

chrozen

ASTM D5837 Player

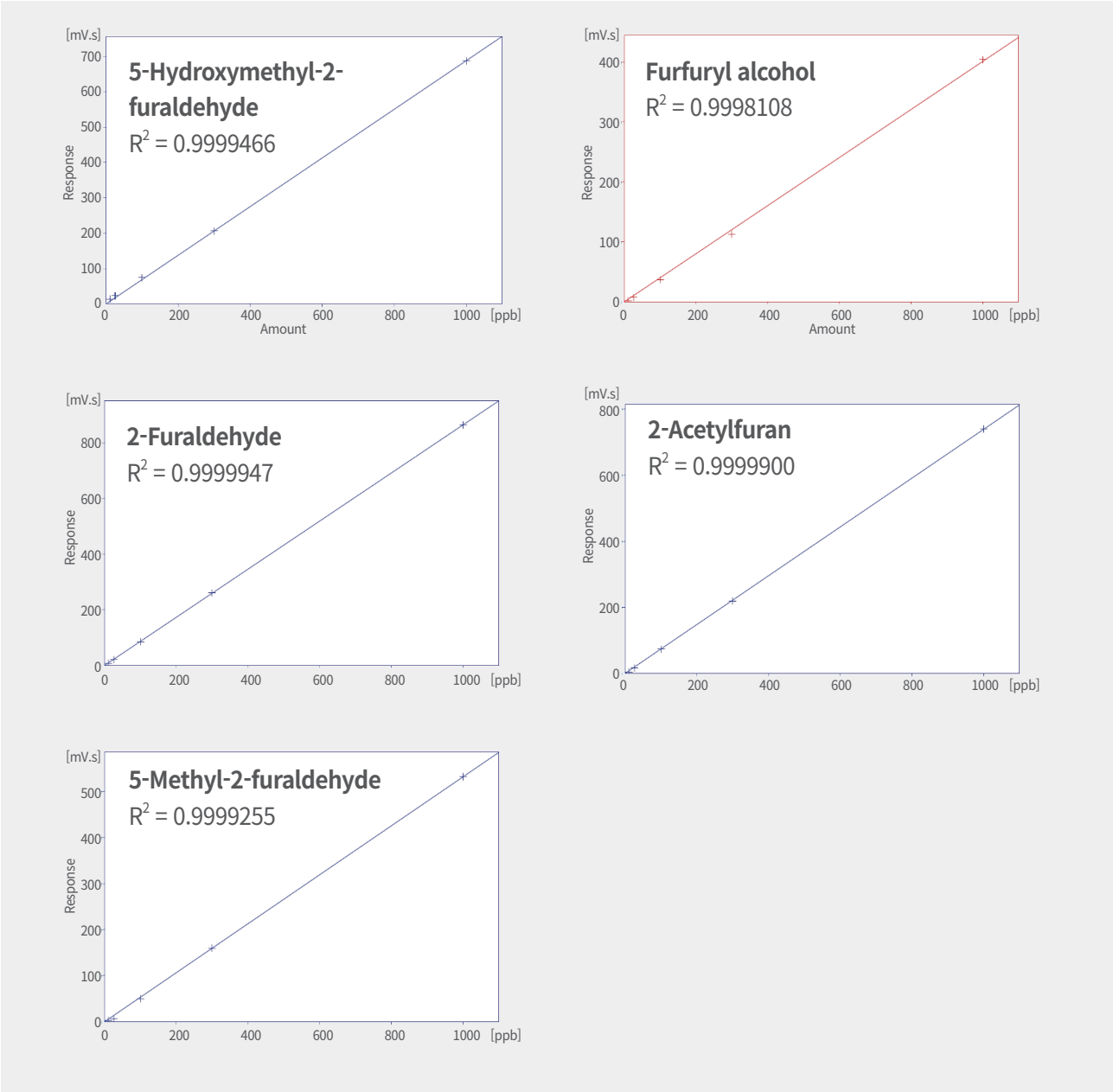
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As the number of aged transformers is getting increased worldwide, it is important to estimate their remaining lifetime in order to prevent premature shutdown of transformers. The life of a power transformer mainly depends on the condition of the insulating paper and the most accurate method for evaluating the degradation of insulating paper in a transformer is to measure its degree of polymerization, but it is impossible to directly check the inside of the transformer in operation. Therefore, the evaluation can be conducted by analyzing Furanic compounds which are generated by the degradation of cellulosic materials used in the insulating paper to make a decision for transformer replacement and maintenances.

As 2-Furaldehyde is the most common Furan compound which is generated in the insulating paper, it is a major indicator that can determine the cellulose degradation.

ChroZen HPLC/PDA analyzes Furanic compounds according to ASTM D5837 method with superior efficiency and accuracy.





