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Test Report – Belgian VOC regulation

1 Sample Information

Sample identification	Ottoflex Abdichtbahn
Batch no.	0701479
Production date	2 August 2010
Product type	Sealing film
Date when sample was received	07.09.2014
Testing (start - end)	24.09.2010 – 22.10.2010

2 Evaluation of the Results

The tested product complies with the requirements of the Federal Public Service Health, Food Chain Safety and Environment: Royal Decree establishing threshold levels for emissions in the indoor environment of building products for certain intended uses [C - 2014 / 24239] (May 2014).

Parameter	**Test after 28 days**	
	Concentration, $\mu g/m^3$	**Limit value,** $\mu g/m^3$
TVOC (Toluene equivalent)	< 5	≤ 1000
TSVOC	< 5	≤ 100
R-value (dimensionless)	0	≤ 1
Total Carcinogens	< 1	≤ 1
Toluene	< 3	≤ 300
Formaldehyde	< 3	≤ 100
Acetaldehyde	< 3	≤ 200

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3 Test Method

Method	**Principle**	**Parameter**	**Quantification limit**	**Uncertainty**
ISO 16000-3, ISO 16000-6, 16000-9, 16000-11				
Internal method numbers: 9810, 9811, 9812, 2808, 8400	GC/MS GC/MS HPLC	VVOC, VOC, SVOC TVVOC, TVOC, TSVOC Volatile Aldehydes	1 µg/m³ 5 µg/m³ 4 µg/m³	22% (RSD) U_m = 2 x RSD= 45 %
Test chamber parameter				
Chamber volume, l 119	Temperature, °C 23±1		Relative humidity, % 50±5	
Air exchange rate, 1/h 0.5	Loading ratio, m²/m³ 0.4			
Sample preparation				
The sealing film was deposited on a glass plate. The test specimen was transferred into a test chamber immediately.				
Deviations from the test method:	None			

For detailed method description see page 5: 5.1 Description of the applied test method

4 Results

4.1 Emissions Test after 28 Days

	CAS No.	Retention time min	ID-Cat	Concen-tration µg/m³	LCI-value µg/m³	R- value	Emission rate µg/(m²*h)	Toluene equivalent µg/m³
TVOC (C_6-C_{16})				< 5	-	-	< 7	< 5
VOC with LCI n.d.	-	-		< 5	-	-	< 7	< 5
R-value = Σ $Conc_i/LCI_i$						0		
VOC without LCI n.d.	-	-	-	< 5	-	-	< 7	< 5
Total VOC without LCI				< 5	-	-	< 7	< 5
Total VVOC (< C_6)				< 5	-	-	< 7	< 5
n.d.	-	-	-	< 5	-	-	< 7	< 5
Total SVOC (> C_{16})				< 5	-	-	< 7	< 5
n.d.	-	-	-	< 5	-	-	< 7	< 5
Total Carcinogens				< 1	-	-	< 2	< 1
n.d.	-	-	-	< 1	-	-	< 2	< 1
Volatile Aldehydes C_1-C_4 measured with DNPH-Method (see 5.1.4)								
Formaldehyde	50-00-0	-	-	< 3	-	-	< 4	-
Acetaldehyde	75-07-0	-	-	< 3	1200	(< 5)	< 4	-
Propionaldehyde	123-38-6	-	-	< 3	-	-	< 4	-
Butyraldehyde	123-72-8	-	-	< 3	650	(< 5)	< 4	-

n.d. Not detected
< Means less than
* Not a part of our accreditation. See 5.1.6 Accreditation

Categories of Identity:

1: Identified and specifically calibrated

2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Calibrated as toluene equivalent

3: Identified by comparison with a mass spectrum obtained from a library. Calibrated as toluene equivalent

