

**Test Report**  
**PROJECT FLOORS GmbH**  
Emission test of  
**TR 810 AP**  
in accordance with M1 classification

July 2011

**Client:** **PROJECT FLOORS GmbH**  
Kalscheurener Str. 19  
50354 Hürth  
Germany

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**Testing Laboratory:** Eurofins Product Testing A/S  
Smedeskovvej 38, DK-8464 Galten



Thomas Neuhaus  
Head of product emission test centre



Martin Møller Pedersen  
M.Sc. (Pharm)

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## Introduction

On 18 April 2011 Eurofins Product Testing A/S received a sample of floor covering named

**TR 810 AP**

Batch: L 306, Date of production: November 2010

for emissions testing in accordance with the M1 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 10 May 2011 the sample had been stored unopened at room temperature.

# 1 Description of the Applied Testing Method

The applied method complies with the Protocol for Chemical and Sensory Testing of Building Materials as defined by the Finnish Emission Classification of Building Materials (version of 2004). 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, 4430 and 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 and the sample was mounted into a frame in accordance with JIS A 1901. The test specimen was transferred into a test chamber immediately (internal method no.: 9810).

## 1.2 Test Chamber

- **Chemical Testing:** The test chamber was consisting of stainless steel and had a volume of 119 litres. The air clean-up was realized 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 m<sup>2</sup> test specimen per m<sup>3</sup> air volume, corresponding to an area specific flow rate of 1.25 m<sup>3</sup>/m<sup>2</sup>h (internal method 9811).
- **Sensory Testing:** The test chamber was a "BIG-PAC" chamber made of glass and had a volume of 200 litres. The air clean-up was realized in multiple steps. Before loading the chamber, a blind check of the empty chamber was performed. The operation parameters were 23 °C, 50 % relative air humidity (in the supply air). When assessing the odour, an area specific air flow rate of 4.76 m<sup>3</sup>/(h x m<sup>2</sup>) assured a flow rate of 0.9 litres per second (3.24 m<sup>3</sup>/h, air exchange 16 per hour) at the chamber outlet. The loading of the test chamber was 3.4 m<sup>2</sup> test specimen per m<sup>3</sup> air volume (internal method 9811).

## 1.3 Sampling, Desorption, Analyses

All emissions were calculated as area specific emission rate SER with the following formula:

$$SER = C \times n / L$$

With:

C Concentration in test chamber, µg/m<sup>3</sup>

n Air exchange rate, 1/h

L Loading factor, m<sup>2</sup>/m<sup>3</sup>

### 1.3.1 Testing of Carcinogens after 28 Days

The presence of volatile organic carcinogens (IARC 1987 listing, category C1, 1 µg/m<sup>2</sup>xh and above), which means benzene and vinyl acetate, was tested.

The test was done by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube) after 28 days. Analyses were done by thermal desorption and gas chromatography / mass spectroscopy (internal methods: 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 ( $1 \mu\text{g}/\text{m}^2\text{xh}$ ) was exceeded. In this case the identity was finally checked by comparing full scan sample mass spectra with full scan standard mass spectra.

### 1.3.2 Testing of VOC, SVOC, VVOC after 28 Days

The emissions of organic compounds after 28 days were tested by drawing air samples from the chamber outlet through Tenax TA tubes (main tube and backup tube). Analyses were done by thermal desorption and gas chromatography / mass spectroscopy (internal methods: 9812 / 2808).

Quantification was done with the Total Ion Chromatogram (TIC) signal, or in case of overlapping peaks by calculating with fragment ions. All identified and non-identified substances were quantified as toluene equivalent if giving more than  $2.5 \mu\text{g}/\text{m}^2\text{xh}$ .

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.
- Very volatile organic compounds VVOC: All substances appearing before n-hexane ( $n\text{-C}_6$ ).
- Semi-volatile organic compounds SVOC: All substances appearing after n-hexadecane ( $n\text{-C}_{16}$ ).

