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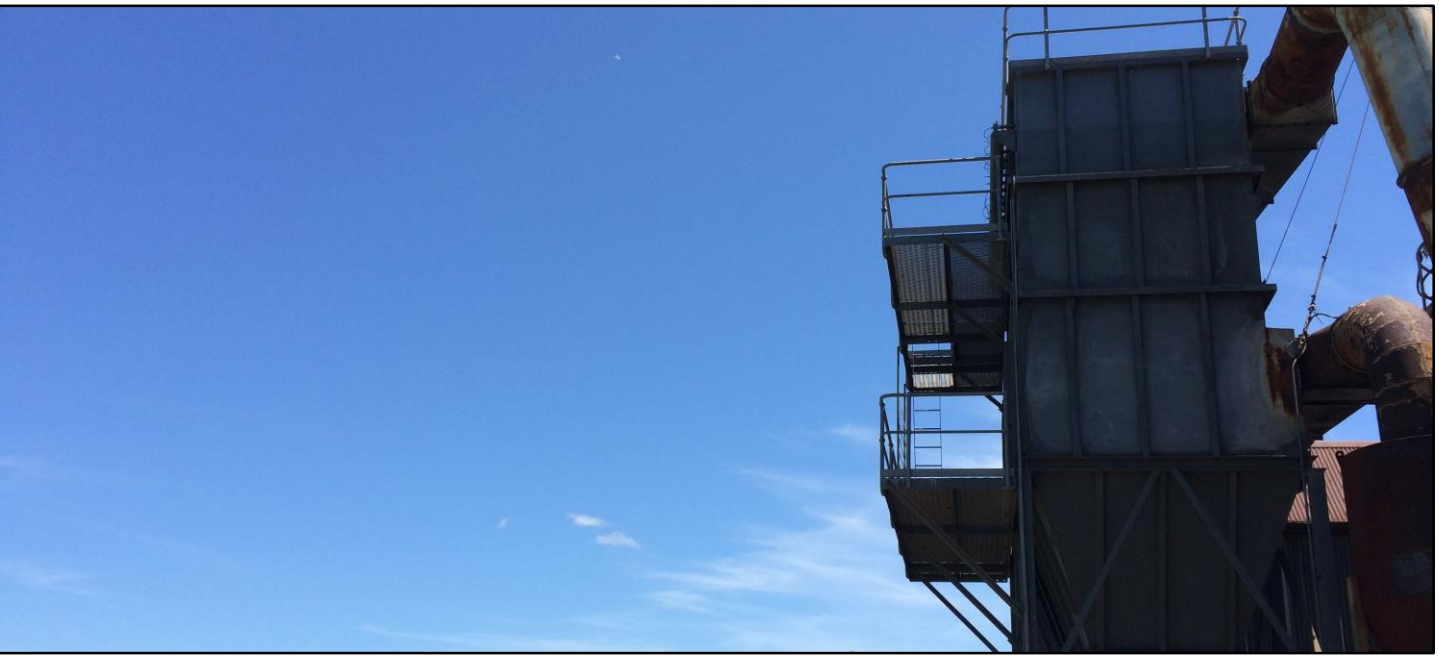
Assured Monitoring Group



# SOURCE EMISSIONS MONITORING – KYOGLE TIMBER PLANT

## BORAL TIMBER

Project ID. 11141

**R_0**

**DATE OF RELEASE: 29/11/2017**

ABN: 87 604 851 078

Unit 7, 142 Tennyson Memorial Avenue – Tennyson – Queensland - 4105

**Table 1: Document approval**

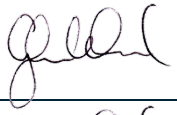
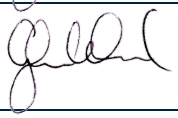
| | Name | Position Title | Signature | Date |
|---|---|---|---|---|
| Author | Zac Heironymus | Technician |  | 23/11/2017 |
| Reviewer | Glenn Ward | Principal Scientist |  | 29/11/2017 |
| Approved | Glenn Ward | Principal Scientist |  | 29/11/2017 |

**Table 2: Revision register**

| Revision | Date | Issuer | Recipient | Comment |
|---|---|---|---|---|
| R_0 | 29/11/2017 | G. Ward | R. Cox | Initial Release |

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## ACCREDITED FOR COMPLIANCE TO ISO/IEC 17025

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

Accreditation ID: 19703

NATA
WORLD RECOGNISED ACCREDITATION

## EXECUTIVE SUMMARY

The following table provides a summary of results from emission monitoring on the main stack (EPA Point 1) at the Boral Timber facility located near Kyogle, NSW. The emission sampling completed on the main stack release point was undertaken in order to determine the concentration and emission rate of the parameters listed in Table 3 to satisfy the requirements of NSW EPA Permit number 906.

