ElectroForce® Integrated Acceleration Compensation Hardware and Software Solution

Product Overview

When making load measurements on a dynamic material testing machine, one of the often ignored sources of error is acceleration induced forces. These forces are the load sensor's response to the real forces induced by motion of the load sensor, but are not true forces applied to the specimen.

The goals of the ElectroForce® Acceleration Compensation Option are to simplify the process of assessing and correcting these acceleration based sources of error, providing standard hardware and fixtures, and automating as much of the process as possible.

Important Features and Benefits

The Acceleration Compensation option measures the dynamic load error and then sets the scale and phase factor so that measured accelerations can be used to correct for dynamic errors during testing. Independent of where the load sensor is located, the software automatically creates the excitation and calculates the correction factors that optimize the compensation over a wide range of test frequencies.

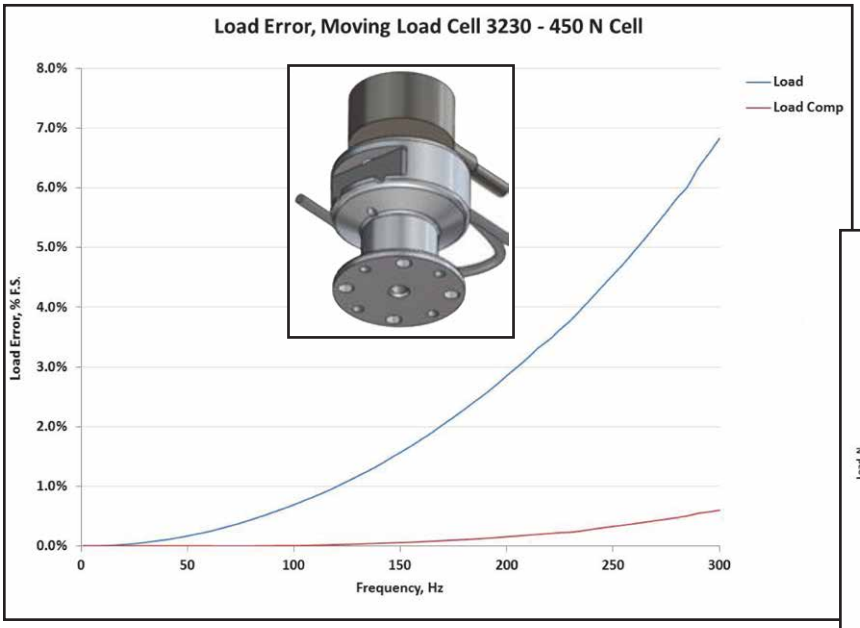
Acceleration Compensation

Will allow you much more freedom in your test hardware configuration.

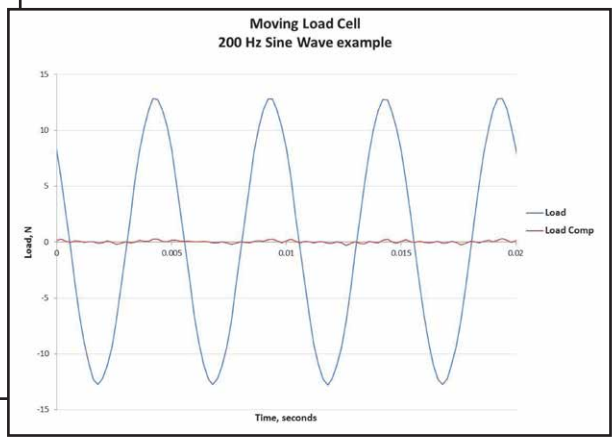
- Moving load cells above baths
- Moving load cells in multi-axis systems
- Load cells with heavy fixtures
- Many tests above 5 or 10 Hz
- Almost all tests above 50 Hz

Tip: To determine if you would benefit, simply run the amplitude and frequency without a specimen – any load you measure is likely an acceleration artifact.

Example of a Moving Load Cell Configuration



The following is an example of actual improvements through reduction in acceleration induced forces achieved by the ElectroForce Acceleration Compensation Option. The configuration is a ElectroForce 3200 test system with the load cell moving with the actuator.



Note: Actual acceleration induced errors are a function of fixture mass and test conditions. Data shown is for example purposes only.

