DATE OF REPORT: 24TH FEBRUARY, 2014

Mr Phillip Redmond
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17 Tralee Street
Bracken Ridge QLD 4017

TEST REPORT NO. JAN14011

STACK EMISSIONS MONITORING CONDUCTED ON THE BOILER INLET DUCT AT BINDAREE BEEF IN INVERELL

DATE OF SAMPLING: 31ST JANUARY, 2014

ACCREDITATION:

AUTHORISATION:

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INTRODUCTION

AirLabs Environmental Pty Ltd was commissioned by Hi-Tech Queensland to perform the following release point determinations at Bindaree Beef at Inverell:

Monitoring of the Boiler Inlet Duct for:

- gas velocity and volume flow rate
- temperature
- molecular weight and dry gas density
- concentration of:
  - water vapour (moisture content)
  - oxygen
  - carbon dioxide
- smoke (Ringelmann scale)
- concentration and emission rate of:
  - solid particles
  - nitrogen oxides
  - fluorides

All sampling was conducted on 31st January, 2014.

QUALITY STATEMENT

AirLabs Environmental is committed to providing the highest quality data to all our clients, as reflected in our ISO 17025 (NATA) accreditation. This requires strict adherence to and continuous improvement of all our processes and test work. Our goal is to exceed the QA/QC requirements as set by our clients and appropriate governmental entities and to insure that all data generated is scientifically valid, defensible and of known accuracy and measurement uncertainty following the best available testing methods.

All sampling was undertaken by Airlabs Environmental, and all analysis by Airlabs Environmental and the National Measurement Institute in accordance with our respective terms of NATA accreditation.

SAMPLE PRESERVATION

Special attention was paid to sample preservation. All sampled were chilled immediately after collection. Upon receipt, the samples were refrigerated prior to analysis.

TEST METHODS

Gas Velocity, Volume Flow Rate and Temperature

Gas velocity and volumetric flow rate were determined in accordance with USEPA Method 2 'Determination of stack gas velocity and volumetric flow rate (type s pitot tube)'. In accordance with this method pressure differential and temperature profiles were obtained across the sampling plane at transverse points specified by NSWDECC TM-1, directly incorporating AS4323.1-1995 'Stationary Source Emissions, Method 1: Selection of Sampling Provisions'. Gas velocity and volume flow rates were then calculated in accordance with USEPA Method 2.

The estimated accuracy for temperature measurement is ± 1°C. The estimated measurement uncertainty for gas velocity and volume flow rate is ± 10%.

Moisture Content

The concentration of water vapour (moisture content) in stack and process gases was determined in accordance with USEPA Method 4 'Determination of Moisture Content in Stack Gases'. A measured volume of filtered gas was percolated through a series of chilled impingers each containing 100 mls of water and then drawn through a silica gel tube.

The total change in volume of water in the impingers and the weight change of the silica gel tube were used to calculate the percentage moisture in the gas stream. The estimated measurement uncertainty is ± 5%.

Oxygen

Oxygen (O_2) concentrations were determined in accordance with USEPA Method 3A 'Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyser Procedure)'. Compliant with this method, a sample gas stream was withdrawn continuously from the source and conveyed to a paramagnetic O_2 analyser.

The instrument was calibrated using ambient air and NATA certified O_2 gas, and zeroed with high purity nitrogen. The estimated measurement uncertainty is ± 2%.

Molecular Weight and Gas Density

The molecular weight and density of source gases was determined in accordance with incorporating USEPA Method 3 'Gas analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight'. A stack gas sample was withdrawn from the stack, conditioned for the removal of moisture and particulate matter. The conditioned gas was then analysed for CO_2, O_2, CO and N_2. This determination was required for calculating isokinetic sampling rates.

Solid Particles

Sampling for solid particles was conducted in accordance with AS4323.2-1995 'Stationary Source Emissions, Method 2: Determination of Total Particulate Matter - Isokinetic Manual Sampling - Gravimetric Method'.

Stack gas was withdrawn isokinetically through a nozzle, which had a sharp and tapered leading edge. Particulate matter was collected on a pre-weighed glass fibre filter located in a holder downstream of the nozzle. Gases were then conditioned (for removal of moisture) and finally metered for flow rate and sample volume. The weight change of the filter was determined using an Ohaus electronic balance and this figure used to calculate the concentration of particulate matter.

The estimated measurement uncertainty is ± 15%.

