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2022

SOURCE EMISSIONS MONITORING – KYOGLE TIMBER MILL

CLIENT: PENTARCH FORESTRY
PROJECT ID: 14447
DATE: 25/08/2022 RELEASE: R_0

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Project Title: Source Emissions Monitoring – Kyogle Timber Mill

Project Reference ID: 14447

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Table 1: History of Revisions

Revision	Date	Issued to	Changes
R_0	25/08/2022	G.Donaldson	Formal report release

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The results of the tests, calibrations and/or measurements included in this document is traceable to Australian/national standards.

Accreditation number: 19703

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EXECUTIVE SUMMARY

The following table provides a summary of results from emission monitoring performed on the main stack (EPA Point 1) at the Pentarch Forestry facility in Kyogle, NSW.

Sampling was conducted by AE on 2nd of August 2022 during typical plant operational activities.

AE was responsible for the collection and analysis of samples, unless otherwise indicated. The samples were recovered and stored in the appropriate manner until their return to the laboratory where the samples were prepared and analysed according to the methodologies listed below in this report.

Table 2: Executive Summary

Release Point Parameter	Unit of Measure	Stack result	Limit
Process conditions		normal	-
Date of testing	dd-mm-yyyy	2/08/2022	-
Run Start Time	hh:mm	8:10:00 AM	-
Run Stop Time	hh:mm	9:10:00 AM	-
Carbon Dioxide Percentage	vol-%	3.08	-
Oxygen Percentage	vol-%	17.5	-
Nitrogen Percentage	%	79.4	-
Dry gas molecular weight	kg/Nm^3	1.30	-
Dry gas molecular weight	g/g-mole	29.2	-
Wet Stack Gas Molecular Weight	g/g-mole	28.8	-
Average Stack Gas Velocity	m/sec	7.31	-
Actual Stack Flow Rate	m^3/min	496	-
Dry standard stack flow rate	Nm^3/min	312	-
Stack PM Concentration	mg/Nm^3	30.2	-
Stack PM Concentration at 14 % O2	mg/Nm^3	61.3	100
Particulate emission rate	g/min	9.44	-
Oxides of nitrogen (NO_2)	mg/Nm^3	45.0	-
NOx Concentration at 14 % O2	mg/Nm^3	91.2	-
emission rate	g/min	14.0	-
Carbon monoxide	mg/Nm^3	95.3	-
CO Concentration at 14 % O2	mg/Nm^3	193	-
emission rate	g/min	29.7	-

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Assured Environmental (AE) was appointed by Pentarch Forestry to undertake stack emission monitoring at the main stack release point of their timber mill facility located in Kyogle, New South Wales. Sampling was conducted by AE in accordance with the test methods listed below on 2nd August 2022.

Prior to commencing the sampling onsite, plant personnel were consulted to confirm that the mill would be undertaking typical operational activities for the duration of the testing period.

AE was responsible for the collection and analysis of samples, unless otherwise stated. The samples were recovered and stored in the appropriate manner until their return to the laboratory. The samples were prepared and analysed according to the methodologies listed below in this report.

2 METHODOLOGY & EQUIPMENT

2.1 Sampling methodology

All sampling and analysis were carried out in accordance with the listed requirements in Table 3. Any method specific comments about the sampling and analytical procedures have been documented where required. The results presented in this report are related to one or more reference calibrations held by AE.

Table 3: List of methods

Parameter	Reference Method	NSW Method	Comments	Analysis by	NATA
Sample plane criteria	AS4323.1	TM-1	Nil	1	Yes
Gas velocity and temperature	USEPA Method 2	TM-2	Nil	1	Yes
Stack gas density	USEPA Method 3	TM-23	Nil	1	Yes
Oxygen & carbon dioxide	USEPA Method 3A	TM-23	A	1	Yes
Stack gas water vapour	USEPA Method 4	TM-22	Nil	1	Yes
Particulate matter	AS4323.2	TM-15	Nil	1	Yes
Nitrogen oxides	USEPA Method 7E	TM-11	A	1	Yes
Carbon monoxide	USEPA Method 10	TM-32	A	1	Yes

Table 4: Sampling comments

Note	Comment
A	Pre & post calibration of the analyser was completed in the laboratory.