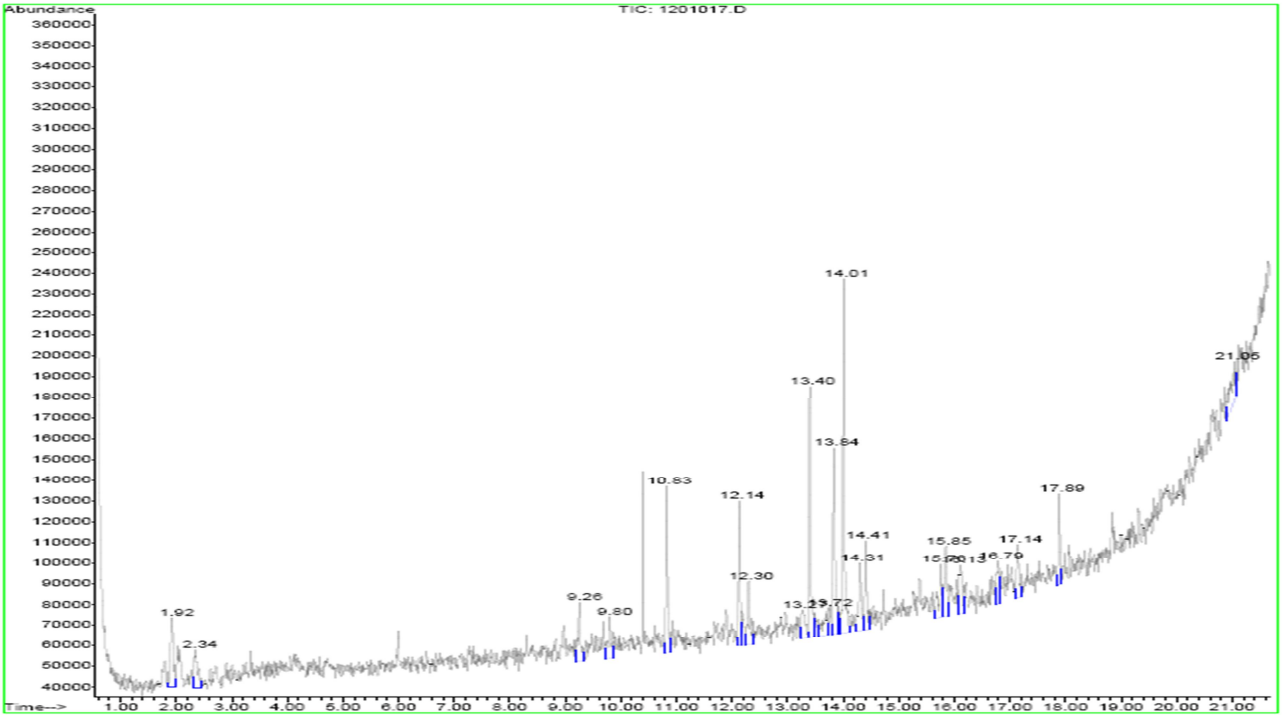
4: Not identified, calibrated as toluene equivalent

Maria Pelle
Chemist

Søren Ryom Villadsen
Analytical Service Manager

4.2 Chromatograms

4.2.1 Chromatogram after 28 days



5 Appendices

5.1 Description of the applied test method

5.1.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed. The operation parameters are 23 ± 1 °C, 50 ± 5 % relative humidity in the supply air and 0.5 air changes per hour (CEN/TS 16516, ISO 16000-9, internal method no.: 54M719811).

5.1.2 Sampling and Analysis

Expression of the test results
All test results are calculated as specific emissions rate, and as extrapolated air concentration in the European Reference Room (CEN/TS 16516).

Testing of Carcinogens
The emission of carcinogens (EU Categories C1A and C1B, as per European law) is tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS (automated thermal desorption coupled with gas chromatography and mass spectroscopy using 30 m HP-5 (slightly polar) column with 0.25 mm ID and 0.25 µm film, Agilent) (CEN/TS 16516, ISO 16000-6, internal methods no.: 54M719812 / 54M712808B). All identified carcinogenic VOCs are listed. If a carcinogenic VOC is not listed then it has not been detected. Quantification is performed using the TIC signal and the relative response factors relative to toluene for the individual compounds.

