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DANAK TEST Reg.nr 522

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Siderise (Special Products) Limited
Lady Lane Industrial Estate
IP7 6BQ Hadleigh, Suffolk
UNITED KINGDOM

VOC EMISSION TEST REPORT
CDPH

1 November 2023

1 Sample Information

Sample name	XFS090 (FS60)
Batch no.	121105
Stated production date	30/08/2023
Product type	Technical insulation
Stated thickness, mm	90
Sample reception	05/09/2023

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
CDPH §	Pass	CDPH/EHLB/Standard Method V1.2. (January 2017)

Full details based on the testing and direct comparison with limit values are available in the following pages
Regarding pass/fail decision rule please see appendix
§ See section 4.4. for deviations.

Henriette Buch Lauersen
Analytical Service Manager

Rasmus Verdier
Analytical Service Manager

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3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [µg/m³]	Calculation of TVOC	Combined uncertainty[a] [RSD(%)]
EN 16516	2017 + A1:2020	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2006-2022 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-
CDPH	CDPH/EHLB/Standard Method V1.2. (January 2017)	2	Toluene equivalents	22%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty[a] [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN 16516:2017+A1:2020, CDPH:2017	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017+A1:2020	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M548400	3-6 µg/m³	HPLC-UV	10%
Sampling on Charcoal tubes	ISO 16200-1:2001	71M549812	60 L	Charcoal	-
Analysis of Charcoal tubes *	ISO-16200-1:2001	71M546081	20 µg/m³	Headspace-GC/MS	10%

4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

Parameters	Value	Sample Conditions	Value
Chamber volume, V[L]	119	Date and time of unpacking	12/09/2023 - 12:27
Air change rate, n[h^{-1}]	1.0	Preconditioning period	-
Air Velocity [m/s]	0.1	Chamber test period	12/09/2023 - 26/09/2023
Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	2.5	Analytical test period	12/09/2023 - 04/10/2023
Relative humidity of supply air, RH [%]	50 ± 3	Exposed sample area [m^2]	0.048
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.4
Background concentration of individual VOC's [µg/m^3]	< 2	Test scenario	Flooring or ceiling
Background concentration of TVOC [µg/m^3]	< 20	Sample thickness [mm]	87

4.2 Preparation of the Test Specimen

Edges and back were covered with aluminium foil.

4.3 Picture of Sample

4.4 Deviations from Referenced Protocols and Regulations

The handover section of the "Chain of custody" document was not completed by the client.

The parameters for classroom and office were calculated by the client to better represent the correct use of the product (see section 6.1.1). This is in compliance with section 4.3.4 and 4.3.5 of CDPH.

The loading factor was less than the lowest factor of 0.3 m^2/m^3 that CDPH method specifies for testing; CDPH method does not specify a clear loading factor in any model room.

4.5 Air Samplings from the Test Chamber

Sampling media	Day (yyyy-mm-dd)	Time (hh:mm)	Volume [L]
11 Day, Tenax TA	2023-09-23	11:24 - 12:24	5.3
11 Day-Res, Tenax TA	2023-09-23	12:25 - 13:12	2.0
11 Day, DNPH silicagel	2023-09-23	11:22 - 13:11	36
11 Day-Res, DNPH silicagel	2023-09-23	11:23 - 13:11	36
12 Day, DNPH silicagel	2023-09-24	11:44 - 13:33	36
12 Day-Res, DNPH silicagel	2023-09-24	11:44 - 13:33	36
12 Day, Tenax TA	2023-09-24	11:45 - 12:46	5.4
12 Day-Res, Tenax TA	2023-09-24	12:46 - 13:34	2.1
14 Day, Tenax TA	2023-09-26	11:27 - 12:27	5.3
14 Day-Res, Tenax TA	2023-09-26	12:27 - 13:18	2.3
14 Day, Carboxen 1000	2023-09-26	08:10 - 10:43	15
14 Day-Res, Carboxen 1000	2023-09-26	08:11 - 10:44	15
14 Day, DNPH silicagel	2023-09-26	11:26 - 13:17	37
14 Day-Res, DNPH silicagel	2023-09-26	11:27 - 13:18	36

5 Results

5.1 VOC Emission Test Results after 11 Days

	CAS No.	Specific Conc. [µg/m³]	Specific SER [µg/(m²·h)]	Toluene eq. [µg/m³]	Toluene SER [µg/(m²·h)]
TVOC (C5-C17)tol. eq.				< 2	< 5
Aldehydes					
Formaldehyde	50-00-0	15	38		
Acetaldehyde	75-07-0	< 3	< 8		

