ENVIRONMENTAL PERMIT APPLICATION TO VARY PERMIT REFERENCE EPR/BN7109IH

MEGGITT AEROSPACE LIMITED

Response to further information request – May 2019

JER1637
Meggitt Permit Variation – Response to Further Information Request
1
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RESPONSE TO FURTHER INFORMATION REQUEST

Quality Management

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1 INTRODUCTION

1.1.1 This document provides the response to the request for further information issued on 24/04/2019. The request sets out further information required by the Environment Agency to duly make an application by Meggitt Aerospace Limited to vary permit BN7109IH relating to the Meggitt Aircraft Braking Systems Carbon Brake Facility at Holbrook Lane, Coventry CV6 4AA.

1.1.2 Section 2 of this document sets out each question in the request for further information followed by the response.

2 FURTHER INFORMATION

2.1 See below for the responses to the further information requirements:

2.2 Question 1.1

In section 4 of the supporting documents submitted with your application (Best Available Techniques (BAT) Assessment) you have stated that the BAT assessment provided 'is limited to the abatement of emissions from the Carbonising furnaces, namely that of VOC's and in particular the proposed use of the thermal oxidiser'.

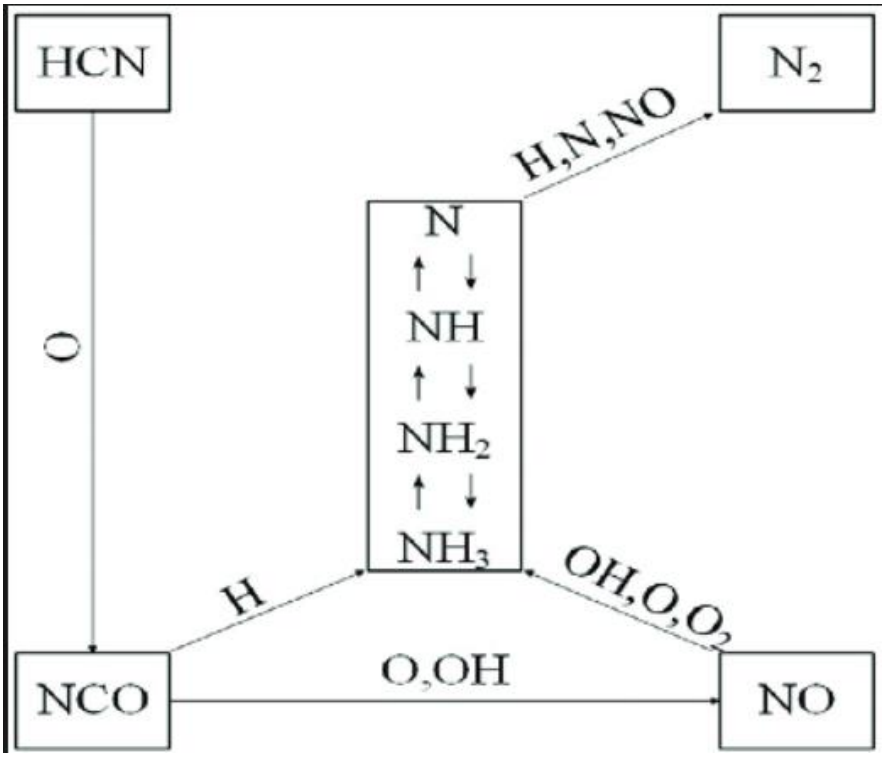
However, we consider the level of assessment provided is not sufficient because you have not assessed whether the proposed abatement techniques can be considered BAT for all the pollutants, media and receptors:

In particular you need to provide a BAT assessment for emissions of nitrogen oxides from the carbonising furnaces. This assessment should include (not limited to):

a. A technical explanation of the prevailing NOx formation mechanism from this process (i.e. whether and to what extent NOx are associated with thermal decomposition of chemically bonded nitrogen in OPAN raw material, thermal mechanism in the thermal oxidiser combustion process, fuel NOx associated with the support fuel burned in the thermal oxidiser);

