

Test Report

Endesign Limited
Product Emissions Test
(Eurofins Indoor Air Comfort Gold)

MFLOR 25-05 PU Blue

March 2013

Client: **Endesign Limited**
Hilltop Barton Road Pulloxhill
Bedfordshire MK45 5HP
England

Date: 12 March 2013

Testing Laboratory: Eurofins Product Testing A/S
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Introduction

On 29 November 2012, Eurofins Product Testing A/S received a sample of a flooring material

- **MFLOR 25-05 PU Blue**
Date of production: 15/11/2013, Batch: NE-120313

for emissions testing in accordance with the Label Eurofins Indoor Air Comfort Gold method. The sample was clearly labelled, properly packaged and not damaged. Testing was carried out in the laboratories of Eurofins Product Testing A/S. Before starting the testing procedure on 21 January 2013 the sample had been stored unopened at room temperature.

1 Description of the applied testing method.

The applied testing method complies with the test method as defined by Eurofins Indoor Air Comfort Gold Label. The test method is based on the published methods: ISO 16000-3, ISO 16000-6, 16000-9, 16000-11. The internal method numbers are: 9810; 9811, 9812, 2808, 8400.

1.1 Test specimen

A sample was sent by the client to the laboratory of Eurofins Product Testing A/S in an airtight package. The package was opened and a test specimen was cut out. Edges and back were covered with aluminium foil. The test specimen was transferred into a test chamber immediately (internal method no.: 9810).

1.2 Test chamber

The test chamber was made of stainless steel and had a volume of 119 litres. The air clean-up was realised in multiple steps. Before loading the chamber a blank check of the empty chamber was performed. The operation parameters were 23 °C, 50 % relative air humidity (in the supply air) with an air exchange rate of ½ per hour. The loading of the test chamber was 0,4 m² test specimen per m³ air volume, corresponding to an area specific flow rate of 1,25 m³/m²h (Interne Methode 9811).

1.3 Sampling, Desorption, Analyses

1.3.1 Testing of Carcinogens after 3 and 28 Days

The presence of carcinogens (EU Categories C1 and C2, as read from the latest publication on the homepage of German BGIA Institute) was tested by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube) after 3 and after 28 days. Analyses were done by thermal desorption (Perkin Elmer) and gas chromatography / mass spectroscopy (30 m column, 0.25 mm ID, 0.25 µm HP-1 film, Agilent) (internal methods no.: 9812 / 2808). The absence of a listed carcinogen was stated if the specific combination of fragment ions was lacking at the specific retention time in the chromatogram. Otherwise it was checked whether the required detection limit (1 µg/m³) was exceeded. In this case the identity was finally checked by comparing full scan sample mass spectra with full scan standard mass spectra.

This test covered only substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occurred, then these could not be monitored (or with limited reliability only).

1.3.2 VOC Emissions Testing after 3 and 28 Days

The emissions of organic compounds after 3 and after 28 days were tested by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube) after 3 and after 28 days. Analyses were done by thermal desorption (Perkin Elmer) and gas chromatography / mass spectroscopy (30 m column, 0.25 mm ID, 0.25 µm HP-1 film, Agilent) (internal methods no.: 9812 / 2808).

All single substances that are listed with a NIK value in the latest AgBB publication were identified if the toluene equivalent in the Total Ion Chromatogram (TIC) exceeded 5 µg/m³. Quantification was done with the respective response factor and the TIC signal, or in case of overlapping peaks by calculating with fragment ions. All other single substances, as well as all non-identified substances, were quantified as toluene equivalent if giving more than 5 µg/m³.

The results of the individual substances were calculated in three groups depending on their appearance in a gas chromatogram when analysing with a non-polar column (HP-1):

- Volatile organic compounds VOC: All substances appearing between these limits.
- Semi-volatile organic compounds SVOC: All substances appearing after n-hexadecane (n-C₁₆).
- Very volatile organic compounds VVOC: All substances appearing before n-hexane (n-C₆).

Calculation of the TVOC (Total Volatile Organic Compounds) was done as defined by AgBB/DIBt test method by addition of the results of all individual substances in the retention time interval C₆-C₁₆. Furthermore the TVOC was calculated as the toluene equivalent of all substances between C₆ and C₁₆, as defined in ISO 16000-6.

Calculation of the TSVOC (Total Semi-Volatile Organic Compounds) was done by addition of the results of all substances between C₁₆ and C₂₂ as toluene equivalent, as defined in ISO 16000-6.

