An Approach to Combine House of Quality and Finite Element Method in Redesigning of Rotary Shaft Multi-Spindle Wheel Nutrunner Machine

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Abstract	An engineering-to-order company has developed multi-spindle wheel nutrunner machines for automotive wheel mounting. The rotating shaft component that supports that machine has experienced compressive and twisting stress during operation, resulting in damage not only to the shaft but also some parts attached to the wheel. This study uses the house of quality (HOQ) and finite element method (FEM) approaches to redesign the rotary shaft to meet quality standards for its engineers, as customers, in a systematic way by using qualitative data from interviews, documents, and questionnaires provided by five rotary shaft engineering experts. Based on the importance levels of technical specifications obtained from the HOQ results, two rotary shaft redesign models for the redesigned models 1 and 2 obtain the maximum von Mises stress from the virtual testing using FEM analysis of 277.5 MPa and 111.8 MPa, respectively, which are below the company standard maximum yield strength of 470 MPa. Hence, using the company's minimum safety factor, the redesigned model 2 is chosen for the improved version of rotary shaft design.
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