

5.2 Analog and Digital Transducers

The transducers can be classified on the basis of the output which may be a continuous function of time or the output may be in discrete steps.

Analog Transducers

- These transducers convert the input quantity into an analog output which is a continuous function of time.
- A strain gauge, LVDT, thermocouples or thermistors are called analog transducers as they produce an output, which is a continuous function of time.

Digital Transducers

- Digital transducers produce an electrical output in the form of pulses which forms an unique code.
- Unique code is generated for each discrete value sensed.

Primary or Secondary

- Some transducers consist of mechanical device along with the electrical device.
- In such transducer's mechanical device acts as a primary transducer and converts physical quantity into mechanical signal.
- The electrical device then converts mechanical signal produced by primary transducer into an electrical signal.
- Therefore, electrical device acts as a secondary transducer.
- For an example, in pressure measurement Bourdons tube acts as a primary transducer which converts a pressure into displacement and LVDT acts as a secondary transducer which converts this displacement into an equivalent electrical signal.

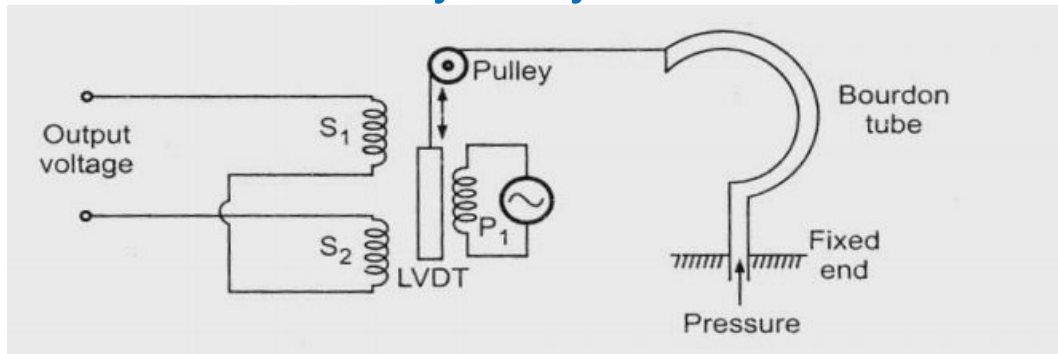


Fig 5.2.1 Pressure Measurement

Transducer and Inverse Transducer

- Transducers convert non-electrical quantity into electrical quantity whereas inverse transducer converts electrical quantity into non-electrical quantity.
- For example, microphone is a transducer which converts sound signal into an electrical signal whereas loudspeaker is an inverse transducer which converts electrical signal into sound signal.

Advantages of Electrical Transducers

- Electrical signal obtained from electrical transducer can be easily processed (mainly amplified) and brought to a level suitable for output device which may be an indicator or recorder.
- The electrical systems can be controlled with a very small level of power
- The electrical output can be easily used, transmitted, and processed for the purpose of measurement.
- With the advent of IC technology, the electronic systems have become extremely small in size, requiring small space for their operation.
- No moving mechanical parts are involved in the electrical systems. Therefore, there is no question of mechanical wear and tear and no possibility of mechanical failure.
- Electrical transducer is almost a must in this modern world. Apart from the merits described above, some disadvantages do exist in electrical sensors.

Disadvantages of Electrical Transducers

- The electrical transducer is sometimes less reliable than mechanical type because of the ageing and drift of the active components.
- Also, the sensing elements and the associated signal processing circuitry are comparatively expensive.
- With the use of better materials, improved technology and circuitry, the range of accuracy and stability have been increased for electrical transducers.
- Using negative feedback technique, the accuracy of measurement and the stability of the system are improved, but all at the expense of increased circuit complexity, more space, and obviously, more cost.

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