OGS

Oil & Gas Systems Limited

Sampling and Analysis

www.ogsl.com

Oil & Gas Systems Limited (OGS) supplies packaged fiscal analysis and pipeline integrity measurement equipment including, but not limited to, process analyser system integration, flare metering and analysis, manual spot sample and automated sampling, CV, H_2S moisture and total sulphur analysis and water quality analysis (including oil in water).

A representative sample of a hydrocarbon product is necessary to ensure proper accounting for transactions and efficient product processing. The amount of hydrocarbon product that is transported between producer, processor, distributor and end-user is significant.

To be able to verify the exact composition of the product is important from an economic and product treatment standpoint. A small percentage saving made by correctly determining composition will quickly recoup the investment made in the purchase of a system designed to obtain an optimum sample. In addition, if the best sampling procedures are followed, the potential for disputes between supplier and customer will be greatly reduced.

Some of the standards that must be adhered to ensure representative samples include ISO 10715 and API 14.1. These standards are the most common and current ones referenced on gas sampling procedures. This figure is a critical component of the flow formula from which we derive the product quantity. An error in sampling affects both quality and quantity, and ultimately profitability.

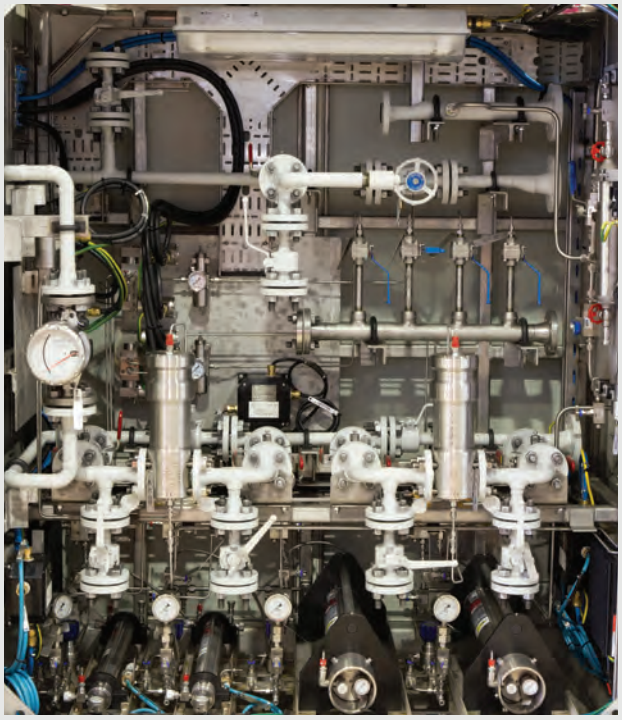
Sampling Systems

A crucial factor in petroleum measurement is quality analysis. For this reason liquid metering systems usually have an associated sampling system.

There are generally two types of sampling - either in-line sampling or bypass sampling and OGS has the expertise and experience to provide such systems to cover all operators requirements.

The automatic sampling of refined hydrocarbon liquids for quality measurement is regulated by the following international standards:

- API MPMS Chapter 8.2: Standard Practice for Automatic Sampling of Petroleum and Petroleum Products.
- ASTM D4177: Standard Practice for Automatic Sampling of Petroleum and Petroleum Products.
- EN ISO 3171: Petroleum Liquids – Automatic pipeline sampling.



Sampling System

Sampling System

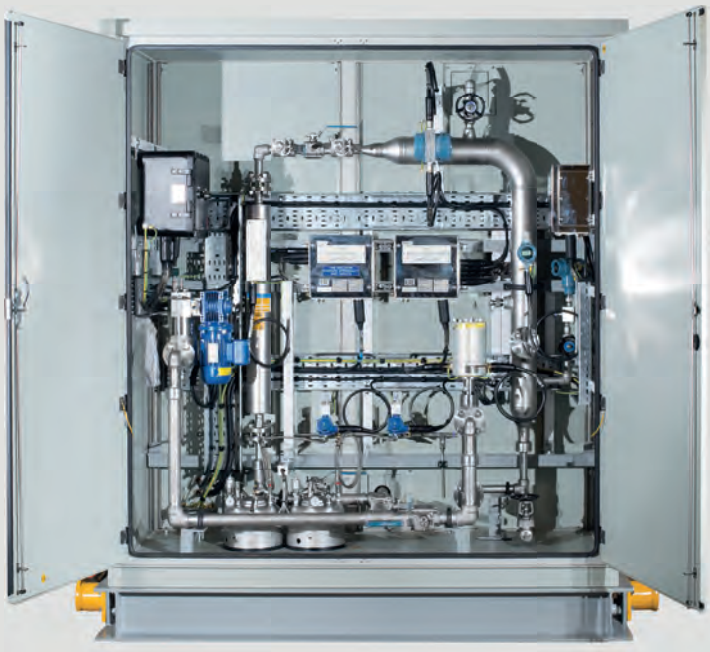
Generally for newer installations, the equipment proposed is based on the understanding that no additional process mixing is required in the sampling systems and that the process lines are already well mixed to acceptable C1/C2 ratios. This however, has not been verified by OGS and it may be necessary to undertake further calculations to determine if static mixing or the use of a jet mix system would be required to ensure true representative sampling for each of the product/fluid lines.

