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Dear Sally,

**BERRIMA CEMENT WORKS - DA 401-11-2002-I MOD 11 - USE OF HICAL50
RESPONSE TO EPA LETTER 01 AUGUST 2019**

I write to you in relation to your email dated 1 August 2019, seeking clarification of our standing in light of correspondence received from the EPA on the same date. We note the correspondence received from the EPA arose as a result of our previous RFI document, dated 1 July 2019.

Boral acknowledges that the EPA is in general agreement that the use of HiCal50 does not appear to present a significant risk for change in the nature of air pollutants, during proposed start-up and shut down conditions. However, we do not accept, nor consider it appropriate, to be imposing arbitrary limits on copper (Cu) in our consent.

The following provides a response to the matters raised in the EPA letter.

Copper Concentration and influence of dioxin and furan formation

The correspondence from the EPA contains a recommendation that condition 3.2.1 of the consent, be amended to include a Cu concentration specification of no greater than 10 microgram/kg for HiCal50. We are assuming this was meant to be milligrams, and are addressing this based on 10mg/kg.

While it is recognised that Cu can influence Dioxin and Furan formation, and it is technically plausible the concentration could be lowered from our existing specification, Boral believes the suggested figure is arbitrary, and not based on any referenced facts. It would appear the figure has been derived from the results of two samples of the HiCal, sourced from Kurri Kurri.

Please note that from all representative samples taken of the Kurri Kurri material, we have recorded and received Cu concentration levels up to 19 mg/kg (see attached summary).

Cu is believed to have a strong catalytic effect, up to 25 times stronger than iron. A review of literature relating to combustion experiments in a laboratory-scale fluidized-bed reactor and the role of copper chloride in the formation of Dioxins and Furans, indicates that Cu can have an effect on formation of dioxins and furans, with fuel Cu concentrations as low as 0.006 and 0.007% (Takeshi et al 2004).

By utilising the 0.006% and 0.007% Cu in fuel, this would equate to a Cu limitation of 60-70mg/kg.

Boral is willing to accept a lower Cu limit as part of the specification, however it needs to be reasonable and only be applied for HiCal/coal blended material when used during start up conditions; rather than in isolation.

The currently approved specification of 400mg/kg is based on HiCal material supplied by Regain. The limitation proposed would eliminate the possibility of the site receiving HiCal material in the future, thereby precluding the possibility of our involvement in opportunities to utilise HiCal50 material in the future; an ongoing supply source (as opposed to a one off supply) would make a separate feed into the kiln economically viable.

Boral requests a Cu limit of 65 mg/kg for HiCal50/coal blended material used during start-up conditions be introduced, and retain the 400mg/kg HiCal Cu limit during normal operations.

Fuel rate

Boral appreciates the concern about limiting the HiCal50 fuel rate to 135 kg/hr when blended at 4% with coal, at 96% and acknowledges that the example provided reflected a HiCal50 132 kg/hr feed rate.

The feed rate of coal is controlled to achieve the heat required for kiln start. As the HiCal50 will be blended with coal, having a 135 kg/hr limit on HiCal during start up conditions, will introduce an impracticable limiting factor for heat within the system, which will negatively impact the ability to start the kiln.

Boral submits that our assessments, and the 4% HiCal limit and CU reduction requested, sufficiently address this concern.

Additional Information - dated 3 June 2004

The EPA noted that they were unsure how our statement “The formation of dioxins and furans is not influenced by the use of alternative fuels and materials. The co-firing of Hi Cal or AKF1 will not influence the formation of dioxins and furans.” as supporting documents were not provided.

Please find below pages 10 and 11 of the document titled Blue Circle Southern Cement Berrima Plant, Proposed Non-Standard Fuels Modification, Additional Information, dated 3 June 2004, which was provided to both the EPA and Department of Planning and Environment as part of the Non-Standard Fuels Modification modified on 26 September 2005.

As is noted, the most important feature of preventing the formation and release of POP's is the quick cooling of kiln gas exhaust gases to a temperature lower than 200C. All exhaust emissions even during start up is <200 degrees.

➤ ***Discuss the potential for the formation of dioxins and furans during co-firing of Hi Cal and AKF1***

The formation of dioxins and furans is not influenced by the use of alternative fuels and materials. The co-firing of Hi Cal or AKF1 will not influence the formation of dioxins and furans.

A paper discussing the formation mechanisms for dioxins and furans prepared by Dr Chris Clunies-Ross is attached (Attachment 6). Dr Clunies-Ross has widely studied the de-novo dioxin and furan formation mechanisms. He completed his PhD on the formation of dioxins and furans and has wide Australian and international experience in emission testing in cement kilns burning a wide range of fuels. Dr Clunies-Ross' report concludes "I would expect neither *de novo* or *precursor* synthesis would be significant formation mechanisms."

The World Business Council for Sustainable Development – Cement Sustainability Initiative has completed an exhaustive review of the Formation and Release of POP's in the Cement Industry. This was conducted under the auspices of the 6th Intergovernmental Negotiating Committee under the Stockholm Convention. The draft report concluded that in relation to cement kiln using alternative fuels and raw materials "Co-processing of alternative fuels and raw materials, fed to the main burner or preheater/precalciner does not influence or change emissions of POP's". A copy of the draft report is attached (Attachment 7) and an electronic copy of draft report is included in the attached CD.

