



APPLICATION NOTE 215WA1201A

LPG Residue Analyser

ASTM D7756-11

About G·A·S

Global Analyser Solutions offers custom configured GC analysers for complex separations, data processing and reporting. We have over 35 years of experience in designing and building turnkey analysers for many application fields. We invite you to take advantage of our latest hardware, software and column technologies to achieve the best possible results.

Our analysers are designed to meet many accepted standard methods (like ASTM, UOP, ISO, etc.) in the Oil and Gas industry. The efficient hardware configurations are based on proven GC technology, resulting in rigid instruments with an optimal return on investment.

The Residues Analyser based on Da Vinci Europe LGI offers an innovative solution for LPG producers, LPG cargo handlers, car manufacturers, refiners, chemical plants, users of the international methods ASTM D2158, EN 15470 or EN15471.

Addressing the analytical challenge of oily residues analysis in LPG

The challenges many of you are facing in the analysis of oily residues in LPG are safety, analysis time and accuracy. Conventional methods such as ASTM D2158, EN 15470 and EN 15471 have known limitations in terms of being labor intensive, time consuming, environmentally unfriendly as well as not providing the source of contamination in the LPG.

The DVE Liquefied Gas Injector complies with the new ASTM D7756-11 GC method for oily residue analysis in LPG.

The ASTM method for 'Residues in Liquefied Petroleum (LP) Gases by Gas Chromatography with Liquid, On-Column Injection' is now available as D 7756-11. The LGI was developed in close cooperation with Shell Global Solutions. With the new ASTM D7756-11 method you will now have an alternative method that addresses your challenges with analysing oily residues in LPG and at the same time improving the analysis in terms of safety, time and accuracy.

Direct On-column Injection

The LGI injects gases in liquid phase under high pressure directly on the analysis column using LVI (Large Volume Injection technique). The LPG light end fraction is vented using SVE (Solvent Vapor Exit), while the heavy part is transferred to the analytical column. Sample introduction is done by the proven Gasoline Direct Injector (GDI). This valve is normally used in the automotive industry to inject fuel in the combustion chamber.

The result is reported in mg/kg (mass ppm). The analysis range is 10 to 600 mg/kg, having a repeatability of less than 5% and a relative standard deviation between 2 and 5 %. The required analysis time is less than 30 minutes





Figure 1. Liquefied Gas Injector

Advantages of ASTM D7756-11

- Safe analysis of LPG residues; open air evaporation is avoided
- Fast Analysis time < 30 minutes
- High accuracy
- Automated GC Analysis
- Indicates source of contamination
- Low LPG volume needed (green solution)



Applications



Figure 3. Mineral oil, standard and sample



Figure 4. Overlay mineral oil



Figure 5. pTBC in LPG

Figure 6. DIPA in LPG



Figure 7. PTV large volume injection with Direct On-Column liner , pre-column and solvent vapor exit



Mineral Oil in LPG

LPG offers several benefits over traditional fuels as LPG is a cleanburning transport fuel with a high energy content and the infrastructure is well developed. One of the fuel specifications for LPG concerns the amount of oily residue, as these lead to troublesome deposits and material changes. Conventional test methods to specify the oily residues require the evaporation of large amounts of LPG (2 kg) and therefore they present a high safety risk. A new technique to determine the oily residues using a fast, safe and accurate method (ASTM D 7756-11) is based on Gas Chromatography combined with the LGI.

TBC in Butadiene

The LGI can be used to determine pTBC in Butadiene. Results demonstrate that the relative standard deviation is less than 4% with an analysis time of 15 minutes. The concentration range is 30-600 mg/kg.

DIPA and elemental Sulfur in LPG

In the past laboratories often faced problems in analysing DIPA (diisopropanolamine, used for desulfurisation) because of its polarity and high boiling point. The LGI offers reliable and convenient analysis: see figure 6, which shows 4 ppm DIPA and 36 ppm oil residue in one single run. Another developed application on LGI is elemental S in LPG.

Key Benefits of the LGI:

- Direct PTV / on-column injection up to 30 bar without use of LSV (Liquid Sampling Valve)
- Fast analysis time of 30 minutes
- Repeatability < 5%
- Proven Gasoline Direct Injector Technology (GDI)
- Sample size from 50 up to 500 ul
- Low maintenance solution
- Results are reported in mg/kg
- Chromatogram indicated composition of contamination to identify source

Specifications



Figure 6. TraceGC with LGI and Pressure Facility

Standardised methods:	ASTM D7756-11
Application:	Custom configured analyser for the analysis of residues in LPG, Butadiene, C3 / C4 streams
Configuration:	Single channel instrument based on Thermo Trace, DVE LGI and Pressure Facility.
	Large volume injection of LPG samples using PTV, pre-column and Solvent Vapor Exit.
Principle:	Direct liquid sample transfer from cylinder to injector without use of LSV.
Injected volume:	50-500 ul
Pressure:	up to 30 bar
Concentration range:	10-600 mg/kg oil in LPG
Detection limit:	1 ppm oil, 100 ppb DIPA
Repeatability:	< 4 %
RSD	2-4 %
Analysis time:	30 min. for oil, 15 min. for DIPA and pTBC
Installation requirements:	See our pre-installation guide for additional requirements.

For more information:



