Introduction

This document is submitted to meet the requirement of section 4.2.2 (a) of the EPR Permit that is for an annual '*review of the results of the monitoring and assessment carried out in accordance with the Permit including an interpretive review of that data*'.

Manual Extractive Monitoring

Annual, six monthly and quarterly compliance monitoring was undertaken, by the prescribed methods, and reported as per the Permit requirements for Emission Points A, C, D, F, G and Y. Any emission breaches were notified under Schedule 5 Part A Notifications with follow up Part B Notifications.

Annual manual monitoring for Emission Point A, Cupola Stack After Oxidiser, for chlorides (as HCl), fluorides (as hydrogen fluoride), hydrogen sulphide and metals (Group 1 and Group 2 as defined in the Permit) are measured in triplicate. The results recorded for these parameters are consistently low by comparison and consistently below their respective emission limit values, with the exception of chlorides. The routine extractive sampling in 2018 continues to show that emissions of HCl exceed the emission limit value. Following trials Knauf Insulation is installing a lime dosing system to reduce HCl levels. The system is due to be commissioned in Q1 2019. Version 010 of the permit was issued to cover this change as agreed with NRW.

Emission Point C Mainline Forming Stack has a six monthly monitoring requirement to determine, by triplicate measurement, particulate, volatile organic compounds (as carbon) (VOCs), ammonia, formaldehyde, phenol and amines. The monitoring results in May were below the emission limit values for all parameters. In October all parameters again tested within the emission limits except particulate matter where 2 out of the 3 results exceeded the limit. These tests took place during a period where a water leak from the beak trough was entering the hot waste pit underneath. The violent creation of steam as the water hits the hot waste is likely to have created airborne particulate matter that would then be drawn through the extraction system and to emission point C. Although the ceilcote scrubber abatement system was operating satisfactorily the increased particulate input resulted in increased particulate emission.

Emission Point D has an annual monitoring requirement to determine particulate matter, VOC as C, ammonia, formaldehyde, phenol and amines. There are no permit limits applied to Emission Point "D" Binder Plant Fume Extraction. The monitoring results are considered to be low when compared with both historic annual data and other emission points on site that do have specified limits.

Emission Point F Mainline Oven Oxidiser is monitored annually. All of the parameters returned results lower than the permitted emission limit values.

Emission Point G, Mainline Cooling Zone, August has quarterly compliance monitoring for particulates and ammonia. Results for particulate matter included exceedances in 1 or 2 out of the 3 measurement runs in Q1, Q2 and Q3. In Q4, after the water flow to the impact jets had been improved with a new pump, all 3 results were within the emission limits. We will see if the reduction in particulate emission is sustained in 2019. Results for ammonia included exceedances in at least 1 of the 3 tests in every quarter. The average of the 3 tests in Q4 was within the emission limit, the first time this year. This may reflect better absorption of ammonia in the impact jet water and/or reduced ammonia content in some of the binders in an ongoing process in 2018. The ammonia emission measurements are quite variable over relatively short periods during testing. Further analysis is required to try to identify the factors that influence this variability. This may require additional measurement of ammonia by different methods outside the reporting requirements of the permit.

Emission Point Y Cold End Dust Extraction No. 2. Was monitored for particulate matter on a quarterly basis. Following consistently low monitoring results it has been agreed by NRW that future testing will be on an annual basis.

Continuous Emissions Monitoring (CEMs)

A differential optical attenuation spectroscopy (DOAS) system, working in both infrared and ultraviolet light, is employed for direct measurement of carbon monoxide, oxides of nitrogen and oxides of sulphur with particulate monitoring by triboelectric probe. To enable continuous correction to NTP conditions at 8% oxygen and dry gas the equipment monitors Hydrogen Sulphide, Oxygen, temperature, barometric pressure and also flowrate to enable mass emission calculations. The equipment is serviced and calibrated, by the equipment suppliers every six months using certified gases for the gas calibrations.

The CEMs data for Emission Point A, Cupola Stack After Oxidiser are reported quarterly as required by the Permit. The validated data demonstrates compliance with the limits, enables reporting of un-authorised releases and enables calculation of period averaged concentration data.

1. **Particulate Matter**

   All results in 2018 were in compliance with Permit conditions

2. **Oxides of Nitrogen (expressed as NO2)**

   All results in 2018 were in compliance with Permit conditions

3. **Oxides of Sulphur (expressed as SO2)**

   A series of exceedances of the Permit level for SO2 emissions in April were found to be due to an increase in sulphur content in the basalt component of the batch mix. This was addressed with the supplier and the basalt content in the batch was also reduced.

   No further exceedances for SO2 emissions were recorded in 2018.

4. **Carbon Monoxide**

   In January leaking tuyere gaskets were replaced to improve cupola stability following high CO emissions. In March an explosion panel was found to be open affecting stability causing high CO. The panel was replaced and had an indication of status sensor fitted (in correct position or not).

