

**Unmatched High Accuracy Performance**  
**Sustainable Heavy Duty Sampler**  
**No pipeline pressure drop**  
**Fully ISO and API compliant**  
**Prevents Cross Contamination between batches**

# Auto Sampling

## e-Jet-Mixing

An important part of crude oil transfers is to have a good metering system in place that doesn't just determine the quantity, but also the quality or the oil composition of the stream. Making or verifying a bill of lading using a certified system for the quantity as well as the quality is in the interests of both the buyer and seller. It is an important tool for hydrocarbon accounting and to prevent possible reputation damage, claims, and paying unnecessary taxes. With stronger variations in the oil composition and the worldwide shortage of the product, measuring the quality of the stream is often underestimated and is becoming increasingly important. With this said, do you want to pay \$100 for a barrel of water?

Usually the larger the pipeline, the more important the accuracy of e.g. the watercut determination becomes. Online devices for watercut determination are commonly used for process monitoring purposes, but simply are not accurate enough to verify a bill of lading. Especially for low watercut streams, accuracies down to a ppm level are not sufficient and compensation is required for variables such as density, viscosity, salinity and sulfur content, to prevent off



readings. Furthermore, there is not an internationally recognized standard available to verify or certify the instrument too. For these reasons automatic sampling systems are used for custody transfer purposes.

## Accuracy Performance

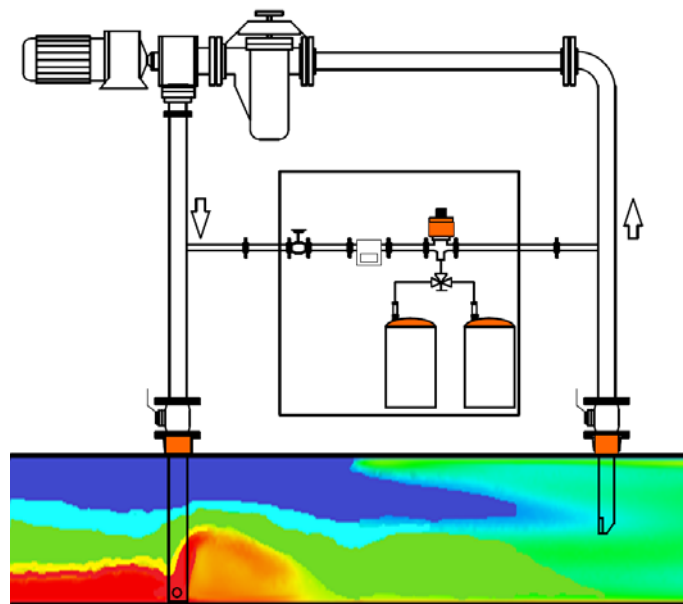
Traditional ways of automatic samplers are systems placed directly into the pipeline assuming a homogenous representative flow, and neglecting possible variations in droplet size, density and viscosity. As a consequence there is a potential of saturation in the pipeline with water travelling at the bottom of the pipeline and bypassing the sampler inlet. Furthermore, such automatic samplers are equipped with a very small inlet, causing the larger water droplets to pass by and making the sample unrepresentative. A solution needs to be found so we are assured of a homogenous flow and a sample collection, independent of the droplet size.

## Reliability Performance

With refineries, storage terminals and offshore locations attempting to reduce their operational and maintenance costs, operators are faced with low cost automatic samplers having a high failure rate. Apart of the high maintenance costs and frequent replacements of parts, operators have to pay for the logistics needed to get the sampler up and running again. Furthermore, operators are faced with custody transfers taking place using equipment which is temporarily not available. The bill of lading that needs to be made or verified is considered unreliable. A solution is desired that is easy to use and has a low failure rate.