5.2 VOC Emission Test Results after 12 Days

	CAS No.	Specific Conc. [µg/m³]	Specific SER [µg/(m²·h)]	Toluene eq. [µg/m³]	Toluene SER [µg/(m²·h)]
TVOC (C5-C17)tol. eq.				< 2	< 5
Aldehydes					
Formaldehyde	50-00-0	14	35		
Acetaldehyde	75-07-0	< 3	< 8		

5.3 VOC Emission Test Results after 14 Days

	CAS No.	Retention time [min]	ID-Cat	SER [µg/(m²·h)]	Classroom Conc. [µg/m³]	Office Conc. [µg/m³]	½ CREL [µg/m³]
VOC (C5-C17)							
None determined					< 1	< 2	
TVOC (C5-C17)tol. eq.				< 5	< 1	< 2	
Aldehydes							
Formaldehyde	50-00-0		1	40	2.5	7.7	9
Acetaldehyde	75-07-0		1	< 8	< 1	< 2	70

6 Summary and Evaluation of the Results

6.1 Comparison with Limit Values of CDPH

Parameters	Test after 14 days			
	CAS No. Single compounds	Concentration in Classroom [µg/m³]	Concentration in Office Room [µg/m³]	½ CREL [µg/m³]
TVOC (C5-C17)tol. eq.	-	< 1	< 2	-
Single compounds (with defined CREL values) None determined	-	-	-	-
Formaldehyde	50-00-0	2.5	7.7	≤ 9
Acetaldehyde	75-07-0	< 1	< 3	≤ 70

6.1.1 Conversion of Emission Rates to CDPH Reference Room Concentrations

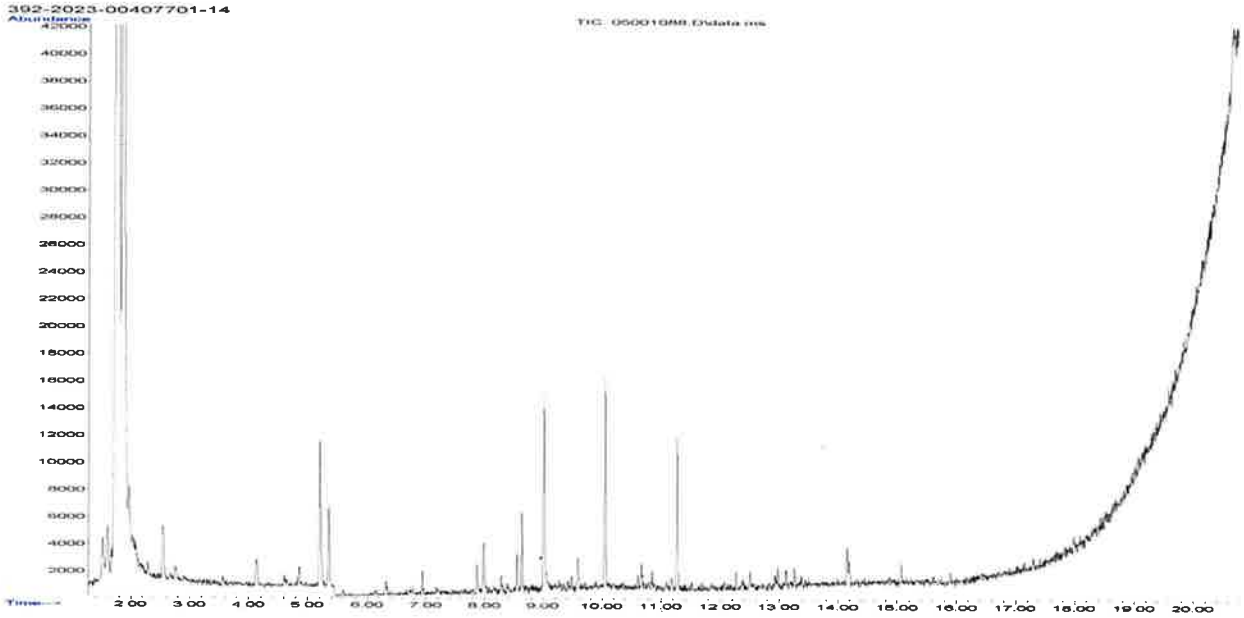
The CDPH method requires calculation of the measured emission rates into concentrations in given reference rooms. The equation and parameters figured below have been applied to calculate the concentrations in an office room or a classroom as required in the CDPH. The area used in the calculation varies depending on the expected usage of the product and therefore several entries can be found. Small and Very Small areas are not provided within the CDPH but are adapted from definitions given in EN 16516 and ISO 16000-9.

