Unit II: Transducers
Module Name: Inductive Pressure transducer
Capacitive transducer (Pressure)
Module No: 12

Pressure Inductive Transducer

A change in the inductance of a sensing element is produced by a pressure change is shown in Fig. 1. It consists of three parts: a **coil**, a **movable magnetic core,** and a **pressure sensing element**. When pressure is applied, the movable magnetic core moves downwards, which increases the permeability of the core, thereby increasing coil inductance. The change in inductance is converted into an electrical signal using an ac bridge.

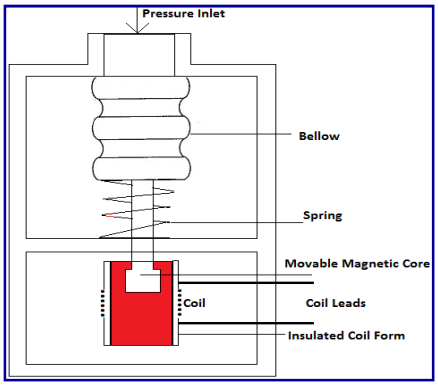

Fig1. Pressure Transducer

An advantage of the inductive type over the resistive type is that no moving contacts are present, thereby providing continuous resolution of the change, with no extra friction load imposed on the measuring system.

Pressure Inductive Transducer (Modified)

In a slightly modified form, this principle is used to obtain a change in mutual inductance between magnetically coupled coils, rather than in the self-inductance of a single coil and is shown in fig 2.

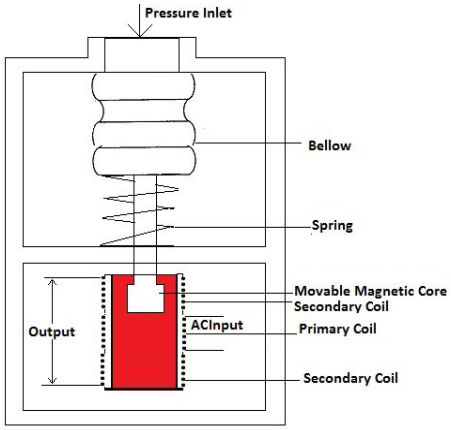

Fig 2. Modified Pressure Inductive Transducer

Capacitive Transducer (Pressure)

In Capacitive Pressure Transducer, there is a change in capacitance with changes in the physical position of the moving element when pressure changes. The capacitance is given by **C=KA/d** (1)

where K = the dielectric constant
A = the total area of the capacitor surfaces
d = distance between two capacitive surfaces
C = the resultant capacitance.

From this equation, it is seen that capacitance increases (i) if the effective area of the plate is increased, and (ii) if the material has a high dielectric constant. The capacitance is reduced if the spacing between the plates is increased.

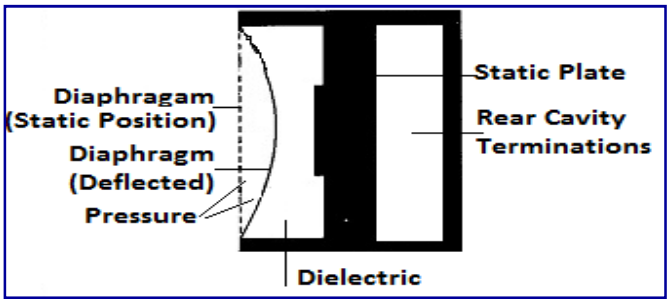

Fig 3. Capacitive Transducer

The Fixed plate is called **Stator**. A movable plate is called **Rotor** which is mechanically coupled to the member under test. As the member moves, the rotor changes its position relative to the stator, thereby changing the effective area between the plates. When pressure is applied, the metallic diaphragm moves inwards to the chamber and when pressure is removed, it moves outwards. As pressure increases, the distance between the plates varies, thereby changing the capacitance of the transducer. The change in capacitance is converted into an electrical signal using an ac bridge.