



Report on the total maximum organic solvent consumption capacity of the seven paint shops on the Broughton site.
(Response to improvement condition IC4)

Airbus Broughton, permit EPR/BM3965IA

Report prepared by

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Summary

Improvement condition IC4 requires the following

“The Operator shall confirm the total maximum consumption capacity of the seven paint shops on site as a mass of organic solvents in both kg/hour and tonnes/year. The seven paint shops are: Haden Booth, Site 5, Interim Single Aisle, Binks, Stringer, West and Final Single Aisle. Confirmation of the total maximum consumption capacity shall be submitted in writing to Natural Resources Wales.”

In order to comply with these requirements, a series of calculations were performed using data sourced from existing 2015 mass balance calculations (tonnes per year) and from actual stack monitoring undertaken during 2016 (Kg per hour).

Method

The total maximum annual (Tonnes/year) and hourly (Kg/hour) consumption values were determined by different methods using data from separate sources.

Annual (Tonnes per year)

Single Aisle Interim, Single Aisle Final, Site 5 (A330 & A350) and West (A380) paint shops coat complete wings and their build rate is measured in 'Wing sets' (a pair) per month. The design maximum rate and actual build rate values for these areas are available and can be used to calculate a ratio (shown in results as a percentage). Having established the ratio of actual to maximum, a scaling factor for each facility could then be determined.

Using the definition of 'Paint shop operations' previously agreed with NRW, the 2015 VOC consumption (mass balance) value for each facility was multiplied by the appropriate scaling factor to determine the individual theoretical 'gross' maximum VOC emission (waste solvent not deducted) values.

Binks, Haden and SMC paint shops coat components rather than complete wings. Their maximum capacity is measured in terms of painting hours per year and this value is available. However, the actual number of hours painting during 2015 is not known so a scaling factor could not be calculated. For these three component paint shops it was decided to use the worst case (A380) scaling factor from the wing paint shops and apply this value to calculate a theoretical maximum VOC consumption from the known 2015 data.

In addition, Binks and Haden facilities fall under the same cost centre so consumption data is only available as a combined value for the two facilities (This is reflected in the quarterly paint shop solvent inventory returns) so they have been treated as a single facility for the purposes of these calculations.

The individual paint shop maximum VOC consumption figures were also totalled to give a theoretical maximum site total.

Solvent waste data is only available as a total site value. Using the ratio of maximum total VOC to actual total VOC, the 2015 waste VOC figure was scaled to estimate a waste value if operating at maximum capacity. The maximum annual waste figure was then deducted to give a theoretical 'net' maximum annual VOC value for all paint shop operations.



Hourly (Kg per hour)

In order to calculate an hourly consumption rate for each paint shop we used actual stack emission monitoring data from 2016. It was not clear from the wording of the improvement condition exactly what was required so it was decided to perform two sets of calculations, one using actual peak emission values and the other using maximum hourly average values.

When considering these calculations the following should be noted

- The VOC values are expressed as TVOC
- Each paint shop value represents only a single stack value
- Waste VOC values are not considered

Actual Peak

Actual peak VOC values are the real time maximum measured values for each facility which occur for only a few minutes in the operating cycle. These values are measured in kilogram per cubic metre. When multiplied by the measured emission flowrate, measured in cubic metres per second, the emission value in Kilogram per second can be determined.

An unrealistic worst case assumption is that this peak value is maintained throughout the operating cycle. If the kilogram per second value is multiplied by 3600, an equivalent hourly value is determined.

Maximum Hourly Average

Hourly average data, measured as kilograms per cubic metre, is the average TVOC value for each hour of monitoring. For the purposes of these calculations, the highest hourly average value was used as a worst case and the calculation performed to determine the equivalent kilogram per hour.

We believe that this method for calculating an hourly consumption rate is more representative than the actual peak value method.

Additional Comments

It should be noted that there are other influencing factors which in future could affect the results of the calculations in this report

- Legislation such as REACH and Civil Aviation Authority requirements can determine the coating products available for Airbus to use. This in turn will affect the source data used in the calculations. Any change resulting in an increase in VOC would be discussed with NRW before implementation.
- Rate capability of a particular paintshop may be influenced by the shift pattern worked as well as by physical infrastructure. Airbus will always seek to optimise working patterns in line with demand. Any change resulting in an increase in VOC would be discussed with NRW before implementation.

Further Work

We propose that in 2017, when complete VOC mass balance data for 2016 is available, we will repeat the calculations to determine the maximum annual consumption capacity (Tonnes per year) in order to validate the results presented in this report.



Results

Annual (Mass balance / 2015 data)

	Max	2015		% Capacity	Multiply by		2015 VOC	Max VOC	T	2015 Waste	Tonne
Binks	8372	n/a	hrs/yr	55.00%	1.818		10.60	19.26		48.73	
Haden	1612	n/a	hrs/yr								
SMC	5824	n/a	hrs/yr	55.00%	1.818		13.04	23.72		Multiply by	
SA Int	60	37.82	sets/mth	63.03%	1.587		12.21	19.37		1.71	
SA Final	63	37.82	sets/mth	60.02%	1.666		26.97	44.93			
A330/A350	16	9.82	sets/mth	61.39%	1.629		18.64	30.36		Max waste	Tonne
A380	4	2.20	sets/mth	55.00%	1.818		13.82	25.12		83.25	
Total							95.27	162.77	Tonne	79.52	Tonne

n/a = data not available (see text for explanation)

Hourly (TVOC / Single stack / 2016 monitoring)

	Real time Peak	mg/m3		Flowrate	m3/sec		Hourly rate	Kg/hr
Binks	154.29			7.50			4.17	
Haden	66.07			19.98			4.75	
SMC	109.21			7.42			2.92	
SA Int	486.03			3.61			6.31	
SA Final	64.20			21.53			4.98	
A330/A350	32.18			20.62			2.39	
A380	251.16			80.80			73.06	
Total							101.90	Kg/hr

	Max hourly average	mg/m3		Flowrate	m3/sec		Hourly rate	Kg/hr
Binks	13.16			7.50			0.36	
Haden	6.02			19.98			0.43	
SMC	18.69			7.42			0.50	
SA Int	73.54			3.61			0.96	
SA Final	13.96			21.53			1.08	
A330/A350	11.31			20.62			0.84	
A380	45.27			80.80			13.17	
Total							18.31	Kg/hr

Glossary

SMC	Stringer Manufacturing Centre
SA	Single Aisle
VOC	Volatile Organic Compound
TVOC	Total Volatile Organic Compounds