

MEASUREMENT OF ENVIRONMENTAL EMISSIONS

DURING

SURFACE TREATMENT OF METAL

at

DUNLOP AEROSPACE BRAKING SYSTEMS
HOLBROOK LANE
COVENTRY
WARWICKSHIRE
CV6 4AA

REPORT NO:	OEH/33550/STAK/SD143	CLIENT REF:	Service Contract: 451120
DATE OF VISIT:	31 January 2005	CONTACT ON SITE:	Mr Dave Warrington
DATE OF REPORT:	14 February 2005	DISK REFERENCE:	N:\Consultants\$\Air Quality\Paul Calland\Jobs 2003-2004\33550 Dunlop\OEH 33550 CS F.doc 14/02/2005 09:08

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EXECUTIVE SUMMARY

Date Of Test & Test Areas

Emissions sampling for Oxides of Nitrogen, Nitric Acid Mist and Hydrogen Fluoride from the Metal Treatment processes stack conducted on 31st January 2005.

Test Conditions

All processes were being operated under normal conditions throughout the sampling periods.

Compliance

Full compliance with the authorisation was achieved during this survey.

Surveyed and Reported by:

Verified by:

Paul Calland
Environmental Scientist

Andy Barnes *BSc (Hons)*
Environmental Scientist

for and on behalf of OEH Group Limited

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1 INTRODUCTION

1.1 Purpose of Survey

The aim of the survey described in this report was to verify compliance with the requirements of the Local Authority Authorisation and the relevant Process Guidance Note, PG4/1(95) - Processes for the surface treatment of metals.

1.2 Terms of Reference

Dunlop Aerospace Braking Systems, Holbrook Lane, Coventry, Warwickshire, CV6 4AA, has commissioned OEH Group Limited to carry out the work described in this report. Monitoring was carried out on 31st January 2005, by Paul Calland, at the request of Mr Pat Cullen.

The work was carried out in accordance with OEH Proposal ref: AL-11275 & 6, dated 18th November 2004, and the client's instructions as set out in Service Contract Ref: 451120.

OEH Group is accredited under ISO-9002 for the provision of health, safety and environmental consultancy services. The work described in this report was carried out in accordance with our ISO-9000 Standard Operating Procedures and Level III: Consultancy Work Instructions. The field sampling and interpretations made in this report are not covered by the scope of OEH's accreditation under UKAS.

1.3 Plant conditions

Production schedules on the dates of the survey were described as normal. Thus, the data reported herein must be considered typical and representative of the environmental levels experienced during normal daily workloads on this site.

2 PROCESS DESCRIPTION

Dunlop Aerospace Braking Systems carry out surface preparation and treatment of aluminium, stainless steel and titanium aviation components at their site in Holbrook Lane, Coventry. The process is prescribed by virtue of the use of nitric and hydrofluoric acids for passivation and surface etching, including de-smutting of metals.

The processes are described in detail in previous OEH Reports.

3 METHODS

3.1 Stack Sampling

3.1.1 Stack Velocity & Temperature Measurements

Stack velocity was investigated using an ellipsoidal nosed pitot tube coupled to an electronic manometer. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer. The procedure is designed to fulfil the main procedural requirements of BS EN 13284: 2002 for the preliminary flow and temperature traverse and for the calculation of volumetric flow rate.

The manometer and thermometer are subject to regular calibration by a UKAS accredited test house using NPL traceable standards.

need to provide calibration certificates.

Diagram may help

3.1.2 Oxides of Nitrogen

Periodic extractive sampling for the oxides of nitrogen (NO, NO₂ & NO₃) was carried out to the main procedural requirements of EPA 7, using a pre-calibrated portable pump connected to an impinger containing a solution of sulphuric acid/ hydrogen peroxide. Analysis is by Ion Chromatography.

need to state what this is

3.1.3 Nitric Acid Mist

Periodic extractive sampling for nitric acid (NO₃) mist was carried out to the main procedural requirements of NIOSH 7903, using a pre-calibrated portable pump connected to a silica gel adsorption tube. Analysis is by Ion Chromatography.

was silica gel positioned after final bottle?
flow thru system controlled by needle? calibrated gas meter?