$$C_{Calculated} = \frac{SER_A \cdot A}{n \cdot V}$$

		Classroom parameters	Office Room parameters
SER	Area specific emission rate, µg/(m²h)	As tested	As tested
n	Air change, h^{-1}	0.82	0.68
V	Volume of reference room, m³	231	30.6
A	Floor area, m²	89.2	11.1
	Walls area, m²	94.6	33.4
	Ceiling and Wall, m²	183.8	N/A
	Door and Millwork, m²	1.89	1.89
	Desk or Chair, units	27	1
	Very Small areas, m²	1.62	0.021
	Small areas, m²	11.55	1.53
	Client specified, m²	11.71	4.03

7 Appendices

7.1 Chromatogram of VOC Emissions after 14 Days



7.2 Chain of Custody

Version 1.1

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Combined Sampling Report and Chain of Custody			
Name of applicant: (name, company, phone)	Richard Critchlow, Siderise (Special Products) Ltd, Lady Lane Industrial Estate, Hadleigh, Suffolk IP7 6BQ, UK, +44 (0) 1473 827895		
Product Information			
Name of the product:	XFS090 (FS60)	**Product type**	Technical insulation
Batch N°:	121105	**Article N°:**	
Model / Program / Series:		**Manufacture:** (Company, Address, Stamp)	Siderise (Special Products) Ltd, Lady Lane Industrial Estate, Hadleigh, Suffolk IP7 6BQ, UK
Production & Sampling information			
Production Date: 30-08-2023. **Time:** 08:01:00		**Sampling Date:** 30/08/2023 **Time:** 11:07:00	
Place of sampling (if deviating from the manufature)	Siderise Insulations Ltd, Forge Industrial Estate Maesteg Bridgend CF34 0AH	**Sample is taken from:**	☑ ongoing production ☐ stocks ☐ retained sample
		Number of samples:	
Person in charge of sampling: (Name, company, telephone)	Darren Jones, Siderise Insulations Ltd. +44 (0)1656 812186	**Signature of sample collector:**	
Where has the product been stored prior to sampling?	☑ production ☐ store ☐ miscellaneous	**How has the product been stored prior to sampling?**	☐ open ☑ in the stack ☐ wrapped up
Place of storage:		*Packing material:*	
Specifics (possible negative influences by air contamination where sample was taken, by petrol emissions, by solvent emissions from production; any other uncertainties, questions, etc).			
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test):	Not applicable as product is symmetrical and 4 cut edges and rear to be taped by Eurofins with 5mm overlap on the exposed face prior to conditioning		
Confirmation from the applicant			
Herewith the signer confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples.			
Date:	**Signature:** (Stamp)		
30-08-2023	From: **Siderise Insulation LTD** Forge Industrial Estate, Maesteg, CF34 0AY Company Reg. 02370350 Signed:.....		

Chain of custody			What is a Chain of custody?
Whenever the sample is handed over, please fill out the below information			
Handed over between:	**Initials + Signature**	**Date + Time**	**Condition**
Handed over by			
Handed over to			
Handed over by			
Handed over to			
Handed over by			
Handed over to			
Laboratory receiving details (date, condition of package and sample, assigned lab no.): 5/9 dk 29. 2023 - 00407701			
Receptionist, Eurofins Product Testing A/S: Marlene Pedersen		**Signature of receptionist:**	

7.3 How to Understand the Results

7.3.1 Acronyms Used in the Report

<	Means less than
>	Means bigger than
*	Not a part of our accreditation
¤	Please see section regarding uncertainty in the Appendices
§	Deviation from method. Please see deviation section
a	The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out
b	The component originates from the substrate and is thus removed
c	The results have been corrected by the emission from the substrate
d	Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5ms GC column. A high degree of uncertainty must be expected
e	The component may be overestimated due to contribution from the system
SER	Specific Emission Rate

7.3.2 Explanation of ID Category

Categories of Identity:

1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.

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

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

4: Not identified, quantified as toluene equivalent.

7.4 Description of VOC Emission Test

7.4.1 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 chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).
The recovery rates in the climate test chamber have been investigated using toluene and n-dodecane. The mean recovery rates of toluene and n-dodecane were concluded to be between 95 % and 100 % depending on the chamber size. These values comply with the criteria of a minimum mean recovery rate of 80 % stated in the 16000-9 test method.
Air sampling from the test chamber is carried out in a clean test chamber room at ambient air pressure and 23 ± 1 °C.

7.4.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

7.4.3 Testing of Carcinogenic VOCs

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) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

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 authentic response factors, or 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).

7.4.4 Testing of VOC

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

7.4.5 Testing of Aldehydes

The presence of aldehydes 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.

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

Conversions of specific aldehydes from µg/m³ to ppm are done by the ideal gas law using a temperature of 23 degree Celsius and standard atmospheric pressure.

