

SHOALHAVEN STARCHES ENVIRONMENTAL PROCEDURE

TITLE:	AIR QUALITY MONITORING PLAN
PURPOSE:	This document details the company's air emission monitoring procedures to ensure compliance with Environment Protection Licence (EPL) No.883 conditions and relevant Development Consents.
SCOPE:	<p>This procedure applies to the air emission points and odour generating activities as defined in the EPL and activities associated with Project Approval 06_0228.</p> <p>The Environmental / Technical Manager is responsible for ensuring compliance with the company's air quality monitoring requirements.</p>
SPECIFICATION:	To meet EPL Guidelines and Department of Planning Consent conditions.
ACTION ON NON-CONFORMANCE	Advise Environmental and Technical Manager and document through Quality Corrective & Preventative Action procedure (QMS-P-0130).
FREQUENCY:	Annual & Quarterly for EPL testing and as specified in this procedure for Development Consent monitoring
REFERENCES:	<p>Shoalhaven Starches Environment Protection Licence 883.</p> <p>Project Approval 06_0228.</p> <p><i>NSW EPA Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (2016).</i></p> <p><i>Protection of the Environment Operations (Clean Air) Regulation 2010.</i></p> <p>GHD Report on Ethanol Upgrade Air Quality Assessment, July 2008, Revision 0.</p> <p>Odour Management Plan EN-P-247</p>

PROCEDURE:

1. Quarterly Environment Protection Licence (EPL) Testing

At the commencement of each EPL year, obtain a quote or quotes (if required) to complete the boiler emission testing and odour testing as per Environment Protection Licence (EPL) Condition M2.1.

During the quoting process Shoalhaven Starches is to advise the company of the following requirements:

- All testing must be undertaken by NATA accredited testing and analysis company (including analytical laboratories)
- All testing must be carried out in accordance with approved test method and EPL monitoring requirements
- Production data is to be obtained from relevant production managers during testing period.
- The Environment and Technical Manager (or nominated delegate) must be informed immediately of any non-conformances with EPL limits.
- The final report is due within 4 weeks of the last day of testing.
- Reports are to be submitted to the Environmental and Technical Manager

2. Boiler 2 (Point 45), Boiler 4 (Point 42), Boiler 5 & 6 (Point 35) Testing

The quarterly testing for the Boilers is per calendar quarterly based on the EPL anniversary date of 30 April each year.

EPL Quarters are:

- 1 May to 31 July
- 1 August to 31 October
- 1 November to 31 January
- 1 February to 30 April

The following table (Table 1) summarises the parameters to be tested for the boilers and associated EPL concentration emission limits (where applicable). These parameters must be tested and reported each quarter.

Table 1 – Boiler 2, 4, 5 & 6 Monitoring Requirements

Parameter	EPA NSW Approved Test Method	EPL 100 percentile concentration limit
Flow, temperature, velocity, pressure of stack gases	TM-2	--
Dry Gas Density/Molecular Weight of stack gases	TM-23	--
Moisture	TM-22	--
Nitrogen Oxides (NO _x)	TM-11	500 mg/m ³
Oxygen	TM-25	>5 %
Sulphur Dioxide	TM-4	600 mg/m ³
Total Solid Particles	TM-15	30 mg/m ³
Fine particulates	OM-5	--
Opacity	CEM-1	20 %
Odour	OM-7	--
VOCs as n-propane equivalent	TM-34	40 mg/m ³
Cadmium	TM-12, TM-13 & TM-14	0.2 mg/m ³
Mercury	TM-12, TM-13 & TM-14	0.2 mg/m ³
Type 1 and Type 2 substances in aggregate	TM-12, TM-13 & TM-14	1 mg/m ³

Key:
 mg/m³ = milligrams per cubic metre
 OM = Other Method
 TM = Test Method

Note: Sulphur Dioxide frequency is yearly in the EPL, however Shoalhaven Starches has made a decision to undertake quarterly testing. Opacity monitoring is continuous.

The Boiler Emission Survey Report must meet the analytical reporting requirements as set out in Section 4 of the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* and also include comparison with EPL emission concentration limits.

Boiler pollution monitoring results are published on the Manildra Group website as per POEO Act requirements.

3. EPL Quarterly Odour Testing

Quarterly odour testing is based on the seasons; hence testing is conducted during summer, autumn, winter and spring. (This occurs to enable consistency in quarterly odour testing which was initially carried out during the four seasons for the previous site approval PRP1).