The draft report on 'Formation and Release of POP's in the Cement Industry' concludes "A smooth and stable kiln process, operating close to the process parameters set points, is beneficial for all kiln emissions as well as the energy use. Quick cooling of kiln exhaust gases to a temperature lower than 200°C is considered to be the most important measure to avoid PCDD/F emissions in wet kilns (process inherent in suspension preheater and precalciner kilns), as well as careful selection and control of substances entering the kiln through the raw material feed." Low exhaust gas temperatures are a feature of the No 6 Kiln preheater/precalciner kiln system. The use of The Protocol for the selection, specification and control of fuels and raw materials will ensure that the control of substances entering the kiln is achieved.

It should be noted that since the trials at Berrima, the new plant upgrade equipment has been installed incorporating evaporative cooling gas conditioning towers that are best available technology for process gas cooling. The conditioning towers ensure rapid cooling through the critical temperature range. This coupled with the very low level of chloride in the processed materials and exhaust gases ensure that dioxin and furan formation conditions will be

avoided. The Berrima process has an inherently low chloride level (less than 0.02% Cl⁻) in the process inputs and therefore does not require a chlorine bypass. The relatively low availability of chlorine within the processed materials is another factor ensuring very low dioxin and furan formation.

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As noted in our previous submission, the 2005 Modification and supporting documentation assumed HiCal/Coal when blended would be used during start-up conditions.

Abnormal Conditions

During periods of abnormal operations provide additional information on:

➤ ***Conditions applied for continuing use of alternative fuels and material***

The following operating conditions will apply to the use of alternative fuels:

1. During kiln light ups the use of alternative fuels (other the alternative fuels pre-blended with coal) will not commence until the kiln burning zone temperature is capable of supporting a stable flame. This is when the burning zone in the kiln achieve bright red hot or where the clinker coating surface temperature is greater than 850°C
2. The use of alternative fuels other than those pre-blended with coal will not commence until the kiln output reaches 80 tonnes per hour of clinker and operating conditions are stable.
3. The maximum firing rate of each alternative fuel will be set in the kiln control system and this rate will not be exceeded during operation.
4. The alternative fuels firing will be stopped automatically when the coal firing stops or the plant stops
5. The use of alternative fuels will not recommence till the kiln output reaches an output rate of 80 tonnes per hour of clinker and operating conditions are stable.
6. The firing of alternative fuels (other than those pre-blended with coal) will be stopped if the kiln has not been stabilised or is experiencing upset conditions which continue for more than 1 hour.
7. These control requirements will be programmed into the control system. This will ensure that the operating rules are applied consistently under all circumstances.
8. Kiln system stability is determined by the parameters used in the fuzzy logic control.

Note: Some alternative fuels will be pre-blended with the raw coal. In this case it is not possible to discontinue the use of these alternative fuels during upset conditions. The rate of use for Hi Cal 50 will be a maximum of 5% of total pulverized fuel rate.

If it not possible to maintain emissions below licence limits the use of the alternative fuels will be stopped until the emissions can be reduced below licence limits.

Energy from Waste Policy Technical Criteria

The EPA has queried how air emissions will be controlled, and risks mitigated, during start-up using HiCal50 fuel without a waste feed interlock. The EPA have noted that waste feed interlocks have not been discussed or proposed within the informations provided.

Boral notes that our modification application, including the air emission review relates to the use of HiCal50 blended during start-up, as we cannot reasonably include interlocks as the product is blended.

The EPA's review states that while the proposal technically does not meet the interlock requirement, the HiCal50 is unlikely to represent a significant risk of chloride compounds with the suggested amendments to the conditions. Boral are prepared to accept the amended conditions, outlined in our above response, to address these concerns.

Conclusion

We trust the above information sufficiently addresses the matters raised by the EPA, and look forward to the timely finalisation of the assessment of the proposal.

Should you have any further questions related to the information provided in this letter, please do not to hesitate to contact the undersigned on 0401 897 486, or adnan.voloder@boral.com.au, or alternatively Greg Johnson, Environmental Sustainability Manager - Boral Cement on 0401 893 420 or greg.johnson@boral.com.au.

Yours sincerely,



Adnan Voloder

Planning & Development Manager (NSW & ACT)
Boral Land & Property Group

References

64. Role of copper chloride in the formation of polychlorinated dibenzo-p-dioxins and dibenzofurans during incineration. Takeshi Hatanaka., Akio Kitajima., Masao Takeuchi. 1, 2004, Chemosphere, Vol. 57, pp. 73-79.

Appendix 1 – Specification Hi Cal 50 (Carbon anode ex-Hydro Kurri Kurri)

Parameter	Units	Typical	Max	Min	Pile A	Pile B	Pile C	Pile G+E	Pile 8+H
Copper (Cu)	mg/kg		400	-	7.00	8.00	9.00	14.00	19.00