

Kwinana Liquor Burner – Emissions Reduction Project

Alcoa World Alumina Australia

**Report and recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia
Bulletin 1163
January 2005**

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time
20 Sept 2004	Minister allows appeals and sets LOA at ARI	
12 Nov 2004	Referral document received by EPA	8 weeks
7 Jan 2005	Final information received from proponent	8 weeks
31 Jan 2005	EPA report and recommendations to the Minister	3 weeks

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1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to the proposal by Alcoa World Alumina Australia (Alcoa) to restart their Liquor Burner at Kwinana with improved emission control equipment.

Alcoa's Kwinana refinery has been operating since 1963 and its operations are managed via a Department of Environment (DoE) licence. The Liquor Burner was an approved part of the refinery and was covered by a previous DoE licence. Alcoa elected to cease operating the Liquor Burner in May 2002 due to public concerns about air emissions from the Liquor Burner at Alcoa's Wagerup refinery.

Alcoa now wishes to recommence Liquor Burner operations and has proposed to install improved pollution control equipment. The proposal for the new pollution control equipment was referred to the EPA in May 2004.

Based on the information provided in the referral document the EPA considered that, while the proposal has the potential to affect the environment, it was an improvement over the approved Liquor Burner operations and could be readily managed by the DoE under Part V of the *Environmental Protection Act 1986*.

As such, the EPA recommended a Level of Assessment (LOA) of "Not Assessed – Managed under Part V". This LOA was appealed and in September 2004, the Minister for the Environment allowed appeals to the extent that the proposal be remitted to the EPA for further assessment at the level of "Assessment on Referral Information" (ARI).

The Minister for the Environment also requested that the EPA review the existing monitoring requirements for the whole of Alcoa's Kwinana refinery and to liaise with the DoE to develop a draft Works Approval and any recommended revisions to the Part V Licence for publication with the EPA's Report and Recommendations.

The proponent subsequently submitted a revised referral document setting out the details of the proposal, potential environmental impacts and appropriate commitments to manage those impacts.

Therefore under Section 40(1) of the Environmental Protection Act, the LOA for this proposal is ARI, and this report provides the EPA advice and recommendations in accordance with Section 44(1).

Appendix 2 contains a draft Works Approval for the proposal (prepared under Part V of the *Environmental Protection Act 1986*), it is included as a matter of information only and does not form part of the EPA's Report and Recommendations. Matters covered in the Works Approval, and which have been taken into account by the EPA, appear in the report itself.

2. The proposal

Alcoa wishes to recommence operation of the Liquor Burner and has proposed to improve the pollution control equipment in order to reduce emissions. Thus the proposal being assessed in this report is the installation of improved pollution control equipment on the existing Liquor Burner.

The existing pollution control equipment on the Liquor Burner consists of a primary and secondary cyclone with water scrubbing.

The proposed pollution control equipment consists of a primary cyclone, filter, wet scrubber and a regenerative thermal oxidiser (RTO). The stack height would also be increased.

Alcoa predicts the proposed equipment will result in reductions of Volatile Organic Compound (VOC) emissions of between 81 and 98 %.

The main characteristics of the proposal are summarised in the table below.

Table 1: Summary of key proposal characteristics

Pollution Control Equipment	Existing	Proposed
primary cyclone	yes	yes
secondary cyclone	yes	no
water scrubber	yes	no
filter	no	yes
wet scrubber	no	yes
regenerative thermal oxidiser	no	yes
stack height	40 metres	70 metres

The potential impacts of the proposal are discussed by the proponent in the referral document (Environ, 2004).

3. Consultation

The proponent has advised that consultation has occurred with the existing Alcoa Community Consultation Network, the Kwinana Town Council and the Cockburn City Council. Alcoa has also formed a Stakeholder Reference Group specifically for this proposal. Further details on the consultation and the matters raised by stakeholders can be found in Section 4 of the referral document.

4. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following environmental factor relevant to the proposal requires evaluation in this report.

4.1 Air Emissions

Description

Alcoa predicts the VOC emissions from the Liquor Burner would be reduced by between 81 and 98% with the new pollution control equipment. The proponent undertook modelling to predict the ambient concentrations of criteria pollutants and VOC's, the details and results of which are described in Section 3.2 of the referral document.

