OPTIMIZING IN SITU DYNAMIC CALIBRATION OF PRESSURE SENSORS USING A PORTABLE, PNEUMATIC-MECHANICAL SYSTEM

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A portable, pneumatic-mechanical device was developed to calibrate blast pressure transducers in place. The application of the in situ blast calibration tool can help assess the accuracy of the measuring system immediately before an experiment as well as perform an end-to-end calibration of the system. The device is hand held and is designed mechanically and pneumatically to deliver a pressure pulse with a known peak pressure. The device and the support system were designed for consistency of the pulse, ease of use, portability, and reliability. A coupler is attached to the front end of the device that provides the interface and transfer condition for delivery of the calibrating pulse to an installed pressure transducer. The original design of the first coupler of the first device was modified to accommodate other pressure sensors. The device can operate with the use of compressed air, nitrogen, or helium depending on the sharpness of the rise times desired to the peak pressure. It is possible to measure a reference pressure from a sensor mounted in the interface coupler near the front nozzle chamber. An evaluation was conducted to assess how to control interacting factors that affect desired rise times, duration of the positive phase of the pulse, and peak pressure. A numerical model is suggested to further evaluate optimal affects of varying parameters. This use of this calibrating system is applicable for condition assessment, qualitative calibration, and frequency response characterization of the measurement system.