Calculation of the TVOC (Total Volatile Organic Compounds) was done by addition of the results of all substances between  $\text{C}_6$  and  $\text{C}_{16}$  as toluene equivalent, 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  $\text{C}_{16}$  and  $\text{C}_{22}$  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  $\text{C}_6$  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 Testing of Formaldehyde after 28 Days

The presence of formaldehyde was tested by drawing air samples from the chamber outlet through DNPH-coated silicagel tubes after 28 days. Analysis was done by solvent desorption, HPLC and UV-/diode array detection (ISO 16000-3, internal methods: 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 ( $5\text{-}10 \mu\text{g}/\text{m}^3$ ) was exceeded. In this case the identity was finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

### 1.3.4 Testing of Ammonia after 28 days

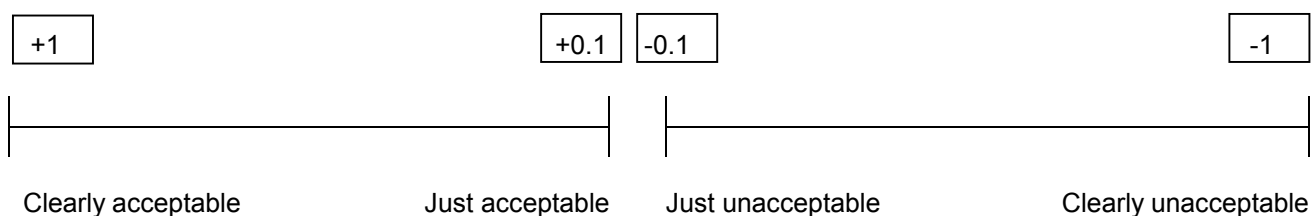
The presence of ammonia was tested by drawing air samples from the chamber outlet through silicagel tubes coated with sulphuric acid after 28 days. Analysis was done by solvent desorption and UV/VIS spectroscopy (internal methods: 9812 / 4430).

The absence of ammonia was stated if the signal was lacking at the specific wavelength. Otherwise it was checked whether the detection limit was exceeded.

### 1.3.5 Sensory Testing after 28 Days

The sensory testing was done after 28 days storage under controlled conditions in the testing chamber. 23 persons assessed the odour first of the room air and then give the odour rating twice for each chamber. Between two assessments there was a minimum break of 2 minutes. Each single judgement was based on the odour impression after 2-3 inhalations. The odour was rated immediately after each assessment on a continuous scale with values between +1 (clearly acceptable) and -1 (clearly unacceptable), with just acceptable = +0.1 and just unacceptable = -0.1. The scale was read with an accuracy of  $\pm 0.1$ . The result was calculated as the average of the assessments from the odour rating of the panel, and only results with a note  $> 0.1$  are accepted. Only panel members rating clean moistened air as acceptable ( $> 0.8$ ) were considered in the calculation.

Sensory acceptance:



### 1.3.6 Deviations from the M1 Test Method

No deviations.

### 1.3.7 Accreditation

The sensory testing method is not yet covered by the accreditation (EN ISO/IEC 17025:2005) by DANAK (no. 522). Anyway, Eurofins is accepted by RTS, Finland, for M1 testing - including sensory testing.

The testing methods described above have been accredited (ISO 17025-1) 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](http://www.eurofins.dk), search: Uncertainty. This uncertainty does not include sensory testing.

## 2 Results

### 2.1 Chemical testing after 28 days

TR 810 AP	CAS No.	Concentration µg/m <sup>3</sup>	Emission rate µg/m <sup>2</sup> xh	Criteria µg/m <sup>2</sup> xh
TVOC (C6-C16)	-	16	20	< 200
Total Carcinogens	-	< 1	< 1	< 5
Formaldehyde	50-00-0	< 3	< 5	< 50
Ammonia	7664-41-7	< 20	< 25	< 30

