

Rocket Structural Testing Load Cell

Industry: Aerospace

Summary

Customer Challenge

NASA's Space Launch System (SLS) core stage will be the largest ever built at 27 feet in diameter and 200+ feet tall. Core components including liquid hydrogen and oxygen tanks must withstand launch loads up to 9 million pounds-force (lbf).

Interface Solution

Interface load cells attached to hydraulic cylinders at various locations along test stands to provide precise test forces. Strain gages bonded to rocket structure surface and connected to data acquisition system for stress analysis.

Results

Engineers are able to measure loads applied at various areas on the rocket structure, verifying the structural performance under simulated launch conditions.

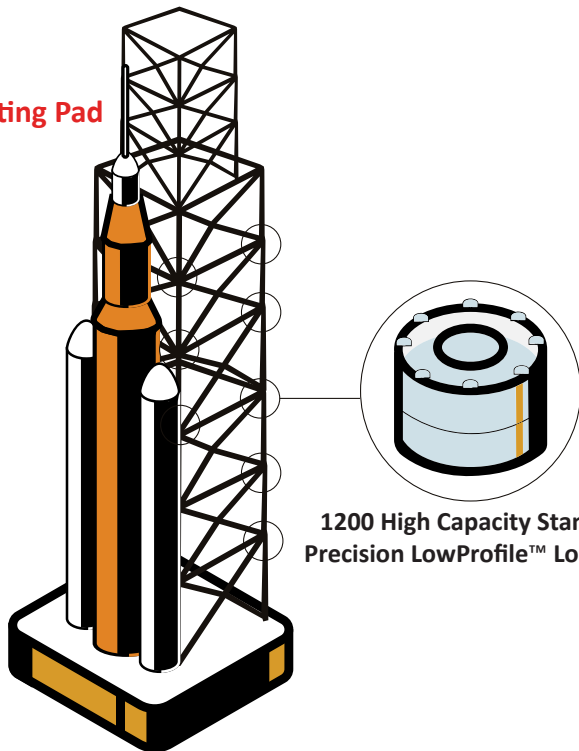
Materials

- 1200 High Capacity Standard Precision Low-Profile™ Load Cell Model 1260 for 600,000 lbf capacity.
- 1200 High Capacity Standard Precision LowProfile™ Load Cell Model 1280 for 1,000,000 lbf capacity.
- 1200 High Capacity Standard Precision LowProfile™ Load Cell Model 1290 for 2,000,000 lbf capacity.

How It Works

1. Marshall Space Flight Center in Huntsville, Alabama built a 215-foot twin tower static test stand to test the 185-foot hydrogen tank. A second 85-foot test stand was built to test oxygen tank and forward skirt.
2. The test stands contain hydraulic cylinders placed at strategic locations to push, pull or twist the structure to produce the required loads calculated by the test engineers to simulate actual launch conditions.
3. Multiple Interface 1200-series load cells of up to 2 million lbf capacity are attached in arrays to the hydraulic cylinders to measure the load being produced by each cylinder within 0.07%.
4. Load cell outputs are also fed back to the control system to control the cylinder forces. Temperature-compensated strain gages within each load cell reduce errors in output to 0.0008%/°F (0.0015%/°C).
5. Strain gauges bonded to the rocket structure being tested are connected to a data acquisition system for stress analysis.

Rocket Testing Pad



1200 High Capacity Standard
Precision LowProfile™ Load Cell