

# Study of emissions from linseed oil-based paints from Allbäck linseed oil products AB

## II - Emissions test of Allbäck's linseed oil paint

### Introduction

The study in hand is a continued investigation of Allbäck's linseed oil-based products with the same purpose as the earlier investigation, namely to map out possible exposure and emission risks and health hazards or other problems thereof.

### Assignment

To investigate Allbäck's white linseed oil paint (representative of other shades) in respect of emission tendencies, through standardised emissions measurements according to the Swedish Paint Manufacturers Association's (SVEFF) trade standard "Chemical emissions from paint and varnish".

### Investigation methods

The use of laboratory able to carry out this type of emissions test and analyse the type of substances that are characteristic of linseed oil-based paints.

Contacts: the person responsible at the laboratory and Allbäck's representative.

Evaluation of the test based on emissions data after 4 and 26 test weeks respectively.

(After receiving bids, the laboratory SP - Sveriges Testings och Forskningsinstitut was engaged to carry out the tests on Allbäck's white linseed oil paint with specification (list of ingredients) as in Appendix 1.)

### Test methodology

See appendix 2 "Measurement of emission factors using the equipment 'Field and Laboratory Emission Cell' FLEC), General Description."

### Results and Evaluation

Based on the results of the emissions test (Appendix 3) and the Trade Recommendations (Appendix 4) and other studies (toxicological and olfactometric) from the Working Environment Institute (Arbetsmiljö institutet) in Denmark (Appendix 5) we reached the following conclusions from the results:

Emissions testing of Allbäck's linseed oil paint, white, showed the following results in respect of the emission factor for volatile organic compounds:

Emission factor, TVOC 64 f.lg/( m<sup>2</sup> x h ) after 4 weeks testing and

Emission factor, TVOC 18 f.lg/( m<sup>2</sup> x h ) after 26 weeks testing.

When compared with the Swedish Paint Manufacturers Association's (Sveriges Färgfabrikanters Förening) trade recommendations, the emission factor (tendency to emit) was average « 100 f.lg/( m<sup>2</sup> x h ) » after 4 weeks and low « 40 f.lg/( m<sup>2</sup> x h ) » after 26 weeks. The paint can therefore be considered to be a very low emitting paint.

With the purpose of judging the paint's tendency to give off odour or give rise to health problems, we have taken as a starting point the emission factors for the individual substances that the paint can emit.

Results in respect of the emissions of individual substances that were analysed and identified in the same emission testing showed the following emission factors after 4 and 26 weeks testing:

Substance	Emission factor (Jlg/( m <sup>2</sup> x h )	
	After 4 weeks	After 26 weeks
Propane acid + Unidentified Substances	10	<5
Hexanal	10	<5
Nonanal	5	5
Formaldehyde	< 10	< 10
Acetaldehyde	< 10	< 10
Propanal	24	< 10
Acrolein	None	None

The *theoretical concentration* (f·Lg l m<sup>3</sup>) of each substance can be calculated from its emission factor and load factor (painted surface in relation to cubic area) and ventilation in the room according to the following:

$$\text{Emission factor (f·Lg/m}^2\text{ h)} \times \text{Load factor (m}^2\text{/m}^3\text{)} \div \text{Air exchange rate (n/h)}$$

Through comparing the calculated theoretical concentration with the Danish Working Environment Institute's (Arbetsmiljøinstituttet) odour threshold and irritation levels (VOC.-base AMI Denmark) for the individual substances, we are able to assess the risk of odour and health problems (irritations) caused by emissions from the paint.

The calculation of theoretical concentration has been effected for two individual substances: Nonanal, with the lowest odour threshold value, and formaldehyde, with the lowest irritation threshold value according to the table in Appendix 5.

The calculations were based on the emission factors for nonanal and formaldehyde after 26 weeks testing and various conditions as set out in the table below:

Conditions:	Theoretical concentration of Nonanal J.l2lm <sup>3</sup>	Theoretical concentration of Formaldehve J.l2: l m <sup>3</sup>
Window material surface 2 m <sup>2</sup> Air exchange rate 0.1 n/h Floor area 60 ml Ceiling height 2.40 m	0.69	<1.39
Window material surface 2 m <sup>2</sup> Air exchange rate 0.5 n/h Floor area 60 ml Ceiling height 2.40 m	0.14	<0.28
Window material surface 4 m <sup>2</sup> Air exchange rate 0.1 n/h Floor area 100 ml Ceiling height 2.80 m	0.71	< 1.43
Window material surface 4 m <sup>2</sup> Air exchange rate 0.5 n/h Floor area 100 ml Ceiling height 2.80 m	0.14	< 0.29

*The odour threshold level for nonanal is 13 f.lg/m<sup>3</sup>; The irritation threshold level for formaldehyde is 150 f.lg/m<sup>3</sup>*

All calculated values are clearly under (< 100) the odour threshold level and irritation level for two of the most important emitted substances. The calculations thus show, given the stated conditions, that the risk of odour or irritations on account of the linseed oil-based paint is very small, even here there is very little air exchange in the room/apartment (corresponding to natural draught ventilation).

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