Calculation of the TVVOC (Total Very Volatile Organic Compounds) was done by addition of the results of all substances appearing before C₆ as toluene equivalent, as defined in ISO 16000-6.

This test covered only substances that can be adsorbed on Tenax TA and that can be thermally desorbed. If other emissions occurred then these could not be monitored (or with limited reliability only).

1.3.3 Calculation of R values after 3 and 28 Days with the German NIK List and the CLI List

The concentrations of all substances in the interval between n-C₆ and n-C₁₆ with more than 5 µg/m³ after 3 and 28 days were divided by their respective NIK value (if given). The sum of the quotients gives the R value:

$$R = \sum_i^n \frac{C_i}{\text{NIK}_i} + \dots + \frac{C_n}{\text{NIK}_n}$$

In parallel, all results were summed up for the substances without published NIK value, but in the interval between n-C₆ and n-C₁₆, when giving more than 5 µg/m³ after 3 and 28 days. A similar calculation was done with the French CLI values (R_F-value).

1.3.4 Testing of Aldehydes after 3 and 28 Days

The presence of aldehydes was tested by drawing air samples from the chamber outlet through DNPH-coated silicagel tubes after 3 and 28 days. Analysis was done by solvent desorption, HPLC and UV-/diode array detection (ISO 16000-3, internal methods no.: 9812 / 8400).

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

1.3.5 Deviations from the Test Method

No deviations.

1.3.6 Quality assurance

Before loading the chamber a blank check of the empty chamber was performed and compliance with background concentrations in accordance with ISO 16000-9 was determined. Sampling at the chamber outlet and subsequent analysis was realised as double determination. For monitoring any breakthrough or overloading of the tubes, two Tenax TA tubes were used in series (or two adsorption areas for silicagel tubes).

In each sequence stability of GC system was checked by a general function test of device and column, and by use of control charts for monitoring mean values and standard deviations for individual VOC. Reproducibility of the method was monitored for two selected VOC per sequence.

1.3.7 Accreditation

The testing methods described above have been accredited (EN ISO/IEC 17025:2005) by DANAK (no. 522). But some parameters are not yet covered by that accreditation. At present the accreditation does not cover the parameters marked with a note *. But the analysis was done for these parameters at the same level of quality as for the accredited parameters.

1.4 Uncertainty of the test method

The relative standard deviation of the test method is amounted to 22% (RSD). The expanded uncertainty U_m is 45% and equals $2 \times \text{RSD}\%$, see also www.eurofins.dk, search: Uncertainty.

2 Results

2.1 Emissions Test after 3 Days

MFLOR 25-05 PU Blue	CAS No.	Retention time min.	ID-Cat.	After 3 days $\mu\text{g}/\text{m}^3$	Criteria e.g. NIK $\mu\text{g}/\text{m}^3$	Criteria e.g. LCI $\mu\text{g}/\text{m}^3$	R_D (c/NIK)	R_F (c/LCI)	Toluene equivalent $\mu\text{g}/\text{m}^3$
TVOC (C₆-C₁₆)				61	1200	-	-	-	61
Substances with NIK- or LCI-value									
Methylethylketone (MEK)	78-93-3	2.03	2	7.2	6000	5000	0.0012	0.0014	7.2
Toluene	108-88-3	4.09	1	54	1900	300	0.028	0.18	54
Total $R_D = \sum \text{Conc}_i/\text{NIK}_i$	-	-	-	-	-	-	0.03	-	-
Substances without NIK- or LCI-value									
n.d.	-	-	-	< 5	-	-	-	-	< 5
Total VOC without NIK	-	-	-	< 5	-	-	-	-	< 5
Total VOC without LCI	-	-	-	< 5	-	-	-	-	< 5
Total VVOC (< n-C₆)	-	-	-	< 5	-	-	-	-	< 5
Single VVOC Substances:									
n.d.	-	-	-	< 5	-	-	-	-	< 5
Total SVOC (> n-C₁₆)	-	-	-	< 5	-	-	-	-	< 5
Single SVOC Substances:									
n.d.	-	-	-	< 5	-	-	-	-	< 5
Total Carcinogens									
n.d.	-	-	-	< 1	10	-	-	-	< 1
n.d.	-	-	-	< 1	-	-	-	-	< 1
Volatile Aldehydes measured with DNPH-Method (see 1.3.4)									
Formaldehyde	50-00-0	-	-	< 3	-	10	-	-	-
Acetaldehyde	75-07-0	-	-	< 3	-	200	-	-	-
Propionaldehyde	123-38-6	-	-	< 3	-	8	-	-	-
Total $R_F = \sum \text{Conc}_i/\text{LCI}_i$	-	-	-	-	-	-	-	0.2	-

n.d. Not detected

< Means less than

* Not a part of our accreditation, see 1.3.7 Accreditation

The results are only valid for the tested sample(s).