At the beginning of each quarter, the approved testing company will advise the Environmental and Technical Manager of the proposed testing dates.

All results are to be presented in the Quarterly Odour Emission Survey report.

Table 2 summarises the odour monitoring locations as per the EPL.

Table 2 –EPL Odour Monitoring Locations

EPA Identification No.	Description of Location
8	No. 1 Gluten Dryer
9	No. 2 Gluten Dryer / Starch Dryer
10	No. 3 Gluten Dryer
11	No. 4 Gluten Dryer
12	No. 1 Starch Dryer
13	No. 3 Starch Dryer
14	No. 4 Starch Dryer
16	Carbon Dioxide Scrubber (outlet)
19	Effluent Storage Dam 1
20	Effluent Storage Dam 2
21	Effluent Storage Dam 3
23	Effluent Storage Dam 5
24	Effluent Storage Dam 6
25	Sulphur Oxidation Pond
35	Boiler 5&6 Combined Stack
39	Inlet pipe to Biofilter's A & B
40	Outlet of Biofilter A
41	Outlet of Biofilter B
42	Boiler No. 4
44	Fermenter
45	Boiler No.2
46	DDG Pellet Plant Stack
47	Starch Dryer No.5

Tables 3, 4 and 5 summarise the parameters to be tested for the Point and Diffuse sources as per the EPL requirements.

Table 3 Sampling and Analysis of Point Sources (EPL Points 8, 9, 10, 11, 12, 13, 14, 16, 47)

Pollutant	Units	Frequency	EPA Approved Test Method
Dry Gas Density	kg/m ³	Quarterly	TM-23
Moisture Content	%	Quarterly	TM-22
Molecular Weight of stack gases	g/g-mole	Quarterly	TM-23
Oxygen (O ₂)	%	Quarterly	TM-25
Temperature	degrees Celsius	Quarterly	TM-2
Velocity	m/s	Quarterly	TM-2
Volumetric Flow Rate	m ³ /s	Quarterly	TM-2
Odour	ou	Quarterly	OM-7

Key:

% = percent
 g/g mole = grams per gram mole
 K = Kelvins
 kg/m³ = Kilograms per cubic metre
 m/s = metres per second
 m³/s = cubic metres per second
 ou = odour units

Table 4 Annual Sampling and Analysis of Diffuse Sources (Points 19, 20, 21, 23, 24, 25)

Pollutant	Units	Frequency	EPA Approved Test Method
Odour	ou	Yearly	OM-7

Key:

OM = Other Method
 ou = odour units

Table 5 Quarterly Sampling and Analysis of Diffuse and Point Sources (Points 35, 39, 40, 41, 42, 44, 45, 46)

Pollutant	Units	Frequency	EPA Approved Test Method
Odour	ou	Quarterly	OM-7

3.1 EPL Odour Dispersion Modelling

Odour dispersion modelling from the odour monitoring results for the reporting period (as required by condition M2.1) is to be included in the annual system performance report submitted to the EPA (refer to EPL condition R4).

N.B. The same odour dispersion model developed by GHD for the annual odour audit approved under development consent 06_0228 must be used.

4. Development Consent 06_0228 Monitoring Requirements

4.1 Biofilter System

Tables 6 summarises the sources from the factory which are ducted to the biofilter as they are *mandatory* as outlined in the Project Approval 06_0228 Ethanol Upgrade Project. Refer to the Odour Management Plan [EN-P-247](#) for further details on the operation of the biofilter.

Table 6 – Mandatory – Sources to be Ducted to Biofilter

Plant	Section	Unit	Identification No.	Odour Emission Rate Before Biofilter Control (ou m³/s)	Predicted Odour Emission Rate After Biofilter (ou m³/s)
DDG (liquids)	Liquids Line	Feed dump tank	DDG 20	8,900	1,335
	Liquids Line	Condensate Tank	DDG 23	25,711	3,857
	Liquids Line	Vent Condenser	DDG 24	3,500	525
	Liquids Line	Finish Feed Tank	DDG 26	18,333	2,750
	Liquids Line	Finisher pump tank	DDG 28	1,433	215
	Liquids Line	Dryer Feed Tank	DDG 30	1,433	215
	Liquids Line	Feed Holding Tank (syrup)	DDG 31	1,317	198
	Liquids Line	CIP Tank	DDG 32	417	63
DDG (Solids)	Solids Line	Feed from blowers to DDG Shed Baghouse	DDG 18	867	130
	Solids Line	DDG Shed Load-out chute dust extraction	DDG 35	Not tested	Not tested

Key:

ou m³/s = odour units cubic metres per second

Table 7 summarises the “*additional*” sources from the factory that may be ducted to the biofilter as outlined in the Development Consent of the Ethanol Upgrade. The “*additional*” sources are combination of Stages 2 and 3 from the GHD 2008 report.

