MEGGiTT
smart engineering for
extreme environments

Shock and vibration measurement technology I

Presented by: Meggitt Sensing Systems, at our facility in Irvine, CA.

Instructor: Jon Wilson, Fellow Member of IEST with over 40 years in dynamic testing and measurement.

Course includes: 3-day applications-oriented short course on shock and vibration measurement. Course includes an extensive plant tour and equipment demonstrations.

Who should attend: Engineers, technicians and quality assurance personnel involved in shock and/or vibration measurement; test laboratory, field test, flight test, instrument selection and/or application.

Course outline:

1. **Introduction to vibration**
   Sources of vibration, effects of vibration and noise, introduction to dynamic motion, specialized language of vibration

2. **Shock motion**
   Transient motion, terms and definitions, sources of shock, structural response to shock, shock response spectrum, physics of shock

3. **How shock and vibration are measured**
   Optical and fixed reference, seismic transducers, measuring displacement, measuring velocity, measuring acceleration, measuring vibratory force, and what to measure.

4. **Accelerometer performance characteristics and error sources**
   Mounting effects, phase shift and damping, transverse sensitivity, amplitude range and linearity, temperature effects, humidity effects, strain effects, EMI/RFI, nuclear radiation, zero shift, stability and aging.

5. **Accelerometer designs and performance**
   Piezoelectric effect, crystals and ceramics, comparison of material properties, PE accelerometers, compression, shear, flexure, multi-axial, high temperature designs, IEPE designs, silicon accelerometers, MEMS, PR accelerometers, variable capacitance accelerometers, smart sensors, TEDS, network sensors, comparison of PE, PR, IEPE, VC.

6. **Signal conditioning, systems and readouts**

   Cables and connections, PE conditioners, IEPE conditioners, PR conditioners, VC conditioners, smart sensor conditioners, frequency response and filtering, integration, noise and noise rejection, isolation and shielding, signal distortion problems, programmable conditioners, readout and recording.

7. **Accelerometer designs and performance**

   Static accelerometer calibration, what is a g?, accuracy, error and uncertainty, dynamic checks, laser interferometry, reciprocity calibration, comparison vibration calibration, frequency response calibration, automated calibration systems, comparison shock calibration, high amplitude shock calibration, extreme temperature calibration, transverse sensitivity calibration, informal procedures, do's and don'ts of calibration

8. **Application considerations**

   Extreme temperatures, modal testing, shock testing, flight vibration testing, vehicular crash testing, and nuclear radiation environments.

9. **Special cases**

   Angular acceleration, torsional motion, rotating machinery vibration, aircraft engine monitoring, and navy shipboard vibration monitoring.

10. **Selecting the best system for your application**

    Selection and application checklist.

11. **Glossary**
12. **Plant tour**