

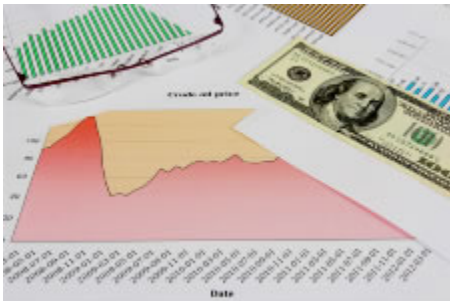


FAST LOOP SAMPLING SYSTEM

CUSTODY TRANSFER CRUDE OIL SAMPLING SYSTEMS



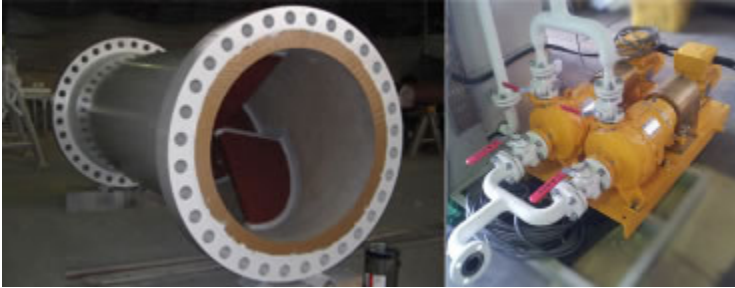
Over the past two decades the EESIFLO organization has supplied numerous liquid sampling systems for international clients, saving oil companies both time and money. Sampling systems for fiscal measurement can be designed and fabricated by EESIFLO International to meet standards such as API 8.2 and ISO 3171. One of the very important aspects of taking a pipeline sample is the ability to create a homogeneous mixture of crude oil and water that can be picked up and pumped into crude oil containers for laboratory analysis.



Our clients benefit from EESIFLO sampling systems because we are already manufacturing the bulk items needed to make up a complete system. This shortens manufacturing lead times and allows us to produce more economical systems for major oil and gas companies. Our project engineers are familiar with the paperwork and certification requirements at each stage and factory acceptance tests at our facilities can be arranged at a reasonable cost, either for the client's direct access or third party testing.

MIXING - A key element

EESIFLO manufactures static mixers and hybrid pump mixing systems to comply with international standards for crude oil sampling.



DESIGN BASIS - MIXING IN A PUMPED FAST LOOP SAMPLING SYSTEM

Other elements that could make up an EESIFLO sampling system are:

- Grab Sampling Pump
- Static Mixer/Pump Mixers
- Sampler Pacer/ optional PLC
- Stainless Steel Cabinet and Controls
- Flow meter for proportional to Flow.
- Online Densitometer
- Sample Receivers - Level Transmitters
- API Oil Centrifuge
- Watercut Meter
- Online Salt in Crude Analyzer
- Online H₂S in Crude Analyzer



Since different areas of the world have slightly (and sometimes very different) technical requirements, it is crucial that the sampling system provider is flexible enough, not only to meet the specifications but also to provide back up and training on site or at our factory.

MORE ABOUT STREAM CONDITIONING - MIXING

DESIGN BASIS - MIXING IN A PUMPED FAST LOOP SAMPLING SYSTEM

Crude oil sampling according to API Chapter 8 and ISO 3171 implies the need for the creation of a homogeneous mixture of the process stream before the sample take-off point. The process mixing/conditioning ensures that samples are representative of the main stream. It is public knowledge that when the C1/C2 ratio is higher than 0.9 we have a stream that can be considered to be "well mixed". This C1/C2 ratio is derived from the "Rate of Energy Dissipation" induced into the process stream.

In EESIFLO's proposal of a fast loop sampling system, the mixing concentration ratio is achieved with the combined "Rate of Energy Dissipation" of a bend in the piping layout, the blade elements (static mixer) and a pump powered sample-return nozzle