Table 5: Analysis notes

Note	Company	Work performed	NATA ID	Report Number
A	AE Pty Ltd	Sampling & analysis	19703	14447

Table 6: Sampling details & operating conditions

TEST ID	Test
Client	Pentarch Forestry
Site	Kyogle
Sample Point	Main stack (EPA point 1)
Reference Method	AS4323.2
Test Parameters	Total solid particulates
Run Start Date	02 August 2022
Project ID	14447
Run ID	1
Run Start Time	08:10
Run Stop Time	09:10

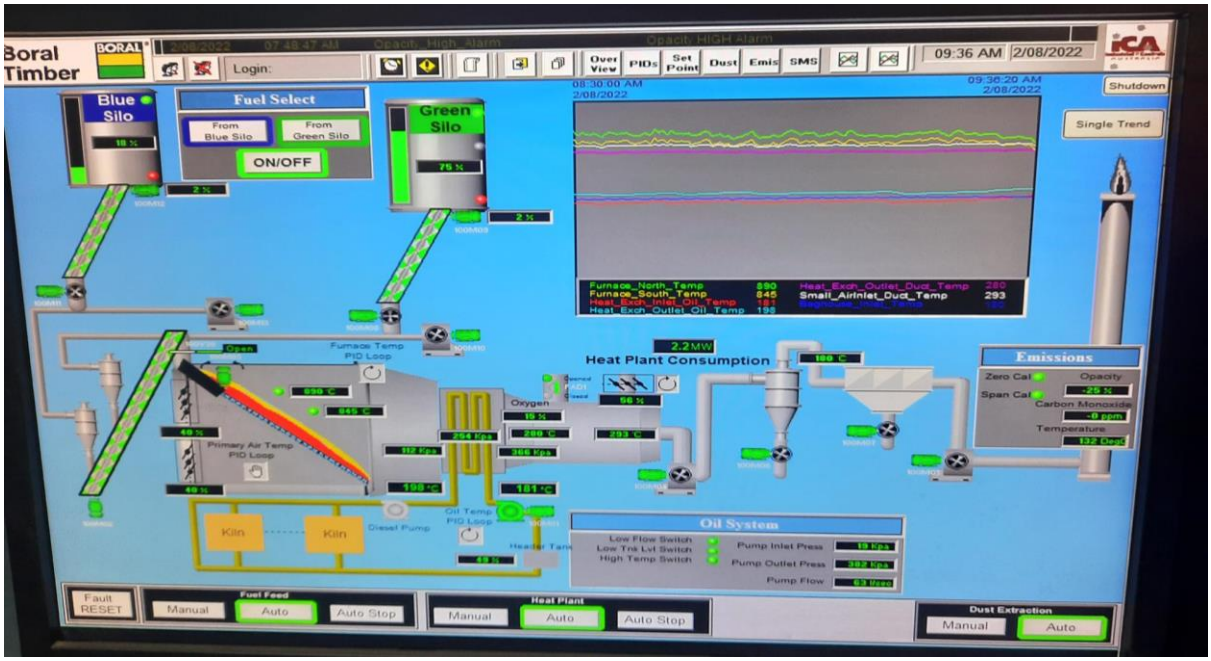

Figure 1: Process screen shot

2.2 Sample location

The below images show the Pentarch Forestry site location and stack position, Kyogle, New South Wales.