7.4.6 Testing of Charcoal tubes

The presence of low boiling VOC is tested by drawing air samples from the test chamber outlet through charcoal tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HS-GC/MS using a stabilwax column. This test only covers substances which has a CREL value and are not possible to sample on Tenax tubes.

7.5 Quality Assurance

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

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

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.

7.6 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.

7.7 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/product-testing/uncertainty/.

7.8 Decision Rules

Eurofins Product Testing A/S, declare statement of conformity based on the "Binary Statement for Simple Acceptance Rule" described in ILAC's "Guidelines on decision Rules and Statements of Conformity" ILAC-G8:09/2019.

This means that results above the detection limit are always reported with two significant digits. Results are evaluated with the same number of significant digits as the corresponding limit values, and conformity is based on results being less than or equal to limit values.

For limit values with more than two significant digits, the third digit will be used to confirm whether a result is below or equal to the limit value. It will always be indicated in the evaluation table if this expanded evaluation is performed.

For further information, please visit www.eurofins.dk/product-testing/om-os/beslutningsregler/

7.9 Version History

Report date	Report number	Modification
01/11/2023	392-2023-00407701_H_EN_rev2	Revision of the conversion from SER to the CDPH reference rooms. The client has provided revised areas for the use of the product. This version is considered valid.
12/10/2023	392-2023-00407701_H_EN_rev1	Revision of the conversion from SER to the CDPH reference rooms. The client has provided more accurate areas for the use of the product. This version is no longer valid.
04/10/2023	392-2023-00407701_H_EN	This version is no longer valid.

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VOC EMISSION TEST REPORT
EN 16516

31 January 2024

1 Sample Information

Sample name	AltroFix W139
Batch no.	10-246624-24
Stated production date	09/10/2023
Product type	Adhesive
Sample reception	08/12/2023

Mads Folkjær
Analytical Chemist

Laura Hartung Sørensen
Analytical Service Manager

Table of contents

2 Applied Test Methods

2.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [µg/m³]	Calculation of TVOC	Combined uncertainty[a] [RSD(%)]
EN 16516	2017 + A1:2020	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2006-2022 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-

2.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty[a] [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN 16516:2017+A1:2020	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017+A1:2020	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M548400	3-6 µg/m³	HPLC-UV	10%

3 Test Parameters, Sample Preparation and Deviations

3.1 VOC Emission Chamber Test Parameters

Parameters	Value	Sample Conditions	Value
Chamber volume, V[L]	119	Date and time of unpacking and start of sample preparation	27/12/2023 - 10:43
Air change rate, n[h^{-1}]	0.5	Preconditioning period	-
Air Velocity [m/s]	0.1	Chamber test period	27/12/2023 - 24/01/2024
Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	0.5	Analytical test period	27/12/2023 - 29/01/2024
Relative humidity of supply air, RH [%]	50 ± 3	Exposed sample area [m^2]	0.12
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	1.0
Background concentration of individual VOC's [$\mu g/m^3$]	< 2	Test scenario	Wall
Background concentration of TVOC [$\mu g/m^3$]	< 20		

3.2 Preparation of the Test Specimen

The two component sample was mixed in a ratio A : B according to the client's instructions before it was homogenised, applied onto a glass plate and structured with a notched trowel.

Application amount, g/m^2	Mixing ratio, A : B	Trowel
2200	12:1	TKB B1

3.3 Picture of Sample

3.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

3.5 Air Samplings from the Test Chamber

Sampling media	Day (yyyy-mm-dd)	Time (hh:mm)	Volume [L]
28 Day, DNPH silicagel	2024-01-24	09:13 - 11:03	36
28 Day-Res, DNPH silicagel	2024-01-24	09:13 - 11:03	36
28 Day, Tenax TA	2024-01-24	09:15 - 10:15	5.1
28 Day-Res, Tenax TA	2024-01-24	10:15 - 11:04	2.3