As stated in a letter from the Department of Planning dated 21 July 2009, “*I concur that the additional odour control works may not necessarily be implemented all at the same time, or concurrently; however the Director-General will direct Shoalhaven Starches on the implementation specific controls listed as additional. This may be concurrently, or it may be one or two items from the list. The Director-General will determine which controls will be implemented and by when.*”

Table 7 – Additional – Sources That May Be Ducted to Biofilter

Plant	Section	Unit	Identification No.	Odour Emission Rate Before Biofilter Control (ou m³/s)	Predicted Odour Emission Rate After Biofilter (ou m³/s)
New DDG Plant		DDG Tank Vents		36,000	5,400
	Dryer Building	Transfer Cyclones (6 units)		9,083	1,362

	Dryer Building	Dryers (6 units)		8,417	1,263
	Dryer Building	Decaners (10 units)		6,321	948
	Pellitiser Plant	Pellitiser Baghouses (2 units)		34,378	5,157
	Fugitives			722	108
Existing DDG	Liquids Line	Vent Condenser Drain	DDG 25	3,167	475
	Liquids Line	Decanter Feed Tank	DDG 1	108	33
	Solids Line	Decaners 3 & 4	DDG 5	1,700	255
	Solids Line	Decaners 1 & 2	DDG 2	260	39
Ethanol (new)	Fermentation	Propagation Tank	2	14,167	2,125
Ethanol (existing)	Fermentation	Yeast Propagators – Tanks 4 & 5	E15	28,333	4,250
	Fermentation	Grain Retention - Tank 2	E8	3,250	975
		Yeast Propagators Tanks 1, 2 & 3	E14	5,500	825
Glucose	Brewers	Enzyme tanks (7)	B7	2,042	613
Farm	Factory Collection	Farm Tank	F18	3,834	1,150
DDG	Liquids Line	Light Phase Tank	DDG 19	450	68
Distillery		Molecular Sieve – Vacuum Drum	D2	1,350	203
Ethanol		Jet Cooker 2 & 4	E7	1,133	170
		Jet Cooker 1 – Retention Tank	E13	1,067	160
Glucose		Drum Vacuum Receiver	C4	3,500	525
		Ion Exchange Effluent Tank	C18	250	38
		Cooker A & B Flash Tanks	B3	950	143

Key:

ou m³/s = odour units cubic metres per second

4.2 Biofilter Monitoring

Table 8 summarises the monitoring requirements for the biofilter's. Note that quarterly testing is to be carried out on:

- Inlet to the Biofilter (Point 39)
- Biofilter bed – 2 sections from each biofilter (Point 40 and 41)

Table 8 – Biofilter Monitoring Requirements

Parameter	Units of Measure	Frequency of Testing	Design Criteria	EPA Approved Test Method
Flow/ Velocity	Nm ³ /hr	Quarterly		TM-2
Temperature	°C	Quarterly	< 40	TM-2
Odour	ou	Quarterly	500	OM-8

Key:

°C = temperature
 m³/hr = cubic metres per hour
 ou = odour units

Odour Removal Efficiency Criteria: > 85%
 (to be calculated by using inlet number and average of each biofilter bed)

Odour Emission Rates criteria:

Mandatory (odour controls)	11,939 ou m ³ /s (peak 27,460 ou m ³ /s)
Mandatory with ethanol upgrade	26,178 ou m ³ /s (peak 60,208 ou m ³ /s)
Additional	36, 916 ou m ³ /s to 38, 221 ou m ³ /s

Note: Odour emission rates relating to Additional odour controls will be required to be re-calculated if the Secretary requires additional controls to be installed. The OER will vary depending on the control installed.

