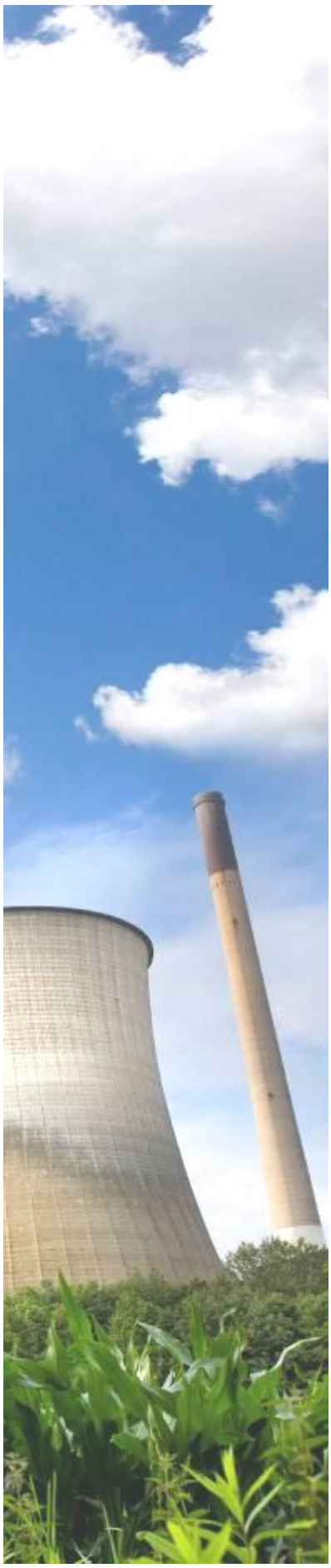
REC
Resource & Environmental Consultants Ltd

UKAS TESTING 2082



MONITORING OF EMISSIONS FROM THE ALUMINIUIM CASTING PROCESS

26 June 2012

Prepared for Sarginsons Industries Ltd

REC Report 71434p1r0

Issued: 20 July 2012

REC Air Quality

GREEN ACHIEVER

SAFEcontractor APPROVED

Prepared for:

Sarginsons Industries Ltd
Torrington Avenue
Coventry
CV4 9AG

Prepared by:

REC Ltd
Unit 19 Bordesley Trading Estate
Bordesley Green Road
Birmingham
B8 1BZ
Tel : 0121 326 7007
Fax : 0121 328 1689
E-mail : sales@recltd.co.uk
Web :www.recltd.co.uk

Issued : 20 July, 2012
Reference : 71434p1r0

Prepared by : _____ [redacted] _____
Michelle Edwards, Team Leader
MM05 659, MCERTS Level 2 TE1 & 2

[redacted]

Reviewed by : _____
Paul Jones, Principal Emissions & Air Quality Cons.
MM02 021, MCERTS Level 2 TE1-4

CONTENTS **Page No.**

EXECUTIVE SUMMARY

Resource & Environmental Consultants (REC) Ltd was commissioned by Sarginsons Industries Ltd to monitor emissions of particulate matter released from process vents from the Aluminium casting process at their site in Coventry.

In accordance with the requirements of their site permit, monitoring has been undertaken for the following pollutants:-

Species	UKAS Accreditation Status	Emission Concentration (mg/Nm^3)	Permit Limit (mg/Nm^3)
Wet Arrestor Stack	B	33.7	50
Dry Arrestor Stack	B	20.4	50

NOTE 1: All data are expressed in mg/Nm^3 at 273K, 101.3kPa, without correction for moisture and oxygen content unless otherwise stated.
NOTE: UKAS Status:- . (B) REC Ltd accredited for sampling only, UKAS accredited analysis conducted by SAL Ltd.

1. INTRODUCTION

1.1 Background

Sarginsons Industries Ltd commissioned REC Ltd to conduct an emission monitoring survey on the Aluminium Casting process at their site in Coventry.

1.2 Scope of the Survey

An emission monitoring survey was required to determine the release concentrations of Particulate matter from two process stacks:

- Wet Arrestor Stack
- Dry Arrestor Stack

Ancillary measurements of stack dimensions, temperature and velocity were also made.

All results were to be reported at 273K, 101.3kPa, wet gas without correction for oxygen content.

