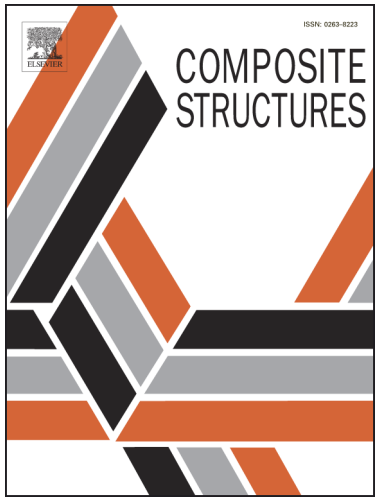

Simulation of the long-term hydrostatic tests on Glass Fiber Reinforced Plastic pipes

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Simulation of the long-term hydrostatic tests on Glass Fiber Reinforced Plastic pipes

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Abstract- The main objective of this paper is to simulate long-term hydrostatic tests on Glass Fiber Reinforced Plastic (GFRP) pipes. An experimental procedure for obtaining pressure class of GFRP pipes on the basis of long-term behavior is very time consuming and costly that sometimes take about 2 years for collecting required data. Then, obtained results are extrapolated to 50 years. In this work, a theoretical modeling procedure is developed to obtain residual strength of pipes after 50 years taking into account creep phenomenon. Developed progressive modelling consists of creep modelling, stress analysis and failure evaluation. An integrated modelling procedure is developed reporting time-to-failure at any desired internal pressure. As a case study and also validation purpose, the developed modeling procedure is conducted for predicting long-term behavior of a specific GFRP pipe subjected to internal pressure. A comparison between real experimental data and theoretical modeling is presented. A very good agreement between predicted 50-year hydrostatic pressure and experimental data implies on the proficiency of the developed modelling. Since the developed modelling is just in need of short-term experimental data on pure resin, it could be used as an appropriate engineering tool for industrial centers.

Keywords: *Composite pipes; Creep analysis; Long-term behavior; Theoretical modelling; Experimental study*

1. Introduction

Thanks to high strength, good corrosion resistance and easy repair and maintenance procedures composite materials have been increasingly introduced into piping systems. A significant growth in the demand for application of composite materials in piping systems can be seen in recent years [1]. Different sectors of civil infrastructure massively utilize Glass Fiber Reinforced Plastic (GFRP) pipes for sewage, service and potable water transmission in offshore facilities, chemical plants, water supply and sewage systems.

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