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GLASS-FIBER TOWPREGS: MANUFACTURING AND CHARACTERIZATION

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Abstract - Towpregs consist of bundles of fibers pre-impregnated with a partially cured resin, being a raw material for different composite manufacturing processes, including filament winding. This technique is widely used to produce technical parts such as Type IV Composite Pressure Vessels (COPV) that store, under pressure, liquids and gases such as compressed air, LPG, CNG and hydrogen. COPV are not yet used in Brazil, even though having direct applicability in key sectors, such as automotive and agriculture. This work focuses on the pilot-scale manufacturing of glass/epoxy towpregs and their characterization. A resin formulation with suitable characteristics comprised of DGEBA-type epoxy resin, amine-type hardener and accelerator was developed and a production line to study and obtain towpregs was implemented using commercial equipment consisting of an unwinder, impregnation bath and rewinder. The studied processing parameters included tow tension, resin temperature, thickness, and homogeneity, and the final characteristics of the towpregs were analyzed including curing degree, and resin content focusing on reaching a production capacity of 1200 m/h. Composite plates and tubes were produced by filament winding using the developed towpreg and characterized using common mechanical tests, such as tensile, compression, in-plane shear and split-disk. Lastly, composite overwrapped pressure vessels (COPV) were produced and tested (burst) to achieve higher TRL of the towpreg and to provide technical information to enable the pioneering future commercialization of towpregs in Brazil.

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