LOW SHEAR MULTIPHASE SAMPLING

Introduction

As a part of optimization of oil production processes, it is common to take samples using different sampling methods. Measurements of oil-water concentrations and droplet size distribution are often of particular interest. Optimization studies may be performance testing of new equipment compared to the old, the effect of production chemicals on fluid properties, or general studies of the efficiency of various separation equipment. It is essential that samples are representative and reflect the real process fluid.

Commonly used sampling techniques of today may disturb the samples during the process of filling the sample container and/or during the process of depressurizing the container. The main sources of influence are free gas flotation during container filling and dissolved gas flotation during container pressure release. Other negative impacts may lie in the length or morphology of the cylinder inlet tubing. Certain sampling points can cause shear forces and pressure drop in the flow, which in turn affect the quality of the samples. Commonly used portable sampling solutions may have a reduced ability of collecting liquid samples at high gas/liquid fractions. Furthermore, liquid volumes are typically small for portable sampling solutions, which, sometimes, is a drawback for the subsequent sample analysis.

If the purpose of the fluid sampling is to measure the dispersed phase concentrations and/or the droplet size distribution of one phase in another, the mentioned negative effects could lead to the distortion of results. Next, the non-representative sample data can lead to wrong conclusions regarding the process plant operation.

Low shear multiphase sampler

To enable representative samples from the multiphase streams, certain precautions to the sampling equipment and procedures must be taken. One of the most common reasons for shearing of sampling fluids is non-isobaric conditions during sampling. A low shear sampler has to ensure that analyzed fluids are not exposed to pressure drop, which in turn, introduce shear forces to the fluid flow. Maintaining isobaric conditions during sampling would allow the collection of representative liquid samples at any gas/liquid ratios.

With the Typhoon MultiPhase Sampler, shown in **Figure 1**, the isobaric conditions of the sampling procedure are achieved via the intermediate pressurization of the sampling cylinder by means of process pressure, illustrated in **Figure 2**. Non-representative fluids are then flushed from the cylinder, while the cylinder pressure is kept near the process pressure value. As shearing forces due to the pressure drop will be minimal, representative samples can be obtained.

Figure 1. –Typhoon MultiPhase Sampler

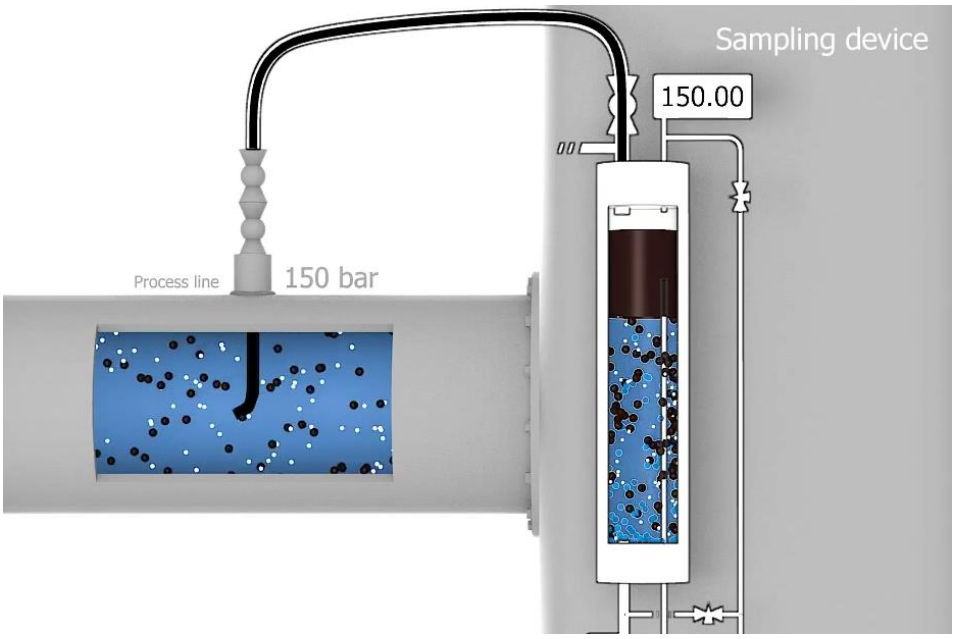

Figure 2. – Multiphase sampling at isobaric conditions.

Generally, the benefits of the low shear multiphase sampler are:

- It eases/enables sampling on high GLR flows.
- It provides larger sample volumes – limits the effect of temporary process fluctuations.
- The fluid that is analyzed is not exposed to pressure drop/shear forces during sampling.
- Free gas flotation during sampling is eliminated.
- Concentration of oil-in-water and water-in-oil is measured on samples not exposed to dissolved gas flotation.
- Oil droplet sizes in water are measured by a method where dissolved gas flotation is controlled.
- Online oil in water droplet size measurements, in the water phase, are possible from both two and three phase flows up to a system pressure of 20 bar. (This requires an online EX instrument.)
- Online oil-in-water concentration measurements of water phase are possible from both two and three phase flows up to any system pressure. (This requires an online EX instrument.)

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