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CFD Prediction of Black Powder Particles' Deposition in Vertical and Horizontal Gas Pipelines

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Abstract

The deposition of Black Powder particles in gas pipelines is a critical industrial problem. Gas-solid flow in a pipe is simulated using the Reynolds Stress Model (RSM) and the Discrete Phase Model (DPM). In this study, 3D meshes for pipes with different orientations are considered. Vertical orientations were, also, considered although they are not as common as the horizontal pipeline in the gas industry. Efforts were made to predict an accurate turbulent flow field as a requirement for successful simulation of particle deposition velocity. A fine mesh was used to resolve the viscous sublayer and DNS or experimental profiles of the fluctuating velocities were imposed to minimize the inaccurate prediction of the RSM model to determine the fluctuating velocity needed for the particle trajectories. Black Powder particles, in the range 1-50 μm , were injected in the computational domain as mono-dispersed and poly-dispersed size distributions

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