< Means less than

Detailed results see annex 2

### 2.2 Sensory testing after 28 days

Sample	TR 810 AP	
	First assessment	Second assessment
<b>Overall average</b>	<b>0.8</b>	
<b>Average</b>	<b>0.8</b>	<b>0.8</b>
1	0.8	0.8
2	0.7	0.7
3	1	1
4	0.8	0.8
5	1	1
6	0.7	0.8
7	0.8	0.8
8	0.9	0.8
9	1	1
10	0.8	0.8
11	0.4	0.4
12	0.1	0.5
13	0.7	0.9
14	1	1
15	0.8	0.9
16	0.8	0.9
17	0.8	0.8
18	1	1

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

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19	1	1
20	1	1
21	0.9	0.9
22	0.9	0.9
23	0.8	0.8

Standard deviation of the sensory testing: 0.2

### 3 Interpretation of the Results

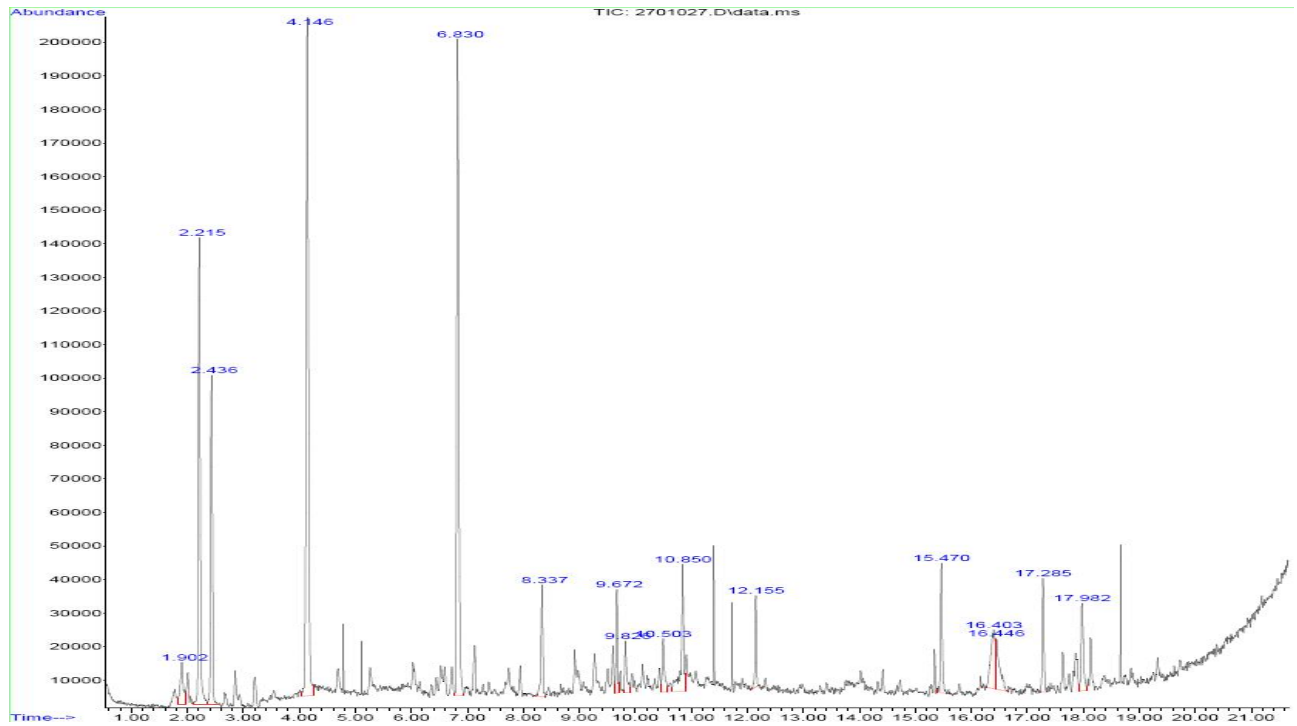
The results of **TR 810 AP** can be summarised within the scope of M1 classification as follows.

