

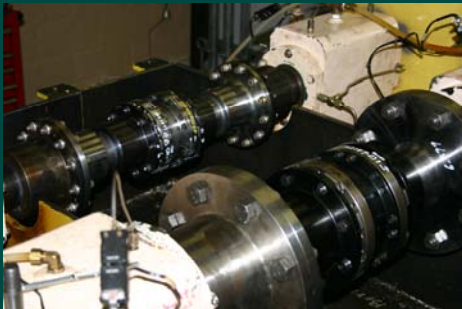
Case Study

Develop a unitised disc pack for 'Thomas' couplings

Project background

A premier US supplier of Power Transmission Components manufactured a variety of couplings to meet requirements for bore fit options, stiffness, balance, shaft gaps, operating speed, and special environmental conditions.

In a drive to increase market share management identified a need to increase coupling torque.



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Problem

Management identified that market share was being eroded as competitors were providing unitised disc packs with higher torque ratings. A Design for Six Sigma team was set up.

The team conducted benchmarking of product and published ratings for five competitors and discovered their own couplings performed well against published ratings whereas all competitors' products did not meet published torque ratings. Nevertheless market share was eroding.

Voice of the customer analysis was conducted. The team concluded that the company's current design with multiple discs and loose washers was difficult to handle during assembly. Customers wanted bushings that retained discs and washers with hardware that was capable of retro fit for bolts, washers, hubs and spacers.

Extensive measurement system analysis was applied in bolt hole pattern and pack thickness and head bushing dimensions.

Solutions

A Design Failure Modes and Effects Analysis defined increased risk of reciprocating torque in application. The coupling was vibrated with eccentric mass to create high frequency torque and tested in reverse torque fatigue to evaluate bolted joint integrity.

Design for assembly and manufacturability techniques were applied to design of discs, bushings and washers to allow use of existing bolts and nuts.

Couplings were also tested at full speed and torque with misalignment conditions for 100 million cycles.

Mistake proofing techniques used included setting dimensions and tolerances for bushing length to prevent extension beyond disc pack. This eliminated loss of clamping action during bolt tightening.

Business benefits

A unitised disc pack was designed and qualified. A 14% increase in average torque rating was achieved with product costs that satisfied requirements for market penetration and increased sales by \$4M.