1.3 Sampling Personnel

Monitoring was conducted by the following REC Ltd permanent staff:-

- Paul Jones - Team Leader, MM02 021, MCERTS Level 2, TE1-4
- Michelle Edwards - Assistant, MM05 659, MCERTS Level 2, TE1&2

2. METHODOLOGY

2.1 Species & Techniques

The following table shows the reference methods used for the emission monitoring survey:

Species	UKAS Status	Method	Uncertainty (±%)	Limit of Detection
Moisture	A	In house method MM0010 based on BS EN 14790	20	0.1%vol
Particulate Matter	B	In house method MM0004 based on BS EN 13284	10	1 mg/m^3

NOTE: UKAS Status:- (A) REC Ltd accredited for sampling and analysis. (B) REC Ltd accredited for sampling only, UKAS accredited analysis conducted by SAL Ltd.

2.2 Sampling & Analytical Methodology

Total Particulate Matter

To determine the concentration of particulate matter in emissions, isokinetic stack sampling equipment satisfying the requirements of BS EN 13284 was utilised and in-house method MM0004 followed.

The Standard describes the methodology for measuring particulate matter under defined conditions and at discrete locations in the duct. Sampling is carried out under isokinetic sampling conditions i.e. the flowrate through the sampling nozzle is adjusted to equal the flowrate in the duct at the sampling positions. Velocity pressures were recorded throughout the monitoring period by means of an 'S' type pitot integral to the sampling probe and nozzle assembly.

A sample of the exhaust stream was removed from the stack via a titanium nozzle and titanium lined heated probe. It was then passed through a quartz fibre filter contained in a heated oven compartment. The temperature of the probe and filter box were maintained at 160ºC i.e. above the dew point of the stack gases, to ensure moisture did not condense on the filter. Each filter used complied with the requirements of Section 6.2.7 of BS EN 13284-1:2001 in that the efficiency was better than 99.5% for particles of 0.3µm diameter (or 99.9% for particles of 0.6µm diameter).

The impinger train was seated in a water bath to cool the gas stream and condense out less volatile gases and water vapour.

The first two impingers encountered by the gas stream contained deionised water. The third impinger was left empty and the fourth contained anhydrous silica gel which was used to dry the gas stream before passing it through a dry gas meter (DGM) to measure the volume of gas sampled.

All the impingers were weighed before and after the sampling run in order to determine the mass of water condensed by the impinger train (in house Method MM0010).

The sample volume collected was in excess of the minimum requirement stated in MM0004. The minimum sample volume ensures the results would be representative of normal plant operating conditions.

Upon completion of sampling, the filter was removed to a clean petri dish, labelled and sealed. The probe and filter housing were rinsed with acetone and water. The washings were collected in a container and submitted for analysis along with the filter.

2.3 Laboratory Analysis

An approved UKAS accredited sub-contractor (SAL Ltd) would undertake the sample analysis for particulate matter.

A copy of the Certificate of Analysis is enclosed in Appendix 1.

3. SAMPLING AND OPERATIONAL DETAILS

3.1 Process Description

The operations at Sarginsons Industries Ltd are authorised under a Part B permit issued by the Local Authority under the Environmental Permitting Regulations, 2010.

The process is therefore under Local Authority regulation and must demonstrate compliance with the emission limits stipulated in the site permit: PPC/020

The site is involved in the production of complex aluminium casts using both low pressure sand and gravity die-casting processes. Both wet and dry arrestors are installed on such processes, assisting in the filtration of fine sand and aluminium particles before they are released out to atmosphere.

These continuous processes operate independently, and are fuelled primarily by electricity.
The wet arrestor process utilises a wet scrubber method of abatement, whilst the dry arrestor utilises a bag filter system.

3.2 Sampling Positions

On the wet and dry arrestor stacks, 2 x 4" BSP sampling ports were installed on a rectangular duct. However due to access restrictions caused by the platforms provided, only one sampling port provided reasonable access for monitoring on each stack. The sampling points provided were at least 4 x hydraulic diameters upstream and less than 4 x hydraulic diameters downstream from any flow disturbance.

The sample port size does not fully comply with the positional requirements of Environment Agency Technical Guidance Note M1 (EA TGN M1). EA TGN M1 requires 2 x 5"BSP sockets to be fitted, However the initial temperature and velocity traverses conducted along the sample planes showed that the flow requirements of EA TGN M1 were met.