Alcoa has committed to a monitoring program which includes:

- verification of stack emission through comprehensive monitoring of criteria pollutants, VOC's, particulates and trace metals,
- ongoing targeted stack emission monitoring, and
- ambient monitoring of VOC's at sites within the refinery and local community.

Assessment

The EPA's environmental objective for this factor is to ensure that gaseous emissions from the plant; meet air quality standards and limits stated in relevant air quality standards/guidelines including the National Environment Protection Measure (NEPM) for ambient air quality; do not cause an environmental or human health/amenity problem; and are minimised using best practicable technology.

The proposed pollution control equipment is similar to that recently installed during a emissions reduction program on Worsley Alumina's Liquor Burner and these controls are considered best practice for the Alumina industry.

The DoE undertook dispersion modelling using DISPMOD, the results of which suggest the proponent's modelled ambient predictions are reasonable and conservative. The DoE advises that Alcoa should be required to demonstrate that the 70 metre high stack will avoid significant building downwash affects.

The EPA notes that the contribution of NO₂ is not insignificant when considered together with the many other sources in the area. However, ambient monitoring at the DoE's Hope Valley monitoring site showed that the NEPM standard for NO₂ was readily complied with while the Liquor Burner was operating between 1998 and 2002.

The Department of Health (DOH) has advised that the Health Risk Assessment of the emissions from the Liquor Burner was undertaken with a relatively conservative approach and based on standard methodology. The margin of safety for the protection of public health identified within the screening assessment and the peer review process is considered adequate by DOH staff.

Both the EPA and DOH note that the incremental ambient concentrations of VOC's when considered in isolation are very small and have a very small incremental health impact. However, there is no information on the cumulative concentrations and this

highlights the need for a comprehensive program to quantify emissions and cumulative ambient concentrations of all potentially significant pollutants in the Kwinana region. The EPA discusses this matter further in Section 6 "Other Advice".

The proponent has committed to ambient monitoring of VOC's, however the emissions from the Liquor Burner are so small that the contribution from the Liquor Burner could not realistically be isolated and assessed. The EPA believes that these monitoring resources could be better utilised in a Kwinana regional study.

Alcoa has also made an additional commitment to demonstrate that the 70 metre stack would avoid significant building downwash effects.

The EPA notes that environmental regulation of this proposal can be adequately addressed through the DoE's Part V process.

Alcoa has submitted a Works Approval application and the DoE has prepared a draft Works Approval for the construction (Appendix 2) which includes a requirement for a Commissioning Plan which addresses measurement of Liquor Burner stack air emissions.

Summary

Having particular regard to the:

- DoE's DISPMOD modelling results;
- ambient monitoring results;
- DoE's draft Works Approval; and
- DOH advice,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

The EPA believes that this proposal (for the installation of improved pollution control equipment) does not warrant Ministerial Conditions because it can be adequately regulated by a Works Approval and Licence, and as such, has not recommended any conditions.

Note: The notification that the DoE had received an application for a Works Approval was advertised in the *West Australian* on 01 November 2004. Subject to the Minister for the Environment's determination of any appeals on this report, the final Works Approval will be issued by the DoE and the usual 21 day appeal period will apply.

5. Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures, if any, to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The proponent's commitments with respect to monitoring can be adequately accommodated through the DoE's Part V process. Since the implementation of this

proposal can be readily managed by the DoE through the Part V process, the EPA does not believe Ministerial conditions are warranted and as such, has not recommended any conditions.

6. Other Advice

Alcoa Kwinana Refinery Emissions and Air Quality Monitoring Program (DoE Part V Licence No. 5245/8)

In the LOA appeal determination, the Minister for the Environment also requested the EPA to review the emissions and air quality monitoring for the Kwinana refinery generally.

The EPA notes that SO₂ emissions are well managed in the Kwinana area and the stack and ambient monitoring requirements in the DoE Licence are appropriate, however SO₂ monitoring of the power house stack should also be included if a significant amount of oil firing is likely to occur. Similarly the ambient dust monitoring requirement is considered appropriate. The quarterly stack monitoring of the calciners (particulates, SO₂, NO_x, CO) and power house (NO_x, CO) is also considered adequate for the pollutants monitored, however further information on the particulate emissions (i.e. PM₁₀ fraction and composition) would also be useful.

