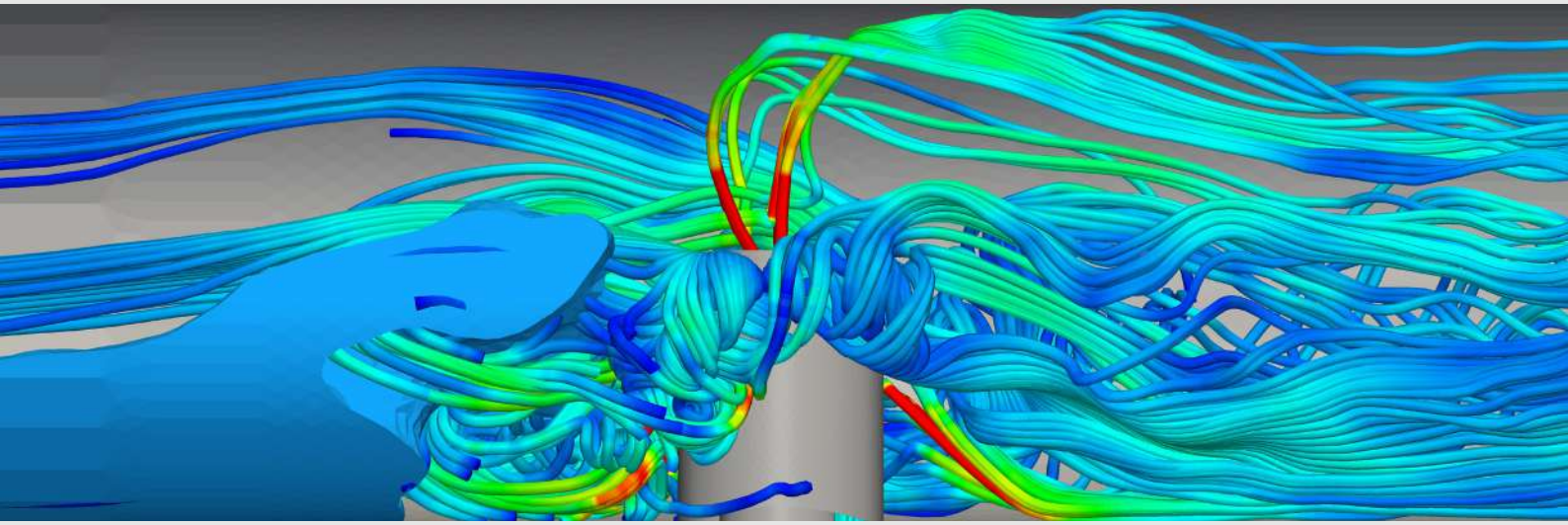
OGM

Oil & Gas Measurement Limited

SmartMix® Technology

Intelligent Jet Mixing System



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SmartMix® Technology for Automatic Sampling with Exceptional Efficiencies

For years, end users and their engineering contractors have striven to install flow metering systems for which manufacturers offer a very precise uncertainty level.

Once installed, the performance of the flow metering system must be corrected using a sampling system, which in turn must comply with international quality measurement standards. While there is significant focus to lower the flow metering uncertainty, the maximum error that is admissible in the quality measurement, particularly as a measure of the mixing efficiency, remains comparatively crude and inaccurate. Therefore, sampling is still the "elephant in the room" that requires immediate attention to reduce the significant loss in revenue that is caused while using current systems. To circumvent these problems, OGM has developed the SmartMix® Technology, which has many unparalleled efficiencies compared to current systems in the market.

Mixing is the Key Step for Accurate Quality Measurement of Petroleum Liquids

In general, assuming all other steps are done with extreme accuracy, the chain of uncertainty in sampling or quality measurement is mainly dependent on how the representative sample is taken, which is wholly dependent on the efficiency and accuracy of the mixing device employed. Any inaccuracy in quality measurement results in significant financial exposure. Therefore, accurate and homogeneous mixing is essential.

"Sampling is not just 'another' function of measurement; it is the heart and soul of the profit figure... It must start correctly if it is to end well!" (D.J. Fish, 1992)

Figures 1 & 2 - Typical SmartMix® Skid

The SmartMix® Technology and its Benefits

Oil & Gas Measurement Limited's (OGM's) SmartMix® Technology brings a paradigm shift in "on-demand" efficient and accurate mixing for the Oil & Gas and allied industries.

Automatic sampling of oil-water flow in pipelines (as set out in ISO 3171, API 8.2 and IP 6.2), requires stream conditioning that must ensure a better than 90% "Grade A" mixing efficiency across the pipe diameter so that representative sampling is possible. However, not all sampling and mixing systems have the same performance. The annual loss in revenue and additional financial exposure due to even the smallest margins of mixing inefficiency could run into tens of millions of dollars per sampling station.

