APPLICATION NOTE

Liquid Chromatography

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Furanic Compounds Determination in UHPLC vs. Conventional LC

Introduction

The analysis of furanic compounds in transformer oil has gained significance in transformer life assessment as a potential alternative to depolymerization degree determination of paper samples.

A certain correlation of depolymerized degree value of paper and furfural in oil was detected by several research groups.

However, there is a relationship between furanic compounds in oil and the remaining lifetime of transformer.

The content of furanic compounds in the oil depends on operation temperature, transformer design, type of oil and paper.

The main benefits of using this method in UHPLC HPLC are:

- Significantly reducing the time of analysis
- Significantly reducing the injected volume
- Reduce the chemicals and solvents consumption
- Preserve the components separation
- Increase the number of samples tested per day

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Potential Market

- Energy (e.g. Electrical plants, Power generation)
- Service labs (e.g. Preventive maintenace)

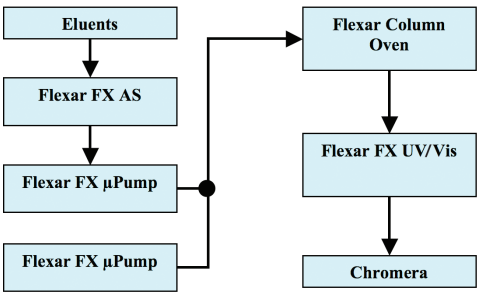
Recommended HPLC conditions

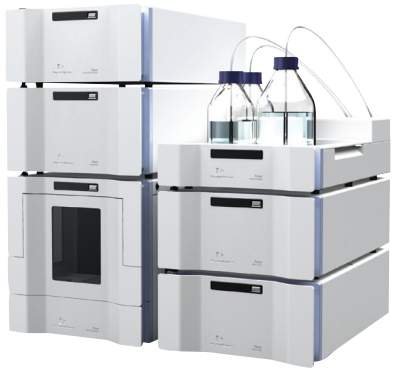
Analytical Column:	PerkinElmer Aqueous C18, 1.9 µm particle size, length x I.D. 50 mm x 2.1 mm
Mobile phase:	Water / Acn 90-10 (initial) gradient to 75-25 (final)
Flow:	0.6 mL/min @ 4000 psi
Column Temperature:	90 °C
UV/Vis Detector:	222 nm
Injection Volume:	5 µL
Total Run Time:	3 min

Suggested UHPLC Flexar® FX-10 Instrument configuration

Flexar Micro Pumps	Binary Micro pumps
Flexar VD	Vacuum degasser 3 channels
Flexar Autosampler	Autosampler
Flexar Oven	Column Oven
Flexar UV/Vis	UV/Vis detector
Chromera®	Chromatography Data System