Figure 2: Site Location

Figure 3: Sampling location on main stack

Table 5: Sample location details

AS4323.1	Sample location	EPA Point 1
	Stack coordinates	UTM 56s:
	Easting	152°59'52.04"E
	Southing	28°39'9.88"S
	Stack Shape	CIRCULAR
	Ideal Sampling Plane Assessment	
	Stack Diameter (m)	1.2
	Stack Cross Section Area (m^2)	1.13
	Distance to upstream disturbance (m) (from disturbance)	6.0
	Upstream Diameters (D)	5.0
	Distance to downstream disturbance (m) (from disturbance)	12.0
	Downstream diameters (D)	10.0
4.2.2 Table 1	Meets Requirements AS4323.1 Table 1	Yes
	Non-deal Sampling Plane Assessment	
	Assessment required?	Yes
	Total traverse point factors	1.0
	Non-conforming Sampling Plane Assessment	
4.2.2(a)	Gas flow in same direction	Yes
4.2.2(b)	Gas flow steady & evenly distributed (cyclonic or swirl <15°)	Yes
4.2.2(c)	Temperature difference between points <10%, and each point <10% of average	Yes
4.2.2(d)	Ratio of highest to lowest differential pressure & ratio highest to lowest velocity	1.7 1.3
4.2.2(e)	Minimum differential pressure	2.50
	Gas temperature above dewpoint	Yes
	Samling Plane Type	
4.2.2, 4.2.3, 4.2.4	Samling plane type	Ideal
	Alternative sampling plane available?	-
	Number of Sample Points Adopted	
	Port size (mm)	100
	Port Thread Type	BSP
	Number of traverses	1
	Number of points per traverse	12
	Total number of traverse points	12
	Flow & temperature compliance check	Yes

2.3 Test equipment

The sampling equipment was transported to site, using a company vehicle. The stack sampling location is accessible using the work platform around the stack. Sample preparation and recoveries were carried out in the vehicle, which acts as a mobile laboratory. For this project, one complete USEPA Method 29 isokinetic sampling train was used, along with multi-gas combustion analyser.

All equipment used during testing meets all relevant performance standards as required by relevant jurisdictions. The isokinetic equipment used for this project was from Apex Instruments.

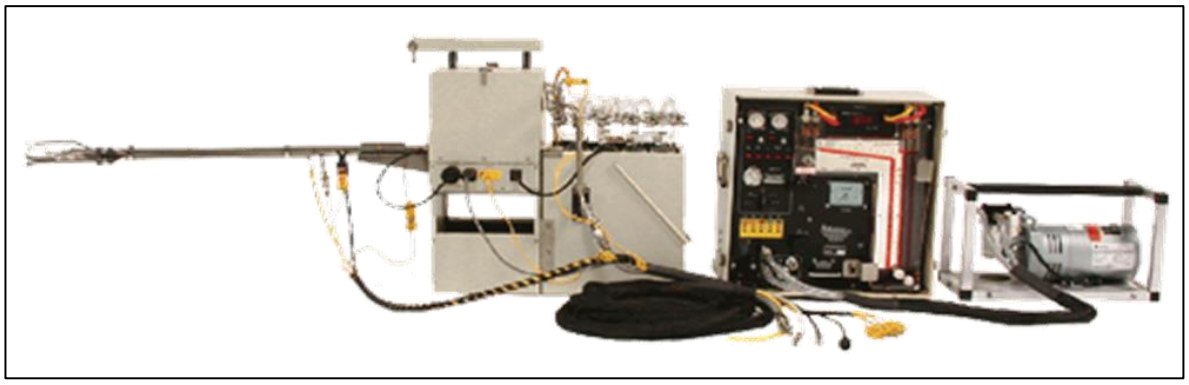

Figure 4: Isokinetic Method 29 sampling assembly

Figure 5: Testo combustion gas analyser

3 QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

AE operates within a quality system based upon the requirements of ISO17025. Our quality system defines specific procedures and methodologies to ensure any project undertaken by AE is conducted with the highest level of quality given the specific confines of each project.

The overall objective of our QA/QC procedures is to representatively sample and accurately analyse components in the gas streams and therefore report valid measurements of emission concentrations.

To ensure representativeness of field work, our quality procedures target:

1. Correct sampling locations
2. Sample time
3. Frequency of samples and
4. Method selection & adherence

To ensure representativeness of lab work, our quality procedures target:

1. Sample preservation
2. Chain of custody (COC)
3. Sample preparation and
4. Analytical techniques

AE maintains strict quality assurance throughout all its sampling programs, covering on-site 'field work' and the analytical phase of our projects. Our QA program covers the calibration of all sampling and analytical apparatus where applicable and the use of spikes, replicate sample and reference standards.

