Wear behavior comparison of abrasion and slurry erosion targeted steels in slurry pot test system

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Slurry-pot tester was designed for experimentally simulating abrasion and slurry erosion wear targeted martensitic steels used in mineral industry and agricultural applications. In these fields the knowledge about system dependent wear resistance and damage mechanisms in custom made test configuration is limited. The developed configuration gives an efficient and simple method to compare wear rate and investigate the dominant wear mechanisms. Samples were mounted vertically to a rotating disc on different radii and orientation to the slurry flow. The rotating disc was placed in a cylindrical container filled with abrasive corundum and water. Total tests duration was 180 hours where specimen dimensions, weight, hardness and surface roughness were investigated for every 20 hours. Microscopy was used to track the damage of the worn zone and materials were ranked according to their wear rate. Mass decreased linearly in function of running distance which is influenced by the impact angle of the slurry flow. The effect of specimen orientation was more dominant factor on the wear rate than the circumferential velocity of the specimen. High speed camera recordings highlighted the different contact conditions resulted in a transition in the wear mechanisms. Three main wear zones were identified on each specimen, the areas of these zones depended on the specimen's position (radii) and orientation. Slurry abrasion was observed at the bottom zone of the specimen due to pure sliding condition under the slurry surface level. At the top of the specimen pitting wear features were present due to fatigue caused by impacting particles above slurry level. Between bottom and top zone a transition zone is distinguished. 3D surface investigation with white light interferometer showed decrease in wear rate when transitioning from the abraded zone which experienced polishing and minor hardening to the pitting zone.

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