



**Our Products Include:**

- Load Cells
  - Custom
  - High Capacity
  - Multiaxes
  - Underwater

- Torque Sensors
  - Custom Torque
  - OEM
  - High Capacity
  - Underwater

Calibration Kits

**Our In-House and Field Services Include:**

- In-House Services
  - Sensor Design
  - Calibration and Gaging Services

- Field Services
  - Measurement of torque and horsepower in rotating equipment
  - Stress/Strain Measurements of Plant Components
  - Measurements in Harsh Environments
  - MOV and AOV Strain Gage Instrumentation
  - Measurement of Thrust and Torque on Valves and Rotating Equipment
  - Structural Integrity Tests (SITs)
  - Permanent and Temporary Monitoring Systems
  - Design and Manufacture of Custom Sensors

Our measurement services are used to quantify operating parameters, aid with diagnostics and preventive maintenance, and troubleshoot causes for equipment failure.

Sensing Systems specializes in conducting measurements and manufacturing sensors to operate in harsh environments such as:

- High Temperature
- Low / Cryogenic Temperature
- Underwater / High Humidity
- High Magnetic Fields
- Chemical / Corrosive

Sensing Systems has extensive measurement experience in the power industry. We service all types of power generation facilities including fossil and hydroelectric.

**Torque and Horsepower Measurements**

Sensing Systems performs torque and horsepower measurements on rotating equipment. These measurements are used to determine true operating conditions on driving and driven equipment. Output and/or input torque and horsepower are measured on turbines, motors and pumps.

Measurements are used to compare true values to specified values and to quantify operating efficiency. In some cases torsional cycling may be occurring causing fatigue cycling and premature failure of components. This condition has been found with auto-compensating feedback systems (i.e. induced draft fans).

**Stress/Strain Measurements**

Sensing Systems has instrumented plant components such as pipes, valves, structural frames, overhead cranes and containment buildings to measure static and/or dynamic stresses experienced by the part or the structure. Equipment failure, malfunction or unusual conditions found during regular operation or maintenance activities are the usual catalysts to perform stress and strain measurements.

Acquisition of stress and strain data may be conducted by Sensing Systems or plant personnel. Testing programs usually involve measurement of other variables such as temperature, displacement, pressure, current, etc. Sensing Systems also performs all of these measurements.

Stress and strain measurements involve the installation of strain gages and the use of data acquisition systems. Please click on Strain Gaging Services to obtain specific information on these services. Please click on Monitoring Systems to obtain information on data acquisition systems.

**Measurements in Harsh Environments**

Sensing Systems has considerable experience and expertise installing and using sensors in adverse conditions. Harsh environments include high temperature, cryogenic temperature, corrosive materials, high magnetic fields and underwater.

We have developed techniques and equipment to cancel or mitigate the adverse effects of the harsh environments on the sensors and installations being used. This is especially true of measurements involving strain gages.

**MOV'S and AOV'S**

Motor Operated Valves (MOVs) and Air Operated Valves (AOVs) are widely used to control power plant processes from the control room. Proper setup of switches and stops are critical to ensure proper operation. The thrust and torque developed on the valve stem during opening and closing cycles are the parameters used to properly setup the mechanical switches and stops controlling valve operation.

**CONTACT US FOR YOUR CUSTOM APPLICATIONS**

We will analyze the requirements of your application and provide a recommendation.

Tel: 508-992-0872 or 800-849-4016

Go to our website: [www.sensing-systems.com](http://www.sensing-systems.com)

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Sensing Systems pioneered the use of strain gages on MOV and AOV stems to measure thrust and/or torque. We established an improved strain gage methodology and procedures through a validation program to measure thrust and torque without requiring field calibrations.

The validation program was executed to validate the strain gage methodology and establish measured accuracy for stem thrust and torque. Over 100 installations were performed and tested on small and large and smooth and threaded stems. All of the common stem materials were tested. This program also verified the effect of temperature on strain gage output.

All installations are performed in compliance with an installation procedure that was developed specifically for applying strain gages to MOV and AOV stems without requiring field calibration of the strain gages. Special tools and processes are used to provide uniform, reliable installations. The chemicals and adhesives used to install the strain gages have been chosen based upon their chemical properties, chloride content and expected operating temperatures.

### **Thrust and Torque on Rotating Equipment**

Pumps and other equipment that experience high thrust loads often experience failures in thrust bearings and/or shafts. Sensing Systems can accurately measure these variables by combining our experience in measuring thrust and torque for MOVs and AOVs with our wireless and telemetry capabilities.

### **Structural Integrity Tests (SIT)**

Sensing Systems personnel have conducted over thirty Structural Integrity Tests on Containment Buildings throughout the United States. SITs require pressurization of containment buildings to design conditions while monitoring and measuring several parameters. Radial and vertical displacement, concrete and liner stresses and temperature throughout the structure are typically measured during SITs. Each test may require up to 150 individual measurements to ensure full containment coverage. The measurements acquired during the SIT are compared to accepted limits prior to startup of the plant.

### **Data Acquisition Systems**

Testing programs require that data be collected using data acquisition systems connected to all the installed sensors. Data acquisition systems must acquire, store and make data available for further analysis.

Sensing Systems utilizes state of the art computer based data acquisition systems. Our equipment can sample at rates as low as once per day and up to 1,000,000 samples per second. Data may be acquired and submitted in different

formats for further review and analysis by our customers. Filtering may be performed during acquisition or digitally following data acquisition. Data analysis such as rainfall may be performed real time by our equipment.

Signal conditioning equipment is used to convert low level signals to high level signals or, depending on the application, to convert analog data to digital data for transmission to a computer. Field equipment configurations are optimized on the basis of number of measurements in the test program, distance between sensors and equipment, required sampling rates, available power and environmental considerations.

### **Permanent Monitoring Systems**

Sensing Systems also installs permanent monitoring systems in the field. Installation, planning and implementation of permanent systems are usually combined with field testing projects. The data acquisition equipment selected for permanent systems typically has communications capabilities using telephone connections or wireless systems for downloading data to computers at the customer facilities.

Our equipment has been left to operate unattended for years at a time while being able to download data to a remote computer using telephone connections.

### **Design and Manufacture of Custom Sensors**

Testing programs require special or unusual sensors for measuring different parameters. When standard force, torque, pressure and displacement sensors do not match the testing application, Sensing Systems designs and manufactures custom sensors. For several projects we instrument existing components and for others we manufacture units that replace existing components.

### **Accuracy**

The accuracy of field measurements varies according to the sensors being used. For most sensors that have been calibrated in the laboratory and installed in the field, accuracies in the range of 0.1 % to 1 % of full scale are typical. Strain and stress measurements require sensors such as strain gages which depend on the installation material for their accuracy. Field accuracies range from 3% to 5% of full scale.

Sensing Systems has pioneered the use of in-situ calibrations for strain gage measurements. We design and manufacture the required fixtures and apparatus to apply a known load to the structure and measure the corresponding output. Using this approach the accuracy may be improved to 0.5% to 1% of full scale.

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