Ultra-low frequency transducers
No impulse lines to clog
No moving parts therefore no wear and tear
No pressure drop
No process shut-down for installation
No leak points
0.15% of reading ± 0.03 ft/s
Independent of pipe material, pipe diameter, and wall thickness
Integrated temperature compensation

Technical facts

Pressurisation:
Without WaveInjector: ± 1.0% of reading ± 0.03 ft/s
With WaveInjector: ± 0.5% of reading ± 0.03 ft/s

Protection degree:
FM Class I, Div. 1/2
up to NEMA 6P

Temperature ranges:
-40 °F to +390 °F (for gases up to +210 °F)
-310 °F to +750 °F (up to +1100 °F are applicable)

Flow rates:
0.03 to 115 ft/s
0.03 to 80 ft/s

Liquids:
1.6 to 40 inches
1/4 inch to 225 inches (liquids), 0.4 to 83 inches (gases)

Gases:
0.03 to 115 ft/s
0.03 to 80 ft/s

Calibrated accuracy:
± 0.5% of reading ± 0.03 ft/s (liquids and gases)
± 1% ... 3% of reading ± 0.03 ft/s
± 1.0% of reading ± 0.03 ft/s

FLEXIM’s FLOWMETERS

FLEXIM is an active leader in many areas of process instrumentation. As a world-wide reference for innovative measurement of fluids and gases, FLEXIM has been leading the way in ultrasonic clamp-on flow metering for more than 20 years. In addition to ultrasonic flow measurement, FLEXIM operates in innovative valve sectors and ultrasonic level, and temperature technology. Our high-tech, user-oriented products are continually developed and improved to meet today’s requirements. The WaveInjector is a perfect example of FLEXIM technology for extremely hostile environments.

FLEXIM provides a metrological alternative, which offers fundamental advantages and has proven itself in numerous refinery applications worldwide. Without the need for pipe work or process shut-downs, the WaveInjector can be mounted to the external surface of the pipe, reducing the plant’s availability and profitability.

The superior metering solution at extreme process temperatures

The WaveInjector® has been specifically engineered for high-temperature applications. Using patented technology, the WaveInjector® dramatically lowers the effusive transducers from the hot pipe, enabling operation at process temperatures up to 1100 °F.

The operational conditions in refineries are very demanding: extreme temperatures, abrasive media and high viscosity. Conventional solutions (orifice, differential pressure, vortex and coriolis, which are used to measure refinery flows, face well-known disadvantages when measuring at high temperatures up to 1100 °F.

FLEXIM’s commitment to customer service

FLEXIM considers itself not only a manufacturer of measuring instruments, but also a provider of technical and consulting services. These services include on-site service possible.

FLEXIM is an active leader in many areas of process instrumentation. As a world-wide provider of technical and consulting services.

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Refinery Solutions

Non-intrusive ultrasonic flow measurement with WaveInjector
Reliable - Safe - Cost Effective

The WaveInjector® provides a metrological alternative, which offers fundamental advantages and has proven itself in numerous refinery applications worldwide. Without the need for pipe work or process shut-downs, the WaveInjector® dramatically lowers the effusive transducers from the hot pipe, enabling operation at process temperatures up to 1100 °F.

Patented measuring technology

With the WaveInjector® FLEXIM provides a metrological alternative, which offers fundamental advantages and has proven itself in numerous refinery applications worldwide. Without the need for pipe work or process shut-downs, the WaveInjector® dramatically lowers the effusive transducers from the hot pipe, enabling operation at process temperatures up to 1100 °F.

A wide range of ultrasonic transducers and transmitters guarantee the ideal adaptation to the individual measurement task, independent of pipe material, wall thickness and measurement range - from within hazardous area FM Class I, Div. 1 to Class I, Div. 2.
Unrivalled advantages of the non-intrusive flow measurement with FLEXIM in Refineries:

- No process data lost for reliability.
- No impulse lines to clog.
- No pressure drop.
- Independent of pipe material, wall thickness and measurement range - even within hazardous areas (FM Class I, Div. 1 and 2).
- Accurate and repeatable measurement.
- Engineered for measurement of all kinds of fluids - independent of free and dissolved gases.
- Integrated temperature compensation.
- Patented measuring technology.
- No pressure drop.
- No moving parts therefore no wear.
- Ultra low frequency transducers.
- No impulse lines to clog.
- Independent of pipe material, wall thickness and measurement range - even within hazardous areas (FM Class I, Div. 1 and 2).
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- Engineered for measurement of all kinds of fluids - independent of free and dissolved gases.
- Integrated temperature compensation.
- Patented measuring technology.
- No pressure drop.
- No moving parts therefore no wear.
- Ultra low frequency transducers.

