

Burbidge & Son Ltd, Awson Street, Coventry

Permit No: PPC/045

Woodcoating

Solvent Management Plan

2011 usage

1. Objective

To establish a Solvent Management Plan following the Secretary of State's Guidance for Wood Coating PG6/33 (11). This document particularly refers to the requirements of paragraph 4.12.

2. Definitions and Interpretations

The Guidance Note refers to specific Inputs and Outputs of organic solvent. The interpretation of the definitions in relation to Burbidge & Son Ltd is as follows;

Definition Ref	Interpretation
I ₁	The input quantity of VOC will be the sum of all coatings and thinners used in the application process and solvent used for cleaning purposes
I ₂	Organic solvents recovered and reused as solvent input into the process.
O ₁	The emission of VOC from the exhaust stacks in the spray booths, drying ovens and paint kitchens. This is calculated as the difference between the input VOC and the other output VOC.
O ₂	Burbidge & Son Ltd do not use a process where solvents are washed in water and therefore this output requirement is not applicable
O ₃	The potential retention of solvent in the coating is a significant problem to the industry. This can lead to coating instability that normally becomes visible as cracks in the lacquer film and also leads to the panels sticking when stacked together and to the imprinting of packaging onto the surface. As these issues are not apparent at Burbidge & Son Ltd then we believe that no solvent is retained in the final product and therefore this output requirement is not applicable.
O ₄	All mixing of the coating components, transfer of coatings and cleaning of application equipment is carried out in extracted areas. This output requirement is therefore not applicable.
O ₅	None of the coatings used at Burbidge & Son Ltd generate emissions from chemical or physical reactions and therefore this output is not applicable.
O ₆	Organic solvents contained in collected waste arise from the residue of coating materials left in the drums. The drums are partially vented then sealed prior to collection. There are no processes at Burbidge & Son that involve the wiping of excess solvent. There is a very low usage of rags for housekeeping purposes. A proportion of this includes contact with a small quantity of solvent but this is carried out in a spraybooth environment and it is believed that the solvent vapour is removed by the airflow into the spraybooth.

O ₇	All materials mixed are used on site and not sold on as a commercially valuable product and therefore this output requirement is not applicable.
O ₈	Materials are sent for recovery and resale but are not reused in the process.
O ₉	To the best of our knowledge all solvent releases are accounted for in the above definitions and therefore this output is not applicable.

3. Methodology

Inputs

3.1 Input I₁

The input data for materials used in the process is calculated from information supplied by the materials manufacturers.

3.2 Input I₂

Organic solvents recovered and reused as solvent input into the process, I₂, are calculated from the capacity of the recycle still and the number of times this is used.

Outputs

The known outputs cannot realistically be calculated with this level of accuracy and traceability. In order to estimate the relevant outputs the following methodologies have been used.

3.3 Output O₆ - Organic solvents contained in collected waste arise from the residue of coating materials left in the drums.

This output is calculated from an estimated 5mm thick residual layer in a coatings container after emptying into a mixing drum or being pumped to the spray gun.

The coating VOC content used to determine O₆ is a weighted figure calculated from the total VOC weight of all materials in kg divided by the total usage of all materials in litres. (It is not an average VOC content of the materials used)

For example assuming a two material usage as follows

100 litres of material with a VOC content of 500 grams/litre

10 litres of material with a VOC content of 800 grams/litre

The simple average VOC content is

$$(500 + 800)/2 = 650$$

The weighted average taking into account relative volumes is

$$((100 \times 500) + (10 \times 800))/110 = 527$$

This weighted average is the VOC content of the mix.

