

Performance Based Analysis of Watermist Protection System in a Conveyor Belt using CFD

Patricio Valdés Gacitúa¹, Miguel Ángel Pérez Arias²

¹MAPA Fire engineering, Santiago, Chile, patricio.valdes@mapafire.com

²MAPA Fire engineering, Santiago, Chile, miguel.perez@mapafire.com



Bio¹: Patricio Valdés is a MSc in fire safety engineering from Ghent university, mainly focused on performance and prescriptive base design of fire safety. He is currently working as an independent consultant as MAPA Fire and as fire safety specialist at University of Chile. Currently he is also teaching postgraduates courses of human behaviour in fire at ESSiIF – by University Isabel I.

Bio²: Miguel Perez is a MSc in structural and fire safety engineering from Edinburgh university, mainly focused on performance and prescriptive base design of fire safety, including complex problems regarding passive fire protection. He is currently working as an independent consultant as MAPA Fire and as fire safety specialist at University of Chile. He posses more than 25 years of experience in fire safety engineering.

Abstract

[*Background*] Usually, sprinklers systems from prescriptive codes are used for the protection of conveyors belts in mining. However, due to an increasing environmental concern with the sprinkler's water discharged, a demand for optional fire protection systems has arisen. [*Objective*] The aim of this study was to investigate whether water mist fire protection systems could provide an equal level of protection, as compared to a regular sprinkler system. [*Method*] A series of CFD simulations using FDS were conducted in accordance to the recommendations given in the FM-Global datasheet protection for conveyor belts, several variations of sprinkler system arrangement and commercially available water mist fire protection systems. The simulations were conducted representing the worst probable and credible fire scenario, which corresponds to a fire in the 130m section of the conveyor belt with 10° of slope. The HRR produced by the fire developed ranging up to 8 MW, considering the material of

the conveyor belt and the fire propagation. *[Results]* The CFD simulations revealed that the sprinklers systems controlled and extinguished the fire in fractions of minutes, as well as the watermist system. On the other hand, the watermist system requires much less water to control the fire and therefore, the amount of water discharged to the environment is much less than the sprinklers system. *[Main conclusions and recommendations]* It is concluded that the protection of closed conveyor belt with a slope are viable with water mist fire protection systems, with the same performance than a sprinklers system but affecting much less the environment where the conveyor belt is placed.

KEYWORD: water mist systems, conveyer belt, FDS, Sprinkler system, mining premises, CFD, PBD.