If the OER criteria for the Biofilter is not achieved, then Shoalhaven Starches would have to investigate the non-compliance through Corrective Action procedure QMS-P-130. The corrective action would involve an audit of the activities associated with the time of the testing and including checks of the Biofilter media.

Once the source of the non-compliance is identified then Shoalhaven Starches would implement a plan to correct the problem and then re-test the biofilter to ensure compliance.

4.3 Odour Verification Testing (MP 06 0228 , condition 6A,6C & 6D)

Additional odour testing verification as set out in Shoalhaven Starches Project Approval 06_0228 conditions of consent are shown below:

Condition 6A: The Independent Odour Audit is to include:

- a) 3monthly (quarterly) odour monitoring with samples taken from the carbon dioxide/ethanol recovery scrubber inlet/s and outlet/s; (identified as EPL Point 16).
- b) quarterly odour monitoring with samples taken of single vent stack (direct to atmosphere) emissions from filling a fermenter tank; (identified as EPL Point 44)

Condition 6C: Quarterly odour monitoring from the DDG exhaust stack and report the results in the independent odour audit (identified as EPL Point 46).

Condition 6D: Odour monitoring on relocated Starch Dryer No.5 - MOD 7 (EPL Point 47) in accordance with requirements of the EPL and the report the results in the independent odour audit.

Condition 6E: If the results of odour monitoring show any odour impact greater than that predicted by the odour dispersion modelling in the EA and the modification proposals referred to in Condition 2 of Schedule 2, the Proponent shall investigate and implement further odour treatment options as directed by the Secretary or the EPA.

4.4 Yearly Compliance Testing for Odours – Mandatory

Each year Shoalhaven Starches must conduct an Independent Odour Audit (Schedule 3, condition 5 of the Development Consent 06_0228). This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary.

Table 9 summarises the yearly testing that may be required to determine compliance with predicted odour emissions for the *Mandatory* Odour Controls (Stage 1 in GHD’s Ethanol Upgrade Air Quality Assessment report).

N.B. The number and location of odour samples may vary as required by the independent odour consultant.

Table 9 – Mandatory - Yearly Compliance Odour Testing

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Test Method	Predicted Odour Emission Rate (ou m³/sec)
Starch Plant (existing)	Gluten Dryers No. 1, 2, 3, 4	Flow, temperature	Quarterly	TM-2	--
		Oxygen	Quarterly	TM-25	--
		Moisture	Quarterly	TM-22	--
		Odour	Quarterly	OM-7	No. 1 - 9,886 (13,182)
					No. 2 - 4,133 (5,511)
					No. 3 - 14,625 (19,501)
					No. 4 - 9,998 (13,331)
Starch Plant	Starch Dryers No. 1, 3, 4 & 5	Flow, temperature	Quarterly	TM-2	--
	Spray Starch	Oxygen	Quarterly	TM-25	--
		Moisture	Quarterly	TM-22	--
		Odour	Quarterly	OM-7	No. 1 - 4,736 (6,315)
					No. 3 - 4,827 (6,436)
					No. 4 - 5,363 (7,151)
					No. 5 - 5,095 (6,794)
	Spray dryer				738 (983)
Ethanol Plant	Grain retention tank 2 (E2)	Flow, temperature	Yearly	TM-2	
(existing)	Feed to distillery (E22)	Oxygen	Yearly	TM-25	
	Farm Tank (F18)	Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	Grain - 3,250 (6,500)

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Test Method	Predicted Odour Emission Rate (ou m ³ /sec)
					Feed – 83 (167)
					Farm tank – 3,834 (7,667)
	Vent stack while filling a Fermenter	Odour	Quarterly	OM-7	--
Glucose	Enzyme Tanks (7 of) (B7)	Flow, temperature	Yearly	TM-2	
		Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	2,042 (4,083)
Farm	WWTP				
	Ponds 1 - 6	Odour	Yearly	OM-8	3,600
	Bulk Volume Fermenter	Odour		OM-8	Negligible
	Membrane Bioreactor	Odour	Yearly	OM-8	500
	Sulphur Oxidising (SO) basin	Odour	Yearly	OM-8	23,400
Flour Mill	4 x cyclones	Flow, temperature	Yearly	TM-2	
		Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	No. 1 – 1,654
					No. 2 – 617
					No. 3 – 1,477
					No. 4 – 551
DDG	Palmer Cooler Bypass Outlet	Flow, temperature		TM-2	Ducted to Boilers
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-8	
	DDG Odour Scrubber Outlet	As above		As above	Ducted to Boilers
	DDG Load Out Shed	As above	Yearly	As above	
	Boiler 5 & 6 Combined Stack Outlet	As above	Quarterly	As above	

Note: (xxx) numbers in the Predicted Odour Emission Rate (OER) column are the OER before control

Key:

ou m³/s = odour units cubic metres per second

OM = Other Method

TM = Test Method

4.5 Compliance Testing for Odours – “Additional”

Table 10 summarises the yearly testing required to determine compliance with predicted odour emissions for Additional Odour Control if required.

