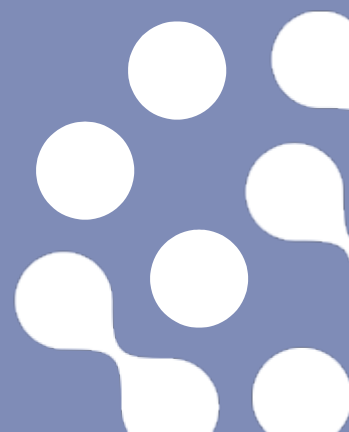


UPC Consulting Ltd, Vaasa

**C_xH_y emission measurement of the
printing machines flue gases after
catalyst system 10.-11.10.2023**

DISTRIBUTION
UPC Consulting Ltd, Kaj Stagnäs (pdf)
Eurofins Nab Labs Oy



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Summary

Orderer: UPC Consulting Ltd/UPC Print
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Contact person: Kaj Stagnäs

Assignment: Quote OP0000778124KDI
C_xH_y emission measurements of the printing machines flue gases after catalyst

Date: 10.-11.10.2023

Meas. staff: Ari Lehtola ja Elias Pasma

Calculated by: Tatu Soikkeli

Reported by: Miia Perälä, miaperala@eurofins.fi

Results: Tables 2, 3 and 4

Eurofins Nab Labs Oy, 12.4.2024



Miia Perälä
M.Sc. (Tech.)

1 General

Eurofins Nab Labs Ltd carried out emission measurements of the printing machines flue gases on 10.-11.10.2023.

The measurements were done by Ari Lehtola and Elias Pasma. Miia Perälä reported results.

2 The measuring methods

Eurofins Nab Labs Oy is accredited by Finnish Accreditation Services (code T111), accreditation requirement SFS-EN ISO/IEC 17025. The measurements and calculations were carried out using methods listed in table 1. Accredited methods are marked with asterisk (*).

Table 1. Measuring methods

Comp	Device	Method	Meas.range	Meas.mode	Standard	Calibr. gas
TVOC*	Testa	Flame ionisation	1-1000 ppm	wet basis	EN 12619:2013 "Determination of the mass concentration of total gaseous organic carbon".	15,43 mg/m ³ n C ₃ H ₈ ± 1 % no. 231
Flow rates*	Pitot-tube, manometer (TSI)		5-40 m/s		ISO 16911-1:2013 In-house method MO-ILMA-6021	

The temperatures were measured by K-type thermocouples. Intab PC-logger, recording interval minute, collected the measuring data. The flow rate measurements data were collected by hand.

3 Results

The measurement results are shown in tables 2 - 4. Results are expressed as average concentration in normal temperature and pressure (273 K, 101,3 kPa), referred as NTP.

The reported uncertainty in tables 2-4 is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Table 2. The results of emission measurements (Lithoman Elephant, channel diameter 600 mm).

Date	11.10.2023
Check point	Flue gas after catalyst
Time	8:19-10:03
Printed product	(app. 3)
C_xH_y (ppm) wet (C₃H₈ eqv.)	5,1 ± 1,2
C_xH_y (mg_{TVOC}/m³NTP) wet	8,2 ± 1,8
Temperature (°C)	311 ± 2
Volume flow (m³ n/s) wet	2,1 ± 0,1
C_xH_y emission (mg_{TVOC}/s)	16,9 ± 3,7

Table 3. The results of emission measurements (Rotoman, channel diameter 600 mm).

Date	10.10.2023
Check point	Flue gas after catalyst
Time	10:02-13:18
Printed product	(app. 1)
C_xH_y (ppm) wet (C₃H₈ eqv.)	1,4 ± 1,2
C_xH_y (mg_{TVOC}/m³NTP) wet	2,2 ± 1,8
Temperature (°C)	343 ± 2
Volume flow (m³ n/s) wet	0,8 ± 0,1
C_xH_y emission (mg_{TVOC}/s)	1,7 ± 1,2

Table 4. The results of emission measurements (Lithoman Mammoth, channel diameter 800 mm).

Date	10.10.2023
Check point	Flue gas after catalyst
Time	14:55-16:14
Printed product	(app. 2)
C_xH_y (ppm) wet (C₃H₈ eqv.)	1,3 ± 1,2
C_xH_y (mg_{TVOC}/m³NTP) wet	2,1 ± 1,8
Temperature (°C)	336 ± 2
Volume flow (m³ n/s) wet	0,7 ± 0,3
C_xH_y emission (mg_{TVOC}/s)	1,5 ± 1,4

The measured TVOC-concentrations of all three printing machines were below emission limit value 20 mgC/Nm³ (LSSAVI/216/04.08/2011, dated 9.12.2014).

Appendix 1:

Printed product during measurement period 1 (10.10.2023 at 10:02-13:18/ Rotoman)

Appendix 2:

Printed product during measurement period 2 (10.10.2023 at 14:55-16:14/ Lithoman Mammoth)

Appendix 3:

Printed product during measurement period 3 (11.10.2023 at 8:19-10:03 Lithoman Elephant)