The test methodologies used for this project are outlined in section 2 of this document. Field test data has been recorded and calculated using direct entry into Microsoft Excel spreadsheets following the procedures of the appropriate test methods. Determination of emission concentrations has been performed using the same Microsoft Excel spreadsheets which are partially supplied as an attachment to this report. More detailed information can be supplied upon request.

QA/QC checks for this project will use validation techniques and criteria appropriate to the type of data and the purpose of the measurement to approve the test report. Records of all data will be maintained. Complete chain of custody (COC) procedures have been followed to document the entire custodial history of each sample. The COC forms also served as a laboratory sheet detailing sample ID and analysis requirements.

Table 7: Sampling data QA/QC checklist

Sampling Data QA/QC Checklist	Comment
Use of appropriate test methods	Yes
'Normal' operation of the process being tested	Yes – as instructed by client
Use of properly operating and calibrated test equipment	Yes
Use of high purity reagents	Yes
Performance of leak checks post sample (at least)	Yes

Table 8: Laboratory data QA/QC checklist

Laboratory Data QA/QC Checklist	Comment
Use of appropriate analytical methods	Yes
Use of properly operating and calibrated analytical equipment	Yes
Precision and accuracy comparable to that achieved in similar projects	Yes
Accurate reporting	Yes

3.1 Measurement Uncertainty

There is an inherent uncertainty associated with any scientific measurement, including stack emissions monitoring. The measurement uncertainty can be controlled with adherence to the reference methodology which includes utilising appropriate calibration standards with corresponding acceptable uncertainty reports.

Many source sampling methods do not outline exact procedures for establishing direct measurement uncertainty. In the absence of a defined procedure, the uncertainty budgets presented are based on estimations using ISO-GUM method.

Each individual source and test may have a unique associated uncertainty, due largely to the stack sample location in relation to the positioning requirements of AS4323.1 and whether it meets the ideal or non-ideal descriptions.

Table 6: Measurement uncertainty budget

Parameter	Reference method	Uncertainty ± %	Coverage factor	Confidence coefficient %
Velocity	USEPA M2	10	2	95
Temperature	USEPA M2	5	2	95
Moisture content	USEPA M4	5	2	95
Oxygen	USEPA M3A	4	2	95
Solid particles	AS4323.2	20	2	95
Oxides of nitrogen	USEPA M7E	12	2	95
Carbon monoxide	USEPA M10	10	2	95

4 DEFINITIONS

The following terms and abbreviations may be used in this report:

Table 9: Definitions

Symbol	Definition
<	The analytes tested for was not detected; the value stated is the reportable limit of detection
Am3	Gas volume in cubic metres at measured conditions
AS	Australian Standard
BH	Back half of sample train (filter holder and impingers) (referred to during sample recovery)
oC	Degrees Celsius
CARB	California Air Resources Board methods
dscm	dry standard cubic meters
FH	Front half of sample train (probe and filter holder) (referred to during sample recovery)
g	Grams
kg	Kilograms
m	Metres
m3	actual gas volume in cubic metres as measured
mbar	Millibars
mg	Milligrams (10-3 grams)
min	Minute
ml	Millilitres
mmH2O	Millimetres of water
Mole	SI unit that measures the amount of substance
N/A	Not applicable
ng	Nanograms (10-9 grams)
NATO	North Atlantic Treaty Organisation
NCASI	National Council for Air and Stream Improvement (USA)
NIOSH	National institute for occupational safety and health (USA)
Nm3	Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa)
NR	Not required on this occasion
OSHA	Occupational Safety and Health Act
PM	Particulate matter
ppb	Parts per billion
ppm	Parts per million
sec	Second
Sm3	Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 15% O2)
STP	Standard temperature and pressure (0°C and 101.3 kPa)
TO	USEPA air toxics method
TWA	Time weighted average
USEPA	United States Environmental Protection Authority

