

Fluids Facts

Application Information - EMEA Sampling procedure and sample representation

Representative sample of hydrocarbon fluids

The concept of a “representative sample” is purely theoretical: it is virtually impossible to take a representative sample of any material when the sample is a very small fraction of the total volume it aims to represent. Notwithstanding their complex composition, hydrocarbon fluids are generally homogeneous thanks to their low viscosity and to the mutual compatibility between their constituents. For this reason, a dedicated storage tank offers the best conditions for taking a sample as representative as possible of the bulk material.

On the other hand, a non dedicated temporary container with a discharging valve offers conditions where the bulk composition may differ substantially from the material present in the area of the discharging valve or on the bottom of the tank, especially in the presence of incompatible or insoluble material (e.g. settling particles or free water). Those areas of inhomogeneity can potentially affect the ability to take a sample representative of the bulk and offer opportunities for discussions on the quality of a whole batch even though the product quality may not be affected.

For those reasons, ExxonMobil uses a sampling procedure which aims to collect a sample as representative as possible of a product stored in a non-dedicated container. It is practiced in cases of a quality concern and is based on an industry standard sampling technique, being ASTM D4057.

Sampling procedure

SCOPE

The technique herein described may be used for sampling of liquids in storage tanks, tank trucks, rail tank cars and ship/barge tanks. All of these liquid recipients will be further referred to as “tank” in this document. For safe sampling technique, principle and equipment, refer to ASTM D4057.

RUNNING TANK SAMPLE

A “running tank sample” usually offers the most representative sample to assess the quality of the bulk of the liquid present in the tank. It however will miss potential contaminants that have accumulated at the bottom of the tank. It is also a technique that requires experience because a sample bottle must be pulled at a certain speed through the product so that it collects equivalent portions of each layer.

COMPOSITE LAYER SAMPLE

Similarly, for tanks equipped with sampling taps at different heights in the tank, a composite sample made from appropriate proportions of samples collected separately from the top, middle and bottom sections may offer an equally representative sample to assess the quality of the bulk of the liquid present in the tank.

For samples collected via sampling taps, the sampling points need to be flushed for an appropriate time that allows a displacement of at least 1.5x the sampling line volume. This technique is not as good as the running sample but it is often more practical and safe to execute. This technique may miss potential contaminants that have accumulated on the bottom of the tank.

ABSOLUTE BOTTOM, UPPER, MIDDLE, LOWER OR TOP SAMPLE

In some cases, it may be relevant to collect a sample from a specific area in the tank. For example, an absolute bottom sample may give important information on the presence of free water, particles or a separated heavier organic layer. Such a sample can be collected from the tank bottom with an absolute bottom sampler. This is a special device which opens when it touches the bottom of the tank.

DISCHARGE VALVE SAMPLE

A discharge valve sample is often the most practical way to take a sample. If taken after a proper (20-liter) flush, it will be similar to a bottom sample. Due to hydrostatic pressures inside a tank, it will not capture potential absolute bottom contaminants that are some distance away from the valve.

With this method, the opening and closing of the valve may introduce extra “valve gasket induced” contaminants. It is therefore important to leave the valve in its position during the flushing and actual sample taking.

QUALITY CONCERN SAMPLE TAKING

In case of a quality concern, the following samples are taken by an independent surveyor: upper, middle, lower, absolute bottom, 20-liter flush and discharge valve. In case of a concern on the surface, a top sample will be also taken. All of these samples will be analysed on the sales specification property of concern and/or on the customer’s concern observation. When all samples re-generate the

concern, the concern is considered “homogeneous”. When only specific samples regenerate the concern, it is considered “inhomogeneous”. A dilution effect during discharge needs also to be taken in consideration.

For example, if a limited number amount of particles or a slight off-spec material is only found at the absolute bottom layer or discharge valve but not in the upper, middle or lower samples, the product is very likely to be on-spec post dilution.

Also during the concern sample taking, a picture of the absolute bottom (through the product) may be also taken to further estimate the magnitude of the concern.

Claims on product quality need to be based on a representative sample of the bulk of the product and not on the first few drops that are sampled from the discharge valve/system. This is best achieved by analyzing a running sample.



References:

- 1 – EC-A-A01 Appearance, free water and particles (ExxonMobil inhouse method)
- 2 - ASTM D4057 Standard Practice for Manual Sampling of Petroleum and Petroleum Products

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