Unique features of the FLEXIM flow-meters:

- Engineered measurement of liquid gas and gas.
- Every measurement system is individually set at a factory before it is shipped.
- Independent of pipe material, wall thickness and measurement range - even within hazardous areas (FM Class I, Div. 1 and 2).
- Integrated temperature compensation.
- Patented measuring technology.
- Delivery time is adapted to the individual measurement task, e.g. with the FLEXIM WaveInjector.
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Technical facts

- Temperature ranges with WaveInjector®:
  - For liquids: 0.03 to 115 °F
  - For gases: 0.03 to 80 °F
- Pressure ranges:
  - For liquids: 100 bar max.
  - For gases: 150 bar max.
- Flow ranges:
  - For liquids: 1:100 to 1:100,000
  - For gases: 1:100 to 1:100,000

FLEXIM is an active leader in many areas of process instrumentation. As a world-renowned manufacturer of flow and gas meters, FLEXIM has introduced a number of innovations in flow measurement technology. In addition to intrusive flow measurement, FLEXIM pioneered in intrusive ultrasonic sensors, which promise entirely new technology, and innovations forever after: a new look at the measuring principle, new materials, new applications.

The FLEXIM Commitment to Customer Service

FLEXIM commits itself to only a professional of measuring instruments, but also in solutions, made by our team of specialists, from initial consultation and system design to maintenance and on-going service: The company's local and national service, is based not only on the highest quality equipment but on their support and services.

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www.flexim.com or call us at:
1-866-852-PIPE

Refinery Solutions

Non-intrusive Flue Measurement - Safety shut-down - Mass Balance - up to 1120 °F

FLEXIM MAMMOTH

Corporation
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Glenview, IL 60025
Telephone: (847) 698-2308

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www.flexim.com or call us at:
1-866-852-PIPE

Non-intrusive ultrasonic flow measurement with WaveInjector

Reliable - Safe - Cost Effective

The WaveInjector® has been specifically engineered for high-temperature applications. Using patented technology, the WaveInjector® dramatically reduces the loss from the hot gas, allowing operation at process temperatures up to 1120 °F.

The operational conditions in refineries are very demanding: extreme temperatures, process data and high accuracy. Conventional solutions include differential pressure, vortex and some meters, which suffer from high maintenance costs, high and lower electronics, frequent maintenance intervals, requiring numerous steps for installation and ongoing measuring process issues without looking for ideal energy balance.

Patented measuring technology

With the WaveInjector® FLEXIM provides a technological alternative, which strikes the balance between high maintenance costs and high performance, meeting the ever-increasing requirements of the industry.

- A wide range of ultrasonic transducers and transmitters guarantee the ideal adaptation to the individual measurement task.
- Independent of pipe material in solids content.
- High turndown ratio readings - even at the lowest flow rates.
- No need for calibration.
- Field calibrated.
- Mass Balance up to 1120 °F.
- Overflash.
- Mass balance.
- Cooling tower balance.
- Struck.
- Steam.
- Hydrate.
- Biodegradable.
- Abrasion.
- Temperature.
- Flow measurement.
- FDF.
- Fast gas.
- Gas.

When Measuring Matters

The superior metering solution at extreme process temperatures.
Unrivaled advantages of the non-intrusive flow measurement with FLEXIM in Refineries:

- No pressure drop: maintenance-free operation due to the non-intrusive measurement principle.
- No measuring point: no need for direct contact with the fluid.
- No moving parts: no wear and tear.
- No pressure drop: constant operation in hazardous areas.

Technical facts:

- Temperature ranges for liquids: -40 °F to +390 °F (for gases up to +210 °F)
- Temperature ranges for gases: -310 °F to +750 °F (up to +1100 °F are applicable)
- Flow rates for liquids: 0.03 to 115 ft/s
- Flow rates for gases: 0.03 to 80 ft/s
- Frequency ranges (gases): 0.4 to 83 inches
- Frequency ranges (liquids): 0.4 to 225 inches
- Calibration accuracy (liquids and gases): ± 0.5% of reading ± 0.03 ft/s
- Repeatability (liquids and gases): ± 1% ... 3% of reading ± 0.03 ft/s

The WaveInjector

- Patented measuring technology within the pipe, reducing the plant's availability and profitability.
- Known shortcomings - often being maintenance intensive, requiring process stops for installation and causing pressure losses.
- Conventional orifice / differential pressure, coriolis and vortex meters, which are used to measure refinery flows, face well-known technical and economic limitations.
- Operational conditions in refineries are very demanding: extreme temperatures, abrasive media and high viscosity.

