Application of predictive numerical methods to improve manufacturing processes for Aero-structures

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ACITURRI has deployed simulation tools to improve their whole composite manufacturing processes in two of their products in the last year: fuselage frames and vertical tail plane ribs. One objective is to predict manufacturing defects in the forming and RTM processes and minimize them to acceptance levels by acting on process cycle parameters, preform shapes or layup definitions. A second objective is the prediction of curing distortions to bring them to acceptable tolerances. Additionally, simulation has added insight and understanding of the physical manufacturing processes. Chained Injection-Curing-Distortion virtual RTM process for the frames and virtual diaphragm thermo-forming plus Curing-Distortion analyses for the ribs have been developed. Simulation results have been correlated with experimental values along the project for the validation of the simulation processes developed using commercial simulation tools from ESI GROUP (PAM-FORM™, PAM-RTM™ and PAM-DISTORTION™).