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Experimental investigation of fatigue damage formation of hybrid pipes subjected to impact loading under internal pre-stress

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Abstract

In this study, the effect of impact loading upon fatigue behavior of hybrid composite pipes has been investigated. The composite pipes were subjected to tangential pre-stress as 3-48 MPa according to ANSI/AWWA C950 standard than, subjected to low velocity impact at 20 J. The impact pre-damaged pipes then subjected to cyclic loading at 50% σ_{ult} in accordance with ASTM D 2992-06. It is also observed that increasing the tangential pre-stress decreases impact damage area and increases fatigue life of the pipe. It is also showed that impact pre-damage are not effective on the fatigue life of the pipe at the pre-stress level of 24 MPa.

Keywords

Low velocity impact, Fatigue, Filament winding, Hybrid composite pipe, Internal pressure.

1. Introduction

The usage of composite materials in wide variety of engineering disciplines has increased considerably in the last decades, where high stiffness and low weight are important [1-3]. Fiber reinforced composite tubes with their greater strength, lighter weight and lower risk of bursting makes them good candidates for applications such as oil and gas industries [4] and it is reported [5] that filament wound composites have been progressively replacing metal for pressurized vessels. It is also reported that composite vessels can contain gas of same volume by lighter structure [6].

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