Natural Resources Wales
Chester Road
Buckley
Flintshire
CH7 3AJ

Attention of: Elizabeth Voice – Regulatory Officer, Industry Regulation Team

29th July 2016

Dear Ms Voice

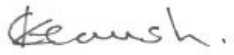
Re: Improvement Programme Item Reference IC35 - Permit Number: EPR/BR9383ID/V008

Please find enclosed a report to satisfy the requirements of Improvement Programme Item Reference 35 as referenced in Table S1.3 of the Environmental Permit.

I trust this information is satisfactory, however, please do not hesitate to contact me should you require any further information.

I look forward to receiving NRW's approval for the identified improvement proposals.

Yours sincerely



Claire Keouski
HSE Manager

COMMERCIAL IN CONFIDENCE

Introduction

This document is submitted to meet the requirement of Improvement Programme Item Reference 35 of Table S1.3 of the EPR Permit, which stipulates that '*the operator shall submit proposals detailing improvements to the abatement equipment for the mainline cooling zone*'.

Overview

Previous testing has shown breaches in emission limits from Emission Point G Main Line Cooling Zone Stack and investigations have shown that the abatement system is not adequate to control emissions since the increase in production. This document details the proposals for the design improvements for NRW's consideration; however, until agreement to and the implementation of the improvements, regular cleaning and routine maintenance works will continue in order to achieve the lowest emission results possible.

Section 1: Abatement System Improvement Proposals

As a result of the project to increase the width of the mainline, a number of improvements will be implemented:

- The curing oven is considered to be a significant source of the ammonia; therefore, the seals from the curing oven will be improved to reduce the amount of ammonia leaking and being entrained with the cooling zone emissions.

- We are currently investigating if the extraction point from the cooling zone suction box can be centrally located underneath the line rather than on the side to give more uniform air flow, hence more uniform cooling, and potentially less fibre drawn from the product as a result, thus reducing the particulate matter.

The improvements, described above, will be implemented during our November 2016 shutdown and once operational in December 2016, re-tests for ammonia and particulate matter will be completed by our stack emissions monitoring contractor to prove compliance.

Section 2: Additional Future Improvements for Consideration

If, following the implementation of the improvements outlined above, stack emissions monitoring results indicate that additional improvements are required to meet the Emission Limit Values; we are currently investigating the following.

Benchmarking Cooling Zone Performance

The Queensferry Plant together with Knauf's Plant Support and Process Development Team for rock mineral wool have carried out benchmarking comparing Queensferry's cooling zone performance with other European plants within Knauf Insulation. Key points identified are:

- Most plants combine all their major process emissions in a single stack instead of Queensferry's approach of using separate stacks for the cooling zone and curing oven. As a result, in other plants the lower flow emissions are mixed with the highest flow emission from the forming drum

extraction which has the highest permitted emissions. There is then a single emission monitoring point in the main stack once all the emissions have been combined.

- The rock mineral wool plant that does have separate measurement for their cooling zone uses a stone wool filter, i.e. a dry process to remove particulate. Typical emission levels are <5mg/m^3 for particulate, but with average 14mg/m^3 for ammonia; this emission level is comparable with Queensferry. The other plant has a limit of 30mg/m^3 for ammonia from their cooling zone, so this is not a problem for them, but it is higher than Queensferry's limit of 10mg/m^3.

- Existing glass mineral wool plants generally use a wet scrubbing process but new plants are being installed with a dry process, similar to stone wool plants. In glass plants, again the standard practice is to combine the cooling zone and curing oven exhausts and feed them to the main chimney with the forming extraction.

Possible solutions considered

Option 1:

Replace the existing wet scrubbing system with a dry system. This would be good for particulate reduction but not for ammonia.

Option 2:

Install a more efficient wet scrubbing system. This might work but the particulate loading is problematic and the absorption of ammonia into the wet scrubbing water will require either an additional treatment stage or a high purge rate with fresh water which the site is not able to accommodate, without increased / continual discharge to sewer.

Option 3:
The combination of a dry filter followed by wet scrubbing, but space is extremely limited for this and requires further waste handling. We will need to investigate this further; however, the question of the efficiency of the ammonia removal will remain.

Option 4:
An oxidiser for the ammonia, but the energy consumption required would make this prohibitive in terms of running costs and there would also be an unacceptably high capital cost.

Option 5:
Combine all major process stacks in one as is considered to be best practice in other Knauf Insulation mineral wool plants (both glass and rock). We would therefore propose to run combined ducting for the cooling zone and the curing oven oxidiser to the main stack.

For this option, we will need to check the capacity of the main stack, however, we are looking to install a new main stack, probably in 2017, so we have the opportunity to consider combining all flows in one stack, even if it needs to be larger. This proposal has the following advantages:

- Ammonia will be mixed with the weakly acidic wet flue gases from the cupola, which should help to neutralise the corrosive effect of the cupola flue gas. We are currently investigating the costs for this option as it seems the most viable at the moment.

- Potentially, the combination of the stacks could also increase the exhaust temperature increasing plume buoyancy and reducing plume visibility.
- The additional flow could increase the exit velocity, again improving plume dispersion.

Conclusions

We request written approval from NRW for the improvement proposals identified in Section 1 of this document, which will be implemented in the November shutdown.

In addition, at this stage, we would appreciate NRW's consideration to the implementation of Option 5 as identified in Section 2 of this document.

Commercial in Confidence

This document contains commercially sensitive information and therefore, we request that the information contained within will be treated as commercial in confidence.

C. Keouski
HSE Manager

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Engineering Project Manager