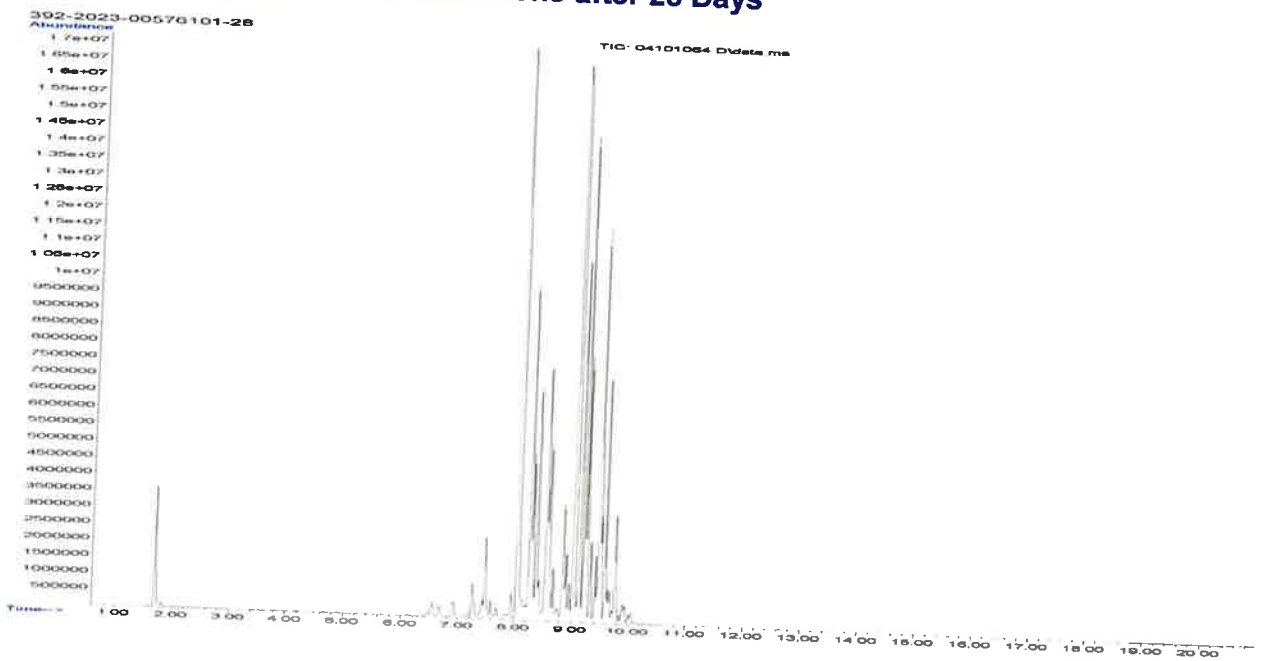
4 Results

4.1 VOC Emission Test Results after 28 Days

	CAS No.	Retention time [min]	ID-Cat	Specific Conc. [µg/m³]	Toluene eq. [µg/m³]	Specific SER [µg/(m²·h)]	R_{EU}
VOC with NIK/LCI							
3,5-Dimethyloctane *	15869-93-9	7.42	1	30	31	15	0.0050
2,2,4,6,6-Pentamethylheptane *	13475-82-6	9.04	1	690	780	340	0.11
Other saturated aliphatic hydrocarbons C9-C16 *		6.4-10.3	2	5700	5700	2900	0.95
VOC without NIK/LCI							
None determined							
Sum of VOC without NIK/LCI				< 5	< 5	< 3	
VVOC compounds							
None determined							
TVVOC				< 5	< 5	< 3	
SVOC compounds							
None determined							
TSVOC				< 5	< 5	< 3	
Carcinogens							
Total carcinogens				< 1	< 1	< 1	
Aldehydes							
Formaldehyde	50-00-0		1	< 3		< 2	
Acetaldehyde	75-07-0		1	< 3		< 2	
Propionaldehyde	123-38-6		1	< 3		< 2	
Butyraldehyde	123-72-8		1	< 3		< 2	
Acrolein *	107-02-8		1	< 5		< 3	
2-Butenal *	123-73-9		1	< 5		< 3	
Glutaraldehyde *	111-30-8		1	< 5		< 3	
R-values							1.1
TVOC				6400	6500	3200	

5 Appendices

5.1 Chromatogram of VOC Emissions after 28 Days



5.2 Sampling Report

Combined Sampling Report and Chain of Custody			
Name of applicant: (name, company, phone)	Karen Masters, Altro Limited, Works Road, Letchworth Garden City, SG6 1NW, UK, +44 1462 480480		
Product information			
Name of the product:	AltroFix W139	**Product type**	Adhesive
Batch N°:	10-246624-24	**Article N°:**	
Model / Program / Series:		**Manufacture:** (Company, Address, Stamp)	Altro Limited, Works Road, Letchworth Garden City, SG6 1NW, UK
Production & Sampling information			
Production Date: **Time:**	09/12/2023	**Sampling Date:** **Time:**	11/12/2023
Place of sampling (if deviating from the manufature)		**Sample is taken from:**	☐ ongoing production ☑ stocks ☐ retained sample
		Number of samples:	1
Person in charge of sampling: (Name, company, telephone)	Karen Masters, Altro Limited	**Signature of sample collector:**	Karen Masters KMasters
Where has the product been stored prior to sampling?	☐ production ☑ store ☐ miscellaneous	**How has the product been stored prior to sampling?**	☐ open ☑ in the stack ☐ wrapped up
Place of storage:	UK	*Packing material:*	
Specifics (possible negative influences by air contamination where sample was taken, by petrol emissions, by solvent emissions from production, any other uncertainties, questions, etc).		Not applicable	
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test):		Not applicable	
Confirmation from the applicant			
Herewith the signer confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples			
Date:	**Signature:** (Stamp)		
7/12/2023	KMasters ALTRO WORKS ROAD LETCHWORTH GARDEN CITY HERTS SG6 1NW TEL +44 (0) 1462 480480 FAX +44 (0) 1462 486001		

