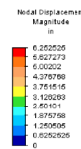
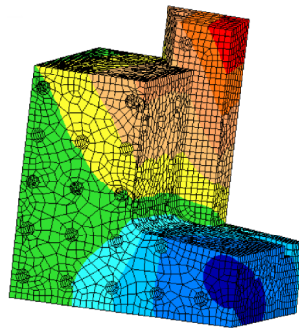

Case Study

Transitioning from the <100 Hz to +500 Hz Vibration Testing Environment Design + Build + Test Solution



Mode: 4 of 5
Frequency: 2990.55 cycles/s
Maximum Value: 6.25253 in
Minimum Value: 0 in



One stop shop for your vibration testing needs.

The Customer

Our customer is a major Tier 1 automotive parts manufacturer of electromechanical devices. They had extensive experience designing and testing their products in the lower frequency ranges (<100 Hz). They were now developing an electromechanical actuator that included an electronic control unit (ECU). The test requirements for this new actuator extended the vibration test frequency range out to 1000 Hz because of the ECU.

During vibration validation, our client experienced a series of failures of a cast magnesium gear box housing on the actuator while it was tested using a vibration fixture of their own design.

The most obvious remedy which was apparent the client engineer was to strengthen the gear box housing. Strengthening the housing succeeded in changing the failure location but not the time-to-failure.

Without high frequency vibration testing experience, the client did not recognize the obvious issues with the vibration fixture and continued to the test replacement actuators until they approached us for a fresh look.

The Challenge

With their development schedule now severely impacted, we needed to evaluate their fixture to identify the issues and then propose and execute on a testing solution within a very compressed time frame.

The Paragon Systems Solution

A summary review of the existing client vibration fixture revealed that it was likely not stiff enough for the 1000 Hz vibration environment.

A full resonance qualification test in all three axes confirmed our suspicions. The test fixture resonances were severe enough that the gearbox mounting locations were experiencing acceleration levels nearly 100 times greater than that required by the client's test specification.

With the clients CAD model and GD&T, we designed a vibration fixture. The new fixture design was optimized with FEA and subsequently fabricated in our in-house shop. The final vibration fixture was qualified with a 3 axis resonance test and was ready within a few weeks of the project kick-off.

With the new qualified vibration fixture, we vibration tested a new batch of actuators for the client, all of which passed the test on the first run.

Many engineers don't recognize the critical role played by the vibration fixture that attaches their device under test (DUT) to the vibration table surface.

A vibration fixture that does not consider the frequency range of the vibration test, can easily magnify or absorb the vibration energy by an order of magnitude or more, thereby under and/or over testing the DUT.

Tools

- Solidworks CAD Software
- ALGOR FEA Software
- Manual & CNC Machine Tools
- Unholtz-Dickie Vibration Machine