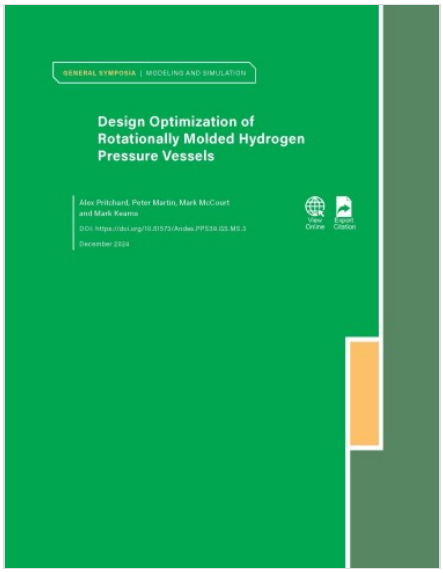
Design Optimization of Rotationally Molded Hydrogen Pressure Vessels

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Sinopsis

Type IV hydrogen pressure vessels are made up of three components: a metallic boss, a polymer liner, and a composite overwrapping layer for reinforcement. Leakproof design of bosses is critical for safety, ensuring a gas-tight seal to prevent explosions due to leaks. Yet, their design has been largely overlooked. Using rotational molding it is possible to fully encap sulate bosses within liners during molding, but numerous challenges must be overcome relat ing to boss design for effective molding. FEA software was applied to virtually prototype boss designs and optimize their mechanical performance under pressure. CAD and FEA software were integrated in this work, enabling basic geometry constraints to be input in CAD, which were then fine-tuned in FEA in response to stress distribution results. This allowed the FEA model to optimize boss designs autonomously. To ensure moldability, initial boss designs were generated using existing rotational molding experience regarding the encapsulation of small inserts during molding. The autonomous optimization technique was then applied to minimize the boss weight by controlling the size of design features, while ensuring mechanical perfor mance constraints were met.



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