Diagrams detailing the sampling positions and taken from Site Worksheets are provided in Appendix 2.

3.3 Uncertainty

Due to the small size of the platforms provided on both the wet and dry arrestor stacks only a single sample plane could be utilised.
On the dry arrestor stack, only a limited number of sample points could be achieved. This will increase the measurement uncertainty from the standard ±10%

On the wet arrestor stack the number of sample points was increased over the single sample plane, therefore the standard measurement uncertainty would apply.

REC has calculated uncertainty budgets for all of the pollutants listed in the Method Details Table in Section 2.1 above in accordance with calculations and methodology supplied by the Source Testing Association (STA). These uncertainties are quoted in the Tables section of this report.

3.4 Emission Monitoring Survey Details

The emission monitoring survey was carried out on the Aluminium Casting process on the 26 June 2012. The table below summarises the actual sampling periods.

SAMPLING PERIODS

Stack	Parameter	Sample Time (& Date)
Wet Arrestor Stack	Particulates	10:18 - 10:58 (26/06/12)
Dry Arrestor Stack	Particulates	12:08 - 12:48 (26/06/12)

4. RESULTS AND DISCUSSION

4.1 Initial Velocity and Temperature Traverse

An initial pitot-static pressure and temperature traverse was carried out. From these data stack velocity, expressed in metres per second (m/s), and volumetric flowrates expressed in cubic metre per hour (m^3/hr) have been calculated.

The results are reported at actual stack conditions and the volumetric flowrate is further expressed at the standard reference conditions of 273K, 101.3kPa i.e. standard temperature and pressure (STP). The results are summarised in Table 1.

4.2 Particulate Matter

The results of the particulate sampling runs are summarised in Tables 2 and 3. From the mass of particulate matter on the filter and in the acetone/water wash residue and volume sampled an emission concentration was calculated.

The results are expressed in mg/m^3 at 273K, 101.3kPa, without correction for water vapour content.

====== End of Report Text ======

TABLES

TABLE 1

FLOW DATA

Stack Ref.	Stack Temp	Av Pitot ΔP	Duct Size	X-Sect. Area	Velocity (actual)	Volume Flow (m^3/hr)	
	(^{0}C)	(Pa)	(cm)	(m^2)	(m/s)	(actual)	(@ ntp)
Wet Arrestor Stack	27	19	48*46	0.221	5.7	4,568	4,154
Dry Arrestor Stack	27	177	90*90	0.810	17.4	50,596	46,043

TABLE 2

PARTICULATE EMISSION DATA SUMMARY – WET ARRESTOR STACK

DATE:26/06/12 **10:18 - 10:58**

Sampling Data	
Run Time (min)	**40**
Total mass H_2O collected (g)	**9.9**
Pitot tube constant, Cp	**0.82**
Dry gas meter (DGM) volume (m^3)	**1.392**
Temperature DGM (^oC)	**21**
Temperature stack (^oC)	**28**
Mean pitot tube pressure drop, delta P (mm H_2O)	**5.6**
Orifice meter pressure drop, delta H (mm H_2O)	**116.0**
Barometric Pressure (kPa)	**100.6**
X-sectional area of stack (m^2)	**0.221**
Nozzle size (mm)	**10.08**
Flow Data	
Velocity, actual (m/s)	**8.0**
Velocity, ntp (m/s)	**7.2**
Vol. Flow, actual (m^3/hr)	**6,373**
Vol. Flow, ntp (m^3/hr)	**5,760**
Volume sampled, ntp, dry gas (m^3)	**1.312**
Volume sampled, ntp, wet gas (m^3)	**1.324**
Analytical Data	
Filter Weight Gain (mg)	**6.6**
Acetone Wash Residue Weight (mg)	**38.0**
Total Particulates (mg)	**44.6**
Partics Field Blank (mg)	**0.8**
Blank % of ELV	**1.2**
Emission Data	
H_2O (% vol)	**0.9**
Percentage Isokinetic	**95.4**
Particulates (mg/m^3)	**33.7**
Uncertainty (± mg/m^3)	**0.8**

