

Industry: Minerals Processing

- Operation in Liquid-Only Flows at Velocities below 3 Feet/Second

SONARtrac[®] SOLUTIONS

The purpose of this application note is to identify a subclass of 'simple' liquid-only applications on which the SONARtrac flowmeter will successfully operate below its specified minimum flow velocity of 3 feet/second, which was broadly defined for operation on 'difficult' multi-phase slurry flows. This application note also presents the operating principles that make this possible so that users may understand how best to apply the technology to solve their flow measuring problems.

Strain-Based Acoustic Operating Principle

The SONARtrac minimum velocity limit of 3 feet/second is a conservative application guideline to ensure proper operation of the flowmeter on a wide range of applications. This includes typical single-phase and multi-phase flows, such as liquid-only flows and heavy slurry applications where significant levels of mechanical vibration and/or acoustic noise are present. It also ensures operation where very stiff pipes are present, such as small diameter Sch 80 steel.

However, many applications have operating environments that have lower levels of mechanical vibration and/or noise, and pipes that are significantly more flexible. These conditions permit flow measurements at velocities significantly lower than 3 feet/second.

Liquid-only applications operating under low levels of mechanical vibration and/or flexible pipes allow flow measurements at velocities significantly below 3 feet/second

The SONARtrac flowmeter operating principle is based on sensing pipe deformation (which is strain in the pipe wall) produced by dynamic pressure fields traveling at the average flow velocity in the pipe. Pipe deformation or strain is also produced by mechanical vibration and acoustic 'noise' traveling in the fluid and/or the pipe wall. The ability to make a flow measurement depends on the relative levels of the flow-generated strain compared to the vibration/acoustic-generated strain, which reach the sensors mounted on the exterior of the pipe. In general, lower vibration/acoustic strain levels and/or higher flow-generated strain levels permit operation at velocities near or below the 3 feet/second guideline.

Factors Favoring Operation Below 3 Feet/Second:

- Low stiffness pipe material; i.e. HDPE preferred over steel.
- Low stiffness pipe geometry; i.e. less wall thickness, such as Sch 5 or Sch 10 preferred over Sch 40 or Sch 80.
- Larger diameter pipes (same material and Schedule); i.e. 24" Sch 10 preferred over 20" Sch 10.
- Low mechanical pipe vibration environment due to good pipe support, i.e. outdoor installation with pipe on ground preferred over long spans on steel pipe supports.
- Long distance from sources of mechanical vibration and acoustic noise; i.e. maximize distance between pumps and flowmeter or automatic valve.
- Gravity fed lines. Typically have lower vibration and acoustic noise compared to pumped flows, if no other equipment nearby.

Typical Applications Permitting Operations Below 3 Feet/Second:

- PLS, raffinate and organic lines in leaching: typically lying on the ground, gravity fed or far from pumps, often HDPE pipe
- Recovered water lines: typically lying on ground or buried, far from pumps, which reduces acoustic noise; flowmeter in underground bunker where ground contact with pipe reduces mechanical vibration
- Phosphoric acid plants: reactor recirculation lines, concentrated phosphoric acid flow

Qualifying Applications for Operation Below 3 Feet/Second:

To qualify your application for operation below 3 feet/second, please contact CiDRA Customer Service or your local CiDRA representative.