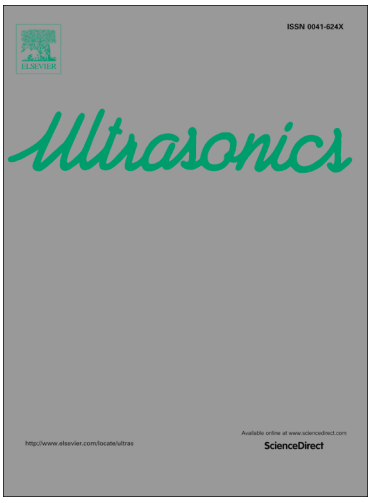

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Influence of severe plastic deformation on fatigue life applied by ultrasonic peening in welded pipe 316 Stainless Steel joints in corrosive environment

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Highlights

Using filler 347 SS for welding in the corrosive environment couldn't increase fatigue-corrosion life, however, it increases tensile strength in weld line about 40%.

Impact tools with striker diameter of 4 and 5 mm on applying UP showed that, in general, striker with 4 mm diameter improved fatigue and even fatigue-corrosion more efficiently.

In fatigue-corrosion the maximum life was achieved in weld by filler 316 SS with UP, while in fatigue the maximum life was achieved in weld by filler 347 SS with UP.

Abstract

Corrosive solutions have an enormous effect on fatigue life of components in refinery industry. Several post-processing solutions are proposed to improve the weld zone, which is affected by the corrosive solutions. Ultrasonic peening (UP) is developed to enhance the fatigue life, specifically in corrosive environments and corrosion resistance of the components. The enhancement mechanism of UP is based on severe plastic deformation and reduction of tensile residual stress in weld toe. In this research, the fatigue-corrosion life of welded 316 Stainless Steel (SS) pipe is enhanced through utilizing UP process with different diameters of strikers. Fatigue-corrosion life of the weld on 316 SS and 347 SS fillers, as experimental samples, is studied in corrosive environments. This study intends to shed more light on the influence of corrosion and strength in fatigue-corrosion life of the sample materials. Therefore, this article studies the microstructure and pitting corrosion of the samples at different zones. The experimental results showed enhancement of fatigue-corrosion life after applying UP. The results revealed that welding by using 316 SS filler and UP with striker diameter of 4 mm have the highest fatigue life in the simulated H_2S corrosive environment.

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