Strategic HPLC configuration



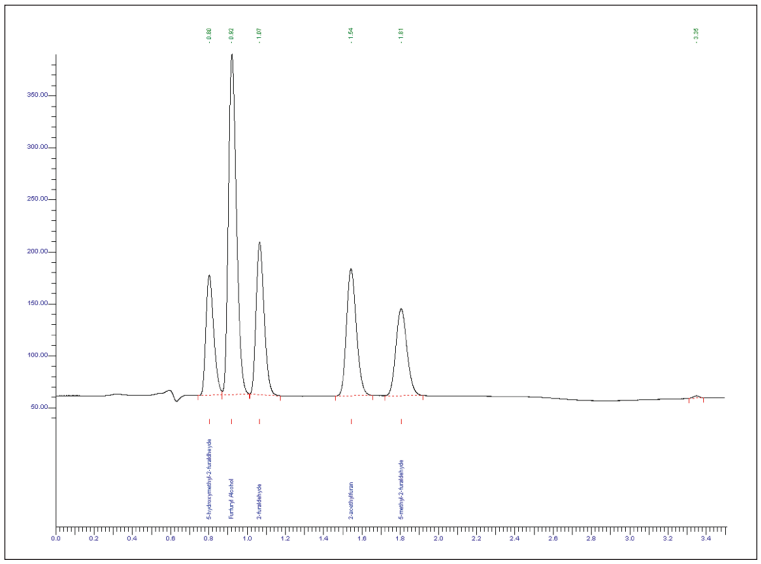


Results

Standard

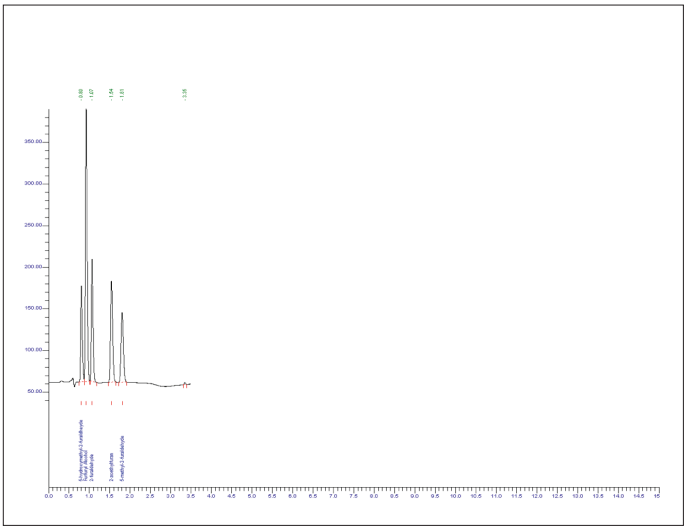
Furanic Standard Solution with "UHPLC"

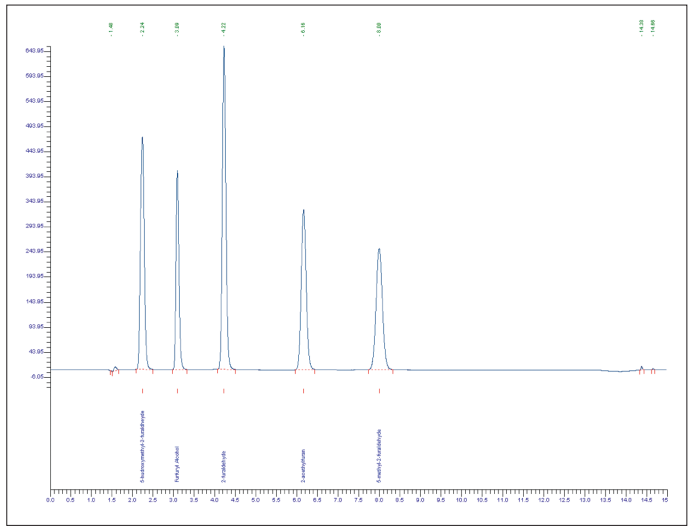
- 5 µL injected 50 ppm for each chemical



Component Name	Retention time (min)	Area (µV/s)	Concentration (ppm)
5-hudroxymethyl-2-furaldheyde	0.505	346637.01	50
Furfuryl Alcohol	0.572	1170302.58	50
2-furaldehyde	0.665	536765.22	50
2-acethylfuran	0.996	513071.16	50
5-methyl-2-furaldehyde	1.125	394632.53	50

Comparison UHPLC vs. traditional HPLC





Solvents R.O.I. calculator

	UHPLC vs. Traditional HPLC
Solvent consumption	Save → 86.7%
Run Time	Save → 71.4%
Samples/hour	Productivity → 375%

References

Reference Method: ASTM®: D5837 - 99

Conclusions

The usage of Flexar FX-10 UHPLC provides several advantages:

- This method using Flexar FX-10 UHPLC allows running the analysis in less then 3 minutes with an excellent peaks separation.
- This method compared to the standard HPLC reported in ASTM® does not require a wavelength change and preserve a very good sensitivity on Furfuril alcohol.

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