The SmartMix® Technology utilises a unique liquid jet in cross flow (LJICF) configuration, where strong-jet and weak-jet interactions cause the vortex entrainment atomisation of the aqueous phase into homogeneously distributed droplets with sufficient turbulence dissipation rate.

The SmartMix® Technology has the highest mixing efficiency and accuracy thereby delivering the best investment for quality measurement with rapid payback time. The technology is engineered to avoid repeated recirculation of samples, thereby ensuring a single pass and accurate sampling within the fast loop by splitting the flow from the discharge side of the pump. This twin stream design entering the jet-mix nozzle, along with the SmartMix® Technology's Advanced Control System (ACS), provides superior and efficient mixing, which in turn delivers practically infinite turndown in flowrates while also ensuring zero pressure drop.

Key Benefits

- Greater than 97% mixing efficiency, saving millions of dollars in lost revenue.
- Efficient horizontal mixing even at very low velocities – without resorting to vertical installations hence avoiding significant pressure drop due to bends while also eliminating significant cost of pipeline rework.
- Efficient mixing even at the worst flow conditions (low velocities, low densities and/or low viscosities).
- Up to 80% shorter nozzle-scoop distance (compared to current systems in the market), allowing very compact design where space is at a premium, particularly offshore.
- No pressure drop in the pipeline due to the presence of the nozzle and scoop assemblies.
- No emulsification of product due to efficient control of droplet size distribution.
- Significantly (up to 50%) lower pump power requirement compared to other system suppliers.