For the residual waste calculation the average VOC content is determined from the data given in the annual VOC return and is calculated by dividing the total VOC by the total volume of material. In this instance

$$34,237 \text{ kg VOC} / 66,568 \text{ litres materials} = 51.4\% \text{ rounded to } 51\%.$$

The volume of material in a drum varies with the type of material. For a typical full drum the depth of material would be 500mm. The residue therefore is equivalent to 1% of the drum height and therefore volume of coating in the drum. The calculated average coating VOC content can be used to determine the VOC content of the residue then extrapolated to give a total for O_6 . The average coating VOC content of the residue is 51%. Therefore the residual VOC equates to 51% of the 1% of residue i.e. 0.51%. The output O_6 is therefore 0.51% of the materials given in I_1 .

3.4 Output O_8 - Materials are sent for recovery and resale but are not reused in the process.

The data for solvent materials sent for recovery is calculated from information supplied by the recycling contractor.

4. Determination of Annual Solvent Consumption

The VOC content and solids content are available from data supplied by the coating manufacturer. The VOC or solids content of the total coating used can be determined by multiplying the volume by VOC or solids content as appropriate.

The annual actual consumption of organic solvents (C) is

$$C = I_1 - O_8$$

5. Determination of Target Emission

The Target Emission for a wood coating installation in the 15 tonne or more solvent consumption band is

$$\text{Total Mass of Solids} \times 1.0 \text{ (see Table 6 PG6/33(11))}$$

Compliance with Reduction Scheme is achieved if the annual actual solvent emission determined by the Solvent Management Plan is less than or equal to the Target Emission.

6. Determination of Annual Actual Solvent Emission

The annual actual solvent emission (para 4.7 PG6/33(11)) is

$$I_1 - O_8 - O_7 - O_6$$

7. Solvent Management Plan

Using the definitions in paragraph 4.12 the input of VOC is

$$I_1$$

The outputs are

$$O_1 + O_6 + O_8 \text{ (other outputs equal zero)}$$

where

I_1 = the quantity of organic solvents used in preparations and as thinners is taken from the annual VOC return

O_1 = the quantity of organic solvent in exhaust stacks from the spray booths, drying ovens and paint kitchens and is the difference between the input VOC and the other outputs

O_6 = organic solvents contained in collected empty drums and is calculated in section 3.3

O_8 = organic solvents sent for recovery and re-sale but not re-used on site

For Burbidge & Son Ltd during 2011

$$I_1 = 49.471 \text{ tonnes}$$

$$O_1 = 34.076 \text{ tonnes}$$

$$O_6 = 0.252 \text{ tonnes}$$

$$O_8 = 15.143 \text{ tonnes}$$

The annual actual consumption (C) of organic solvents in 2011 is

$$C = 49.471 - 15.143 = 34.328 \text{ tonnes}$$

The annual actual solvent emission for Burbidge & Son Ltd in 2011 equals

$$49.471 - 15.143 - 0 - 0.252 = 34.076 \text{ tonnes}$$

The Total Mass of Solids is shown in the annual VOC return for Burbidge & Son Ltd. and is

$$25.071 \text{ tonnes}$$

The Target Emission is therefore

$$25.071 \times 1.0 = 25.071 \text{ tonnes}$$

The annual actual solvent emission is therefore greater than the target emission.

Data

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Coatings on Wood, Usage 2011

Fujichem Sonneborn

Coating	Type	density kg/l	VOC kg/l	solids kg/l	total litres	total kg	total VOC kg	total solids kg
01:60	thinner	0.850	0.850	0.000	11600	9860.00	9860.00	0.00
01:446	thinner	0.792	0.792	0.000	550	435.60	435.60	0.00
04:34 C6574	stain	0.794	0.640	0.153	538	427.17	344.32	82.31
09:09	thinner	0.880	0.880	0.000	610	536.80	536.80	0.00
40:337M/A	lacquer	0.962	0.602	0.360	5	4.81	3.01	1.80
40:3595/A	lacquer	0.948	0.581	0.367	700	663.60	406.70	256.90
40:3739/A	lacquer	0.958	0.578	0.380	2997	2870.65	1733.33	1138.44
40:452SM/A	lacquer	0.963	0.548	0.315	5	4.82	2.74	1.58
40:AH-11	catalyst	0.892	0.745	0.147	481	428.61	357.97	70.63
41:64X4420/A	lacquer	0.981	0.565	0.417	300	294.30	169.50	125.10
501:213	thinner	0.731	0.731	0.000	50	36.55	36.55	0.00
					sub-total VOC		13886.52	
					sub-total solids			1676.76

