is 2.10^6 Nm^3/h for a pulse-jet filter of 10^4 bags (7m length). The medium is challenged with periodic bursts of high concentration of metallic aerosol. Lifetime of conventional felts is conditioned by early clogging. Looking for a rationale for media selection adapted to the specific characteristics and dynamics of this raw aerosol, a 3-year field study aiming to assess the performance of membrane-coated vs. conventional felt confronted with the same history was undertaken.

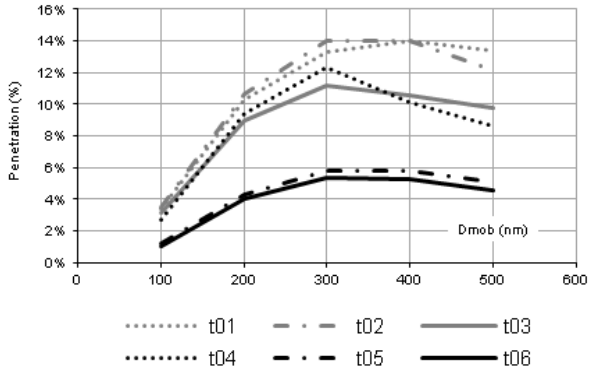

Figure 1 Fractional penetration as obtained in the lab of loaded coupons of conventional filter media

Results will be presented about: lab tests (Figure 1) and SEM/EDX analysis of loaded media (Figure 2). There is evidence (Múgica et al, 2014) on the high metallic content within the MPPS range of conventional polyesters felts. This critical point was solved by membrane-coated structures. Lifetime and residual pressure drop along the 3-year period will be discussed. The membrane-structured medium allows for a simultaneous control of metallic and particulate emissions through a biased fractional efficiency curve, improving the fractional efficiency at the Pb- and Zn-bearing size bin.

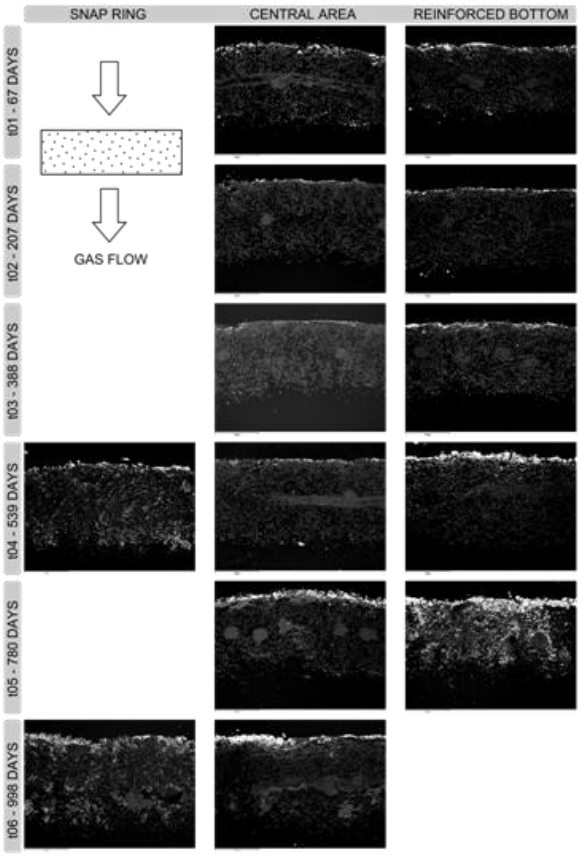

Figure 2 Aging of conventional medium and metal clogging.

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I. Mugica, R. Tucho, F. Vergniory, G. Aragon and C. Gutierrez-Cañas (2014), Lifetime and performance of filter media challenged by ultrafine metallic aerosols: An experimental study in a 160 t steel/heat EAF meltshop, Aerosol Technology 2014, Karlsruhe, Binnig, J. et al. (2011). *Powder Technology*, 211, 275-279.
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