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Numerical Investigation of Pressure Drop and Erosion Wear by Computational Fluid Dynamics Simulation

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Abstract : The modernization of computer technology and commercial computational fluid dynamic (CFD) simulation has given better detailed results as compared to experimental investigation techniques. CFD techniques are widely used in different field due to its flexibility and performance. Evaluation of pipeline erosion is complex phenomenon to solve by numerical arithmetic technique, whereas CFD simulation is an easy tool to resolve that type of problem. Erosion wear behaviour due to solid–liquid mixture in the slurry pipeline has been investigated using commercial CFD code in FLUENT. Multi-phase Euler-Lagrange model was adopted to predict the solid particle erosion wear in 22.5° pipe bend for the flow of bottom ash-water suspension. The present study addresses erosion prediction in three dimensional 22.5° pipe bend for two-phase (solid and liquid) flow using finite volume method with standard k-ε turbulence, discrete phase model and evaluation of erosion wear rate with varying velocity 2-4 m/s. The result shows that velocity of solid-liquid mixture found to be highly dominating parameter as compared to solid concentration, density, and particle size. At low velocity, settling takes place in the pipe bend due to low inertia and gravitational effect on solid particulate which leads to high erosion at bottom side of pipeline.

Keywords : computational fluid dynamics (CFD), erosion, slurry transportation, k-ε Model
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