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2.2 Emissions Test after 28 Days

MFLOR 25-05 PU Blue	CAS No.	Retention time min.	ID-Cat.	After 28 days $\mu\text{g}/\text{m}^3$	Criteria e.g. NIK $\mu\text{g}/\text{m}^3$	Criteria e.g. LCI $\mu\text{g}/\text{m}^3$	R _D (c/NIK)	R _F (c/LCI)	Toluene equivalent $\mu\text{g}/\text{m}^3$
TVOC (C₆-C₁₆)				27	160	-	-	-	27
Substances with NIK- or LCI-value									
Toluene	108-88-3	4.22	1	27	1900	300	0.014	0.09	27
Total R_D = $\sum \text{Conc}_i/\text{NIK}_i$	-	-	-	-	1	-	< 1	-	-
Substances without NIK- or LCI-value									
n.d.	-	-	-	< 5	-	-	-	-	< 5
Total VOC without NIK	-	-	-	< 5	100	-	-	-	< 5
Total VOC without LCI	-	-	-	< 5	100	-	-	-	< 5
Total VVOC (< n-C₆)	-	-	-	< 5	-	-	-	-	< 5
Single VVOC Substances:									
n.d.	-	-	-	< 5	-	-	-	-	< 5
Total SVOC (> n-C₁₆)	-	-	-	< 5	40	-	-	-	< 5
Single SVOC Substances:									
n.d.	-	-	-	< 5	-	-	-	-	< 5
CMR-substances and other regulated VOC in France									
Benzol	71-43-2	-	-	< 1	1	-	-	-	< 1
Trichlorethylene	79-01-6	-	-	< 1	1	-	-	-	< 1
Dibutylphthalate	84-74-2	-	-	< 1	1	-	-	-	< 1
Diethylhexylphthalate	117-81-7	-	-	< 1	1	-	-	-	< 1
Other CMR-substances	-	-	-	< 1	-	-	-	-	< 1
Volatile Aldehydes measured with DNPH-Method (see 1.3.4)									
Formaldehyde	50-00-0	-	-	< 3	-	10	-	-	-
Acetaldehyde	75-07-0	-	-	< 3	-	200	-	-	-
Propionaldehyde	123-38-6	-	-	< 3	-	8	-	-	-
Total aldehydes (Without formaldehyde)	-	-	-	< 5	-	-	-	-	-
Total R_F = $\sum \text{Conc}_i/\text{LCI}_i$	-	-	-	-	-	1	-	0.09	-

n.d. Not detected

< Means less than

* Not a part of our accreditation, see 1.3.7 Accreditation

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Categories of identity:

- 1 = definitely identified, specifically calibrated
- 2 = identified by comparison with a mass spectrum obtained from a library, identity 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

