



Coupling Corporation of America

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Coupling Corporation Saves the Day with Lightweight, High Speed Coupling

Recently a company with a high speed test stand was experiencing prolonged problems running at the high end of their speed range. The system was driven by a 150HP motor which drove a speed-increasing gearbox to speeds of 30,000 RPM on the output side. Unfortunately, for many years, the stand was unable to reach the top speeds due to extreme vibrations, presumably caused by a critical speed. The most recent attempt resulted in a failure of the system which required a new gearbox shaft. With a batch of tests scheduled to run at 30,000 RPM in a few short months, the pressure was on to find a solution.

The gearbox output shaft had a relatively small diameter which seemed to be a likely culprit for overhung moment problems. Further modal analysis was performed on the system to determine the performance characteristics, and it was determined that the current shaft geometry along with the coupling overhung weight was indeed causing a critical speed to fall right at the top of the system speed range. There were two possible solutions – increase the gearbox output shaft size, or dramatically reduce the overhung weight on the shaft – down to a target of 0.7 pounds.

The first option was not very practical because it required too many changes to the gearbox which was very costly and had a long leadtime. The second option seemed more practical until the original coupling manufacturer looked into the changes and determined that they were not possible. After consulting with a few other coupling manufactures with similar results, they finally called CCA.

Besides the very difficult weight requirements, the situation also required a large amount of axial movement as well – more than $\pm 0.050''$ – because of a large thermal growth and a significant thrust load. CCA was able to digest the requirements and design a custom solution that, on paper, was a match with the needs of the critical speed analysis. The design was taken from the drawing board to the manufacturing cell where it became real. The final coupling design used a mix of titanium and steel to meet the overhung weight target as well as the axial movement and torque requirements.

After years of not being able to run the test stand at full speed, the company installed the new coupling and was finally able to run successfully at 30,000 RPM for an extended time. CCA had solved the problem – on budget and on schedule. Just another example of CCA coming through for a customer with a solution beyond a catalog.