Structural Behavior of GFRP Beams under High Temperature Condition

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Summary

Glass fiber reinforced polymers, GFRP, are extensively applied in industrial plants as those of oil and gas exploitation. Its high corrosion resistance combined with appropriate structural behavior brings many advantages to this material, especially when environmental conditions demand for corrosion resistant materials. In this context the pultrusion technology permits large production of standardized shapes for structural applications, which appears as a good solution where metal sections can be replaced by GFRP members.

The present research is aimed to study the structural behavior of pultruded members under high temperature conditions, as those that could develop in accident scenarios in industrial installations. For this, an experimental program is under development and the present paper shows the results of pultruded beams tested under high temperature conditions, revealing its stiffness and strength degradation, as well as creep. The temperature range up to 100º C, with both steady state and transient temperature conditions. The composite material is based on E-glass fiber plus polyester isopthalic or vinyl ester matrix.

Keywords: glass fiber reinforced polymers, pultruded members, structural behaviour, high temperature, creep.

1. Introduction

In Brazil, composite materials based on GFRP present significant increase of applications in structural engineering, and pultruded profiles are widely applied in industrial plants. As a consequence, resistance degradation due to high temperature has to be considered, since these structural members usually does not have any protection against temperature raise. In such case, it is important to investigate the temperature effect in the behavior of pultruded profiles. This problem is referred, for example, for the case of grated grid floor systems addressed to industrial applications, for which the structural behavior must be investigated including high temperature effects [1].

Previous experimental results indicated degradation of mechanical properties of GFRP members under high temperature: i) reduction of the Young's modulus; ii) reduction of flexural strength; iii) some evidence of creep [2], [3].

The objective of this paper is to present partial results of an experimental program aimed to investigate the flexural behavior of a pultruded GFRP members under high temperature.

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