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Francesco Lambiase, Massimo Durante

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Mechanical behavior of Punched Holes produced on thin Glass Fiber Reinforced Plastic laminates

Francesco Lambiase^{1,2} and Massimo Durante³

¹Dept. of Industrial and Information Engineering and Economics, University of L'Aquila, via G. Gronchi 18, Zona Industriale di Pile, 67100 (AQ), Italy.

²University of Naples Federico II, CIRTIBS Research Centre, P.le Tecchio 80, 80125 Naples, Italy.

³Dept. of Chemical, Materials and Industrial Production Engineering, University of Naples Federico II, Piazzale Tecchio 80, Naples, Italy.

Abstract

The present investigation deals with an experimental analysis of punching process of Glass Fiber Reinforced Plastics (GFRP) sheets. The process has the potential to dramatically reduce the cycle time; thus, it can be used for industrial applications where large numbers of holes are needed. However, the laminate damage represents the major concern for the employment of hole punching. Thus, a campaign of experimental tests was conducted on thin laminates with varying the punch-die clearance. In addition, drilled holes were performed in order to compare the quality and strength of the holes performed by drilling and punching processes. To assess the influence of the process parameters on the holes quality, mechanical characterization was performed by means of tensile test with central hole and bearing test. Moreover, morphological analysis was conducted to determine the quality of the punched hole and the extension of the delaminated region. According to the achieved results, the damage produced by punching process, especially when small clearances were used, is limited and comparable to that produced by drilling process.

Keywords: Punching, drilling, hole, mechanical behavior, thin laminate, joining.

¹ Corresponding author:

F. Lambiase

francesco.lambiase@univaq.it

Montelucio di Roio, 67040 (AQ), Italy

Tel. N.: (+39) 0862 434343

Fax N.: (+39) 0862 434303

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