Table 10 – Additional – Yearly Compliance Odour Testing

Location	Unit	Parameters to Monitor	Frequency	EPA Approved Test Method	Predicted Odour Emission Rate (ou m ³ /sec)
Starch Plant	Gluten Dryer No. 5	Flow, temperature	Yearly	TM-2	
	Gluten grinder	Oxygen	Yearly	TM-25	
		Moisture	Yearly	TM-22	
		Odour	Yearly	OM-7	No. 5 – 9,661 (22,220)
					Grinder – 9,661 (22,220)

Note: (xxx) numbers in the Predicted Odour Emission Rate (OER) column are the OER before control

Key:

ou m³/s = odour units cubic metres per second

OM = Other Method

TM = Test Method

5. National Pollutant Inventory (NPI)

If Shoalhaven Starches uses more than a specified amount of one or more NPI listed substances, or consumes more than a specified amount of fuel or electric power, Shoalhaven Starches will be required to estimate and report emissions of these substances.

Shoalhaven Starches does trigger thresholds and hence is required to report to the Environment Protection Authority (EPA) every year by 30 September, as described in the *Protection of the Environment Operations (General) Regulation 2009*.

The NPI Report measures the air emissions per point source on site. The Environment and Technical Manager has responsibility for ensuring the NPI reporting requirements are met; supporting data and the NPI reports must be kept for a minimum of 4 years.

Table 11 summarises Shoalhaven Starches major air emission sources and the control measures implemented to mitigate air pollution.

Table 11 – Air Emissions Source Summary

Location	Emission Control Measures	Pollutants	OEH Approved Test Method	POEO (Clean Air) Regulation limit / EPL Limit
Boilers 1, 3 & 7 - Natural Gas & Biogas	Low NOx Burner	Nitrogen Oxides (NO _x)	TM-11	500 mg/m ³
Boilers 2, 4, 5 & 6 – Coal	Cyclone	TSP	TM-15 (AS4323.2)	30 mg/m ³
	Fabric Filter / Baghouse	Sulphur Dioxide	TM-4	600 mg/m ³
	Staged combustion, automatic tuning of air/gas ratios and continuous oxygen monitoring.	PM ₁₀	OM-5	-
		Metals (Type I & II)	TM-12,13 & 14	1 mg/m ³
		VOC	TM-34	40 mg/m ³
Continuous opacity Monitoring	Carbon Monoxide	TM-32	-	

Location	Emission Control Measures	Pollutants	OEH Approved Test Method	POEO (Clean Air) Regulation limit / EPL Limit
Gluten Dryers No. 1 – No. 7	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	50 mg/m ³
Starch Dryers No.1 – No5	Wet Scrubber, Cyclones	TSP	TM-15 (AS4323.2)	50 mg/m ³
Spray Dryer	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	50 mg/m ³
Flour Mill	Fabric Filter / Baghouse	TSP	TM-15 (AS4323.2)	20 mg/m ³
Odour Sources – Refer to Appendix A & D of <i>Report on Ethanol Upgrade Air Quality Assessment</i> , GHD 2008	<ul style="list-style-type: none"> - Biofilter. - Improved DDG loadout. - Wastewater Treatment Plant & Biogas Recovery Plant. - Wet legs on tanks. - Foul process air sources piped to boilers for odour destruction. 	Odour	OM-7	-

Key:

CO ₂	=	Carbon Dioxide
VOC	=	Volatile Organic Compounds
mg/m ³	=	milligrams per cubic metre
POEO	=	Protection of the Environment (Clean Air) Regulation 2002
PM ₁₀	=	Particulate matter less than 10 microns
TM	=	Test Method
TSP	=	Total Solid Particles

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DATE: 16-11-2018

DATE: 16-11-2018