

INSTRUMENTATION AND CONTROL (SEM-IV:ME) Course Code- PCC-ME 207

Lecture 7 SENSOR AND TRANSDUCERS

3.FORCE SENSOR

3.1 Strain Gauge Load Cell

- A load cell is a "load transducer" which converts the weight or load acting on it into electrical signals.
- A load cell is composed of an aluminum alloy spring element, strain gauges (serving as sensors) and a bridge circuit.
- The strain gauges themselves are bonded onto four areas which become considerably distorted in the spring element. The load cell detects the force of the distortion as voltage change.





Fig. 2-11. Bellows sensor





Fig. 3-8. LVDT pressure transducer





4.4Piezoelectric actuators and sensors

Piezoelectric effect (sensor)

An electric field is generated due to a change in dimensions of a material (Curie brothers 1880)



Converse Piezoelectric effect (actuator)

A change in dimensions of a material due to the Application of an electric field



Polarisation of a piezoelectric material

 Subject a piezoelectric material to a large voltage near the Curie temperature then the dipoles align



 Curie temperature is the temperature above which the material loses its piezoelectric property

Practical Accelerometer Designs

Compression Type



Advantages

- Few Parts / Easy to Fabricate
- High Resonant Frequency

Disadvantages

- Very high thermal transient sensitivity
- High base strain sensitivity

Piezoelectric Force Transducer





Piezoelectric element

- Can be used in tension and compression
- Fragile to moments

PIEZOELECTRIC SENSORS









4.5 Tactile Sensor

- The term **tactile sensor** usually refers to a transducer that is sensitive to touch, force, or pressure.
- The term **tactile sensor** usually refers to a transducer that is sensitive to touch, force, or pressure.
- Tactile sensors are useful in a wide variety of applications for robotics and computer hardware and even security systems.