**Table 3: Summary of results**

| Release Point Parameter | Result | Permit Limit | Unit of Measure | Reference Conditions |
|---|---|---|---|---|
| Process conditions | 2.6 Mw (normal) | | | |
| Run Start Date | 26/10/2017 | | dd-mm-yy | |
| Run Start Time | 12:00:00 PM | | hh:mm | |
| Run Stop Time | 1:20:00 PM | | hh:mm | |
| Carbon Dioxide Percentage | 4.85 | - | vol-% | |
| Nitrogen Percentage | 77.9 | - | % | |
| Dry Gas Molecular Weight | 1.32 | - | kg/Nm$^3$ | |
| Dry Gas Molecular Weight | 29.5 | - | g/g-mole | |
| Wet Stack Gas Molecular Weight | 28.9 | - | g/g-mole | |
| Average Stack Gas Velocity | 5.80 | - | m/sec | |
| Actual Stack Flow Rate | 394 | - | m$^3$/min | |
| Dry Standard Stack Flow Rate | 244 | - | Nm$^3$/min-dry | |
| Stack PM Concentration | 2.23 | - | mg/Nm$^3$ | |
| Stack PM Concentration at 14 % $O_2$ | 4.19 | 30 | mg/Nm$^3$ | dry, 273 K, 101.3 kPa |
| Particulate Emission Rate | 0.544 | - | g/min | |
| Nitrogen Oxides (NOx as $NO_2$) | 59.9 | - | mg/Nm$^3$ | |
| Nitrogen Oxides at 14 % $O_2$ | 113 | - | mg/Nm$^3$ | dry, 273 K, 101.3 kPa |
| Nitrogen Oxides (NOx as $NO_2$) | 14.6 | - | g/min | |
| Carbon Monoxide (CO) | 60.0 | - | mg/Nm$^3$ | |
| Carbon Monoxide at 14 % $O_2$ | 113 | - | mg/Nm$^3$ | dry, 273 K, 101.3 kPa |
| Carbon Monoxide (CO) | 14.7 | - | g/min | |

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# 1 INTRODUCTION

Assured Monitoring Group (AMG) was appointed by Boral Shared Services to sample and analyse source emissions from their timber facility located in Kyogle, New South Wales. Sampling was conducted by AMG on the 26th of October 2017 during typical plant operational activities.

AMG 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.

# 2 METHODOLGY & EQUIPMENT

## 2.1 Sampling methodology

All sampling and analysis was carried in accordance to the listed requirements in Table 4. Any deviations to these methods have been documented where required.

**Table 4: Test methods**

| Parameter | AS/USEPA Method | NSW Method | Analysis | Comments | NATA |
|---|---|---|---|---|---|
| Sample plane criteria | AS 4323.1 | TM-1 | 1 | Nil | Yes |
| Gas velocity and temperature | USEPA M2 | TM-2 | 1 | Nil | Yes |
| Stack gas density | USEPA M3 | TM-23 | 1 | Nil | Yes |
| Oxygen & carbon dioxide | USEPA M3A | TM-23 | 1 | A | Yes |
| Stack gas water vapour | USEPA M4 | TM-22 | 1 | Nil | Yes |
| Particulate matter | AS 4323.2 | TM-15 | 1 | Nil | Yes |
| Nitrogen oxides | USEPA M7E | TM-11 | 1 | A | Yes |
| Carbon monoxide | USEPA M10 | TM-32 | 1 | A | Yes |

**Table 5: Analysis notes**

| Note | Company | Work performed | Accreditation | Report Number |
|---|---|---|---|---|
| 1 | AMG Pty Ltd | Sampling & analysis | NATA: 19703 | 11141 |

**Table 6: Sampling comments**

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

## 2.2 Sampling location

The below images show the Boral Timber site location and stack location, Kyogle, NSW.