Nitrogen Oxides

Nitric oxide (NO) and nitrogen dioxide (NO_2) concentrations were monitored in accordance with USEPA Method 7E 'Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyser Procedure)'. The sample gas was withdrawn continuously from the gas stream and a portion was conveyed to a $NO/NO_2/NO_x$ Chemiluminescent analyser.

The analyser was calibrated in accordance with the method using NATA certified NO and NO_2 span gases and zeroed with dry nitrogen. Total nitrogen oxides (NOx) are expressed as NO_2. The estimated measurement uncertainty is ± 5%.

Fluorides

Sampling for gaseous and particulate fluorides was conducted in accordance with US EPA Method 13B - Determination of Total Fluoride Emissions from Stationary Sources. Stack gas was withdrawn isokinetically through a nozzle having a sharp and tapered leading edge.

Particulate matter was collected on a low fluoride (< 0.01 mg F/cm^2) 0.2 µm organic membrane filter located in a holder in a heated box. This was followed by an impinger train situated in an ice bath. The first two impingers each contained 100 ml of deionised distilled water. The third impinger was empty to collect any carry-over liquid, and the fourth impinger contained 250 g of silica gel to dry the gas stream prior to metering.

The filter retained particulate fluorides and gaseous fluorides were absorbed in the deionised distilled water. The two fractions were analysed separately utilising ion chromatography. Fluorides are expressed as hydrofluoric acid (HF). The estimated measurement uncertainty is ± 20%.

Smoke

Smoke was determined in accordance with Australian Standard 3543 - 1989 'Use of Standard Ringelmann and Australian Standard Minature Smoke Charts'. An Australian Standard Miniature Smoke Chart was utilised in this assessment.

DEFINITIONS

'USEPA'	United States Environmental Protection Agency.
'N/A'	Not applicable.
'Am^3'	Actual gas volume in cubic metres at stack conditions.
'STP'	Standard temperature and pressure (0°C and 101.3 kPa).
'Nm^3'	Gas volume in wet cubic metres at STP.
'm^3'	Gas volume in dry cubic metres at STP.
'<'	Less than. The value stated is the limit of detection.
'g'	Grams.
'mg'	Milligrams (10^{-3} grams).
'µg'	Micrograms (10^{-6} grams).
'min'	Minute.

SAMPLING POSITION

Table 1: Sampling Plane Details for the Boiler Inlet Duct

Parameter	
Duct shape	Rectangular
Duct dimensions at sampling plane (m)	0.83 x 0.74
Type of Disturbance, Upstream	Bend
Distance from Upstream Obstruction (m)	> 4 D
Type of Disturbance, Downstream	Stack Exit
Distance to Downstream Obstruction (m)	< 2 D
Compliance with AS4323.1, Ideal Conditions	No
Standard No. of Sampling Points per Traverse	2
Number of Traverses	2
Correction Factor	Yes
Corrected No. of Sampling Points per Traverse	3
Total No. of Sampling Points	6
Stratified	No
Cyclonic	No (< 15°)
Velocity Difference	1.4:1 (< 1.6:1)
Absolute Temperature Difference (K)	< 10%
Compliance with AS4323.1, Non-Ideal Conditions	Yes

RESULTS – Boiler Inlet Duct

Company Hi-Tech Queensland

Site Bindaree Beef Inverell

Date of Test 31st January, 2014

Source Tested Boiler Inlet Duct

Sampling Period 09:05 – 11:32

Sampling Officer L. Taylor

Table 2: Test Conditions for the Boiler Inlet Duct

Test Conditions	
Stack dimensions at sampling plane (m)	0.83 x 0.74
Stack gas temperature (K)	498 (225°C)
Average velocity at sampling plane (m/s)	15.1
Actual gas flow rate (Am^3/min)	556
Gas flow rate at STP, dry (m^3/min)	294
Moisture content (%v/v)	3.40
Average oxygen concentration (%v/v, dry)	11.0
Average carbon dioxide concentration (%v/v, dry)	6.50

Table 3: Test Results for the Boiler Inlet Duct

Parameter	**Measured Concentration (mg/m^3) [a]**	**NSWEPA Concentration Limit (mg/m^3) [a]**	**Emission Rate (g/min)**
Total Solid Particulates	420	**250**	120
Nitrogen Oxides (as NO_2)	250	**2500**	74
Fluorine (F_2)	0.68	**50**	0.20
Smoke (Ringelmann scale)	Ringelmann 2	**Ringelmann 3**	N/A

[a] Unless otherwise stated.