

proportional
speed

in the flow path. These reflections undergo frequency shifts to the Mach number (V/C where V is the fluid speed and C is the speed of sound).

Acceptable fluids must:

- support the passage of sound
- contain sufficient scatterers or other disturbances to provide a Doppler reflection but not contain so many scatterers that the sound cannot penetrate into the flow
- be in a full pipeline
- be continuous, not pulsating flow
- contain no material to deposit on the wall

Advantages include:

- suitable for liquids with entrained gases or undissolved solids
- easy to install
- low price

Limitations:

- not recommended for single-phase fluids
- accuracies between 3% & 5% when installed properly

1. Beam Drift

acoustic
downstream
eddy
signal.

Principle of Operation: The ultrasonic transmitter utilizes 2 beams separated by a short distance to send sonic signals with the fluid. When turbulent flow occurs, the movement of the eddy causes a change to the acoustic signal which produces a unique signature. The transmitter looks for the second identical acoustic signal. When found, the difference in time is calculated to determine the velocity.

Advantages include:

- suitable for highly turbulent flow

Limitations:

- will **not** work in laminar flow and some swirl flows

2. Surface Height In Open or Partially Filled Channels

flume or
can be

Principle of Operation: The height of a liquid in an open weir or a partially filled duct is a function of the flow velocity. The height

measurements.

found using ultrasonic air-or-liquid path time-of-flight