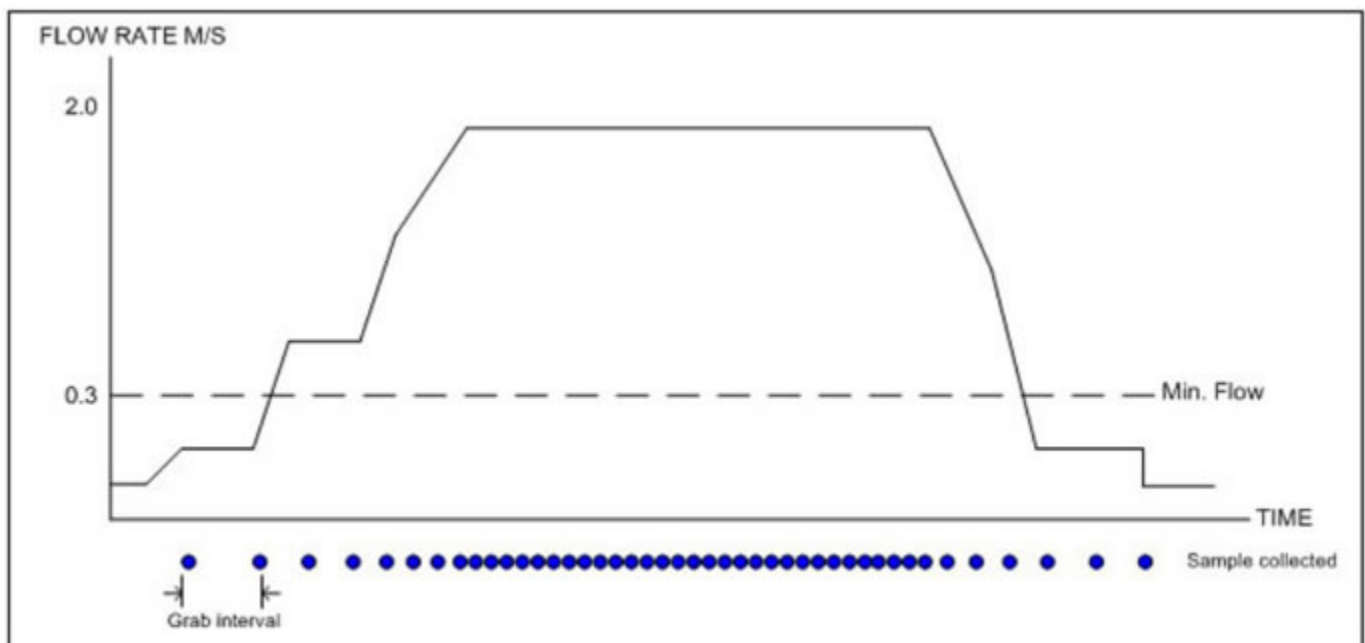


Frequently Asked Questions

1: Will the Static Mixer work at low flow?

Static Mixers are generally designed for flow velocity between 0.6 m/s to 4m/s. Given special attention to the angle adjustment and arrangement to the baffles the static mixer is able to achieve mixing effect at low flow without compromising the pressure drop at high flow (within 4 psi). Most automatic sampling systems are proportional to flow but there is a concern with some that the static mixer does not fulfill the mixing specifications while others deem this to be insignificant. The graph illustration below explains a typical proportional to flow rate sampling scenario.

At the minimum flow of a process it is evident the sampler sample collection interval is much longer than it is at maximum flow. Certain groups have determined that this has minimum influence on the overall composite sample i.e. the proportion of time for low flow regimes is much less than other times and might be considered insignificant while others prefer to maintain mixing for sample collection at all times, even during the minimal low flow. In both cases EESIFLO has a solution by either fabricating crude oil sampling systems with static mixers or a hybrid combination of pumps/nozzles/mixers where smaller pumps are installed that only need to be triggered during low flow period.



The above answers apply only to pipe size above 2 inches.

EESIFLO is a company that can design a more economical complete sampling system with capital equipment savings and energy conservation in mind and still meet user requirements

The Static Mixer is highly recommended for mixing simply because it is the most cost effective means for this application. Unfortunately, the performance of the static mixer can deteriorate considerably when the flow velocity falls below 0.6m/s. Common specifications require that sampling take place at all flow rates, even at low flow. A popular method of determining sample grab rate is "proportional to flow" sampling where the grab rate increases with velocity while inversely there are long dwell times at lowest flow. Since there are long dwell times (very few sample grabs) at lowest velocities, it could be argued by some that "grabbing" during those periods will have little effect on the overall composite sample while others do not want to miss out on a single drop at any time during any flow period. These systems are designed and built for the latter group.

Pump Circulating Loop Mixing is highly recognized as the best alternative for mixing at all flow rates. This is somewhat true, provided the pump is sized to deliver a substantial velocity at the outlet/nozzle i.e at a velocity that is much higher than the main stream. In many cases, the higher flow rates can become problematic (not just technically) but from an economical and practical standpoint. Engineers who have been left with no other choice but to use pumps and nozzles might want to consider other alternatives provided by EESIFLO.

EESIFLO has successfully designed and supplied oil companies a system that combines a static mixer with fast sampling fast loop pumps and nozzles. This hybrid method of stream conditioning meets the technical requirements at high and low flow. The logic dictates that at high flow rates there is sufficient energy for the static mixer to perform optimally and at a low flow rate the pump and nozzle system can be triggered to condition the media.

The complete systems are currently being designed, manufactured, tested and shipped from EESIFLO International Pte Ltd.