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Commentary

Methodology for Evaluating the Progression of Damage in a GFRP Laminate Subjected to Vertical Weight Drop Impacts

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Commentary

The use of composite materials is increasing in the industry in all its forms. It is in the food industry, textile, shipbuilding, metalworking, car manufacturing, etc. Not only are they innovating in the use of new materials to improve the use of equipment and increase its useful life, but they are also replacing traditional materials with better demands and performance. There is a constant demand for new materials. Polymerics are especially light, moldable and when combined with others, they can have very reliable and resistant mechanical properties. In such a way that in the case of laminated materials, users are looking for methods and forms to be able to evaluate these benefits. There are numerous expensive and complex methodology that are often difficult to apply. The application of composite materials with polymeric matrix for example in the case of boats, this was initially developed by a need to obtain ships that are lighter, stronger, resistant to corrosion, resistance to the environment, ability to mold structures with complex geometries, ability to adapt its mechanical resistance according to load conditions, excellent mechanical resistance in relation to its low weight, ease of repair and excellent durability.

When polymers are used in composite materials, there is the disadvantage that the matrix has low resistance to damage and must work in conjunction with a fiber that improves it. In the case of composite material laminates made with reinforcing fibers (glass, carbon, polyamides, or other types) and a polymer matrix (epoxy, vinyl ester, polyester, etc.), the matrix is the first to absorb the damage causing it to produce microcracks inside. The greater the number of impacts, the more microcracks are produced, which are concatenated with each other, producing cracks in the matrix. The cracks, depending on the intensity of the blows and the duration of the impact cycles, jump from one layer of the laminate to another contiguous one, producing breaks between the layers called delamination. In such a way that the damage in this type of materials takes the form of intralaminar cracks and interlaminar debonding. In this way, developing methodologies to evaluate the damage in the matrix and establish patterns in the behavior of laminates made of composite materials, will allow knowing the limits of their performance, the damage threshold, their evolution of flexural strength and other mechanical properties. This evaluation makes it possible to focus and define the proper use of the composite material and if what is being offered is going to achieve an adequate useful life. The industry is demanding, and in order to innovate and use them in different areas and equipment, processes, and ways of understanding what happens to the product during its use must be considered. The use of vertical tests for weight drop has always been

an option to be able to evaluate the behavior of a polymer to the energetic loads that are imposed in its use. The investigations developed and exposed in numerous scientific documents indicate that the correct use of accelerometers, impact controls, tests with wide energy ranges or very low energy tests, are the appropriate way to examine the behavior of polymeric composite materials. It should be noted that we live in a world of energy and evaluating how different types of energy influence within a composite material, is the way to understand it. They are mixed with nanoparticles, with viscoelastic, with metals and fibers, the use of viscoelastic in laminates of composite materials has the damping subject to the orientation of the fibers and is an important factor to absorb impact energy in the same way as to absorb vibratory energy. The future is in polymer composites, and we are only at the beginning of their development. The industry will be modified every day and different from the previous one that we knew, in such a way that knowing these materials becomes an important basis for research and industrial development.