This test only covers substances that can be adsorbed on Tenax TA and can be thermally desorbed. If other emissions occur, then these substances cannot be detected (or with limited reliability only).

Testing of VOC and TVOC Emissions
The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film) (CEN/TS 16516, ISO 16000-6, internal methods no.: 54M719812 / 54M712808B).

All single substances that are listed with a LCI value from the EU list and in the latest AgBB publication are identified if present. Quantification is done using the TIC signal and the relative response factors relative to toluene. For certain compound groups, which differ significantly in chemistry from toluene, quantification is performed relative to a representative member of the group for more accurate and precise results. This can include quantification of for example glycols and acids. In addition to that, all results are also expressed in toluene equivalents. All other single substances, as well as all non-identified substances, are quantified in toluene equivalents.

The results of the individual substances are calculated in three groups depending on their retention time when analyzing using a non-polar column (HP-1):

- Volatile Organic Compounds (VOC) are defined as: All substances eluting between and including n-hexane (n-C_6) and n-hexadecane (n-C_{16}).
- Semi-Volatile Organic Compounds (SVOC) are defined as: All substances eluting after n-hexadecane (n-C_{16}) and before and including n-docosane (n-C_{22}).
- Very Volatile Organic Compounds (VVOC) are defined as: All substances eluting before n-hexane (n-C_6).

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 5 µg/m^3. The TVOC is can be expressed either in toluene equivalents as defined in CEN/TS 16516

and similar to ISO 16000-6, or as the sum of concentrations using relative response factors. Compounds that are regarded as VOC in line with the above definition but elute after n-C_{16} on the HP-5 column are treated as VOC, and are added to the TVOC.

Total Semi-Volatile Organic Compounds (TSVOC) is calculated by the summation of all individual SVOCs expressed in toluene equivalents with a concentration ≥ 5 µg/m^3, as defined in CEN/TS 16516. VOCs that are regarded as VOC in line with the above definition, but elute after n-C_{16} in this test, are not added to the TSVOC.

Total Very Volatile Organic Compounds (TVVOC) is calculated by the summation of all individual VVOCs with a concentration ≥ 5 µg/m^3 and expressed in toluene equivalents, as defined in CEN/TS 16516. VOCs that are regarded as VOC in line with the above definition, but elute before n-C_6 in this test, are not added to the TVVOC.

This test only covers substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occur then these substances cannot be detected (or with limited reliability only).

5.1.3 Calculation of R Values with LCI Lists (R_{BE})

The concentrations of all VOCs ≥ 5 µg/m^3 in the interval between n-C_6 and n-C_{16} are divided by their respective LCI/NIK value (if given). The sum of the quotients gives the R value:

$$R = \sum_{i}^{n} \left({c_i}/{LCI_i} + \ldots + {c_n}/{LCI_n} \right)$$

This R value is calculated for the European LCI list for the Belgian LCI list.

All compounds without published LCI value in the interval between n-C_6 and n-C_{16} and concentration ≥ 5 µg/m³ are summed up as sum of VOCs without LCI if required by the standard or protocol.

5.1.4 Testing of Aldehydes

The presence of aldehydes after the specified duration of storage in the ventilated test chamber is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection (ISO 16000-3, VDI 3862 Blatt 3, internal methods no.: 54M719812 / 54M718400).

The absence of formaldehyde is stated if the specific wavelength UV detector response is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the detection limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

5.1.5 Quality assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with CEN/TS 16516 / ISO 16000-9 is determined.

Sampling at the chamber outlet and subsequent analysis is performed in duplicate.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

5.1.6 Accreditation

The testing methods described above are accredited on line with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation.

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

5.1.7 Uncertainty of the test method

The relative standard deviation of the test method amounts to 22% (RSD). The expanded uncertainty U_m is 45% and equals 2 x RSD. For further information please visit www.eurofins.dk/uncertainty.