- FLEXIM provides a metrological alternative, which offers fundamental advantages and has proven itself in thousands of installations worldwide.
- FLEXIM considers itself not only a manufacturer of measuring instruments, but also a partner dedicated to providing the highest quality equipment with the best support and service processes.

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The superior metering solution at extreme process temperatures

- Non-intrusive ultrasonic flow measurement with WaveInjector

Reliable - Safe - Cost Effective
Field-Proven Clamp-On Flow Measurement

Case Study: Clamp-On Flow Measurement of Bitumen at Suncor Energy

Due to the high viscosity and abrasive properties of the bitumen, the company Suncor Energy required a reliable flow measurement technology. The solution was the Clamp-On Flow Measurement technology from FLEXIM. The application was part of the bitumen flow line at Suncor Energy’s Fort McMurray refinery, where the bitumen is heat treated in order to make it more fluid. The new solution proved to be reliable and easy to install, thus reducing the overall costs for the refinery.

Refinery Flows

Flow Measurement of Gases

FLEXIM has a proven track record in reliable and accurate flow measurement of gases such as vacuum and atmospheric gases, as well as gas and liquid mixtures. The solution is especially suitable for high pressure applications and can be used in conjunction with FLEXIM's WaveInjector for high pressure applications. The system provides a safe and reliable solution for the measurement of gas flows, even in the presence of solids.

Spent Acid Strength Measurement

Within alkylation plants, highly concentrated sulfuric and hydrofluoric acid is used to form high molecular weight olefins from lower molecular weight hydrocarbons. The acid's concentration either non-intrusively from the pipe wall outside by means of an acoustic meter or inline by refractometry. The online analysis of hydrocarbon products, such as aromatics, oil distillates or raffinates is of utmost importance to guarantee agreed quality standards. The FLEXIM WaveInjector is a safe and non-intrusive solution for such real time analysis and can either determine the concentration, or inline by refractometry, as another example, as another example, of saturated aromatic and olefin compounds. The solution is especially suitable for high pressure applications.

Hydrocarbon Quality Control

Other Refinery Applications

FLEXIM’s NDIR infrared analyser line meters process gases and non process gases for the identification and tank dewatering applications. Both vibrate meters, and gas flow meters for the identification and tank dewatering applications can be used in conjunction with FLEXIM’s WaveInjector for high pressure applications. The system provides a safe and reliable solution for the measurement of gas flows, even in the presence of solids.

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Case Study: Clamp-On Flow Measurement of Bitumen at Suncor Energy

Numerous times, the WaveInjector formation and avoid operational safety risks. High viscosity liquids, containing solids (coke fines), the stream can solidify inside the pipe, causing a blockage. Shut-downs are not required.

Flow meters in FCC reflux lines or fractionator bottoms face the challenge of the abrasive catalyst particles in the slurry causing wear and tear, nor can be a risk for leaks. A high degree of abrasion on any inline measurement systems, the use of non-intrusive ultrasonic flow meters is almost inevitable.

Another significant advantage of the non-intrusive ultrasonic measurement of:

- Distillation Columns (ADU / VDU)
- Fluid Catalytic Cracking (FCC)
- Hydrocracker and Desulfurisation
- Blending
- Sweetening
- Treating & Gasolizing
- Destillates
- Gas
- ’40 °F - 85 °F, app. 5 bar
- LPG
- ’40 °F - 85 °F, app. 7 bar
- Thermally cracked Residue
- Heavy cracked Distillate
- Coker Naphtha
- Petroleum Coke
- Asphalt
- Light Crude Distillate
- Gas, 40 °F - 85 °F
- Light Naphtha
- 85 °F - 195 °F
- C9 - C16
- 350 °F - 570 °F
- C10 - C16
- 300 °F - 530 °F
- Paraffin
- 195 °F - 390 °F
- Aromatic
- 650 °F - 750 °F
- Process Water
- atmospheric Residue

Field-Proven Clamp-On Flow Measurement

When testing flow meters with FLEXIM proved to be a better alternative. It does not use a “bucket” between the fluid and the measurement device and the measuring transducer housing is not required. The elimination of the bucket results in an increased measurement accuracy. The ability to measure the material of the bucket, which was not no longer possible due to plant operations. The result is a substantially lower time to use modern ultrasonic flow meters for most FLEXIM with the Waterjet on the field. This flow meter technology is used to reduce costs in the upgrade process.

