INSERTION TYPE MAGNETIC FLOW METERS

Operating Principle

The MagProbe operates utilizing Faraday's principle of magnetic conduction, whereby a moving conductor (the liquid) has a voltage imposed on it that is directly proportional to two variables – the strength of a local magnetic field and the velocity of the moving conductor.

$$\text{Imposed voltage} \propto \text{Magnetic field} \times \text{Fluid velocity}$$

If the strength of the magnetic field is held constant, then the magnitude of the voltage will be proportional to the velocity of the moving conductor. The equation then simplifies to:

$$\text{Imposed voltage} \propto \text{Fluid velocity}$$

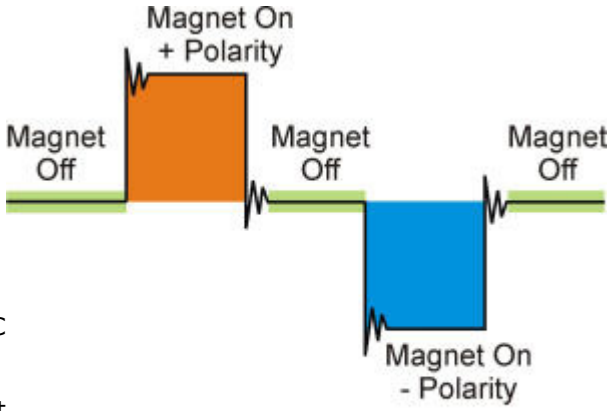

Figure 1 - Magnet Excitation

The MFX applies tri-stated, alternating polarity DC pulses to an integral electromagnet (Figure 1). Voltage measurements are made with the magnet off, to measure ambient background noise, and then with the magnet on in both polarities. The magnitude difference in voltage measured is proportional to flow. Once fluid velocity is measured, then various volumetric flow measurements will be obtained if the pipe internal diameter (I.D.) is known.

Point-velocity flow meters measure the fluid velocity at a specified depth into the fluid stream, typically 1/8 of the pipe I.D., which has been proven to be the nominal velocity point when symmetrical flow profiles are present. This assumption requires the probe to be downstream of any piping condition (elbows, valves, thermo-wells, tees, etc.) that can cause flow abnormalities. Typically, a minimum of 15 pipe diameters of straight pipe is required to develop symmetrical flow profile.

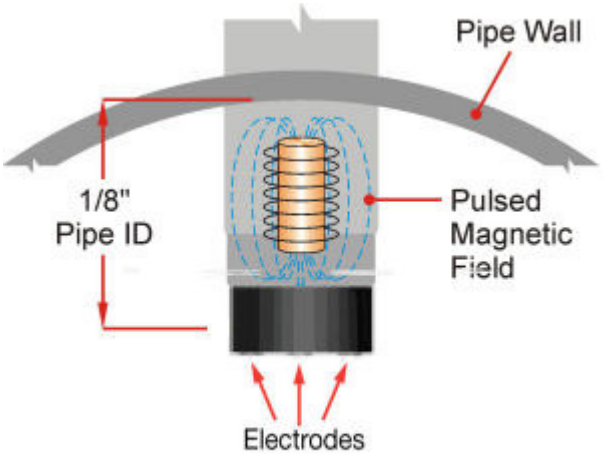

Figure 2 - MagProbe Design