Figure 1: Site location

Figure 2: Sample platform location

**Table 7: Stack description**

| Sample location | EPA Point 1 |
|---|---|
| Stack coordinates | UTM |
| easting | 499784.97E |
| northing | 6830484.21S |
| Stack Exit point from ground (m) | unknown |
| Stack Shape | CIRCULAR |
| Stack Diameter (m) | 1.2 |
| Stack Cross Section Area ($m^2$) | 1.13 |
| Distance to upstream disturbance (m) | 6.0 |
| Diameters (D) | 5.0 |
| Distance to downstream disturbance (m) | 8.0 |
| Diameters (D) | 6.7 |
| Total traverse point factors | 1.05 , 1 , 1.05 , 16 |
| Port size (mm) | 100 |
| Port Thread Type | BSP |
| Number of traverses | 2 |
| Number of points per traverse | 8 |
| Total number of traverse points | 16 |
| Flow & temperature compliance check | YES |

## 2.3 Plant operation

During the sampling, the plant was considered to be operating at standard, representative process load. The furnace supplies heat to the drying kilns.

## 2.4 Test equipment

The sampling equipment was transported to site using a company vehicle. The stack sample location is accessible using installed walkways and ladders. All sampling equipment was located on the stack platform and on the ground below, while sample preparation and recoveries were carried in the vehicle which acts as a mobile laboratory. For this project, two complete isokinetic and non-isokinetic sampling trains were used, along with a multi-gas combustion analyser.

All equipment used during the course of the testing is sourced from Apex Instruments, an industry leader in the supply of source testing equipment.

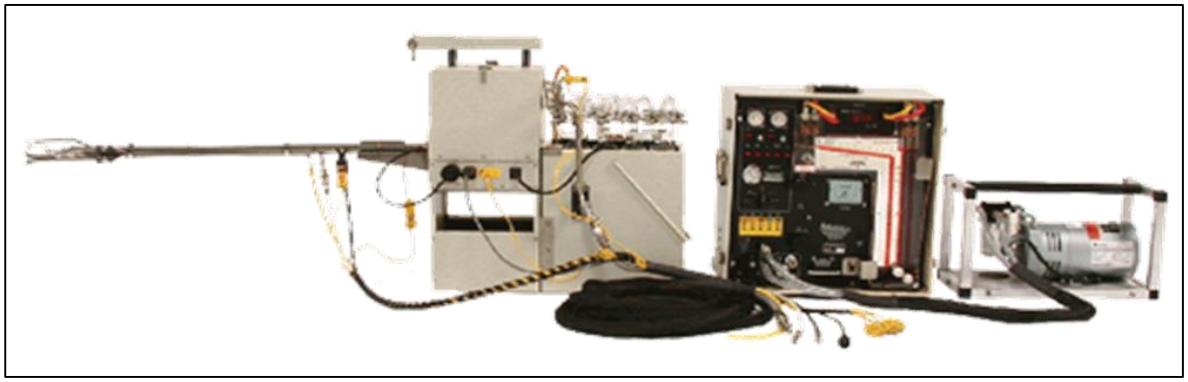

Figure 3: Full isokinetic sampling assembly


Figure 4: MRU combustion gas analyser

# 3 QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

AMG 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 AMG 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

AMG 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 has 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 8: 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 Boral |
| 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 9: 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 |

# 4 DEFINITIONS

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

**Table 10: Definitions**

| Symbol | Definition |
|---|---|
| < | The analytes tested for was not detected; the value stated is the reportable limit of detection |
| $Am^3$ | 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) |
| °C | 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) |
| f/ml | Fibres per millilitre |
| g | Grams |
| kg | Kilograms |
| m | Metres |
| $m^3$ | actual gas volume in cubic metres as measured |
| mbar | Millibars |
| mg | Milligrams ($10^{-3}$ grams) |
| min | Minute |
| ml | Millilitres |
| $mmH_2O$ | 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 |
| NIOSH | National institute for occupational safety and health (USA) |
| $Nm^3$ | Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) |
| NMI | National Measurement Institute |
| NM VOC | Non methane volatile organic compound |
| NR | Not required on this occasion |
| OSHA | Occupational Safety and Health Act |
| ou | Odour unit |
| PCDD | Polychlorinated dibenzo-*p*-dioxin |
| PCDF | Polychlorinated dibenzofuran |
| PM | Particulate matter |
| ppb | Parts per billion |
| ppm | Parts per million |
| sec | Second |
| $Sm^3$ | 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% $O_2$) |
| 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 11: Results Summary