OGS designs and supplies manual, fast loop or isokinetic homogeneous mixing systems to ensure compliance with ISO 3171 using either clients nominated suppliers or our own range of Maurer™ samplers and accessories as appropriate.

SmartMix® for Automatic Sampling with Exceptional Efficiency

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, our sister company, Oil & Gas Measurement Limited (OGM) has developed the SmartMix® technology, which has many unparalleled efficiencies compared to current systems in the market.



Typical SmartMix® Sampling & Analysis Cabinet

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)

The SmartMix® Technology and its Benefits

Oil & Gas Measurement Limited's (OGM's) SmartMix® technology brings a paradigm shift in efficient and accurate mixing for the oil and gas and allied industries.

The SmartMix® technology has the highest mixing efficiency and accuracy thereby delivering the best investment for quality measurement with rapid payback of investment. 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® control system, provides superior and efficient mixing, which in turn delivers practically infinite turndown in flowrates while also ensuring zero pressure drop.

Typical SmartMix® Skid

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.

Samplers

The sampling system is optimised for low maintenance requirements and sustainability. An integral component of the system is the cell sampler which ensures a consistent and repeatable sample is taken. The cell sampler uses a three-step technique to ensure its performance stays unaffected by possible variations in the process.

This sampler is essentially a power driven metering pump. The sampling mechanism is a tubular stem with an inner concentric capture tube and a piston. Each cycle first captures a precise volume of sample and then pumps it through a back pressure valve to a sample collection receiver.

The in-line sampler installed in a correctly designed system will take representative grabs of line fluid at a predetermined rate normally relative to the pipeline flowrate. The composite of these grabs (typically 1,000 to 10,000 collected during a pipeline transfer) provides a representative sample of the oil batch for laboratory analysis and reference. The rate of sampling is normally controlled by a flow computer which measures flow in the main export pipeline.

OGS will supply systems incorporating clients preferred/approved supplier of samplers as required. If a customer has no preference we would use the most appropriate sampler or by choice, Maurer™ Instruments products which have the following sample rates:

- Electrically operated sampler - up to a maximum 15 grabs/min
- Pneumatically operated sampler - up to a maximum 30 grabs/min

Electric Insertion Sampler & Interface Box

Sample Receiver & Weigh Scales

Pneumatic Cell Sampler

Water Cut and Density Measurement

It is common as part of the liquid sampling system to install densitometers and oil in water monitors for online quality management.

OGS designs and manufactures such systems using industry recognised analyser manufacturers and packages them with all necessary pressure let down equipment and controls.

Gas Analysis Packages

OGS can provide full analysis packages suitable for use in fiscal gas measurement. Typical gas analysis packages would include:

- Gas chromatograph (C1 – C12 as applicable)
- CO_2
- H_2S
- Oxygen
- Dew point
- Wobbe index
- Other parameters to meet the clients specific requirements

We utilise industry standard analysers which are then integrated within an enclosure complete with the required pressure let-down equipment.

These enclosures are available in stainless steel or other suitable materials complete with full HVAC or natural ventilation and fire and gas detection and alarm facilities.

OGS can provide complete design, manufacture, assembly and test of the following types of metering systems for the following applications:

- Offshore platforms and FPSOs
- Onshore installations including terminals and refineries
- Pipelines
- Petrochemical facilities
- Power stations

OGS can supply systems for hydrocarbon applications such as crude oil, conventional or unconventional natural gas and condensate as well as refined products including LPG, lubricants, fuel oil, kerosene and naphtha.

Scope of Supply

OGS undertakes the complete design and supply of skid mounted or packaged equipment and our scope of supply typically covers all stages of project execution including:

- Detailed design and engineering
- Project management
- Start-up and commissioning supervision
- Training and support
- Manufacture
- Shipping and packing
- Calibration, integrated testing and certification

Gas Analyser House

Approvals

Fast Loop System

Since the company was established in 1989, we have continously developed our approach to design, procurement, project management, assembly, testing and supply of packaged equipment.

OGS was one of the first systems integrators to achieve ISO 9001 approval. Now, our approvals include:

- ISO 9001:2008 - Quality Management System Registration
- ISO/TS 29001:2010 - Petroleum, petrochemical and natural gas industries - Sector Specific Quality Management System
- OHSAS 18001:2007- Health & Safety Management System

We are approved by a wide range of operating companies worldwide which include BP, Shell, Chevron, BG, Saudi Aramco, PDO and ADNOC Group Companies, KOC and KNPC. We are also registered on the FPAL and Achilles databases for the UK and Norway and are a GE Global Source approved supplier.

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