The EPA agrees with the proposed Liquor Burner monitoring program to characterise the Liquor Burner emissions (such as VOC's, particulates, metals, dioxins and furans) definitively. It does not, however, address the refinery as a whole. As such, the EPA recommends that the DoE use Part V of the *Environmental Protection Act 1986* to require Alcoa to prepare and implement an Emission Characterisation Plan which identifies all potentially significant pollutant species and accurately defines quantities and discharge parameters from both point and fugitive sources.

Kwinana's industry in general

Stage 1 of the Kwinana Gap Emissions Study (DoE, 2004) notes that while SO₂ is well monitored and understood, there are gaps in available information for particulates and NO_x and recommends further consideration of organic emissions once reliable data are available. There is also a need for more definitive information on the pollutant discharge parameters that would be needed for detailed cumulative modelling and health risk assessment.

Community expectations are that industry should have accurate and comprehensive data on all of its discharges publicly available. The EPA notes that while the National Pollutant Inventory (NPI) reporting provides useful and transparent data, there are limitations on the estimation applied.

During Stage 2 of the Kwinana Gap Emissions Study, further consideration will be given to organic emissions and the EPA recommends that industry be proactive in accurately characterising all its emissions. Where there is a need for more information, the EPA recommends that industries prepare and implement Emission Characterisation Plans to identify all potentially significant pollutant species and

accurately define quantities and discharge parameters from both point and fugitive sources.

The EPA strongly recommends that all industry in the Kwinana area participate in a Kwinana region study of all potentially significant pollutants and detailed cumulative modelling. This would give the community greater confidence and would facilitate the environmental impact assessment of future proposals. The EPA suggests that the Minister for the Environment write to the Kwinana Industries Council (KIC) about coordinating such a study.

7. Conclusions

The EPA has considered the proposal by Alcoa to install improved emission control equipment on the Liquor Burner at the Kwinana refinery.

The EPA has concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised.

8. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is the installation of improved pollution control equipment on the Liquor Burner;
2. That the Minister considers the report on the relevant environmental factor as set out in Section 4;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised.
4. That the Minister notes the EPA's other advice to the DoE, Alcoa and industry in general with respect to emissions characterisation.

Appendix 1

References

DoE (2004). *Kwinana Gap Emissions Study*. Department of Environment,
Government of Western Australia, June 2004.

Environ (2004). *Kwinana Liquor Burner – Emissions Reduction Project*.
Environmental Referral Document, Environ, November 2004, WA.

Appendix 2

Draft Department of Environment Works Approval

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DEPARTMENT OF ENVIRONMENT

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PREAMBLE

The following statements in this Preamble either reflect important sections of the *Environmental Protection Act 1986* (EP Act) or provide relevant background information for the reader. **They should not be regarded as conditions of draft works approval.**

For the final Works Approval, this Preamble will be replaced by a separate Assessment Report document. The Assessment Report will set out the context in which the works approval is issued. Consistent with the recommendations of the Welker Review, that report will document the DoE's assessment of the significance of discharges to the environment likely to result from the proposed works, the risk assessed impacts of the identified discharges and the managed framework of monitoring of the identified discharges. The report will build upon the understanding of the proposal determined under Part IV of the EP Act by the Environmental Protection Authority.

Applicability

This works approval is issued to Alcoa of Australia Limited T/A Alcoa World Alumina Australia for the construction of upgraded air pollution control equipment on the Liquor Burner facility at the Kwinana Alumina Refinery, located at Lot 102 Sutton Road, Naval Base. This works approval applies to, but is not necessarily limited to the following:

- Waste emissions to the environment,
- Particulate control facilities,
- Regenerative thermal oxidiser unit,
- Condensing Wet scrubber, and
- A 70 metre high liquor burner stack (replacing the existing 46 metre stack).

Emissions Testing

The works approval holder is expected to construct and maintain the upgraded Liquor Burner such that it is able to carry out appropriate source testing of its emissions and monitor and record the concentration and mass of emissions released to the environment. Any source monitoring would be conducted at times which can be reasonably assumed and shown to be characteristic of normal operating conditions.