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Coatings on Wood, Usage 2011

Beckers Acroma

Coating	Type	density kg/l	VOC kg/l	solids kg/l	total litres	total kg	total VOC kg	total solids kg
DC1066	lacquer	0.98	0.416	0.559	1119	1096.6	465.5	625.5
DM394-0010	lacquer	0.990	0.532	0.458	6640	6573.6	3532.5	3042.9
DT2004	thinner	0.860	0.861	0.000	540	464.4	464.9	0.0
DV309	catalyst	0.870	0.675	0.120	871	757.8	587.9	104.6
WM1629-005	w/b lacquer UV	1.050	0.045	0.389	195	204.8	8.8	75.9
WM1629-030	w/b lacquer UV	1.050	0.045	0.389	0	0.0	0.0	0.0
WM2023-0005	w/b lacquer UV	1.060	0.015	0.426	2540	2692.4	38.1	1082.3
WM2023-0030	w/b lacquer UV	1.050	0.018	0.402	2590	2719.5	46.6	1042.1
WM2023-0405	w/b lacquer UV	1.060	0.016	0.427	97	102.8	1.6	41.4
XX699	cleaner	1.000	0.124	0.000	450	450.0	55.8	0.0
					sub-total VOC		5201.70	
					sub-total solids			6014.84

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Coatings on Wood, Usage 2011

Others

Coating	Type	density kg/l	VOC kg/l	solids kg/l	total litres	total kg	total VOC kg	total solids kg
recycled on site	thinner	0.850	0.850	0.000	4875	4143.75	4143.75	0
					sub-total VOC		4143.75	
					sub-total solids			0

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Sherwin Williams (1)		density kg/l	VOC kg/l	solids kg/l	UoM	total amount	total VOC kg	total solids kg
Coating	Type							
AC60087001	lacquer	1.200	0.030	0.057	litre	1	0.03	0.05
Butyl Acetate	thinner	0.881	0.881	0.000	litre	1900	1673.90	0.00
DT1146	thinner	0.875	0.875	0.000	litre		0.00	0.00
DT1150	thinner	0.830	0.830	0.000	litre	1775	1473.25	0.00
SUG340	lacquer	1.280	0.639	0.639	litre	7800	4984.20	4984.20
TH720	hardener	0.960	0.707	0.248	litre	4425	3128.48	1097.40
TH773	hardener	0.940	0.671	0.263	litre	13	8.39	3.29
TH780	hardener	0.960	0.691	0.269	litre		0.00	0.00
TU14813025	lacquer	1.310	0.394	0.915	kg		0.00	0.00
TZ3610025	lacquer	1.010	0.523	0.487	litre	50	26.15	24.37
TZ7010025	lacquer	0.920	0.644	0.276	litre		0.00	0.00
WM1629000520	lacquer	1.05	0.045	0.389	litre	1400	63.00	544.60
WM1629040520	lacquer	1.05	0.045	0.389	litre	100	4.50	38.90
ZZL0455005	lacquer	1.010	0.518	0.492	kg	25	12.82	12.18
ZZL0987005	lacquer	1.300	0.463	0.836	kg	1350	480.81	868.15
ZZL0988005	lacquer	1.290	0.459	0.830	kg	3500	1245.35	2251.94
ZZL1222005	lacquer	1.290	0.450	0.840	kg	130	45.35	84.65
ZZL1437005	lacquer	1.290	0.542	0.748	kg	770	323.52	446.48
ZZL1836005	lacquer	1.300	0.476	0.823	kg	6000	2196.92	3798.46
ZZL1837005	lacquer	1.150	0.569	0.581	kg	20	9.90	10.10
ZZL1978005	lacquer	1.250	0.560	0.690	kg		0.00	0.00
ZZL26070	lacquer	1.091	0.583	0.508	kg	10	5.34	4.66
ZZL26090	lacquer	1.101	0.589	0.512	kg	20	10.70	9.30
ZZL26100	lacquer	1.100	0.592	0.508	kg	10	5.38	4.62
ZZL2666005	lacquer	1.325	0.607	0.718	kg	50	22.91	27.09
ZZL2766005	lacquer	1.125	0.529	0.605	kg	1650	775.87	887.33
ZZL3081005	lacquer	1.321	0.497	0.823	litre	450	223.65	370.35
ZZL3204005	lacquer	1.346	0.615	0.731	kg		0.00	0.00
ZZL3319500	lacquer	1.099	0.595	0.504	kg	10	5.41	4.59