Calibration Curves for Furanic Compounds – Solid Phase Extraction (SPE)

Extraction Efficiencies

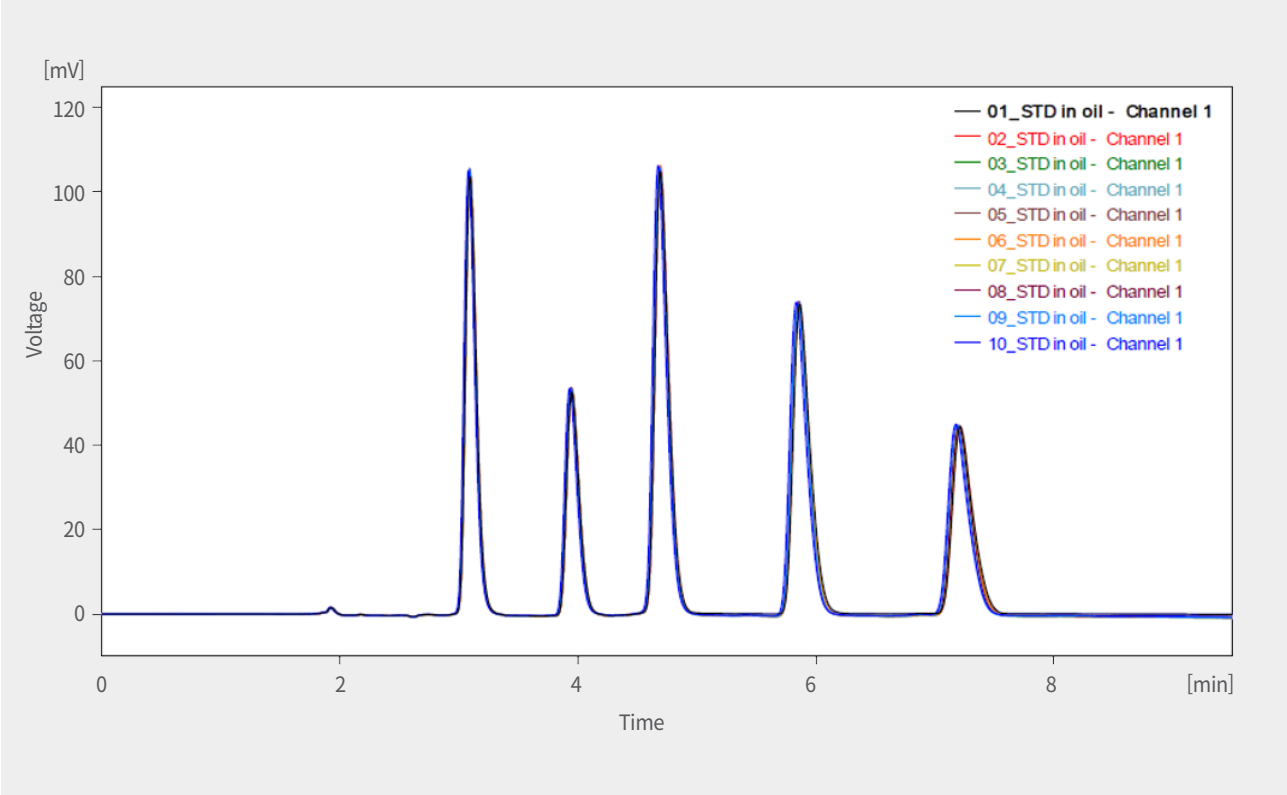
To determine the extraction efficiency for each furanic compounds, run 1 mg/L of extraction standards in solvent and 1 mg/L of calibration standards in oil three times each. The average peak area for each compound is used to calculate the extraction efficiency from the appropriate equation as follows.

Solid-phase extraction : $EE,\% = (R_O/R_S)) \times (V_E/10) \times 100$

EE= Extraction efficiency
R_O= Average peak area of calibration standard in oil 1 mg/L
R_S= Average peak area of extraction standard in solvent 1 mg/L
V_E= Volume of solvent used for extraction
10= Constant (Volume of oil standard used for analysis is 10 mL)

Validity of Test Method – Solid Phase Extraction (Concentration of 100 µg/kg)

	Analyte	R.T. (min)	MDL (ppb)	Extraction efficiency (%)	Precision (%)	Precision (%) (Limit by ASTM D5837)
1	5-Hydroxymethyl-2-furaldehyde	3.10	1.40	98.7	0.50	5.5
2	Furfuryl alcohol	3.95	3.98	96.9	1.40	16.7
3	2-Furaldehyde	4.70	1.64	97.8	0.58	6.0
4	2-Acetylfuran	5.87	2.22	91.0	0.78	7.7
5	5-Methyl-2-furaldehyde	7.21	3.67	96.2	1.29	6.0



SPE_STD in oil_1000ppb_overlay

The precision is calculated by 10 sequence injections according to ASTM D5837 and the method detection limit (MDL) is referred by Environment Research QA/QC Handbook by National Institute of Environmental Research (2011).

The solid phase extraction was adopted as a preparation method due to its highest sensitivity with the superior extraction efficiency and the great peak shape although it requires a SPE column use and the long preparation time due to the complicated extraction procedure.

The correlation coefficients of calibration curve for furanic compounds were determined greater than 0.999 and the precision is also better than the ASTM D5387 regulation. ChroZen ASTM D5837 Player guarantees the reliable data for analysis of furanic compounds according to ASTM D5837.

ChroZen ASTM D5837 Player

Total Dream Solution includes:

1. Smart Hardware Platform by ChroZen HPLC with PDA
2. Smart Software Control (Chromatography Data System)
3. All Related Consumables and Accessories
4. Columns
   - Silica SPE Column, Solid phase extraction column filled with 500 mg of silica
   - C18 (4.6 mm x 250 mm, 5 µm)

Target Compound Coverage	5-Hydroxymethyl-2-furaldehyde
	Furfuryl alcohol
	2-Furaldehyde
	2-Acetylfuran
	5-Methyl-2-furaldehyde





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