NONDESTRUCTIVE TESTING AND IDENTIFICATION OF DEFECTS IN GFRP PIPES USING PULSE ACTIVE INFRARED THERMOGRAPHY

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ABSTRACT

Composite materials such as glass fibre reinforced polymers (GFRP) are increasingly being used on offshore pipeline installations. The production of a defect free composite structure is a formidable challenge and requires stringent quality control measures. Detection of defects is very essential as they may have adverse effects on the performance and safe operation of composite structures. Various NDT methods are available to inspect composite structures. These include x-ray radiography, ultrasonic testing, time of flight diffraction technique, and infrared thermography. The aim of this paper is to study the viability and efficiency of the infrared thermography technique in locating and analyzing the subsurface defects in GFRP pipes. Delaminations of known sizes are intentionally simulated and introduced at different locations within the GFRP pipes. Thermal imaging and data acquisition is achieved by using a THERMACAM PM 290 infrared thermal imaging camera. The analysis is based on pulse active thermography using the reflection method in which the location of delaminations and the effect of variation in defect dimension are analyzed. Results show that the location and size of delaminations are key parameters affecting detectability. The thermal contrast is heavily dependent on depth of delamination and the larger the defect the higher is the level of detectability.

KEYWORDS: GFRP pipe, Nondestructive testing, Defects, Delamination, Infrared thermography, Emissivity.