In line with the Minister for the Environment's decision on 10 January 2005 on the outcome of appeals relating to the refinery licence, the DoE will liaise with the works approval holder to ensure that an Environmental Improvement Plan process is developed. This will be conducted in consultation with the Stakeholder Reference Group and the Community Consultative Network to confirm that the anticipated concentration of emissions released to the environment from the upgraded liquor burner are comparable to those identified during assessment of this proposal.

Emergency, Accident or Malfunction

The licensee should advise the Director as soon as practicable of the identification of any discharge of waste which has occurred as a result of an emergency, accident or malfunction, or extreme weather condition, otherwise than in accordance with any condition of this works approval and has caused or is likely to cause pollution.

General Requirements

- The works approval holder should take all reasonable and practicable measures to prevent pollution of the environment.

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- The works approval holder should ensure that all aspects of the proposed operation comply with the *Environmental Protection (Noise) Regulations 1997*.

The works approval holder should take all reasonable and practicable measures to prevent or minimise the emission of odours from the premises. It is an offence under s49 of the Act to emit, or cause to be emitted, an unreasonable emission of odour from any premises.

Non-Standard Operations

The works approval holder should advise the Department of Environment at least 24 hours prior to the commencement of any planned non-standard operations that may have the potential to cause pollution.

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CONDITIONS OF WORKS APPROVAL

DEFINITIONS

In these conditions of works approval, unless inconsistent with the text or subject matter:

“Director” and “Department of Environment” for the purpose of correspondence means –
Regional Manager, Kwinana Peel Region
Department of Environment
PO Box 454
KWINANA WA 6966
Telephone: 9411 1777
Facsimile: 9419 5897

“Director” means Director, Environmental Management Division of the Department of Environment for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;

“DoE” means Department of Environment;

“g/ m³” means grams per cubic metre;

“LBF” means Liquor Burner facility;

“licence” means Licence No. 5245/8 issued to Alcoa of Australia Limited T/A Alcoa World Alumina Australia for the premises on 1 September 2004 pursuant to section 56 of the *Environmental Protection Act 1986*;

“mg/m³” means milligrams per cubic metre;

“NATA” means National Association of Testing Authorities;

“NO₂” means nitrogen dioxide;

“NO_x” means oxides of nitrogen;

“ongoing operation” means operation of equipment post wet commissioning, under normal operating conditions.

“oxides of nitrogen” for the purposes of this Works Approval means nitrogen dioxide at a 7% oxygen reference level;

“Particulate Matter” “PM” or “particulate” means solid particles or liquid droplets suspended or carried in air;

“TSP” means total suspended particulates;

“USEPA” means United States Environment Protection Agency;

“wet commissioning” means operation of equipment for the first time post construction for the purposes of trialing or testing performance of the equipment that involves storage, processing or treatment of caustic soda and/or Bayer liquor or alumina tri-hydrate, or the discharge of waste;

“VOCs” means Volatile Organic Compounds;

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GENERAL CONDITIONS

GENERAL CONSTRUCTION AND OPERATION DESCRIPTION

- G1(a) Subject to condition G1(b), the works approval holder shall construct and operate the works in accordance with:
- (i) The works approval application dated 9 August 2004; and
 - (ii) The document titled “Kwinana Liquor Burner Emissions Reduction Project – Works Approval Application”, dated 30 July 2004.
- G1(b) Where the details and commitments of the documents listed in condition G1(a) are inconsistent with any conditions of the works approval, the works approval shall prevail.

NOTIFICATION OF COMMISSIONING

- G2 The works approval holder shall submit a Commissioning Plan to the Director at least 5 working days prior to wet commissioning. The Commissioning Plan shall indicate when wet commissioning will take place, details of the “as constructed” configuration of the Particulate Control Equipment and Regenerative Thermal Oxidiser that were subject to clarification during the final design phase as highlighted in section 2.5.1 and 2.5.3 respectively of the document referred to in G1(a)(ii), a schedule that includes duration and times, the proposed throughput and plans to manage and measure liquor burner stack air emissions.