- The carbonising furnace directly exhausts the waste gas which is a highly concentrated stream containing pollutants such as hydrogen cyanide, carbon monoxide and ammonia in a nitrogen rich stream of low gas flow rate (~ 50 m3/h). This stream is directly vented into the combustion chamber of the thermal oxidiser. There is no NOx produced in the carbonisation furnace process itself.
- The NO_x is formed in the Lesni thermal oxidiser from the oxidation of hydrogen cyanide (HCN) and as thermal NOx from the burner.
- The gas burner type used is low NOx burner type Maxon burner type kinemax 3". The burners use natural gas as a fuel and therefore this does not lead to the production of fuel NOx.
- The new Lesni has a longer residence time to help with the process and reduce the emission levels.
- The ammonia produced as a by-product from the carbonising process acts in the same way as if there was to be selective non-catalytic reduction (SNCR) fitted to the system and subsequently reduces NOx emissions hence eliminating the need for an SCR chamber and the ammonia dosing.
- It is proposed as part of the commissioning process to monitor levels of ammonia to show that this is used up in the NOx abatement process.
- The SCR or SNCR techniques with ammonia or urea injection are /could be implemented as tail end equipment after oxidizer if levels of NOx are very high in the final exhaust.
- NOx emissions are largely influenced by the amount of HCN produced in the carbonising furnace and often there will be little NOx produced.
- Further details of the chemistry of the process can be found in figure 2.1 below

Figure 2.1: Process Chemistry



b. Linked to the item above, a review of the carbonization process and downstream thermal oxidation to confirm whether this is carried out in optimal condition to minimize emissions, taking into account cross-media effects such as implications of reducing incineration temperatures on NOx formation versus reduction of other targeted pollutants;

- In the carbonisation stage there is significant elimination of hydrogen from the structure as a result of larger carbonaceous structures being formed as the fibre transitions to a carbon fibre from an OPAN fibre. Hydrogen Cyanide (HCN) is produced in small quantities – and it is this which needs to be incinerated. The Lesni allows this process of incineration to occur at around 850 deg C, which is low enough not to oxidise the nitrogen produced (and present in the covering atmosphere) into significant quantities of NOx type compounds.

c. A description of the techniques implemented in the design of the thermal oxidiser to reduce fuel NOx generation;

- Further techniques were talked about regarding reducing the NOx, by adding a SCR (selective catalytic reduction) system with ammonia doping to the thermal oxidiser; this was previously used on the current thermal oxidiser but was subsequently removed as the ammonia produced by the carbonising furnace process was shown to have the same effect of reducing the NOx emissions.
- For the new proposed thermal oxidiser, the manufacturer has assessed that SCR isn't required due to the presence of Ammonia as a by-product.
- The existing thermal oxidiser unit has a 1 second residence time, whereas, the new unit is designed for 2 seconds which will give lower CO and lower NOx.

- The new thermal oxidiser will also include the use of low NOx burners.

d. An assessment of an appropriate combination of BAT to reduce overall NOx emissions from the Lensi thermal oxidizer, including a justification that the proposed design is BAT for this application;

- The use of low-NOx burners and either SNCR or SCR is considered BAT for the reduction of NOx emissions. The system utilises low-NOx burners and as detailed above, the ammonia produced will act in the same way as if a SNCR abatement system was included in the plant.
- It is proposed that an improvement condition is added whereby further assessment of NOx and ammonia emissions shall be undertaken as part of the commissioning to ascertain appropriate emission limits for the permit.

e. A review of the proposed emission concentration and proposed emission limit for NOx emitted from this process to justify whether this can be considered associated with BAT. You are currently proposing an emission limit of 1,400 mg/m3 of NOx at 11% oxygen from this process but it this emission level is not adequately supported and justified in your application as an emission level associated with BAT. Also, this emission level appears not to be in line with the thermal oxidiser manufacturer's stated emission level for NOx of 600 mg/m3 (as per Lensi technical data sheet in Appendix 2 of the supporting documents submitted with your application – technical specifications).

- The 600 mg/m3 detailed by lesni is at an oxygen condition of 11% to 18%, however, as this is a bespoke design for the Meggitt process this is not currently installed, and monitoring has not yet been carried out on this system.
- With the use of low-NOx burners and the ammonia acting in reducing the NOx, the manufacturer is confident that the emissions will be below this. This is further demonstrated by the monitoring data shown in table 2.1 below for the current thermal oxidiser for which this is a replacement. The new thermal oxidiser is newer and more efficient technology with a longer residence time and therefore will give a reduction in emissions.
- It is proposed that an improvement condition is added whereby further assessment of NOx and ammonia emissions shall be undertaken as part of the commissioning to ascertain appropriate emission limits for the permit.

f. You may inform your assessment with a review of actual emission data from the existing carbonising furnaces and existing Lensi Thermal Oxidiser if the process is scaled up in terms of throughput, but substantially unchanged, as stated in your application.

