

Application News

Gas Chromatography

Improved ASTM-D3612 Method A TOGA System

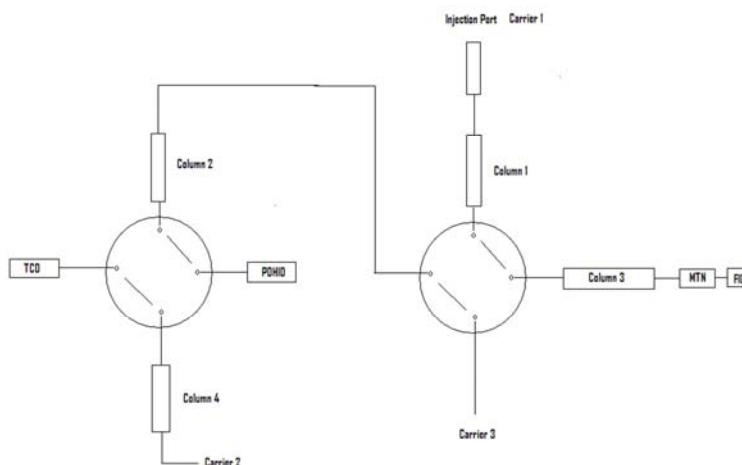
Method A outlines the classical procedure for quantifying the gases contained within transformer oil. Labs that began performing this test on their transformers have many years of historic data that remains important today. This data is used to track the changing conditions within a specific transformer, and by monitoring gas levels, judgments may be made as to when preventive maintenance should be performed. This analysis method has been in use for many years and is known to have some areas of weakness. This document describes the technological advances in Gas Chromatography that are employed here to incrementally improve the original method.

Improvements

Hydrogen detection levels have always been a problem with the original method. Detection was performed by Thermal Conductivity, a universal detector that is not very sensitive. Typical detection levels are in the 1 to 10 ppm range depending on injection volume. These detection limits are dramatically improved by adopting the use of a Valco Pulsed Discharge Helium Ionization Detector. With this non-selective ionization detector, the system now realizes detection limits of 100 ppb for hydrogen, carbon monoxide, and methane.

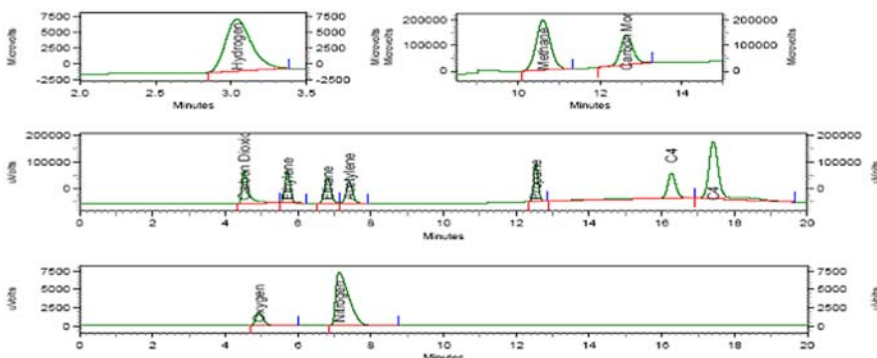
Another problem with the original method is that the chromatography does not account for propane or butane. These gases are formed in the same manner as the other transformer oil gases, and if present and not allowed to elute, will cause problems in subsequent analyses. By redesigning the chromatographic scheme, these gases are allowed to elute with separation and within 18 minutes.

Our third improvement is to the data system. Our CLASS-VP chromatography software allows for the automatic calculation of each data file to correct for actual temperature and atmospheric pressure to output the final result.



Sample Chromatogram

Sample Name: 8' t column
 Method: C:\EZStart\Projects\Default\Method\toga_tprog3.met
 File Name: C:\EZStart\Projects\Default\Data\toga\toga032304.009.dat
 Analysis Time: 03/24/2004 11:33:07 AM



Data Processing and Reporting

The six variables can be entered into the batch table before each run so the software can calculate the corrected result.

Sample Art	ISTD Art	Multiplic 1	Multiplic 2	Multiplic 3	Unit 1	Unit 2	Unit 3

A custom report is produced that displays the final result.

PDD Results

Name	Retention Time	Area	ESTD concentration
Hydrogen	3.041	98389	0.0
Methane	10.608	4746849	0.0
Carbon Monoxide	12.641	2457908	0.0

FID Results

Name	Retention Time	Area	ESTD concentration
Carbon Dioxide	4.518	1439771	0.0
Ethylene	5.716	1135065	0.0
Ethane	6.815	1143100	0.0
Acetylene	7.408	979463	0.0
Propane	12.541	1161720	0.0
C4	16.276	1689575	0.0
C4	17.424	4247348	0.0

TCD Results

Name	Retention Time	Area	ESTD concentration
Oxygen	4.923	26137	0.0
Nitrogen	7.131	181293	0.0

Hardware: 220-94736-00

- GC-2014, TCD, FID, PDHID
- 2 four-port 1/16 in valves
- Injection Port Methanizer
- Four Columns
- CLASS-VP Data System (Sold Separately)
- Standard Data Station (Sold Separately)

Required Gases

- Helium: 99.999%
- Hydrogen: 99.999%
- Air: 99.99%

Detection Limits

- H2, CO and CH4: 100ppb
- N2 and O2: Meets ASTM specifications
- Hydrocarbon Gases to C4: 1ppm