Influence of sample dimensions on single lap joints: effect of interactions between parameters

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Abstract-

The main aim is to understand the effect of adhesive thickness, length and width, and their interactions for highly flexible adhesives on single lap joint tests. Their behavior is completely different from brittle adhesive joints, and their modelling is more difficult with inaccurate results, which makes experimental tests crucial. With this study, future costs will be reduced when working with flexible adhesives since fractional factorial design 2 k allows to reduce drastically the number of tests. In this case, with three factors (adhesive thickness, substrates length, and width) and five specimens for each combination of them, tests were reduced from 300 to 40, with the subsequent cost reduction. The effect on shear stress, strain, Young’s modulus, and absorbed energy by the adhesive joint was studied, using steel substrates with polyurethane adhesive. It has been found that shear stress is mostly affected by the adhesive thickness, the higher the thickness, the lower the stress. In the case of strain, elastic modulus and absorbed energy, the most influent factor is the overlap length. It presents an inverse relation with strain and energy, and a direct one with modulus. With this method the effect of various factors can be known simultaneously.

Index Terms- Single lap joints, mechanical properties, fractional factorial design

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