Chain of custody			What is a Chain of custody?
Whenever the sample is handed over, please fill out the below information			
Handed over between:	**Initials + Signature**	**Date + Time**	**Condition**
Handed over by			
Handed over to			
Handed over by			
Handed over to			
Handed over by			
Handed over to			
Laboratory receiving details (date, condition of package and sample, assigned lab no.): 8/12 ok 392 2023-00576101			
Receptionist, Eurofins Product Testing A/S:		**Signature of receptionist:**	

5.3 How to Understand the Results

5.3.1 Acronyms Used in the Report

<	Means less than
>	Means bigger than
*	Not a part of our accreditation
¤	Please see section regarding uncertainty in the Appendices
§	Deviation from method. Please see deviation section
a	The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out
b	The component originates from the substrate and is thus removed
c	The results have been corrected by the emission from the substrate
d	Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5ms GC column. A high degree of uncertainty must be expected
e	The component may be overestimated due to contribution from the system
SER	Specific Emission Rate

5.3.2 Explanation of ID Category

Categories of Identity:

1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.

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

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

4: Not identified, quantified as toluene equivalent.

5.4 Applied LCI Values

5.4.1 LCI/NIK Values for Compounds found after 28 Day Measurements

Compound	CAS No.	LCI [µg/m³]
3,5-Dimethyloctane *	15869-93-9	6000
2,2,4,6,6-Pentamethylheptane *	13475-82-6	6000
Other saturated aliphatic hydrocarbons C9-C16 *		6000

5.5 Description of VOC Emission Test

5.5.1 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 chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).
The recovery rates in the climate test chamber have been investigated using toluene and n-dodecane. The mean recovery rates of toluene and n-dodecane were concluded to be between 95 % and 100 % depending on the chamber size. These values comply with the criteria of a minimum mean recovery rate of 80 % stated in the 16000-9 test method.
Air sampling from the test chamber is carried out in a clean test chamber room at ambient air pressure and 23 ± 1 °C.

5.5.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

5.5.3 Testing of Carcinogenic VOCs

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) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

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 authentic response factors, or 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).

5.5.4 Testing of VOC, SVOC and VVOC

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) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All single substances that are listed with a LCI/NIK value in the latest publications (hereafter referred to as target compounds) are identified if present. All other appearing VOCs are identified as far as possible. Quantification of target compounds is done using the TIC signal and authentic response factors, or 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 non-target compounds, 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-C6) and n-hexadecane (n-C16)

- Semi-Volatile Organic Compounds (SVOC) are defined as: All substances eluting after n-hexadecane (n-C16) and before and including n-docosane (n-C22)
- Very Volatile Organic Compounds (VVOC) are defined as: All substances eluting before n-hexane (n-C6).

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 5 µg/m³. The TVOC can be expressed either in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6, or as the sum of concentrations using specific or relative response factors. In the case of summation of concentrations using authentic or relative response factors, the toluene equivalent is applied to all non-target and non-identified VOCs before summing up. Compounds regarded as VOC in line with the above definition but elute before n-C6 or after n-C16 on the HP-5 column are treated as VOC, and are thus 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/m³, as defined in EN 16516. VOCs that are regarded as VOC in line with the above definition, but elute after n-C16 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/m³ and expressed in toluene equivalents. VOCs that are regarded as VOC in line with the above definition, but elute before n-C6 in this test, are not added to the TVVOC.

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

5.5.5 Testing of Aldehydes

The presence of aldehydes 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.

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

Conversions of specific aldehydes from µg/m³ to ppm are done by the ideal gas law using a temperature of 23 degree Celsius and standard atmospheric pressure.

5.6 Quality Assurance

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

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

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.

5.7 Accreditation

The testing methods described above are accredited online 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.

5.8 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/product-testing/uncertainty/.