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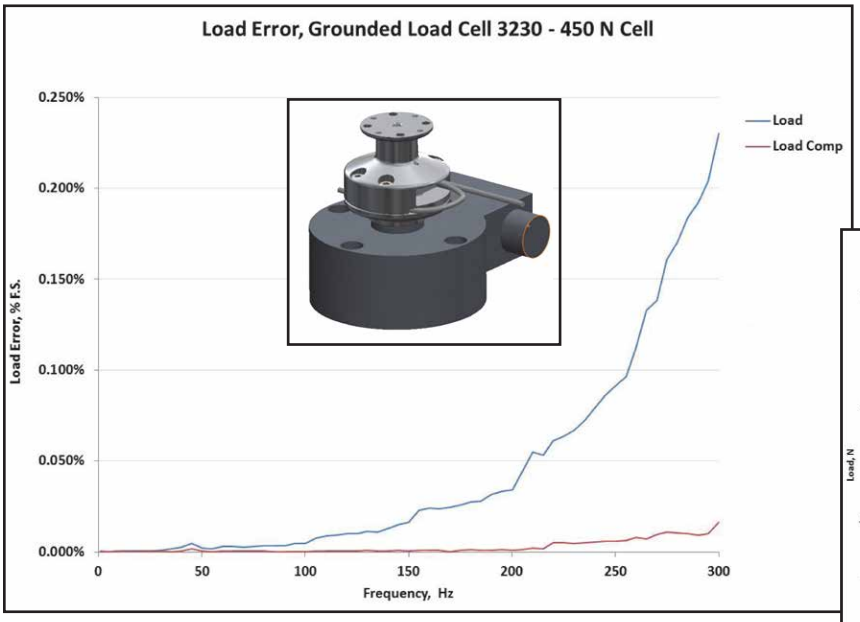
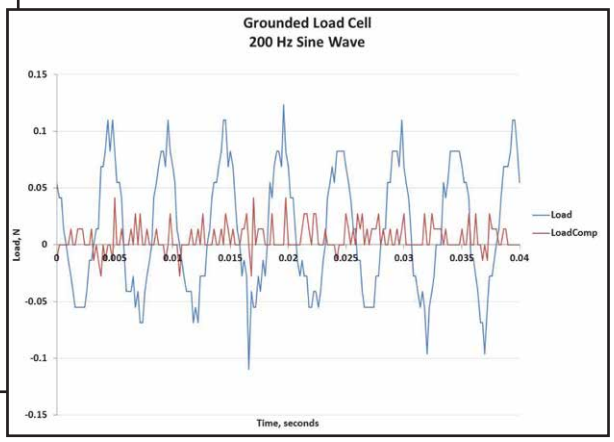
Example of a Non-moving Load Cell Configuration



The following is an example of actual improvements through reduction in acceleration induced forces achieved by the ElectroForce® Acceleration Compensation Option. The configuration is a ElectroForce 3200 test system with the load cell mounted to the base of the load frame.

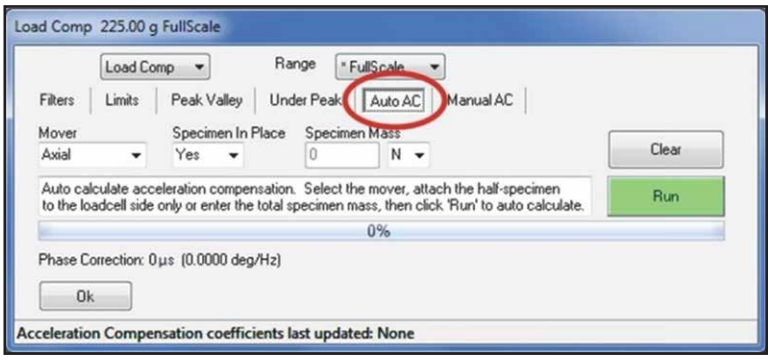


NOTE: Actual acceleration induced errors are a function of fixture mass and test conditions. Data shown is for example purposes only.

Automation of Acceleration Compensation

Automated Acceleration Compensation Algorithm

- Quickly optimizes settings to remove acceleration-induced errors
- Automated similar to TunelQ® software
- Corrects for both fixture mass and channel phase delay
- For HADS systems, it also adds the ability to compensate without an accelerometer



The ElectroForce Acceleration Compensation method allows for estimation and compensation of acceleration induced load sensor error that is straightforward for a user to implement since the entire process is automated. This automated process can be used for output shaft mounted load sensors, as well as frame mounted sensors. For frame mounted sensors, an accelerometer must be used, but for output shaft mounted sensors, the HADS displacement derived acceleration can be used when available. For critical use cases, this prepares the investigator for full implementation of ASTM E467-08; or for others, the user will have greatly minimized the dynamic load error, and can better estimate the level of error present in their test results.

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