Inductive Transducer

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Principles of inductive transducer

- The inductive transducer uses one of the following principles.

- Change of self-inductance
- Change of mutual inductance
- Production of eddy current

Inductive transducer based on Change of Self Inductance

- The self- inductance of a coil is given by the equation $L = \frac{N^2}{R}$..... (1)
- The equation for reluctance of the coil is given by $R = \frac{l}{\mu A}$ ..... (2)
- Substitute (2) in (1) we get $L = \frac{N^2 \mu A}{l}$ ....(3)
- A measuring signal like temperature, pressure, displacement or the like, changes any one of the parameters of an inductor causes a change in its inductance. The change in self- inductance is a measure of measuring (temperature, pressure, displacement etc) signal.
- The change inductance can be measure by a suitable electronics circuit.

Inductive transducer based on change of Mutual Inductance

- The mutual inductance between two coils is given by

$$M = K\sqrt{L_1 L_2}$$

- The coefficient of coupling K depends on the distance of separation and orientation between two coils.
- For example, to measure displacement make one coil is fix and the other is movable.
- The movement of the movable coil changes the coefficient of coupling and hence the mutual inductance.

Inductive Transducer based on Production of Eddy Current

- When a coil is placed near to an alternating current carrying conductor, an Eddy current is induced in it. This eddy current produces its own flux. The induced flux is proportional to the eddy current. This induced flux tries to reduce the flux of the current carrying coil.

- $L = \frac{N\phi}{I}$

- The nearer the coils, higher will be eddy current in second coil and higher is the reduction in inductance in the current conduction coil. It means the inductance of coil varied with the variation of distance between the two coils.