- The site is currently permitted and carries out the process using an existing carbonising furnace and Lesni thermal oxidiser. The proposed changes will increase the production capacity; however, the new thermal oxidiser will have an increase residence time and is scoped by the manufacturer as an improvement on the existing abatement system due to improvements in technology since the current system was installed.
- Previous monitoring results from the current Lesni thermal oxidiser can be found in table 2.1 below:

Table 2.1: Current Thermal Oxidiser Monitoring Data

Date	NOx (mg/m3)*	Comments
March 2010	566	
March 2011	1400	
September 2011	1396	
March 2012	394	
September 2012	1220	
February 2013	60	
August 2013	812	
February 2014	593	
September 2014	365	
February 2015	444	
September 2015	681	
February 2016	584	
August 2016	205	
February 2017	654	
February 2017	1489	Lesni Burner Broken so exceeded limit
February 2018	306	
August 2018	284	
February 2019	310	

*measured at 11% oxygen as agreed previously with the Environment Agency.

2.3 Question 1.2

Provide a description of abatement techniques for particulate to be emitted from the new emission sources (A23, A24 and A25). Provide justification / explanation on how you have determined the emission rates /emission levels of PM_{10} expected to be emitted from these sources for inclusion in the H1 Risk Assessment and Air Impact Assessment;

2.3.1 An email from Ian Kelcey (Environment Agency Site Regulating officer) is included in **Appendix A**. Following submission of IC4, for which emissions limits for A19, A20 and A21 (Machine room extraction units) were to be determined, he has stated the following:

There are no limits set on the basis of IC4 by that time, which is unsurprising.

Testing showed values around 1mg/m3 particulates and the emission points are dust filters. My opinion would have been that such emission points (package dust filters on extraction duty)- shown as they were to be well managed- would not justify further interest in terms of ELVs. Control would be via appropriate preventative maintenance of filter media under the EMS. Which would be why I didn't set any limits at the next variation.

2.3.2 As the new units (emissions points A23, A24 and A25) are the same as the old units (emissions points A19, A20 and A21) it is proposed that as detailed in Ian Kelcey's email, no emissions limits are applied to these emissions points and yearly extractive sampling is carried out.

2.3.3 Emission Point A23 - The Mazak extractor uses a Cartridge based filter which can achieve <2mg/m^3 emissions with a maximum air volume of 10,000m^3/hr

2.3.4 Emission Point A24 & A25 - <5mg/m3 emissions with an estimated maximum air volume of 7,000 m3/hr. The two Chiron extractors use cartridge-based filters which can achieve <5mg/m^3 emissions with an estimated maximum air volume of 7,000 m^3/hr.

2.3.5 The manufacturer specifications for both filter types used can be found in **Appendix B** to this response.

2.4 Question 2

State the reference conditions for the new Lensi thermal oxidiser emissions levels provided in section 4 of the supporting documents submitted with your application (Best Available Techniques (BAT) Assessment, and Appendix 2 of the supporting documents submitted with your application (technical specifications).

2.4.1 It is proposed that as part of this variation the emission limit be determined after commissioning of the new thermal oxidiser as part of an improvement condition. It is proposed to monitor emissions as part of commissioning and assess the monitoring data and submit a report detailing the appropriate emissions limits to be applied to the thermal oxidiser.

2.4.2 The NOx concentration of 600 mg/m^3 is the manufacturers guaranteed value at actual oxygen concentrations up to 18% oxygen. The emission limit of 1,400mg/Nm^3 proposed is at 11%, during commissioning, testing will be completed to determine whether a lower limit can be applied.

2.4.3 The reason for this proposal is as the new thermal oxidiser is a bespoke design for the carbonisation process, Lesni are only able to give indicative achievable NOx emissions based on the technology and until constructed and commissioned at which point monitoring can be carried out.

2.4.4 Table 2.2 below shows the NOx emissions monitoring results for the current thermal oxidiser. These show that the current thermal oxidiser has been achieving compliance with the current emissions limits, however, this is a variable process and thus variability can be seen in the monitoring data across the period.

2.4.5 The new thermal oxidiser is of newer and improved technology and will have a greater residence time of 2 seconds rather than 1 second for the waste gases therefore the emissions of hydrogen cyanide, carbon monoxide and NOx will be improved on those currently found. The new thermal oxidiser has included design modifications such as increased residence time with a view of achieving improvements in the emissions from the site.

