



# Liquid Fertilizer (non-pressurized) Sampling

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# Liquid Fertilizer (non-pressurized) Sampling

## 1. Introduction

With the acceleration of global fertilizer trade, IFA's diverse membership has experienced an increasing number of contractual disputes due to the use of different methods and procedures to sample and analyze international product shipments at different points in the supply chain. In a member-driven initiative, a broad-based international task force was formed to address this matter.

Accurate and representative sampling is a challenging operation that requires both knowledge of the product as well as the correct application of the sampling process. Sampling procedures must be applied in a strict manner by trained personnel with prior sampling experience. Moreover, a standardized approach must be adopted irrespective of the sampling location, shipment mass or volume, or commodity.

## 2. Sampling of liquid (non-pressurized) fertilizer and solutions

The objective of sampling is to obtain a small portion of material from a selected area within a container or tank which is representative of the material in the area or, in the case of running or all-level samples, a sample whose composition is representative of the total material in the container.

Sampling of liquid fertilizer may be carried out on fertilizer material stored in tanks, truck, railcar, bulk flex container or drums. **TABLE 1** lists various industry manual sampling methods and procedures for the sampling of liquid fertilizer materials. Comparably, the methods listed follow the same principle with basic, minimum conditions that must be fulfilled to ensure that a sample of fertilizer fairly represents the lot of fertilizer from which the sample is taken. These minimum conditions are as follows:

- A. Determine the purpose for which the sample is required and determine the characteristics of the material, i.e., its estimated quality, homogeneity, viscosity, etc.
- B. Samples should be taken from a properly agitated lot without contamination.
- C. Determine the type of samples to be taken;
  - a. Storage Tanks – Upper, Middle & Lower
  - b. Ship/barge – Running sample from each individual tank
  - c. Railcar/truck – Spot or Tube sample from access point
  - d. Drums – Tube sample
- D. Determine the number of sampling units for the shipment. Increment samples should be of minimum capacity 500 ml and of approximately equal volumes.
- E. Obtain a sample of a sufficient mass or volume for the required analyses

It should be noted that, while the basic sampling methods outlined are comparable in principle, due care must be followed in utilizing proper sampling equipment / apparatus for the material being sampled.

Increments collected should be stored immediately in sufficient bottle / container capable of preserving the integrity of the collected increments.

These recommendations outline the principles to be observed. They should not take precedence over any specific sampling instruction, method or standard.

Review by the IFA working group have shown that ASTM International method E300 Standard Practice for Sampling Industrial Chemicals provides comprehensive procedures for sampling of liquid materials and includes recommendations for determining the number and location of such samples, to ensure their being representative of the lot in accordance with accepted probability sampling principles.

During any sampling operation, consideration must be given to conditions that help to minimize health and safety risks to personnel.

Disclaimer:

*Manual sampling from the top of loaded Truck, Railcar or Bulk Container (car top) is a dangerous activity and should only be carried out from a safe location such as loading rack or platform.*

*Car top sampling should only be performed in locations and facilities where such an activity is permitted in accordance with the local facilities health and safety rules.*

*While recognizing that car top sampling is common practice in many locations, IFA does not accept any responsibility for any incident that may result from the execution of such sampling activities, nor for any of the other activities described in this paper.*

## 2.1. Terminology of Sampling Type

- **Average sample:** one that consists of proportionate parts from all sections of the container.
- **Spot sample:** a sample taken at a specific location in a tank or from a flowing stream in a pipe at a specific time.
- **Composite sample:** a blend of spot samples mixed in proportion to the volumes of material from which the spot samples were obtained.
- **All-level sample:** one obtained by submerging a closed sampler to a point as near as possible to the draw-off level, then opening the sampler and raising it at a rate such that it is about three fourths full as it emerges from the liquid.
- **Upper/Middle/Lower sample:** individual spot samples taken from the upper third, middle and lower third of the tank.
- **Continuous sample:** a spot or drip sample obtained from a pipeline conveying the product in such a manner as to give a representative average of the stream throughout the period of transit.
- **Tube or thief sample:** a spot sample obtained with a sampling tube or thief from a specific point in the container. A tube sampler may be utilized to obtain an all-level sample from a drum.
- **Valve/Tap sample:** a spot sample obtained from a draw-off or discharge valve.