5.9 Version History

Report date	Report number	Modification
31/01/2024	392-2023-00576101_QE_EN	Current version


PANEL INNOVATION
An Industry First

THE BACKGROUND

As part of strides to create healthier, more sustainable building practices, the industry has developed a number of well-known, and well-utilised standards, in order to measure, monitor and assess our projects.

At Thorpes Joinery, we understand the pivotal role construction materials play in the overall impact of a building on both the environment and its occupants, and look for opportunities to lessen or negate this impact wherever possible.

On such opportunity was presented on one of our projects 'Project Emerald', which carried a clear and ambitious target: to create the country's healthiest workspace.

Clearly, BREEAM (Building Research Establishment Environmental Assessment Method) and WELL building standards were going to take centre stage, with "Outstanding" and "Platinum" expected at a minimum.

THE CHALLENGE

As part of our shared commitment with Overbury and our client, we sought areas for innovation, and aimed to identify problem areas within the project.

On such issue identified was the use of Volatile Organic Compounds (VOCs).

Commonly found in many construction materials, especially lacquers, VOCs can contribute to indoor air pollution, posing potential health risks and environmental harm.

For example, a recent study* found that after the application of lacquer VOC concentration increased greatly, with the amount released jumping by over 200%.

There have been efforts to reduce this, with new products and techniques hitting the market, but there have been limited practical applications so far.

**Wang, Q., Zeng, B., Shen, J. et al. Effect of lacquer decoration on VOCs and odor release from P. neurantha (Hemsl.) Gamble. Sci Rep 10, 9565 (2020). https://doi.org/10.1038/s41598-020-66724-0*

THORPES JOINERY

Product tested

18mm MDF
Faced with pure timber veneer
(Compatible with American Black Walnut)
With a clear semi matt euro class B lacquer
Overall panel performs to euro class B

Testing body

eurofins

Eurofins is the world market leader for VOC emission chamber testing with more than 20 years experience in delivering reliable test results

For example BREEAM requirements are:

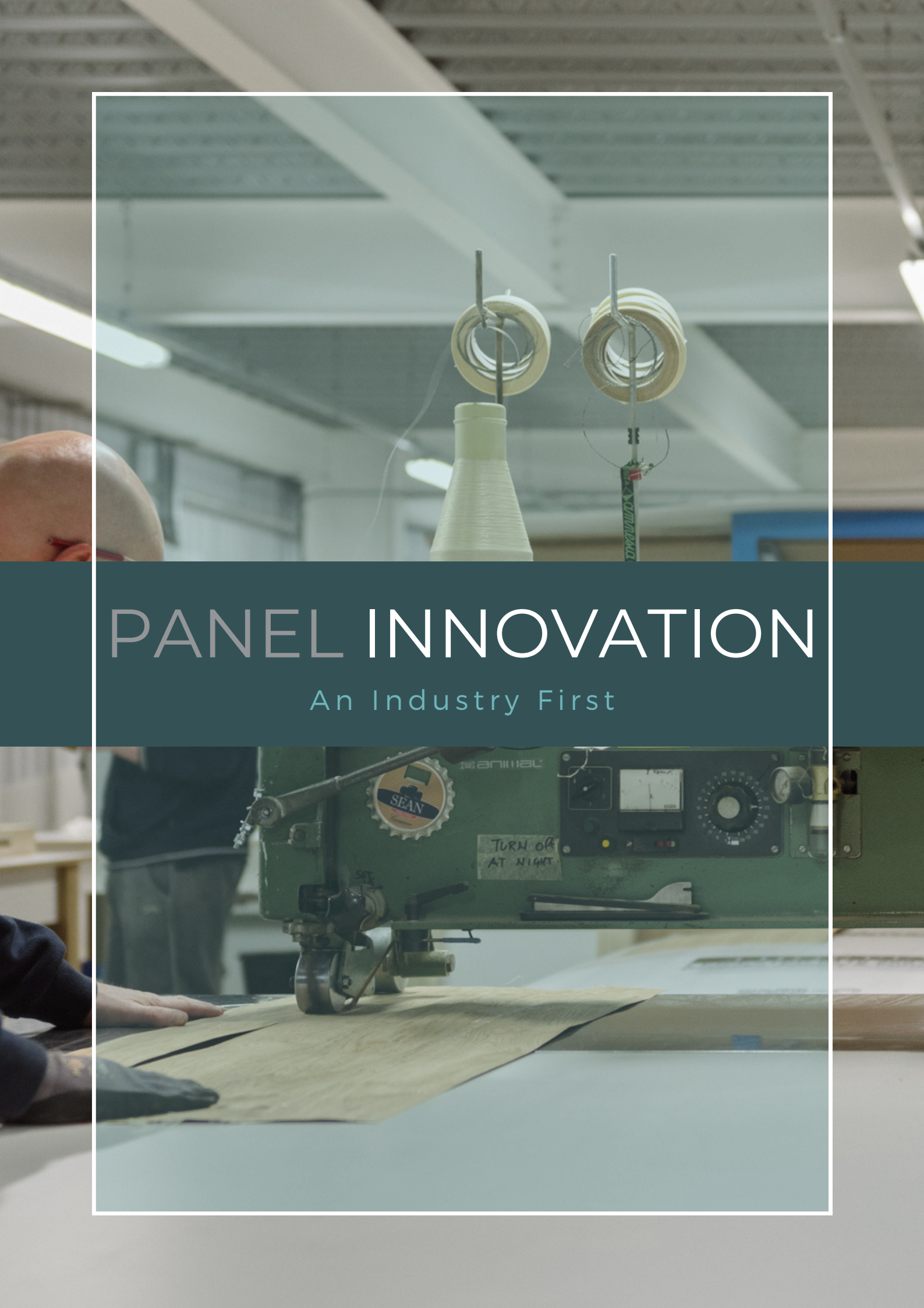
To gain this credit, formaldehyde and TVOC concentration levels must be within specified limits OR corrective measures put in place to meet these limits.