| RESULTS | | | |
|---|---|---|---|
| **Source Data** | | | Stack SDS version - 3.1 |
| Client | | | Boral Timber |
| Site | | | Kyogle |
| Sample Point | | | EPA Point 1 |
| Reference Method | | | USEPA Method 5 - ISOKINETIC |
| Test Parameters | | | PM & gases |
| Process conditions | | | 2.6 Mw (normal operations) |
| **Historical Data & Hardware Information - Manual Sample** | | | |
| Run Start Date | | dd-mm-yy | Thursday, 26 October 2017 |
| Project ID | | | 11141 |
| Run ID | | | -1 |
| Run Start Time | Ti | hh:mm | 12:00:00 |
| Run Stop Time | Tf | hh:mm | 13:20:00 |
| Positioning compliance check with AS4323.1 | | | Non-ideal |
| Flow & temperature compliance check with AS4323.1 | | | YES |
| Traverse pt factors; up, down, total & trav pts | | | 1.05 , 1 , 1.05 , 16 |
| Console Serial Number | | | SN474 |
| Meter Calibration Factor | (Y) | | 1.023 |
| Orifice Coefficient | | (DH@) | 49.38 |
| Pitot Tube Coefficient | (Cp) | | 0.84 |
| Actual Nozzle Diameter | (Dna) | mm | 8.41 |
| **Stack Test Data** | | | |
| Initial Meter Volume | (Vm)i | $m^3$ | 67.715 |
| Final Meter Volume | (Vm)f | $m^3$ | 68.750 |
| Actual Sampling Time | (Q) | minutes | 80 |
| Average Meter Temperature | (tm)avg | °C | 33 |
| Average Stack Temperature | (ts)avg | °C | 143 |
| Barometric Pressure | (Pb) | mb | 1009 |
| Stack Static Pressure | (Pstatic) | mm $H_2O$ | -10.0 |
| Absolute Stack Pressure | (Ps) | mb | 1008 |
| **Sample Volumes** | | | |
| Actual Meter Volume | (Vm) | $m^3$ | 1.059 |
| Standard Meter Volume | (Vm)std | $Nm^3$ | 0.943 |
| **Moisture Content Data** | | | |
| Water vapour concentration | (Bws(calc)) | % | 5.10 |
| **Stack Gas Density Analysis Data** | | | |
| Carbon Dioxide Percentage | (%CO2) | % | 4.85 |
| Oxygen Percentage | (%O2) | % | 17.2 |
| Carbon Monoxide Percentage | (%CO) | % | 0.005 |
| Nitrogen Percentage | (%N2) | % | 77.9 |
| Dry Gas Molecular Weight | (Md) | kg/$Nm^3$ | 1.32 |
| Dry Gas Molecular Weight | (Md) | g/g-mole | 29.5 |
| Wet Stack Gas Molecular Weight | (Ms) | g/g-mole | 28.9 |
| **Volumetric Flow Rate Data (at Sample Plane)** | | | |
| Average Stack Gas Velocity | (vs) | m/sec | 5.80 |
| Stack Diameter | Ds | m | 1.20 |
| Stack Cross-Sectional Area | (As) | $m^2$ | 1.13 |
| Upstream distance (from disturbance) | B | m | 6.00 |
| Downstream distance (from disturbance) | A | m | 8.00 |
| Actual Stack Flow Rate | (Qaw) | $m^3$/min | 394 |
| Wet Standard Stack Flow Rate | (Qsw) | $Nm^3$/min-wet | 257 |
| Dry Standard Stack Flow Rate | (Qsd) | $Nm^3$/min-dry | 244 |
| Percent of Isokinetic Rate | (I) | % | 98.4 |
| **Particulate Matter (PM) Concentration** | | | |
| Total Mass of Particulates | (mn) | g | 0.002 |
| Stack PM Concentration | (cs) | mg/$Nm^3$ | 2.23 |
| Stack PM Concentration at 14 % $O_2$ | (cs) | mg/$Nm^3$ | 4.19 |
| Particulate Emission Rate | (E) | g/min | 0.544 |
| **Instrumental Analyser Raw Data Averages** | | | |
| Oxides of Nitrogen | (NOx) | ppm | 29.2 |
| Carbon Monoxide | (CO) | ppm | 48.0 |
| **Average Oxides of Nitrogen (USEPA Method 7E - instrumental analyser)** | | | |
| Nitrogen Oxides (NOx as $NO_2$) | (Conc) | mg/$Nm^3$ | 59.9 |
| Nitrogen Oxides at 14 % $O_2$ | (Conc) | mg/$Nm^3$ | 113 |
| Nitrogen Oxides (NOx as $NO_2$) | (E) | g/min | 14.6 |
| **Average Carbon Monoxide (USEPA Method 10 - instrumental analyser)** | | | |
| Carbon Monoxide (CO) | (Conc) | mg/$Nm^3$ | 60.0 |
| Carbon Monoxide at 14 % $O_2$ | (Conc) | mg/$Nm^3$ | 113 |
| Carbon Monoxide (CO) | (E) | g/min | 14.7 |