**Table 1:** List of sampling methods and procedures for the sampling of liquid fertilizer materials

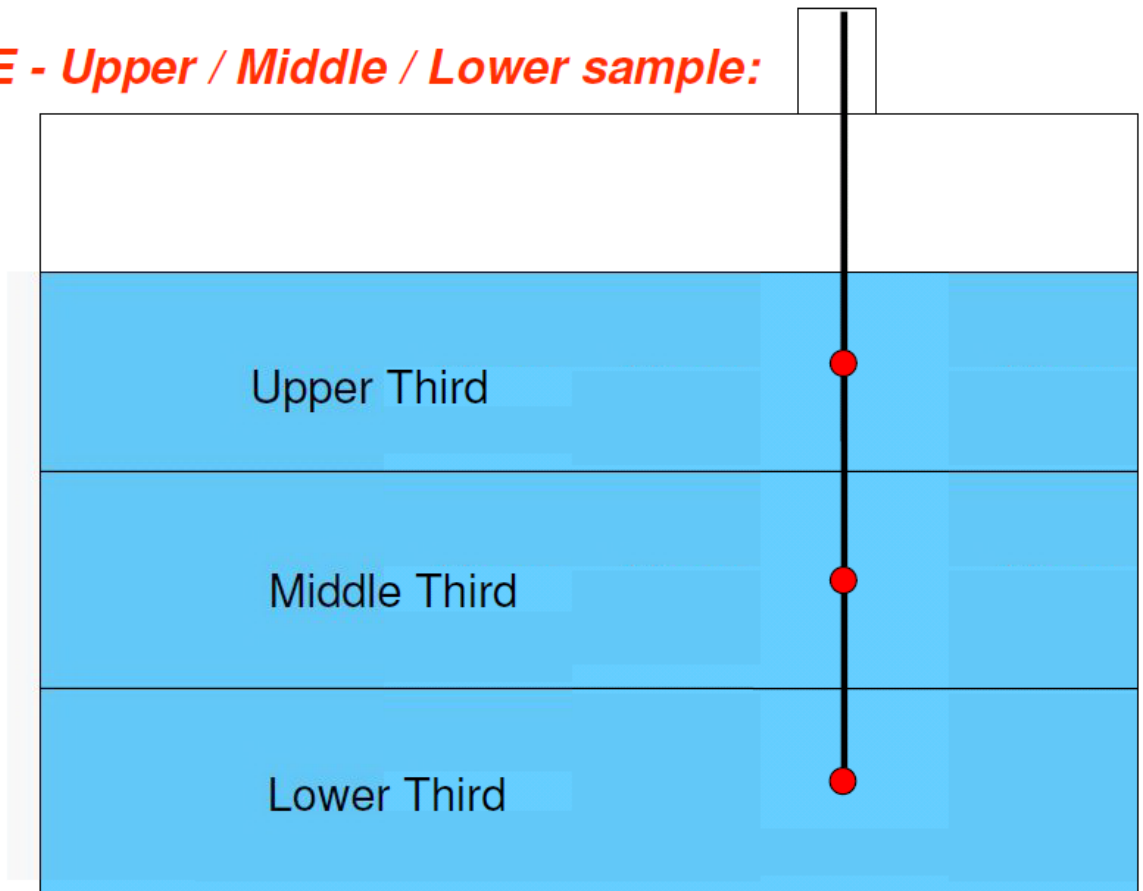
Standard Nr.	Sampling Type	Apparatus	Sample container	Sample Reduction	Remarks / Limitations of the method
<b>TFI I.B.4</b> The Fertiliser Institute  Liquids, Suspension & Non-Pressure Solutions	Mixing Vat Storage Tank Delivery Line Valve	Missouri or Indiana Sampling Bottle  Texas Liquid Sampler	Glass or Polyethylene Bottles		A critical requirement in getting a representative sample of a liquid fertilizer is to take the sample directly from the main body of the material without contamination. Avoid, whenever possible, taking samples from lines and valves.
<b>AOAC 969.01</b> AOAC International  Sampling of Fluid Fertilizers	Mixing Vat Storage Tank Delivery Tank	Missouri or Indiana Sampling Bottle  Texas Liquid Sampler	Glass or Polyethylene Bottles		Take sample from surface or through direct tap. Alternatively, lower sample container into well-mixed material through port in top of tank and let fill.
<b>ASTM E300-03</b> ASTM International  Sampling Industrial Chemicals	Bottle sampling (tank samples) Thief sampling (bottom samples) Tap sampling (fixed sampling point) Continuous sampling (filling lines) Tube sampling (drums and cans) Jar sampling (small discharge streams)	Weighted Bottle Sampler  Thief (Bomb or Core) Sampler  Probe / Tube Sampler	Clear or Brown Glass or Polyethylene Bottles	Prepare a composite sample in the laboratory (not in the field) by mixing all portions of samples taken by proportion to the volumes of material from which the samples were obtained.	This practice covers procedures for sampling several classes of industrial chemicals. It also includes recommendations for determining the number and location of such samples, to ensure their being representative of the lot in accordance with accepted probability sampling principles.
<b>AAPFCO American Association of Plant Food Control Officials</b>  Sampling Fluid Fertilizers	Mixing Vat / Tank Container Delivery Line Direct Tap / Valve Manifold	Missouri or Indiana (MO/IN) Sampling Device  Texas Liquid Sampler	Polyethylene Bottles		A most important consideration in sampling fluid fertilizers is to be sure that the sample comes from a properly agitated lot without contamination. Sampling from manifold lines serving more than one storage tank and from long delivery lines is to be avoided whenever possible.