TABLE 3

PARTICULATE EMISSION DATA SUMMARY – DRY ARRESTOR STACK

DATE:26/06/12 **12:08 - 12:48**

Sampling Data	
Run Time (min)	**40**
Total mass H_2O collected (g)	**13.3**
Pitot tube constant, Cp	**0.82**
Dry gas meter (DGM) volume (m^3)	**1.550**
Temperature DGM (^oC)	**23**
Temperature stack (^oC)	**28**
Mean pitot tube pressure drop, delta P (mm H_2O)	**29.8**
Orifice meter pressure drop, delta H (mm H_2O)	**133.0**
Barometric Pressure (kPa)	**100.6**
X-sectional area of stack (m^2)	**0.221**
Nozzle size (mm)	**6.86**
Flow Data	
Velocity, actual (m/s)	**18.5**
Velocity, ntp (m/s)	**16.7**
Vol. Flow, actual (m^3/hr)	**14,697**
Vol. Flow, ntp (m^3/hr)	**13,279**
Volume sampled, ntp, dry gas (m^3)	**1.452**
Volume sampled, ntp, wet gas (m^3)	**1.468**
Analytical Data	
Filter Weight Gain (mg)	**13.0**
Acetone Wash Residue Weight (mg)	**17.0**
Total Particulates (mg)	**30.0**
Partics Field Blank (mg)	**1.8**
Blank % of ELV	**2.5**
Emission Data	
H_2O (% vol)	**1.1**
Percentage Isokinetic	**99.0**
Particulates (mg/m^3)	**20.4**
Uncertainty (± mg/m^3)	**0.5**

APPENDIX 1

Certificate of Analysis

Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514788) whose address is at
Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2404

Report Number: 286061-1

Date of Report: 12-Jul-2012

Customer: Resource Environmental Consultants Ltd
Unit 19
Bordesley Trading Estate
Bordesley Green Road
Birmingham
B8 1BZ

Customer Contact: Ms Michelle Edwards

Customer Job Reference: 71434
Customer Site Reference: 26/06/2012
Date Job Received at SAL: 06-Jul-2012
Date Analysis Started: 09-Jul-2012
Date Analysis Completed: 12-Jul-2012

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs

UKAS TESTING
1549

Report checked
and authorised by :
Mary Drury
Project Manager

Issued by :
Mary Drury
Project Manager

Signature Not Verified
Digitally signed by Mary Drury
Date: 2012.07.12 17:31:06 BST
Reason: Issue
Location: SAL

SAL Reference: 286061
Project Site: 26/06/2012
Customer Reference: 71434

Wash(Acetone) Analysed as Wash(Acetone)
Miscellaneous

				SAL Reference	**286061 002**	**286061 004**	**286061 006**	**286061 008**
				Customer Sample Reference	**71434/2**	**71434/4**	**71434/6**	**71434/8**
				Test Sample	**AR**	**AR**	**AR**	**AR**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Particulates (Total)	Grav	0.1	mg	U	**38**	**0.3**	**17**	<0.1

SAL Reference: 286061
Project Site: 26/06/2012
Customer Reference: 71434

Filter Quartz 90mm Analysed as Filter Quartz 90mm
Miscellaneous

				SAL Reference	**286061 001**	**286061 003**
				Customer Sample Reference	**71434/1**	**71434/3**
				Test Sample	**AR**	**AR**
				Filter Reference	**299**	**278**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Particulates (Total)	Grav (5 Dec)	0.10	mg	U	**6.6**	**0.47**

SAL Reference: 286061
Project Site: 26/06/2012
Customer Reference: 71434

Filter Quartz 110mm Analysed as Filter Quartz 110mm
Miscellaneous

				SAL Reference	**286061 005**	**286061 007**
				Customer Sample Reference	**71434/5**	**71434/7**
				Test Sample	**AR**	**AR**
				Filter Reference	**345**	**285**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Particulates (Total)	Grav (5 Dec)	0.10	mg	U	**13**	**1.8**

