An Experimental Study of the Impact Erosion for high Pressure pipe Manifold

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Abstract

The impact erosion is regard as the most important failure cause of the pipe manifolds used in well completion and recovery under the action of the high pressure multiphase fluid such as output liquid or fracturing fluid. Particularly, the rapid erosive wear occurring under incorrect conditions can lead to boring and the high-pressure fluid leaking in a very short period that could bring about an accident. It is necessary to carry out experimental study on the impact erosion of the high-pressure pipe manifolds for the prevention of erosive wear. However existing impact erosion test machines present limitations being used to investigate the erosive wear of the components due to the lack of stress loading on specimen. It is noticed that the high-pressure fluid can put great stress on the pipe which may have a remarkable effect on the erosive wear. Thus a new type of tester with a specimen loading system is introduced to simulate the erosive wear behavior of the high- pressure pipe manifolds caused by the multiphase fluid. This new impact testing machine takes advantage of the mechanical structure and instrumentation on an existing erosion tester. In the tester, the angle adjustable specimen holder is linked with a hydraulic loading system and the distance between the specimen and the slurry jet nozzle is also adjustable. In this paper, the test methods for this machine are described. Then a series of wear test results under the different conditions of load, fluid velocity, impact angle, specimen material and slurry are presented, the effects of these conditions on the impact erosion wear are discussed in detail. Especially, the effect of the specimen entirety stress on the wear raises awareness. The results showed that the erosion wear rate increases rapidly when the entirety stress on the specimen exceed a specific value, the stress has a remarkable effect on the erosive wear of high-pressure pipe manifolds. The affecting mechanism of the stress on the impact erosion wear is worthy of in-depth study.

Key words: Impact Erosion; High-pressure pipe Manifolds; Multiphase Flow.