

Flow visualization simulation of cemented tailings backfill slurry by particle tracking technology

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Abstract

Pipeline flow visualization of cemented tailings backfill slurry (CTBS) improves the safety and stability of transportation. High turbidity and low resolution make it difficult for conventional methods to monitor the particle distribution state of CTBS in a short period of time. Particle tracking technology (PTT) is used to simulate and investigate the flow characteristics of CTBS pipeline, combine with theoretical analysis to construct a CTBS pipeline visualization model, elaborate the particle distribution state when CTBS flows in the pipeline, and explore the effects of pipe diameter (PD), flow velocity (FV) and tailings gradation (TG) on the particle distribution. The results show that particle tracking technology is better applied to investigate the particle transport distribution characteristics of CTBS tailings. Three concepts of particle accumulated gravity G_a , static friction angle θ and diameter dividing line are defined, and the transport pipe is divided into light wear zone, medium wear zone and heavy wear zone. The increase in pipe diameter increases the content of fine particles at the pipe wall and the thickness of the lubrication layer becomes larger, which improves the safety and stability of CTBS transport. The increased flow velocity reduces the settling phenomenon of large size particles and improves the transport efficiency, which increases the pipeline transport resistance. The wider the range of tailings gradation and the smaller the ratio of the number of large size tailings to small size tailings, the more suitable the tailings are for pipeline transportation as a backfill aggregate.

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