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Analytical solution to calculate the stress distribution in pin-and-collar samples bonded with anaerobic adhesives (following ISO 10123 standard)

M.A. Martínez Casanova; F. Velasco López; J. Abenojar Buendia; M. Pantoja Ruiz; J.C. Real Romero

Abstract-

In this work, we analyse cylindrical joints bonded with anaerobic adhesives, applying the principles found in a paper of Nemes et al. [Int J Adhes Adhes 2006; 26(6) :474]. Nemes’ paper gives an analytical solution for the different stresses that appear on the three elements of the cylindrical assembly (two tubes and the adhesive) over the whole joining surface. A detailed study of this paper allowed us to develop a new mathematical model to be applied to a pin-and-collar specimen, in particular to the standard system, which appears in ISO 10123. From the mechanical and geometrical properties of the components and the axial loading applied on the system, it has been possible to obtain the intensity and distribution of stresses in the assembly graphically, using the mathematical program MathCAD. Consequently, it is possible to calculate the so far unknown value of maximum shear stress.So knowing the shear stress, the model allows (i) to predict the distribution of stresses in the adhesive bond and (ii) to carry out a parametric study of the bond; that is to say, it allows to evaluate the influence of geometrical parameters and the influence of the selected adhesive in the stress distribution within the bond. It is, therefore, a methodology, which will make possible to calculate, quickly and simply, the distribution of stresses and the maximum shear strength in the adhesive. Moreover, it makes unnecessary to carry out numerous mechanical tests.

Index Terms- Anaerobic; Stress distribution; Maximum shear stress

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