How it Works

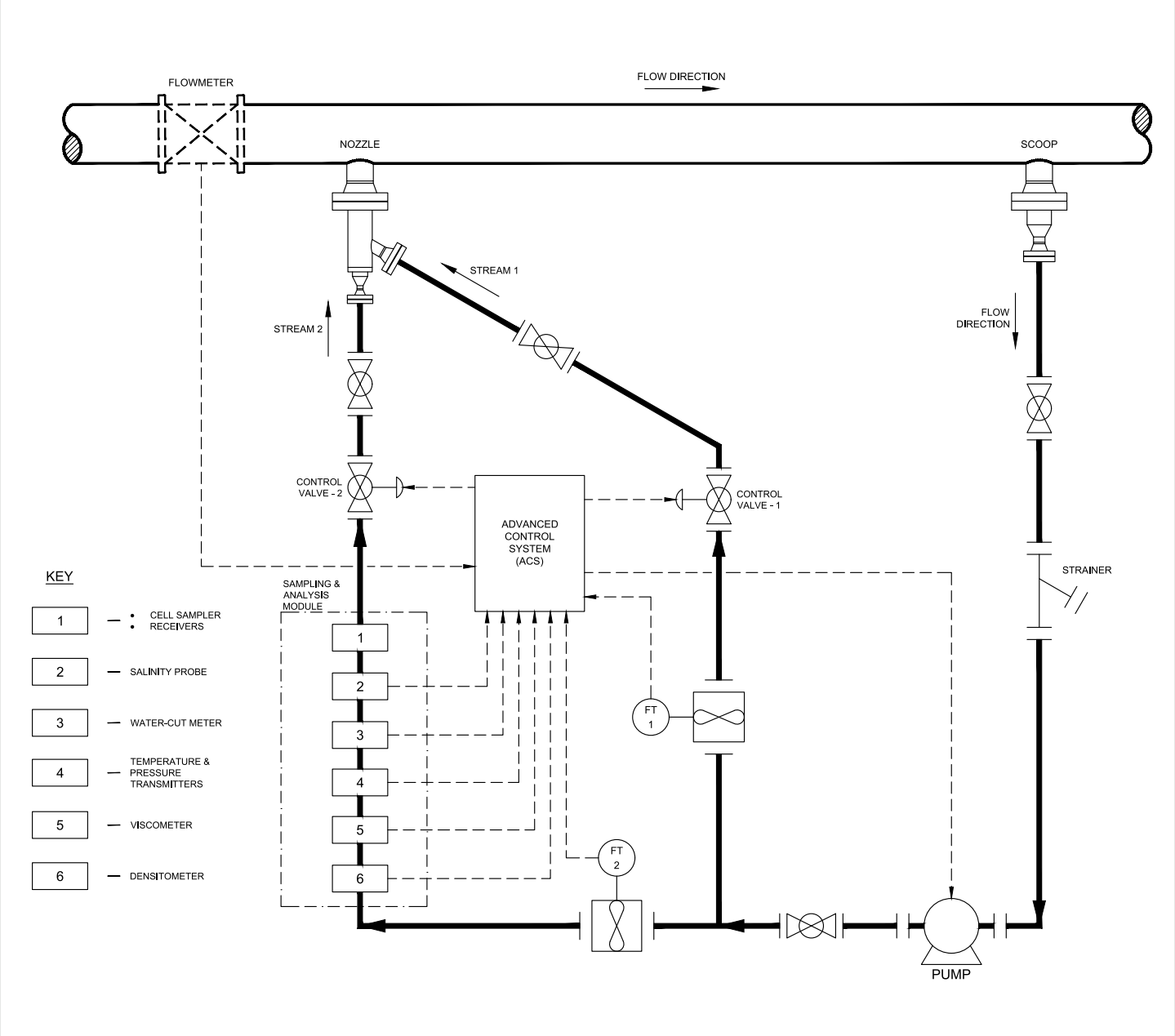

Figure 3 - Typical SmartMix® System Configuration

Fluid is withdrawn from the mainline via the SmartMix® scoop and is reinjected into the mainline using the SmartMix® twin-stream jet nozzles. These jets interact in a very complex but efficient manner with the main flow, which achieves a turbulence dissipation level that is the centrepiece of the technology. This ensures homogeneous mixing with low power requirement. The scoop is sized to have a sufficiently large inlet so that it can achieve a representative or homogeneous sample with true isokinetic inlet velocity.

At the discharge side of the pump, one stream flows through the quality cabinet, which can be equipped with a selection of analytical equipment such as densitometers, viscometers, water cut meters, salinity probes, etc. Also, automatic grab samplers and sample receivers are included, which typically take regular 1cc samples and direct them to a sample receiver for laboratory analysis.

In operation, based on the mainline flowmeter reading, the SmartMix® ACS sets a total injection rate for the fast loop. Then, using the composition and fluid properties data from the analytical equipment in the quality skid, the SmartMix® ACS employs its advanced optimisation algorithm to adjust the total injection rate as well as the flows in the twin streams via the combined interaction of the pump, flow meters and control valves.

This ACS optimised delivery of flows through the mixing nozzles ensures efficient homogeneous mixing in the pipeline. Therefore, the SmartMix® Technology is not only highly efficient but also brings a paradigm shift in custody transfer applications, which heralds "on-demand" mixing.

Why Choose SmartMix® Technology?

All elements of the system interact to guarantee that the flow through the fast loop into the mixing section will be based on real time flowing conditions and achieve optimum mixing.

Rather than setting the fast loop flowrate at one condition during initial start-up and operating it at this rate throughout all the pipeline operating conditions, the SmartMix® ACS adjusts the flowrates through the mixing nozzle to ensure that the correct mixing is achieved based on the following parameters:

- Pipeline flowrate
- Operating pressure
- Operating temperature
- Fluid density
- Actual water cut
- Actual viscosity
- Salinity

As the SmartMix® Technology provides optimum mixing based on real time flowing conditions and compositions, the accuracy of the sampling system is greatly improved.

Figure 4 - Typical SmartMix® Skid ▶

Applications

The SmartMix® Technology is available for use in a variety of mixing applications including:

- Crude oil sampling
- Oil blending
- Refined petroleum products
- Natural gas condensate

Figure 5 - OGM's Oil-Water Multiphase Loop (10") used to conduct validation and proving tests for SmartMix® Technology

Flexible Scope of Supply

For upgrades of existing systems, where much of the quality and sampling equipment may already exist, OGM can supply the SmartMix® Technology's mixing device, its ACS and solution engineering only. Alternatively, a complete bespoke system, including pumps, quality and sampling skid(s) can be provided to suit customer requirements.

Figure 6 - Large Liquid Metering Skid delivered to Major End User

To Request a Quotation

Please provide us with as much information for the following parameters as possible:

SmartMix® System:

1. Maximum, normal & minimum flowrates expected in the pipe
2. Nominal diameter and schedule of the pipe
3. Material of the pipe (e.g. carbon steel)
4. Description of upstream fittings & equipment with approx. distances (elbows, valves etc.)
5. Operating pressure & temperature
6. Operating density (SG/°API)
7. Operating viscosity range of the fluid
8. Design pressure & temperature or ANSI Class
9. Maximum, normal & minimum expected water content %
10. Salinity of water (if known)
11. Other sampling parameters required e.g. H_2S, RVP, sediment etc.
12. Any applicable project/plant specifications
13. Installation spatial description/specification

Sampling & Analysis:

1. No. of automatic grab samplers required (e.g. 1 daily, 1 weekly, 1 spare)
2. Is instrument air available
3. Manual sample point/s required
4. No. of sample receivers required (e.g. 1 daily, 1 weekly, 1 spare)
5. Atmospheric or constant pressure type receivers
6. Preferred size of receivers
7. Preferred equipment manufacturers
8. Additional density analyser/s required
9. Additional water cut analyser/s required
10. Type & quantity of any other analysers required (e.g. H_2S, vapour pressure, RVP, sediment etc.)

OGM

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