Standard Nr.	Sampling Type	Apparatus	Sample container	Sample Reduction	Remarks / Limitations of the method
<b>EC 2003/2003 Annex IV</b> Official Journal of the European Union		Open Tube, Bottle or another appropriate equipment		The samples must be taken and prepared as quickly as possible bearing in mind the precautions necessary to ensure that they remain representative of the fertilizer sampled.	In the case of fluid fertilizers, if possible the sampled portion should be mixed prior to sampling.
<b>ISO/DIS 10696</b>  Fluid Fertilizers – Methods of Sampling	Fluid fertilizers including; solutions, slurries, suspensions and liquid products with significant vapor pressure	Tube Sampler  Weighted Bottle  Continuous Sampler Device  Valve Sample	Bottles should be clean, dry & inert (fabricated of materials that do not affect the characteristics of the fertilizer to be sampled)	Rotary Divider  Vessel, capable of being well agitated to ensure its contents are homogeneous, from which final samples can be poured	Method recognizes that certain precautions are required, when sampling viscous fluids, to ensure that samples are generally representative.
<b>European Commission Taxation &amp; Customs</b>  Sampling Methods – Sampling of Liquids	Storage Tank  Ship or Barge, Motor Carrier  Transport Package	Dipping Vessel  Vacuum Sampler  Pipeline Sampler  Pipette Type Sampler  Scoop Sampler  Piston Tube	Depending on the type of fuels to be sampled, the sample containers may be made of metal, glass or plastic.	The incremental samples from all sampling spots/levels are collected in a mixing vessel, and after they have been thoroughly mixed an aggregate sample is created.	If the products are non-homogenous due to their nature, the products must be homogenized by mixing, shaking, or circulation through liquid pumps, etc. prior to sampling. If homogenization is not possible, a larger number of incremental samples must be taken at various depths to ensure that a representative sample is obtained.

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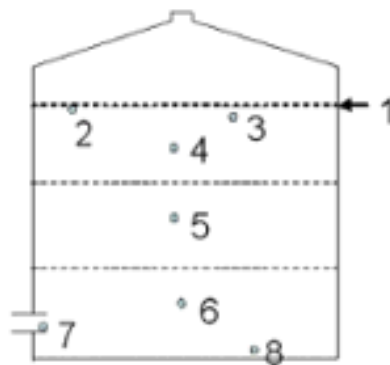
## 2.2. Sampling Schemes

**EXAMPLE - Upper / Middle / Lower sample:**

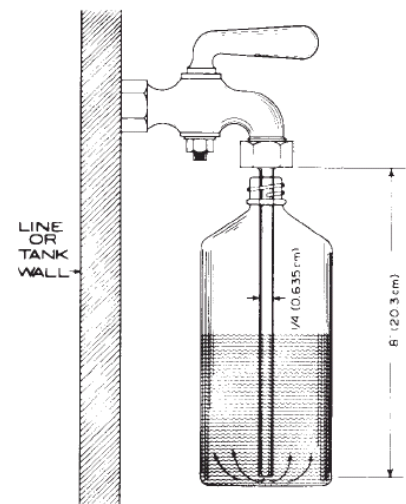


*Tank sampling pattern*

- 1 - liquid surface
- 2 - surface sample
- 3 - top sample
- 4 - **upper sample**
- 5 - **middle sample**
- 6 - **lower sample**
- 7 - outlet sample
- 8 - bottom sample



*Vertical Tank*



*Direct Tap / Valve Outlet Sampling*



## 2.3. Sampling Apparatus

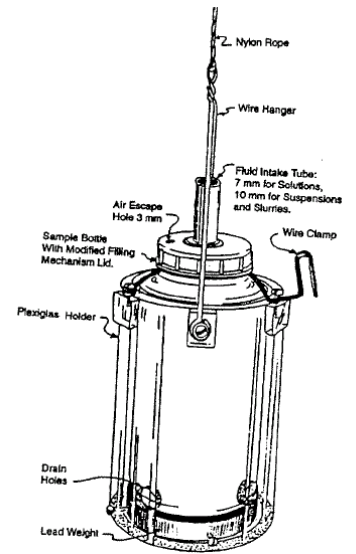
**Stoppered bottle**



**Zone Sampler**



**Indiana Sampler**



**Tank Car (Texas Tube Type) Sampler**



**Drum Thief (Tube) Sampler**