

Magnetic Flow meters

- ❖ **Electromagnetic/magnetic** flow meters, or **magmeters**, are comprised of a transmitter and sensor that together measure flow. The magnetic flow meter's sensor is placed inline and measures an induced voltage generated by the fluid as it flows through a pipe. The transmitter takes the voltage generated by the sensor, converts the voltage into a flow measurement and transmits that flow measurement to a control system.
- ❖ The operation of magnetic flow meters is based on **Faraday's law of electromagnetic induction**. Magmeters can detect the flow of conductive fluids only. Early magflow meter designs required a minimum fluidic conductivity of 1-5 microsiemens per centimeter for their operation. The newer designs have reduced that requirement a hundredfold to between 0.05 and 0.1.

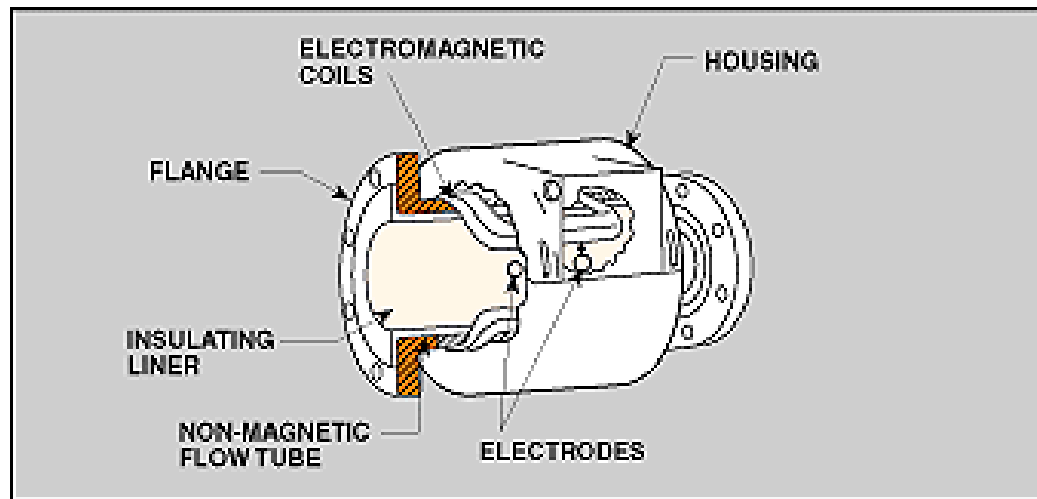
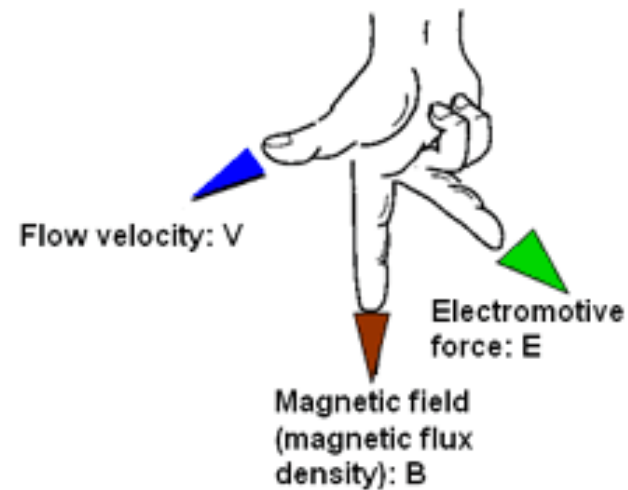
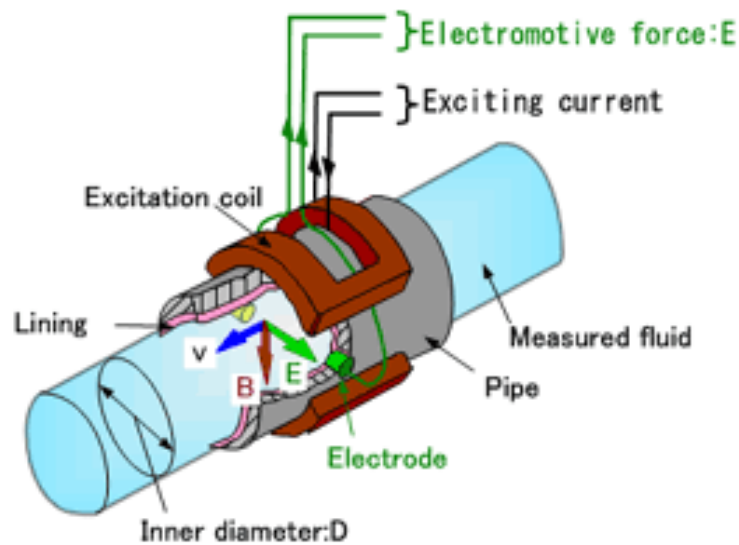