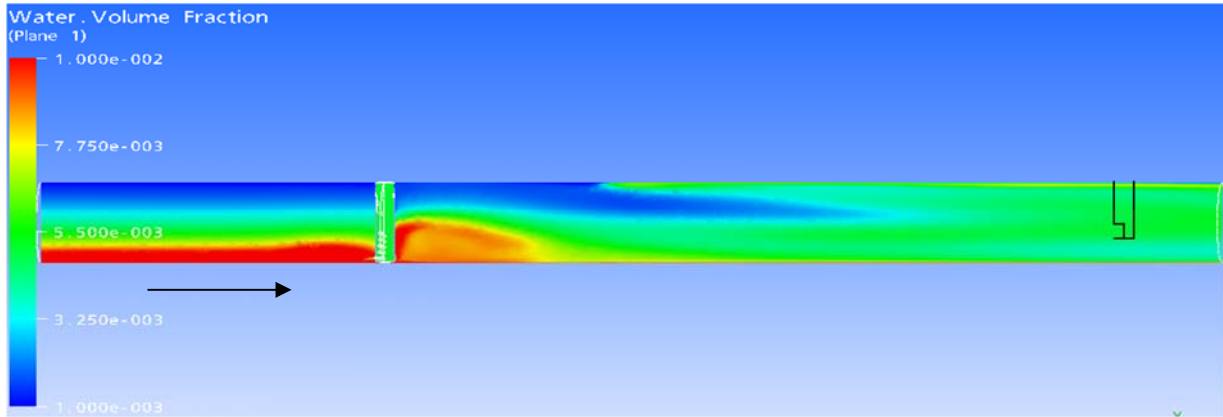
## KPS e-Jet-Mixing™

Depending upon the process conditions, inline mixing is commonly required for large pipelines in order to create a homogeneous flow. Traditionally, static mixing devices consisting of a series of baffles or metal plates are installed in the main pipeline and are used to create enough turbulence to get a properly mixed flow. The energy needed for mixing comes from a loss in pressure as fluids flow through the static mixer. With this said, operators find this a less attractive solution because a loss in pressure would mean less throughput. Furthermore, static mixers are designed to operate with a certain turndown ratio, providing operators with inaccurate sampling results at the start and end of the batch. The patented e-Jetmix™ technology provides the perfect solution for such applications, with nihil pressure drop in the main pipeline and a homogenous flow independent upon the flowrate. The KPS e-Jetmixer™ is an efficient design, consisting of an external pump, mixing nozzle, and a take-off quill, as drawn in the picture below. A part of the main stream is pumped around and re-injected into the mainstream using the efficient and patented KPS nozzle mixing device. In the created loop, where the innovative and sustainable CS-01 cell sampler is located, accurate and representative grabs are taken and transferred to receiver cans. Furthermore, the e-Jetmix™ nozzle and quill can be retracted for pigging purposes.



## CFD Modeling

Confronted with the complex of variations in densities, viscosities, and flowrate, possible making the flow non-homogeneous; users no longer have to rely on just a rule of thumb or previous experiences. KPS has the capability to verify the installation design using advanced CFD modeling software. This tool can precisely determine the behavior in the pipeline for the entire operating envelope, and makes sure the customer is not faced with possible inaccurate results.



## Minimize upon cross contamination

Traditional inline sampler devices, which are located directly on the pipeline, the distance between the automatic sampler and receiver cans are often several meters. This way, operations can easily swap the receiver cans. However, the longer the distance between the sampler and receiver cans the more likely cross contamination between batches can occur. Using the KPS Fastloop Sampling Systems or the KPS e-JetMix™ Sampling Systems, the KPS CS-01 cell sampler is located just above the receiver cans, and is designed to minimize the possible contamination between batches. Furthermore, possible water traps in U-bends are prevented.

## Sustainable Heavy Duty Sampler

The KPS e-JetMix™ Sampling Systems optimized for low maintenance requirements and sustainability. An integral part of the KPS e-JetMix™ sampler is the innovative KPS CS-01 cell sampler, which is a unique sampler containing several unique features that allow for a unmatched high mean time between failure rate. As a consequence, operators save out a great amount of operational and logistic costs and prevent possible discussions about the reliability and accuracy of the entire sampling system. The KPS CS-01 heavy duty automatic sampler, is capable of handling heavy crude oils containing high solid contents, and highly viscose crudes. The CS-01 uses a three-step technique to assure that the performance stays unaffected by possible variations in the process.



## KPS: Your Partner in Sampling

With automatic crude oil sampling it's not just the purchase of the right components; it is the integration of them to form a complete system. Depending upon the crude oil composition and possible contaminants, the proper materials need to be selected. With close to 100 automatic samplers installed within a 20 minute range of the head office, in the Rotterdam harbor area. KPS got the opportunity to develop over time unique low maintenance automatic sampling system designs. The KPS automatic samplers are not just designed to be more sustainable, but also provide a high accuracy based on previous experiences and CFD modeling software.

## Specifications

Applications	Crude oil/water mixture, refined hydrocarbons & chemicals
Max line temperature	Designed to suit
Max line pressure	Designed to suit
Line size range	8" - 52" (other sizes are available on request)
Line tapping size	Typically 2" - 6" (application dependent)
Velocity range	Designed to suit
Options	<ul style="list-style-type: none"><li>- Withdrawable KPS e-JetMix™ nozzle and quill</li><li>- Extractor tool for withdrawable nozzle and quill This tool can be used to insert and retract at process conditions without de-pressurising and draining the pipeline.</li><li>- On-line analysers such as a water-in-oil monitor and a densitometer can be integrated as part of the sampling loop providing a real-time signal of the pipeline contents and a direct comparison of results.</li></ul>

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## OTHER KPS PRODUCTS:

- Automatic Gas Sampling
- Online Analyzer Systems