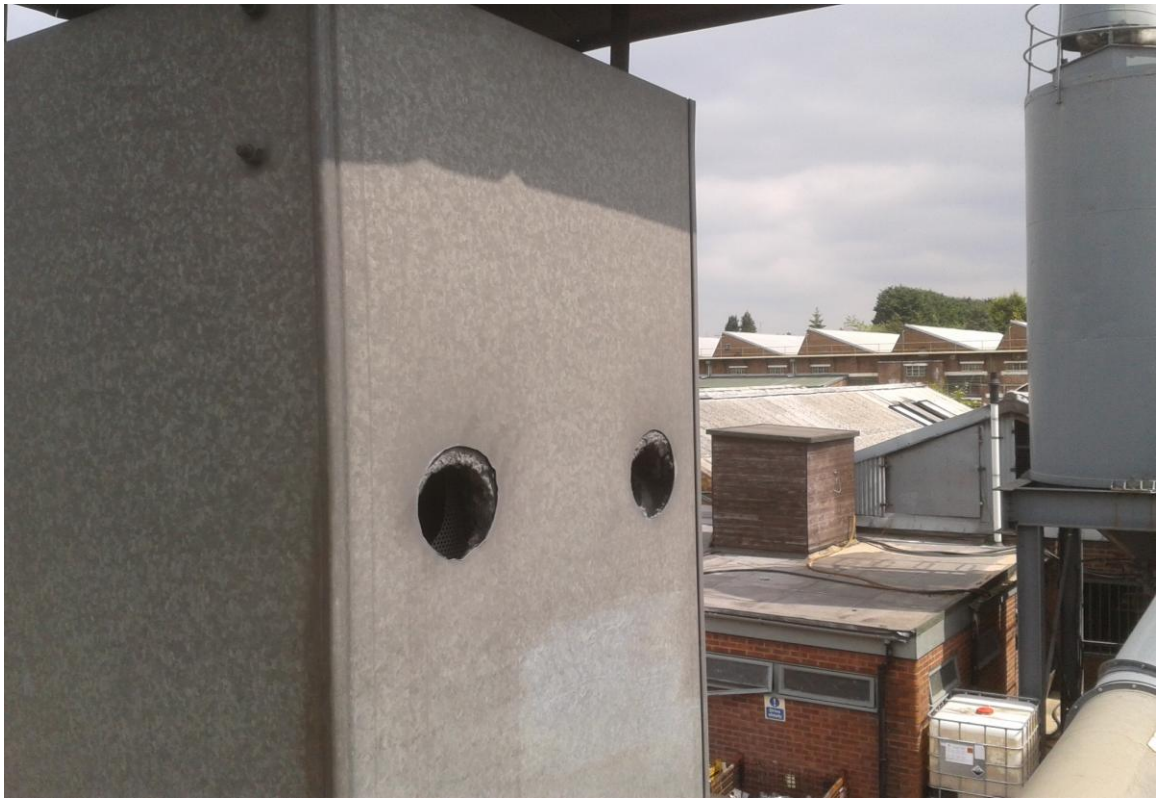
Index to symbols used in 286061-1

Value	Description
AR	As Received
U	Analysis is UKAS accredited

APPENDIX 2

Photos of Sampling Points

Wet Arrestor



Dry Arrestor

APPENDIX 3

Calculations

Conversion Factors

ppm ® mg/Nm³ (at 273K, 101.3kPa: STP)

CO	x	1.25	
SO_2	x	2.86	
VOC's	x	1.61	(ppm as C_3H_8 to mg/Nm^3 as C)
NO_X	x	2.05	(ppm NO + NO_2 to mg/m^3 as NO_2)

Oxygen Correction to Reference Value

Concentration at (STP) -> Concentration at 273K, 101.3kPa, reference O_2 and Dry Gas, i.e.

Concentration X ((20.9-O_2 ref)/(20.9-O_2 measured)) = Concentration at ref Oxygen state.

Example Calculation

SO_2 concentration at STP	=	170.7 mg/Nm³
Oxygen percentage in gas stream	=	13.8%
Reference Oxygen	=	11%

SO_2 concentration at reference O_2 conditions	=	170.7 ((20.9-11)/(20.9-13.8))
	=	238 mg/Nm³ at 273K, 101.3kPa, 11% O_2 and Dry Gas

Moisture Correction (Wet to Dry)

Concentration of Gas Dry = Concentration of x 100/100-Bws Gas Wet

Concentration of Gas Wet = Concentration of x 100-Bws/100 Gas Dry

Where Bws = moisture content of gas stream in percent (Vol/Vol).

Example

VOC concentration	=	25 mg/Nm³ (Wet)
Moisture Content	=	27.1%
Concentration of VOC	=	25 (100/(100-27.1))

Carbon (C) to Trichloethylene (TCE)

ppm TCE = ppm C x 0.6715

TCE in mg/m^3 = TCE ppm x 5.864 (Mol Wt/22.4)