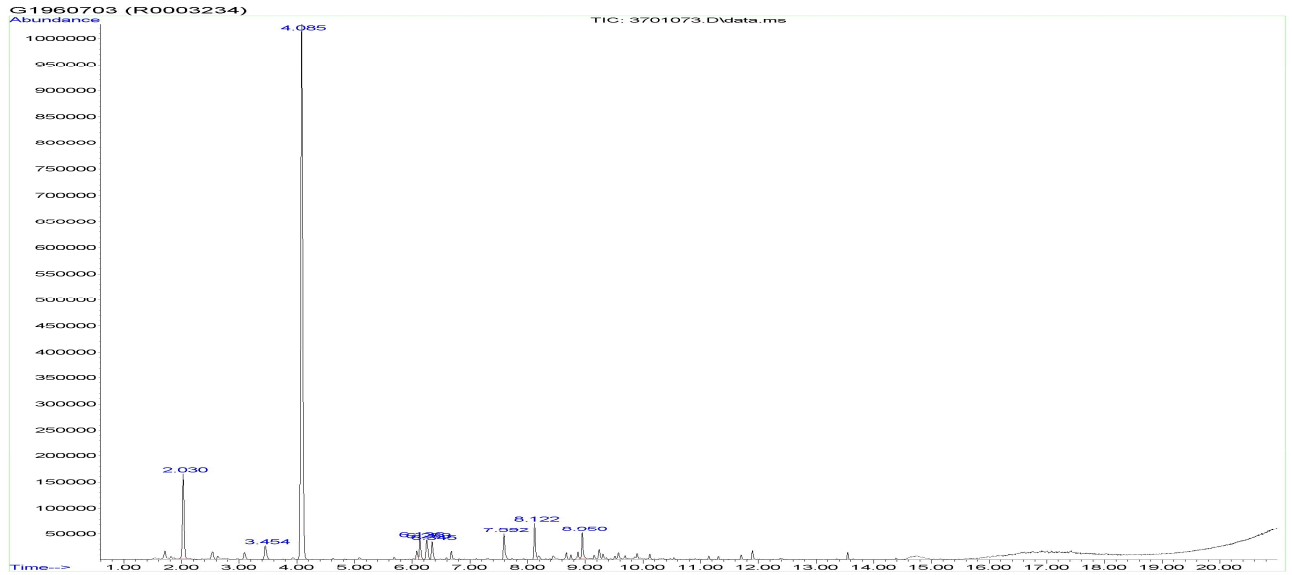
3 Interpretation of the Results

The results of MFLOR 25-05 PU Blue can be summarised as follows:

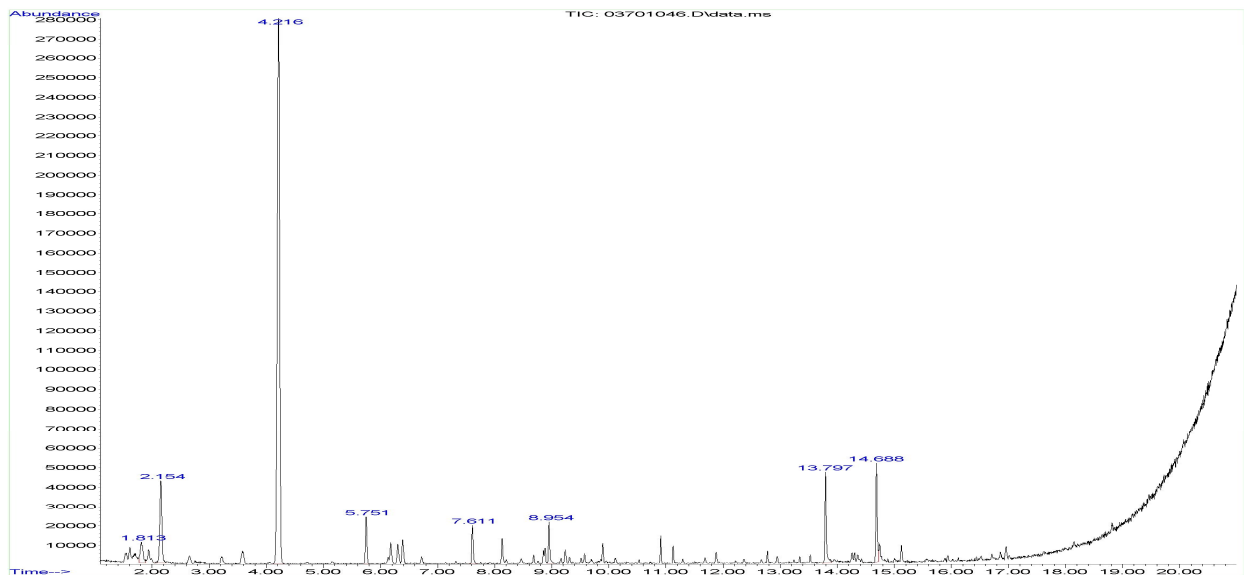
- **No** carcinogens could be detected after 3 and after 28 days.
- The Total VOC ("TVOC") after was **below** the classification threshold of 160 µg/m³ and 1000 µg/m³.
- The Total SVOC after 28 Days was **below** the classification threshold of 40 µg/m³.
- The classification value R for the VOC substances with more than 5 µg/m³ after 28 days was **below** the classification threshold of 1.
- The Total VOC without assigned NIK value after 28 days was **below** the classification threshold of 100 µg/m³.
- The formaldehyde emission after 28 days was **below** the classification threshold of 10 µg/m³.

The tested product MFLOR 25-05 PU Blue complies with the requirements of Eurofins Indoor Air Comfort Gold Label, version 3.1.

Appendix 1: Chromatogram VOC after 3 days



Appendix 2: Chromatogram VOC after 28 days



Please consider the different scales.

The results are only valid for the tested sample(s).

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