5 RESULTS

Table 7: Sample information

Source Data			
Client		Pentarch Forestry	
Site		Kyogle	
Sample Point		EPA Point 1	
Reference Method		AS4323.2 - ISOKINETIC	
Test Parameters		PM & Gases	
Process conditions		normal	
Historical Data & Hardware Information - Manual Sample			
Run Start Date		2/08/2022	dd-mm-yyyy
Project ID		14447	
Run ID		-1	
Run Start Time	Ti	08:10	hh:mm
Run Stop Time	Tf	09:10	hh:mm
Positioning compliance check with AS4323.1		Ideal	
Flow & temperature compliance check with AS4323.1		Yes	
Traverse pt factors; up, down, total & trav pts		1 , 1 , 1 , 12	
Console Serial Number		SN174	
Meter Calibration Factor	(Y)	0.994	
Orifice Coefficient		46.78	($DH_@$)
Pitot Tube Coefficient	(C_p)	0.84	
Actual Nozzle Diameter	(D_{na})	8.89	mm
Stack Test Data			
Initial Meter Volume	$(V_m)_i$	9.333	m^3
Final Meter Volume	$(V_m)_f$	10.374	m^3
Actual Sampling Time	(Q)	60	minutes
Average Meter Temperature	$(t_m)_{avg}$	15.0	°C
Average Stack Temperature	$(t_s)_{avg}$	144	°C
Barometric Pressure	(P_b)	1012	mb
Stack Static Pressure	(P_{static})	-8.00	mm H_2O
Absolute Stack Pressure	(P_s)	1011	mb
Sample Volumes			
Actual Meter Volume	(V_m)	1.035	m^3
Standard Meter Volume	$(V_m)_{std}$	0.982	Nm^3
Moisture Content Data			
Water vapour concentration	($B_{ws(calc)}$)	3.79	%
Stack Gas Density Analysis Data			
Carbon Dioxide Percentage	(%CO_2)	3.08	%
Oxygen Percentage	(%O_2)	17.5	%
Carbon Monoxide Percentage	(%CO)	0.01	%
Nitrogen Percentage	(%N_2)	79.4	%
Dry Gas Molecular Weight	(M_d)	1.30	kg/Nm^3
Dry Gas Molecular Weight	(M_d)	29.2	g/g-mole
Wet Stack Gas Molecular Weight	(M_s)	28.8	g/g-mole
Volumetric Flow Rate Data (at Sample Plane)			
Average Stack Gas Velocity	(v_s)	7.31	m/sec
Stack Diameter	Ds	1.20	m
Stack Cross-Sectional Area	(A_s)	1.13	m^2
Upstream distance (from disturbance)	B	6.00	m
Downstream distance (from disturbance)	A	12.00	m
Actual Stack Flow Rate	(Q_{aw})	496	m^3/min
Wet Standard Stack Flow Rate	(Q_{sw})	324	Nm^3/min-wet
Dry Standard Stack Flow Rate	(Q_{sd})	312	Nm^3/min-dry
Percent of Isokinetic Rate	(I)	95.5	%

Table 8: Sample information

Particulate Matter (PM) Concentration			
Total Mass of Particulates	(m_n)	0.0297	g
Stack PM Concentration	(c_s)	30.24	mg/Nm^3
Stack PM Concentration at 14% O2	(c_s)	61.31	mg/Nm^3
Particulate Emission Rate	(E)	9.442	g/min
Instrumental Analyser - Historical Data & Hardware Information			
Analyser serial number, make & model		SN730	value
Analyser Total Sampling Time	(Q)	00:48	hh:min
Instrumental Analyser Raw Data Averages			
Oxides of Nitrogen	(NOx)	21.9	ppm
Carbon Monoxide	(CO)	76	ppm
Average Oxides of Nitrogen (USEPA Method 7E - instrumental analyser)			
Nitrogen Oxides (NOx as NO_2)	(Conc)	45.0	mg/Nm^3
Nitrogen Oxides at 14% O2	(Conc)	91	mg/Nm^3
Nitrogen Oxides (NOx as NO_2)	(E)	14.04	g/min
Average Carbon Monoxide (USEPA Method 10 - instrumental analyser)			
Carbon Monoxide (CO)	(Conc)	95	mg/Nm^3
Carbon Monoxide at 14% O2	(Conc)	193	mg/Nm^3
Carbon Monoxide (CO)	(E)	30	g/min