

# Electrostatic discharges inside storage silo during loading of polypropylene powders

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## Abstract

Electrostatic charge is virtually generated in all industrial processes involving the use of powders. In particular, when powders are transferred, loaded, or stored in places such as silos, they become highly tribocharged as a result of the friction and collision of pipe-particles and inter-particles. Most significantly, the accumulated electrostatic charges on powders may generate incendiary electrostatic discharges which in turn will result in the dust explosions.

An actual-sized pneumatic powder transport facility and an image-intensifier system were used in this study. This study is focused on the electrostatic discharges inside storage silo during the loading of polypropylene (PP, 2 - 3mm in size) powder. 0.68 kg/s of PP was loaded continuously into the silo until its total mass reached approximately 800 kg. The charge to mass ratio of the loading powders remained at the constant value of about -12  $\mu\text{C}/\text{kg}$  during powder loading.

The results obtained from the experiments show that the ring shaped electrostatic discharges appeared at the center of silo at about 7 s after initial loading, when the amount of loaded PP powder was about 5 kg. The diameter of the ring shaped electrostatic discharges grew larger as the loading time continuously passed. This was because the diameter of the accumulated PP powders increased in silo during running time, meaning that electrostatic discharge occurred between settled PP powders and the grounded metal silo wall. Additionally, the electrostatic discharges during the loading of powder in this study were observed clearly and classified in three kinds of discharges, as brush, linear, or broad bulk surface discharges.