Receiving the advantage, the dynamic measurement sys-
tem has already been put in place at many HCU loop control points. Due to the application of FLEXIM’s range of hazardous area portable liquid flow meters, often struggle with impulse line clogging causing opera-
tion problems.

Other Refinery Applications

FLEXIM’s non-intrusive ultrasonic line meters provides the refinery with the flexibility to perform dual applications without.

- Portable measurements
- High pressure
- Pumping
- Gel
- High viscosity liquids
- Flow determination
- Corrosion monitoring
- Mixing / dosing
- Temperature compensated concentration, or inline by refractometry. It can be done by different methods. Both means for determining the liquids’s sonic velocity, which stands in distinct relation to its temperature level of the process fed and spent acid. Within alkylation plants highly concentrated sulfuric or hydrofluoric acid is used for acid recovery processes and monitoring. FLEXIM’s inline Process Refractometer PIOX is the ideal measuring instrument for these applications. Its performance ensures that the entire measurement system is constantly monitored for a contamination risk. Thus, it is highly advantageous for acid recovery systems, which are exposed to an increased concentration of acid.

The online analysis of hydrocarbon products, such as aromatics, alcohols or carboxylic acids, is of utmost importance to prevent damage to the equipment due to buildup of scale. FLEXIM’s inline Process Refractometer PIOX is the ideal solution for this task. It enables a high degree of accuracy and reliability, which is of utmost importance in the process industries. The device is easy to maintain and requires no process shutdowns.

Spat Speed Strength Measurement

Not every measurement point within a refinery needs to be constantly monitored. Fast, regular surveys and check metering / verification tasks.

Step-by-step check and in-line process verification, for example, by comparing the results of inline analysis with parallel test results by laboratory analysis. This allows for a safer and more consistent process.

Hydrocarbon Quality Control

The online analysis of hydrocarbon products, such as aromatics, alcohols or carboxylic acids, is of utmost importance to prevent damage to the equipment due to buildup of scale. FLEXIM’s inline Process Refractometer PIOX is the ideal solution for this task. It enables a high degree of accuracy and reliability, which is of utmost importance in the process industries. The device is easy to maintain and requires no process shutdowns.
Heat transfer oil lines
Overflash circulation as water / hydrocarbon cuts can
Small diameter lines with very low flow
ADU and VDU residues making cost intensive laboratory
and many other support processes
ADU outlets with various distillates without showing any measure

Field-Proven

...
Case Study: Clamp-On Flow Measurement of Bitumen at Suncor Energy

In Suncor’s Fort McMurray mine, about 500,000 tons of oil sands are mined per day from the surface, which is then dried and transported to the processing unit. About 50% of the recovered and heated bitumen is sent by pipeline to the extraction plant, the raw bitumen is separated from sand, water and minerals, and depressurized before loading on trucks for transport. Each load contains about 300,000 tons of oil sands, transport the ore to the processing unit. At the extraction plant, the raw bitumen is separated from sand, water and minerals, and depressurized before loading on trucks for transport. Each load contains about 300,000 tons of oil sands, then the bitumen is sent to the refinery plant for processing.

To improve the efficiency and accuracy of flow measurement, FLEXIM’s Clamp-On Flow Measurement is used to measure the flow of the bitumen during the transport process. The Clamp-On Flow Measurement System (FLEXIM® HPI) has proven its high reliability, durability and ease of installation, providing accurate flow measurement without the need for invasive installation or downtime.

Receiving the advantages of the non-intrusive measurement system, FLEXIM® Clamp-On Flow Measurement System has already been installed at a number of refineries worldwide, providing accurate flow measurement for the transport and processing of bitumen.

Flow Measurement of Gas

FLEXIM® Clamp-On Flow Measurement System is also used for the measurement of gases in refineries. The measurement range for gas flow is typically higher than for liquid flow measurements, ranging from 0 to 10,000 Standard Cubic Feet per Hour (SCFH). The measurement range for gas flow is typically higher than for liquid flow measurements, ranging from 0 to 10,000 Standard Cubic Feet per Hour (SCFH).

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Ultra low frequency transducers
No limitations for liquids
Engineered for measurement of
Independent of pipe material, wall thickness and measurement range - even within hazardous areas (FM Class I, Div. 1 and 2).

The superior metering solution at extreme process temperatures
Non-intrusive ultrasonic flow measurement with WaveInjector
Reliable - Safe - Cost Effective

FLEXIM AMERICAS

In partnership with WaveInjector

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