SUBMISSION OF COMPLIANCE CERTIFICATE

- G3(a) The works approval holder shall submit a Compliance Certificate to the Director following the completion of construction and wet commissioning of the works outlined in the works approval application and supporting documentation, and prior to putting the same into ongoing operation.
- G3(b) The Compliance Certificate shall certify that the works were constructed in accordance with the conditions of works approval and documentation supporting the application to construct the works, and shall be signed by an authorised officer of Alcoa World Alumina Australia with the printed name and position of that person within the company, and preferably will contain the Company seal.

AIR POLLUTION CONTROL CONDITIONS

CONSTRUCTION OF POLLUTION CONTROL EQUIPMENT

- A1 The works approval holder shall design and construct pollution control equipment for the Liquor Burner to comply with design emission concentrations for the parameters shown in Column 1 of Table 1 equal to or lower than those shown in Column 2 of Table 1;

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Table 1: Liquor Burner Emissions Reduction Performance

Column 1	Column 2	Column 3
Parameter	Design Emission Concentration *	Mass Emission Reduction represented by design (%)
Particulate Matter (TSP)	10 mg/m ³	96
Nitrogen Oxides (NOx)	135 mg/m ³	0
Carbon monoxide	200 mg/m ³	92
VOC's		98
Acetone	5 mg/m ³	97
Acetaldehyde	2 mg/m ³	90
Formaldehyde	0.4 mg/m ³	81
Benzene	2 mg/m ³	97
Toluene	0.5 mg/m ³	87

* expressed dry at 0 degrees Celsius and 1.0 atmosphere (101.325 kilopascals)

Column 3 sets out the designed emissions reductions compared to liquor burner emissions before the liquor burner was turned off in May 2002 as set out in the documents referred to in Condition G1.

DUST - GENERAL REQUIREMENT

- A2 The works approval holder shall take all reasonable and practicable measures, including the use of water carts and/or dust suppression agents, to prevent the generation of visible dust crossing the boundary of the premises during construction activities.

LIQUOR BURNER STACK

- A3(a) The works approval holder is permitted to construct a waste emission point to the environment for gaseous and particulate waste from the liquor burner (Specific details of the type and a reference map of the location to be provided).
- A3(b) The works approval holder shall design and construct the waste emission point so that no significant building downwash occurs when contaminants are emitted into the environment.

STACK SAMPLING PORTS, PLATFORMS, ACCESS WAYS

- A4 The works approval holder shall construct source emission sampling points for the monitoring of emissions. The works approval holder shall construct walkways, platforms and source emission sampling points for the Liquor Burner exhaust stack in accordance with Australian Standard 4323.1 –1995 (Stationary source emissions, Method 1: Selection of sampling positions).

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WATER POLLUTION CONTROL CONDITIONS

BUNDING REQUIREMENTS

- W1(a) The works approval holder shall locate the condensing wet scrubber, including transfer facilities, within a bunded area(s) that meets the following performance specifications:
- (i) a permeability of 10^{-9} metres per second or less;
 - (ii) designed to contain not less than 110% of the volume of the largest vessel or inter-connected system, and,
 - (iii) designed to contain at least 25% of the total volume of substances stored in the compound.
- W1(b) The compound(s) described in part (a) to this condition shall:
- (i) be graded or include a sump to allow recovery of liquid;
 - (ii) be chemically resistant to the substances stored;
 - (iii) include valves, pumps and meters associated with transfer operations wherever practical. Otherwise the equipment shall be adequately protected (eg. bollards) and contained in an area designed to permit recovery of chemicals released following accidents or vandalism;
 - (iv) be designed such that jetting from any storage vessel or fitting will be captured within the bunded area [see for example Australian Standard 1940-1993 Section 5.9.3 (g)];
 - (v) be designed such that chemicals which may react dangerously if they come into contact, are in separate bunds in the same compound or in different compounds; and
 - (vi) be controlled such that sufficient capacity of the bund is maintained at all times (eg. regular inspection and pumping of trapped uncontaminated rain water).

SEVERENCE

It is the intent of these works approval conditions that they shall operate so that, if a condition or a part of a condition is beyond my power to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within my power to impose and are not otherwise *ultra vires* or invalid.

.....
Officer delegated under Section 20
of the *Environmental Protection Act 1986*
Date of Issue: