Appendix 6 - Releases to Air

The Environment Agency Air Emissions Risk Assessment for Environmental Permits approach as set out here on the .gov website (https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit) has been utilised to predict releases to air from the new JCB Cab Systems factory development.

As JCB has not previously utilised the proposed chemical and ultrasound combination for cleaning parts, we do not have any existing process data to use in predicting emissions. However in order to understand whether any acid is likley to be released from the tank a trial simulation on a smaller scale has been completed by the chemical supplier – please see section C2 for further details. For this reason the calculations below cover the following emissions points:

- **Off-line Wet Paint Repair Combination Booth**
- **E-coat Oven**
- **Powder Cure Oven**

And do not cover:

- **Pre- Treatment Lip Extract – Stages 1 and 2 Alkaline Degrease**
- **Pre-Treatment Lip Extract – Stages 5 and 6 Acid and Ultrasound Descale**

Procedure

The following steps have been completed in order to arrive at an assessment of the emissions as ***not requiring any further action or assessments:***

1. Calculation of the process contribution (PC)
2. Identification of any insignificant PCs and removal from the assessment
3. Calculation of the predicted environmental concentration (PEC) for each relevant substance where PEC = PC + ambient levels
4. Identification of any further insignificant emissions and removal from the assessment
5. Compare PC & PEC with environmental standards, and determine whether detailed modelling or further action/assessments are required.

The process steps followed are set out in detail here:

STAGE 1

There are five stacks on the new factory building; each of which is between 3.0m and 4.76m above the roof apex. The building height is 13m.

Stack 1 - Repair Booth. Stack height from apex = 4.76m
Stack 2 - Electrocoat. Stack height from apex = 3m
Stack 3 - Powder Oven. Stack height from apex = 3m
Stack 4 - Lip Extract tanks 1 & 2 (Acid descale). Stack height from apex = 4.76m
Stack 5 - Lip Extract tanks 5 & 6 (acid descale with ultrasound). Stack height from apex = 4.76m

For the 'effective height of release' calculation, L is equal to either the height of the building or the diagonal length of the building (whichever is lower). The diagonal length is the highest of these two values, therefore, L = 13 (building height).

If another building is within a 5 x L distance (65m), it can influence the calculation. On this site, there are no other buildings within this distance.

For emission points equal to or >3m from apex height which are also <2.5 times the building height; the following calculation applies:

Firstly a value must be derived for the actual height of emission MINUS height of the tallest building within 5 x L m. If no other building exists within 5 x L m then the emitting building height should be used; so in this scenario the height of the new factory has been used.

Within the method this value is multiplied by 1.66 to give the effective height of release. Since the method uses 'banded' dispersion factors, these heights were then compared to the derived graphs of dispersion factors [see Dispersion Factor Graphed tab in attached spreadsheet]. Dispersion factors for annual, monthly and hourly periods are shown below.

Stack 1 - Release height = 17.76m. Building height = 13m.
Effective release height = 7.9m
Dispersion Factors
Annual = 60
Monthly = 175
Hourly = 1250

Stack 2 - Release height = 16m. Building height = 13m.
Effective release height = 4.98m
Dispersion Factors
Annual = 95
Monthly = 275
Hourly = 2000

Stack 3 - Release height = 16m. Building height = 13m.
Effective release height = 4.98m
Dispersion Factors
Annual = 95
Monthly = 275
Hourly = 2000

Stack 4 - Release height = 17.76m. Building height = 13m.
Effective release height = 7.9m
Dispersion Factors
Annual = 60
Monthly = 175
Hourly = 1250

Stack 5 - Release height = 17.76m. Building height = 13m.
Effective release height = 7.9m
Dispersion Factors
Annual = 60
Monthly = 175
Hourly = 1250

Stage 2 Dispersion factor multiplied by release rate from existing process

Process contribution to air was determined by multiplying the dispersion factor by the release rate (grammes/second). In line with the method, the release rate was determined by multiplying the flow rate in cubic metres per second by the substance concentration (in mgs per cubic metre) divided by 1000.

[2017 monitoring results for the existing factory are attached as Appendix xxxxx].
All PCs are given in micrograms per metre cubed.

Stack 1 PC – Repair Combi-Booth (consisting of two separate ducts combining pre-emission)
Duct a
Annual PM PC = 0.08
Annual VOC PC = 0.66
Monthly PM PC = 0.23
Monthly VOC PC = 1.90
Hourly PM PC = 1.68
Hourly VOC PC = 13.60

Duct b
Annual PM PC = 0.076
Annual VOC PC = 0.89
Monthly PM PC = 0.22
Monthly VOC PC = 2.58
Hourly PM PC = 1.58
Hourly VOC PC = 18.44

The values from both ducts were added together to give a total emission:
Annual PM PC = 0.157
Annual VOC PC = 1.54
Monthly PM PC = 0.46
Monthly VOC PC = 4.49
Hourly PM PC = 3.27
Hourly VOC PC = 32.04

Stack 2 PC E-Coat Oven
Annual PM PC = 0.08
Annual VOC PC = 1.96
Monthly PM PC = 0.23

Monthly VOC PC = 5.68
Hourly PM PC = 1.64
Hourly VOC PC = 41.33

Stack 3 PC – Powder Cure Oven
Annual PM PC = 0.10
Annual VOC PC = 1.79
Monthly PM PC = 0.30
Monthly VOC PC = 5.18
Hourly PM PC = 2.20
Hourly VOC PC = 37.68

Stacks 4 and 5 (pre-treatment with acid and pre-treatment with acid and ultrasound) are not expected to produce particulate matter or VOCs

Stage 3 – Comparison with required standards
The PCs from each stack were summed and compared against the relevant standards. For VOC, the default worst-case assumption is that the release comprises 100% benzene, for which there is an annual mean of 5 microgram per metre cubed. This worst case scenario has been used within the calculations here.

For VOC an annual standard of 5 microgrammes per metre cubed is required to be met. The sum of the annual VOC PCs is 5.29 prior to any correction for shutdown periods. Since the factory will be closed for shutdowns over 6 weeks of the year a reduction in emissions of 10% has been applied which results in a reduced annual VOC PC of 4.76.

For PM, an annual standard of 40 micrograms per metre cubed applies. The 24hr standard is 50 micrograms per metre cubed. Hourly PCs can be converted to 24 hrs by multiplying by 0.59.

The sum of the annual PM PCs is 1.011.
The sum of the 24 hour PM PCs is 11.476

No insignificant PCs were identified.

The annual VOC limit is marginally exceeded, but it should be borne in mind that this calculation assumes the emission is 100% benzene, and may overestimate the impact of this emission. Nevertheless, predicted environmental concentrations (PECs) should be derived for emissions discussed above.