Figure 9: Major components of obstruction-free electromagnetic flowmeter's flowtube include electrodes and coils.



Faraday's Law

According to this law, a conductor that passes through a magnetic field produces voltage proportional to the relative velocities between the magnetic field and the conductor. The law can be applied to flowmeter systems because many fluids are conductive to a certain degree. The amount of voltage they generate as they move through a passage can be transmitted as a signal measuring quantity or flow characteristics.

$$E = BDV/C$$

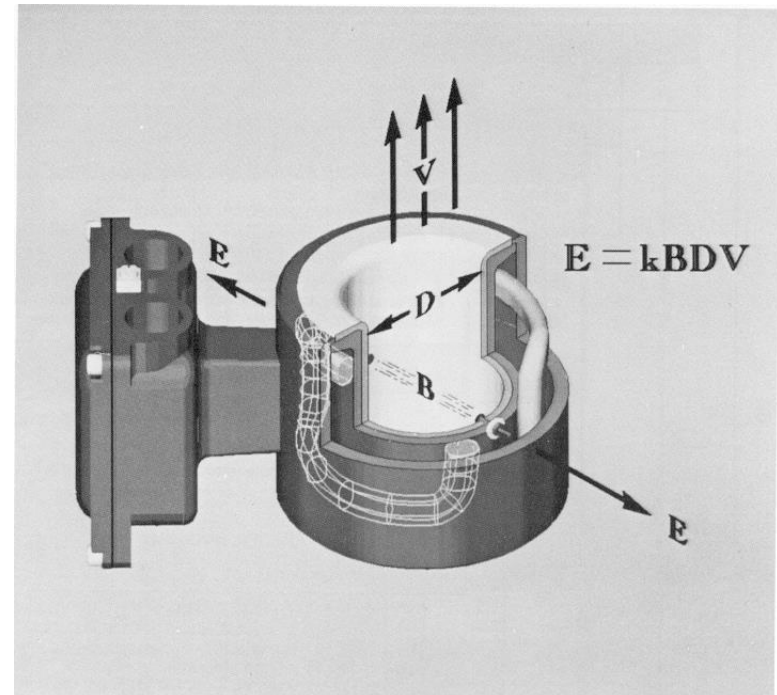
E = Induced Voltage

B = Magnetic Field Strength

D = Inner Diameter of Pipe

V = Average Velocity

C = Constant



Advantages of Magnetic Flow Meter :

- Power usage is relatively low, with electrical power requirements as low as 15 watts for some models.
- They are mechanically obstructionless and can be equipped with abrasion-resistant liners, making them effective for measuring slurries and other erosive fluids.
- They are capable of dealing with most kinds of acids and bases, as well as water and water-based solutions, due to lining materials that are both insulators and have corrosion resistance.
- Relatively small amounts of electrode metals are needed for magnetic flowmeters.
- They can measure both very low flows and very high volume flow rates, with a minimum diameter of roughly 0.125 inches and a maximum volume of up to 10 cubic feet.
- They can usually measure multidirectional flow, either upstream or downstream.

Disadvantages of Magnetic Flow Measurement

- Hydrodynamic effects can alter the normal flow pattern and disturb the velocity rate enough to interfere with operations
- Special care is required for erosive application
Difficulties in on site calibration
High cost
- Depending on their size and capacity, magnetic flowmeters can be relatively heavy.
- higher corrosion and abrasion resistance can be expensive.

Applications of Electromagnetic Flow Meters

- They are useful in quantification of potable water
- They can be used at construction sites of the flow measurement of slurries
- They are useful at petroleum plants to measure the flow rate of combustible fuels
- They are useful in measuring displacement of explosive liquids, paints, and abrasives