Sherwin Williams (2)		density	VOC	solids	UoM	total amount	total VOC	total solids
Coating	Type	kg/l	kg/l	kg/l			kg	kg
ZZL3368005	lacquer	1.321	0.497	0.823	litre	330	164.01	271.59
ZZL3369005	lacquer	1.348	0.616	0.732	litre	550	338.80	402.60
ZZL3370005	lacquer	1.339	0.614	0.725	litre	650	399.10	471.25
ZZL3371005	lacquer	1.341	0.614	0.727	litre	750	460.50	545.25
ZZL3372005	lacquer	1.343	0.614	0.729	litre	160	98.24	116.64
ZZL3374005	lacquer	1.290	0.459	0.830	kg	50	17.79	32.17
ZZL41930	lacquer	1.140	0.005	0.459	kg	25	0.11	10.07
ZZP0120	stain	0.840	0.840	0.108	litre	50	42.00	5.40
ZZP0130	stain	0.840	0.840	0.091	litre	50	42.00	4.55
sub-total VOC							18288.37	
sub-total solids								17332.23

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Coatings on Wood, Usage 2011

Intercoat		density	VOC	solids	total	total	total	total
Coating	Type	kg/l	kg/l	kg/l	litres	kg	VOC	solids
		kg/l	kg/l	kg/l			kg	kg
13900/2.25/CPO	catalyst	0.900	0.697	0.200	4.5	4.05	3.14	0.90
31608/25/BRG	thinner	0.840	0.827	0.000	9275	7791	7674.14	0.00
36923/25/PDE	stain	0.870	0.833	0.041	298	259.26	248.13	12.22
37630/25/CPO	w/b uv lacquer	1.050	0.002	0.423	37	38.85	0.06	15.65
38643/22.5/PDE	ac basecoat	0.970	0.550	0.416	22.5	21.825	12.37	9.37
40490/22.5/PDE	a/c basecoat	0.980	0.555	0.418	22.5	22.05	12.48	9.41
					sub-total		7950.31	
					VOC			
					sub-total			47.54
					solids			

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Coatings on Wood, Usage 2011

Recovery

Company	Type	VOC kg/l	total litres	total VOC kg
Intercoat	waste to reclaim	0.720	13105	9435.60
Intercoat	clean to reclaim	0.870	6560	5707.20
Total				15142.80

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VOC by supplier/ tonnes	Fujichem Sonneborn	13.887
	Beckers Acroma	5.202
	Others	4.144
	Sherwin Williams	18.288
	Intercoat	7.950
Total VOC Input (I ₁)/ tonnes		49.471

Total VOC Output to Reclaim (O ₈)/tonnes	15.143
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Nett Consumption VOC (C ₁)/ tonnes	34.328
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Solids by supplier/ tonnes	Fujichem Sonneborn	1.677
	Beckers Acroma	6.015
	Others	0.000
	Sherwin Williams	17.332
	Intercoat	0.048
Total solids/ tonnes		25.071

Ratio VOC : solids	1.369	:1
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