3.1.4 Fluorides

Periodic extractive sampling for fluorides was conducted using a calibrated pump connected to an impinger sampling train containing solutions of 0.1N Sulphuric acid (H₂SO₄) and 0.1N Sodium Hydroxide (NaOH). The method is based on, and intended to satisfy the main procedural requirements of USEPA 26. Analysis is by Ion Chromatography.

does not have to meet do it as App 2 samp pg 411

3.2 Analysis

3.2.1 Techniques & Detection Limits

Analyte	Analysis Technique	Detection Limit	Analytical Precision, %	Method Reference
Oxides of Nitrogen	Ion Chromatography	1 µg	10	EPA 7
Nitric Acid Mist	Ion Chromatography	1 µg	10	NIOSH 7903
Halogens & Halides	Ion Chromatography	1 µg	10	USEPA 26

3.2.2 Accreditation

Service Category	ISO 9002	UKAS ¹
Consultancy	Yes	No
Analysis		
- Anions; Based on Various MDHS, NIOSH, EPA & internal methods	Yes	No
¹ UKAS lab number 1821		
Stack sampling team is a member of the Source Testing Association		

4 PRESENTATION OF RESULTS

The following table gives summary details of the mean emission concentrations measured for all parameters.

Sampling Position	Mean Total NO _x Emission (mg.m ⁻³)	Mean Nitric Acid Mist Emission (mg.m ⁻³)	Mean HF Emission (mg.m ⁻³)
Metal Treatment Stack	7.5	4.2	0.03

Results reported at Standard Conditions of 273K and 101.3kPa, no correction for water vapour content.

Appendix I of this report lists in tabular form details of the results for all parameters. For ease of interpretation, the data are classified under the following columns.

- Location of sampling and activity monitored.
- Time of sampling.
- Analyte monitored.
- Release limits, in milligrammes per cubic metre.
- Stack release concentrations, in milligrammes per cubic metre. Release data were corrected for standard temperature (273K), and pressure (101.3kPa).

Stack Parameters; Mean air velocity (m/sec), mean volume flow rate (Nm³/hr), mean temperature (°C), cross sectional area (m²).

5 DISCUSSION

The processes monitored are covered, a Local Authority Authorisation and by the Secretary of States Guidance Note PG4/1(95) – Processes for the surface treatment of metals. The following emission limits apply:

Parameter	Emissions Limit
Oxides of Nitrogen	400 mg.m ⁻³ (1 hour mean)
Hydrogen Fluoride	10 mg.m ⁻³ (1 hour mean)

5.1 Oxides of Nitrogen

Emission levels of total oxides of nitrogen from the stack, at an average of 7.5 mg.m⁻³, were significantly below the 400mg.m⁻³ limit.

5.2 Nitric Acid Mist

Emission levels of nitric acid from the stack averaged 4.2 mg.m⁻³, and made up around 60% of the total NO_x emission.

5.3 Hydrogen Fluoride

Emission levels from the stack, at an average of 0.03mg.m⁻³, were significantly below the 10 mg.m⁻³ limit.

6 CONCLUSIONS

From the data reported it can be seen that the processes demonstrate compliance with the authorisation and Process Guidance Note under normal and typical workloads.

7 APPENDICES

Appendix I: Detailed Results Table

APPENDIX I
DETAILED RESULTS TABLE

RELEASE DATA FOR DUNLOP AEROSPACE BRAKING SYSTEMS

ENVIRONMENTAL RELEASE LEVELS			
STACK REFERENCE AND ACTIVITY MONITORED	Metal Treatment Stack		
TIME OF SAMPLING	10:00 – 11:00		
DATE OF SAMPLING	31 st January 2005		
ANALYTE(S)	UNITS	RELEASE LIMIT	ENVIRONMENTAL RELEASE LEVELS
Total Oxides of Nitrogen	mg.m ⁻³	400	8.2
Nitric Acid Mist	mg.m ⁻³	n/a	5.4
Hydrogen Fluoride	mg.m ⁻³	10	0.03
STACK PHYSICAL PARAMETERS			
Mean Air Velocity	m/sec	± 10%	5.2
Mean Volume Flow Rate	Nm ³ /hr	± 10%	27076
Mean Temperature	°C	± 1%	18
Cross Sectional Area	m ²	± 1%	1.540

Release data and stack flow parameters have been corrected for standard temperature (273°K) and pressure (101.3kPa) but no correction has been made for water vapour.

Plant Type	Metal Treatment	Stack Area (m ²)	1.540
Job Number	OEH 333550	Ambient Temp (C)	16
Client Name	Dunlop ABS	Stack Diameter (cm)	140
Date	31-Jan-05	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	20
		Ambient Pressure (kPa)	101.3

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	6	10	14	18	20	22	20	19	14	9
Temperature (°C)	18	18	18	18	18	18	18	18	18	18
Duct Velocity (m/s)	3.1	4.1	4.8	5.4	5.7	6.0	5.7	5.6	4.8	3.9
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	10	15	17	21	23	25	27	22	17	10
Temperature (°C)	18	18	18	18	18	18	18	18	18	18
Duct Velocity (m/s)	4.1	5.0	5.3	5.9	6.2	6.4	6.7	6.0	5.3	4.1

Absolute Mean Duct Velocity (m/s) 5.2
Absolute Flow Rate (m³/hr) 28856
Normalised Flow Rate (Nm³/hr) 27076