There are two measures that must be met in order to gain this credit. These levels are measured post-construction, but pre-occupancy.

- The formaldehyde concentration level needs to be less than or equal to 100µg/averaged over 30 minutes. **Thorpes = 24µg/averaged over 30 minutes**
- The total volatile organic compound (TVOC) concentration level needs to be less than 300µg/over 8 hours. **Thorpes = 100µg/over 8 hours**

As the test below have measured against regulations in France, Italy, Germany and Belgium we have classed these as European

VOC	European VOC regulation	European construction component VOC	Eurofins Indoor Air Comfort	BREEAM International V6	BREEAM NOR V6	EU Taxonomy
Formaldehyde	Pass	Pass	Pass	Pass	Pass	Pass
Acetaldehyde	Pass	Pass	Pass	Pass	Pass	Pass
Toluene	Pass	Pass	Pass	Pass	Pass	Pass
Tetrachloroethylene	Pass	Pass	Pass	Pass	Pass	Pass
Xylene	Pass	Pass	Pass	Pass	Pass	Pass
1,2,4 - Trimrthlbenzene	Pass	Pass	Pass	Pass	Pass	Pass
1,4 - Dichlorobenzene	Pass	Pass	Pass	Pass	Pass	Pass
Ethylbenzene	Pass	Pass	Pass	Pass	Pass	Pass
2-Butoxyethanol	Pass	Pass	Pass	Pass	Pass	Pass
Styrene	Pass	Pass	Pass	Pass	Pass	Pass
TVOC (total volatile organic compounds)	Pass	Pass	Pass	Pass	Pass	Pass



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THE DEVELOPMENT

The challenge of sourcing Class B fire rated lacquer that meets BREEAM and WELL standards prompted a shift towards product testing.

We set out to achieve what we believe to be an industry-first: a veneered, MDF panel finished in a Class B, water-based lacquer that would meet the stringent requirements of both WELL and BREEAM.

This process involved creating a unique build-up for the product, before sending for testing in Denmark with Eurofins: the world market leader for VOC emission chamber testing.

Once there, it was subjected to a 28-day chamber test.

This test showcased a VOC level of ≤160 µg/m3 , and a Formaldehyde Level of 130 µg/m3, comfortably below the WELL threshold of 0.01mg/m3.

The product also demonstrated compliance with various regulations, including French VOC Regulation, French CMR components, Italian CAM Edilizia, ABG/AgBB, Belgian Regulation, and Indoor Air Comfort standards.

THE IMPACT

The introduction of our timber veneered panel has had a profound impact on our service offerings in the commercial fit-out market.

Beyond the technical achievements, the development process emphasized a careful sourcing approach, leveraging supplier relationships and industry knowledge spanning decades.

The commitment to sustainability is evident in the responsible sourcing certificates for the substrate and veneer (FSC Compliant). Additionally, the adhesives and lacquer components are procured from companies with 'ISO 14001 integrated management systems' certificates, affirming their dedication to sustainable operations.

The implications of this innovation extend far beyond the technical realm.

The new product not only meets high standards for emissions and fire regulations but also contributes to creating a cleaner workspace without compromising aesthetics or performance.

Architects, designers, and contractors now have access to a sustainable material that not only enhances the aesthetic appeal of their projects but also contributes to a healthier indoor environment.

THORPES JOINERY

Product tested

18mm MDF
Faced with pure timber veneer
(Compatible with American Black Walnut)
With a clear semi matt euro class B lacquer
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