   In May an exceedance was caused by an electrical power supply failure to the site (Scottish Power supply issue).

   In September exceedances were found to be due to the failure of an abatement process fan changing the energy balance in the system. This caused incomplete combustion of CO when the gas requirement exceeded supply capacity. The fan was re-instated and the power to this and other fans is now monitored within our site data system to aid with fault finding.

   In November the daily average CO limit was exceeded due to unusually high CO from the cupola affecting the temperature control in the burner. The burner temperature set point was increased to resolve this.

5. **CEMS Equipment Reliability**

   In July a problem with the Oxygen probe resulted in high SO2 readings exceeding the permitted limits. This was a false reading and was temporarily dealt with by using a fixed ‘typical’ oxygen value in the correction calculation until the probe was fixed.

In October the spare AR600 had to be installed and an input module changed when there was a flash card failure. The spare AR600 unit then had a failure when the optical grating lost its home position. During this period a corrupt file on the flash card also affected some measurements. The failure of the primary and spare units so close together, though for unrelated reasons, resulted in a period where there was no CEMs monitoring. Close monitoring of other process parameters was established and communicated to NRW. The monitoring related to cupola stability, melt batch content, dust collection equipment and abatement burner stability.

The primary AR600 was restored to full operation. A review of the failures concluded that holding a functioning spare on site remains the best option. When fitted the spare passed the functionality checks, only failing 36 hours later. It is not reasonable to hold a second spare unit to cover such circumstances when repair turn round times can normally be expected to be covered by the spare. A proposal to swap primary and secondary on a regular basis was rejected as it would create gaps in the monitoring (unless done on shutdowns) and it might unnecessarily confuse the issue regarding calibration and linearity checks.

Storm Water

Storm water suspended solids, pH and chemical oxygen demand (COD) are measured on a six monthly basis as required by the Permit. Samples are taken from each discharge point L3 to L6.

In 2018 sampling was undertaken during July and December. Knauf Insulation recognise that the first samples were taken just after the first six months and will endeavour to ensure that future samples will be taken within the specified periods.

The samples were analysed by an independent, UKAS accredited laboratory. The results for both periods are within the expected ranges normally seen for storm water discharges from the site. They do not raise any concerns that there may be contamination being washed into the local water course during rainfall.

There were no instances of chemical/oil or other spillage entering the surface drains. During 2018 the surface water drain emergency shut off valves at discharge points L3 to L6 were serviced by the company that supplied them.

Performance Parameters (Table S4.2 in the Permit)

1. **Total hours operating with by-pass stack open and blast air on**

   2.07 hours for the year reflects the average result in a good year and does not flag up any control concerns.

2. **Mains Water Usage**

   43056 m3 is an increase that is mainly a result of increased production but also includes extra process water usage in the Cooling Zone emission abatement spray system. A water filter modification has reduced the additional water usage in the spray system through improved solids removal.

3. **Primary Energy Imported**

   123310 MWh represents an increased energy consumption. However this is due to increased sustained production and energy consumption per tonne of product has reduced significantly.

4. Amount of Hydrated Lime Used

New in version 010 of the permit. This system will be commissioned in Q1 of 2019. This will be the start of reporting lime usage

Complaints

Three emissions have seen multiple complaints that Knauf Insulation continue to monitor.

Emissions from the Cooling Zone Stack (G) affecting premises on Factory Road. The effect reported is intermittent and over a short period. The phenomena have been witnessed but a root cause is yet to be identified. This process essentially pulls cold air through product leaving the oven and shouldn't generate smoke. Investigation will continue when the issue is evident.

Fugitive emissions from the cupola building affecting premises on Factory Road. Observation of tap outs and start-ups by Knauf Insulation personnel have not shown deviations from procedures or seen excessive fume generation. Observation of these processes continues on an occasional basis.

Emissions from the main stack plume grounding at Sandycroft school site. Again the effect is intermittent and short lived. Investigation of each report has been done as quickly as possible but in all cases there has been no visible fume grounding and no odour evident. This does not prevent each complaint from being treated as genuine and plant conditions are investigated for indications of instability, unusual occurrences and high emissions as measured by CEMS. In the majority of cases nothing out of control has been found. While we are in control of the process and our measured emissions from the source of the complaint are within permitted levels we cannot control local weather patterns and wind movements that might cause the plume to ground. Substantial modelling of the stack plume has been undertaken to assess the effect on the local area and our neighbours. There may be an opportunity to change the situation regarding plume grounding if the current proposals to have a taller stack are able to progress. It should however be remembered that given the right atmospheric conditions any plume would potentially ground somewhere.

Conclusion

Process emissions are monitored in accordance with the Permit requirements and show that the controls and abatement normally result in the emissions being maintained within permitted limits. Where there are problems with un-authorised emissions, equipment breakdown and/or other unforeseen situations, every effort is made to ensure the plant regains compliance as soon as is possible within practical timescales.

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29/1/2019