Table 2.2: Current Thermal Oxidiser Monitoring Data

Date	NOx (mg/m3)	Comments
March 2010	566	
March 2011	1400	
September 2011	1396	
March 2012	394	
September 2012	1220	
February 2013	60	
August 2013	812	
February 2014	593	
September 2014	365	
February 2015	444	
September 2015	681	
February 2016	584	
August 2016	205	
February 2017	654	
February 2017	1489	Lesni Burner Broken so exceeded limit
February 2018	306	
August 2018	284	
February 2019	310	

2.5 Question 3

Confirm whether the thermal oxidation process will be effective in abating ammonia in the off-gas from the carbonizing furnaces to an extent that emissions of this pollutant are negligible; if ammonia is emitted, you need to submit an impact assessment for this pollutant as well;

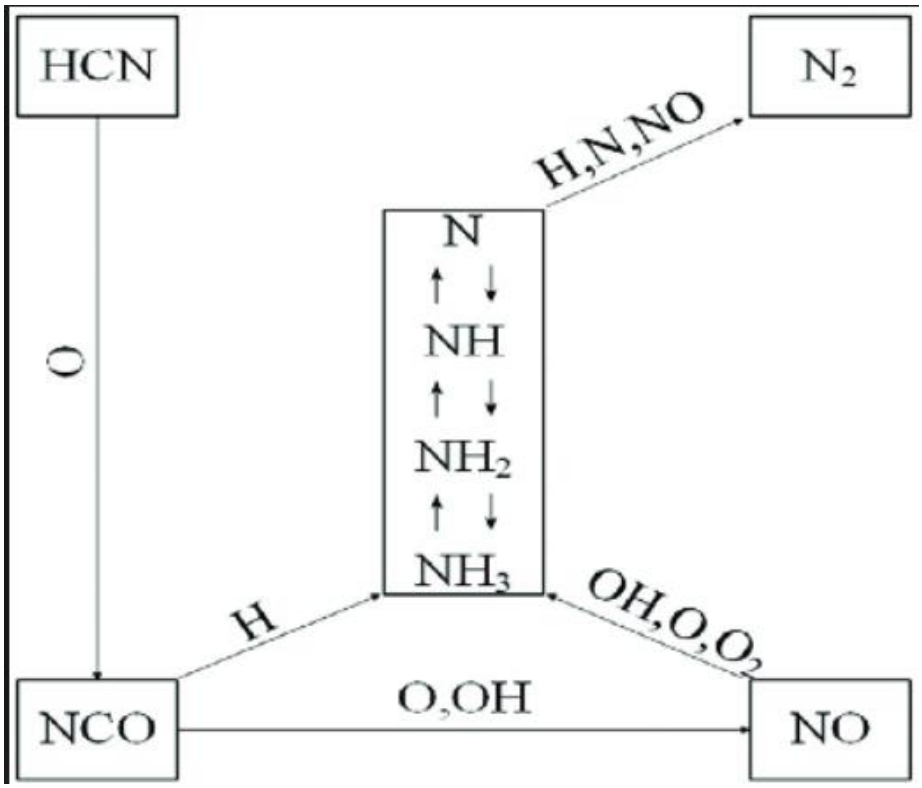
2.5.1 Ammonia is produced as a by-product from the carbonising process, however, it acts in the same way as that of a selective non-catalytic reduction (SNCR) system and subsequently reduces NOx emissions forming nitrogen and water in the process. Ammonia emissions from the thermal oxidiser are considered negligible based on previous monitoring of ammonia emissions from the current thermal oxidiser The current thermal oxidiser previously had a selective catalytic reduction (SCR) system but this was subsequently removed due to the ammonia produced in the furnace process being sufficient to reduce NOx emissions.

2.5.2 As detailed in the response to question 2 above, it is proposed that an improvement condition be included to monitor emissions from the thermal oxidiser as part of commissioning and submit a report detailing appropriate emissions limits. As part of this monitoring strategy, ammonia will be monitored to show that it is used up in the NOx abatement and emissions of ammonia are negligible.

2.5.3 Due to the ammonia being present in the gases from the carbonising furnace, the technology provider has stated that is not a requirement to include ammonia injection to abate NOx emissions, Ammonia shall be monitored during commissioning to demonstrate ammonia emissions are insignificant.

2.5.4 Further details of the chemistry of the process can be found in figure 2.1 below:

Figure 2.2: Process Chemistry



2.6 Question 4

Air impact Assessment:

a. *Provide a description of installation environs, nearby receptors, receptors types (including sensitive receptors such as schools, hospitals, etc.), possibly supported by graphic / GIS mapping.*

2.6.1 See amended air quality assessment in **Appendix C** for further information.

b. *Provide consistent naming /numbering of emission sources between application report, H1 tool, Air Impact Assessment report;*

2.6.2 The air emissions reference points have been updated as follows:

- A22 – New Thermal Oxidiser
- A23 – Mazak Dust Extraction
- A24 – Chiron Dust Extraction
- A25 – Chiron Dust Extraction

2.6.3 . The amended air quality assessment can be found as **Appendix C**, the updated environmental risk assessment and H1 can be found as **Appendix D**.

c. *Provide justification for emissions of PM from new dust extraction emission points (A23, A24 and A25);*

2.6.4 See response to question 1.2 in section 2.3 above. The emissions were provided by the manufacturer.

d. No short-term PEC calculated for either NOx or PM_{10}. Provide this information to demonstrate AQS are not likely to be exceeded;

2.6.5 No short-term PECs have been calculated for NOx and PM_{10} as these were considered in the H1 assessment and were screened out as insignificant (<10% ST & 1% LT) and therefore no detailed modelling was undertaken for either of these.

2.6.6 Modelling of long-term impacts for NOx and PM_{10} have been undertaken. See amended air quality assessment in **Appendix C** for further information.

e. *There seems to be a mistake in adding the short-term PC from the new (and existing) Lesni thermal oxidiser to the short-term PC from the boiler stacks in Table 13 of the Air Impact Assessment report. As a consequence, impacts are underestimated as PC <20% of the available headroom. Clarify whether our understanding is correct and update report and conclusions according to results after amending table 13, or provide clarification on this point, if applicable;*

2.6.7 The air quality assessment has been checked by our air quality specialist and we confirm that Table 13 is correct. The mass release from the proposed new Lesni stack dominates the short-term concentration at that receptor for that particular hour with the chosen modelled year, whereas this was previously not the case with the current thermal oxidiser.

2.6.8 The receptor is virtually on the site boundary and any result will be heavily influenced both spatially and temporally by the localised weather conditions. The emissions from the boilers have had little or no impact on the result at that receptor at the time period.

2.6.9 The amended air quality assessment in **Appendix C** has been updated to include further clarity on the predicted short-term PCs as presented.

f. *If there are changes determined by response to item 1.1 above, such as changes of emission levels, the Air Impact Assessment would need to be updated to reflect these changes.*

2.6.10 There are no changes to the emissions levels, however, as the plant has been upgraded and emissions improved, this will be confirmed during commissioning. It is proposed that an improvement condition is included whereby the emissions shall be monitored during commissioning and a report proposing emissions limits be submitted. Should it then be required, further modelling shall be undertaken.

2.7 Question 5

Provide the following document referred in the Site Condition Report, but that seems to have been missed: WYG Environment, 'Meggitt Aerospace, Coventry – Geo-Environmental Site Investigation Factual and Interpretative Report', reference: 'A107448', June 2018.

2.7.1 The report is provided in **Appendix E** to this response.

2.8 Question 6

The application states: 'There shall be a new emission to sewer from the newly installed cooling towers (emission point reference S4). This will be a direct replacement of emission point S2 and will be a like for like discharge under the terms of the existing trade effluent consent, therefore; it is assessed that there will be no change to the risk assessment for the current emissions point.'

a. *Confirm whether S2 has to be removed from the permit after this variation;*

2.8.1 S2 is not to be removed as part of this variation, however once the new cooling towers are constructed, they will discharge via S4 and the emission to S2 from the current cooling towers stopped. S2 shall be removed from the permit as part of a future permit variation. There shall be no change to the permitted discharge which shall continue under the terms of the trade effluent discharge consent which can be found in **Appendix F**. During commissioning, all discharges shall be within the terms of the trade effluent consent.

b. *Provide Trade Effluent Discharge consent to confirm the consented discharge flow rate is not increased by this application.*

2.8.2 The Trade Effluent Discharge consent is provided in **Appendix F** to this response There shall be no change to this discharge consent as a result of the activities described in the permit variation application.

APPENDICES

Appendix A

Email from Environment Agency Regulating Officer

Appendix B

Dust Filter Technical Specifications

Appendix C

Updated Air Quality Assessment

Appendix D

Updated Environmental Risk Assessment & H1

Appendix E

WYG Geo-Environmental Site Investigation Report

Appendix F

Trade Effluent Discharge Consent