#### The emission rate after 28 days was

- **Below** the classification threshold of 200  $\mu\text{g}/\text{m}^2\text{h}$  for TVOC
- **Below** the classification threshold of 1  $\mu\text{g}/\text{m}^2\text{h}$  for carcinogens
- **Below** the classification threshold of 50  $\mu\text{g}/\text{m}^2\text{h}$  for formaldehyde
- **Below** the classification threshold of 30  $\mu\text{g}/\text{m}^2\text{h}$  for ammonia
- The sensory acceptance **meets** the classification criterion (+0.1 or higher)

**The tested product TR 810 AP complies with the requirements of M1 for the tested parameters.**

Annex 1: Chromatogram VOC after 28 days



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

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## Annex 2: Test Report for Delivery to RTS, Finland

## Emission measurements for the emission classification of building materials

Product: Floor covering					
Product name	TR 810 AP				
Production date (by the manufacturer)	11-2011				
Sending date (by the manufacturer)	-				
Description of packaging and transport	Properly packaged and not damaged				
Product received at the testing laboratory, date	18-4-2011				
Thickness of the sample	-				
Test period started, date	10-5-2011				
Conditions during ageing (C°,RH%)	23 °C, 50 % RH in test chamber				
Emission sampling, date	7-6-2011				
Chamber technique					
Parameter	Chamber volume (m <sup>3</sup> ) and type	Air change rate (h <sup>-1</sup> )	Temperature (°C ± °C)	Relative humidity (%)	Test specimen loading factor (m <sup>2</sup> m <sup>-3</sup> )
VOC, TVOC, Formaldehyde, Ammonia	stainless steel	0.5	23 ± 1	50	0.4
Sensory evaluation	200 litres BIG-PAC	16	23 ± 1	50	3.4
Emission sampling and analytical methods					
Parameter	Method, Standard or own validated method	Adsorbent / Absorbent	Sampling volume (l)	Quantification / Analysis method	Detection limit of the method used
VOC, TVOC	2808	Tenax	Ca 9.6	GC/MS	2.5 µg/m <sup>2</sup> h
Formaldehyde	8400	DNPH-coated silicagel	Ca 50	HPLC/UV	5 µg/m <sup>2</sup> h
Ammonia	4430	Sulphuric acid coated silicagel	Ca 100	Spectrofotometry	13 µg/m <sup>2</sup> h
Sensory evaluation	9800 mod.	-	-	Human nose	-

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<b>Results – Specific emission rates, SER</b>			
TVOC	$\mu\text{g}/(\text{m}^2\text{h})$ as toluene equivalent between C <sub>6</sub> to C <sub>16</sub>	20	
Single VOCs C <sub>6</sub> to C <sub>16</sub>	See separate table		
Single VOCs outside the frame C <sub>6</sub> to C <sub>16</sub>	See separate table		
Formaldehyde	$\mu\text{g}/(\text{m}^2\text{h})$	< 5	
Ammonia	$\mu\text{g}/(\text{m}^2\text{h})$	< 25	
Carcinogens, SER > 1 $\mu\text{g}/(\text{m}^2\text{h})$	$\mu\text{g}/(\text{m}^2\text{h})$ as toluene equivalents	< 1	
The chromatogram with identified main components	Annex 1		
Sensory evaluation	Average of acceptability	0.8	
<b>Single VOCs C6-C16</b>			
Retention time	Name	CAS Number	$\mu\text{g} / (\text{m}^2\text{h})$
4.15	Toluene	108-88-3	18
15.47	1,6-Dioxacyclododecane-7,12-dione *	777-95-7	2.5
		TVOC	20
		Identified	20
		Identification %	100%
<b>Single VOCs outside the frame C6-C16</b>			
Retention time	Name	CAS Number	$\mu\text{g} / (\text{m}^2\text{h})$
No single VOC's detected			
		TVOC+TSVOC	-
		Identified	-
		Identification %	-
<b>Measurement uncertainty</b>		<b>The uncertainty of the testing procedure including all steps from material or product sampling to final results.</b>	
SER <sub>TVOC</sub>	± 22 % RSD	SER <sub>NH3</sub>	± 22 % RSD
		SER <sub>Formaldehyde</sub>	± 22 % RSD

\* Not a part of our accreditation. See 1.3.7 Accreditation