

Design and Analysis of a Laminated Composite Automotive Drive Shaft

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Abstract : Advanced composite materials have a great importance in engineering structures due to their high specific modulus and strength and low weight. These materials can be used in design and fabrication of automotive drive shafts to reduce the weight of the structure. Hence, an optimum design of a composite drive shaft satisfying the design criteria, can be an appropriate substitution of metallic drive shafts. The aim of this study is to design and analyze a composite automotive drive shaft with high specific strength and low weight satisfying the design criteria. Tsai-Wu criterion is chosen as the failure criterion. Various designs with different lay-ups and materials are investigated based on the design requirements and finally, an optimum design satisfying the design criteria is chosen based on the weight and cost considerations. The results of this study indicate that if the weight is the main concern, a shaft made of Carbon/Epoxy can be a good option, and if the cost is a more important parameter, a hybrid shaft made of aluminum and Carbon/Epoxy can be considered.

Keywords : Bending natural frequency, Composite drive shaft, Peak torque, Torsional buckling

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