

THATCHAM

TRAINING CENTRE



EVALUATION REPORT
ON THE
AIR GUNSA AZ3 HTE
GRAVITY SPRAY GUN

CONDUCTED BY
THATCHAM
TRAINING CENTRE

JANUARY 2000



**REPORT OF THE EVALUATION OF THE
PAINT TRANSFER EFFICIENCY
(BY WEIGHT) OF THE AIR GUNSA
AZ3 HTE GRAVITY SPRAY GUN
CARRIED OUT BY
THE MOTOR INSURANCE REPAIR
RESEARCH CENTRE,
THATCHAM TRAINING AT THE
REQUEST OF ANESTA IWATA
COMPANY**

JANUARY 2000

OBJECTIVE

To determine the paint transfer efficiency (weight) of the Air Gunsa AZ3 HTE gravity spray gun.

METHOD

Draft 7 “Determination of the Transfer Efficiency of atomising and spraying equipment for liquid coating materials – Part 1: Flat Panels” produced as a European Standard by CEN. Document – CEN/TC271/WG2 N34 – 99E dated 09/10/99 Method 2 was used for the basis of the evaluation.

Paint materials used were all car refinish materials, 2K VHS Primer, water based base coat, 2K lacquer and 2K direct gloss. All were E.P.A. Stage 2 compliant, sprayed as one pass onto a vertically mounted aluminium foil, spraying time about 3 seconds. The foils were sprayed in a conventional down draft spray booth, keeping the spray within the area of the foil (see Appendix A3 for further details).

Foils were preweighed and then reweighed after coating and stoving to give ‘dry-up’ material. The spray gun was weighed before and after the paint application to determine ‘wet spray material’. To maintain a consistent gun distance from the foil, two parallel steel round bars were fixed across the front of the foil at a set distance so that by sliding the gun along the bars, a consistent spray distance and gun angle was maintained from the foil. Each aluminium foil was secured with clips to a steel backing panel and placed on the jig for spraying (see Appendix A3). After spraying, the foils were placed into a further spray booth on a steel backing panel for stoving. (Details of stoving are recorded on result sheets Appendix B6).

Before evaluation began, paint fluid flow, viscosity, temperature and solids were measured and after test, the viscosity and paint temperature were remeasured. (See Appendix B5 for method).

After stoving the fan widths were measured at three positions on each foil (See Appendix B3 and B4)

RESULTS

See Appendix B6 for recorded results and calculations.

NOTE:

- i) Test method states paint thickness should be measured. This was not possible with the paint thickness gauge available.

- ii) Test method states the foil width should be 1½ times the fan width. In a few instances it was lower than this, but this was considered detrimental to the results rather than beneficial.
- iii) The test method states “New coating materials shall be prepared for test purposes where the viscosity of the coating material has changed by 5% of its value on make-up”
Although on average the evaluation time for each variable was only 20-25 minutes, using 2K products a viscosity rise of more than 5% in some cases did occur especially on primer. Result Sheets 1 to 4 for primer indicate that although a viscosity rise of 7-9 seconds occurred during each evaluation, the T.E. for the first foil sprayed and the last (e.g. Result Sheet 2, Foil 49 first sprayed, Foil 52 last) was not affected by this viscosity rise.
- iv) The Test method also states “Mixed multi component coating materials is not to be used for test purposes if its age exceeds 50% of the pot life”. The pot life for the primer used is 60-90 minutes at 20°C. As stated earlier, an evaluation was carried out within 20-25 minutes keeping within these limits.
- v) At 15 cm gun distance from object, a fast gun movement is required to eliminate paint sags using 2K lacquer and direct gloss

CONCLUSION

The Air Guns AZ3 HTE gravity spray gun achieved a transfer efficiency (weight) of greater than 65% when used as detailed in this report.

LIST OF APPENDICES

- A1 Summary of Results T.E.
- A2 Transfer Efficiency (T.E.) Calculations – see previous report
- A3 a) Position of Panels in Spray Booth
b) Foil Test Sample - Size and Area Sprayed



- B1 Variables assessed and Panel Numbers
- B2 Materials used in Transfer Efficiency Tests and mix ratios.
- B3 Fan width results
a) Gun Distance 15 cm b) Gun distance 20 cm
- B4 Fluid flow and average fan width
- B5 Method for Material Solids
Viscosity
Paint Fluid Flow
- B6
- | | | | |
|-----------------|--------------------|----------|------|
| Result Sheet 1 | 2K VHS Primer | 1.75 BAR | 15cm |
| Result Sheet 2 | 2K VHS Primer | 2.0 BAR | 15cm |
| Result Sheet 3 | 2K VHS Primer | 1.75 BAR | 20cm |
| Result Sheet 4 | 2K VHS Primer | 2.0 BAR | 20cm |
| Result Sheet 5 | Water Base Coat | 1.75 BAR | 15cm |
| Result Sheet 6 | Water Base Coat | 2.0 BAR | 15cm |
| Result Sheet 7 | Water Base Coat | 1.75 BAR | 20cm |
| Result Sheet 8 | Water Base Coat | 2.0 BAR | 20cm |
| Result Sheet 9 | 2K HS Lacquer | 1.75 BAR | 15cm |
| Result Sheet 10 | 2K HS Lacquer | 2.0 BAR | 15cm |
| Result Sheet 11 | 2K HS Lacquer | 1.75 BAR | 20cm |
| Result Sheet 12 | 2K HS Lacquer | 2.0 BAR | 20cm |
| Result Sheet 13 | 2K HS Direct Gloss | 1.75 BAR | 15cm |
| Result Sheet 14 | 2K HS Direct Gloss | 2.0 BAR | 15cm |
| Result Sheet 15 | 2K HS Direct Gloss | 1.75 BAR | 20cm |
| Result Sheet 16 | 2K HS Direct Gloss | 2.0 BAR | 20cm |

APPENDIX A1

SUMMARY OF RESULTS T.E. % (BY WEIGHT)

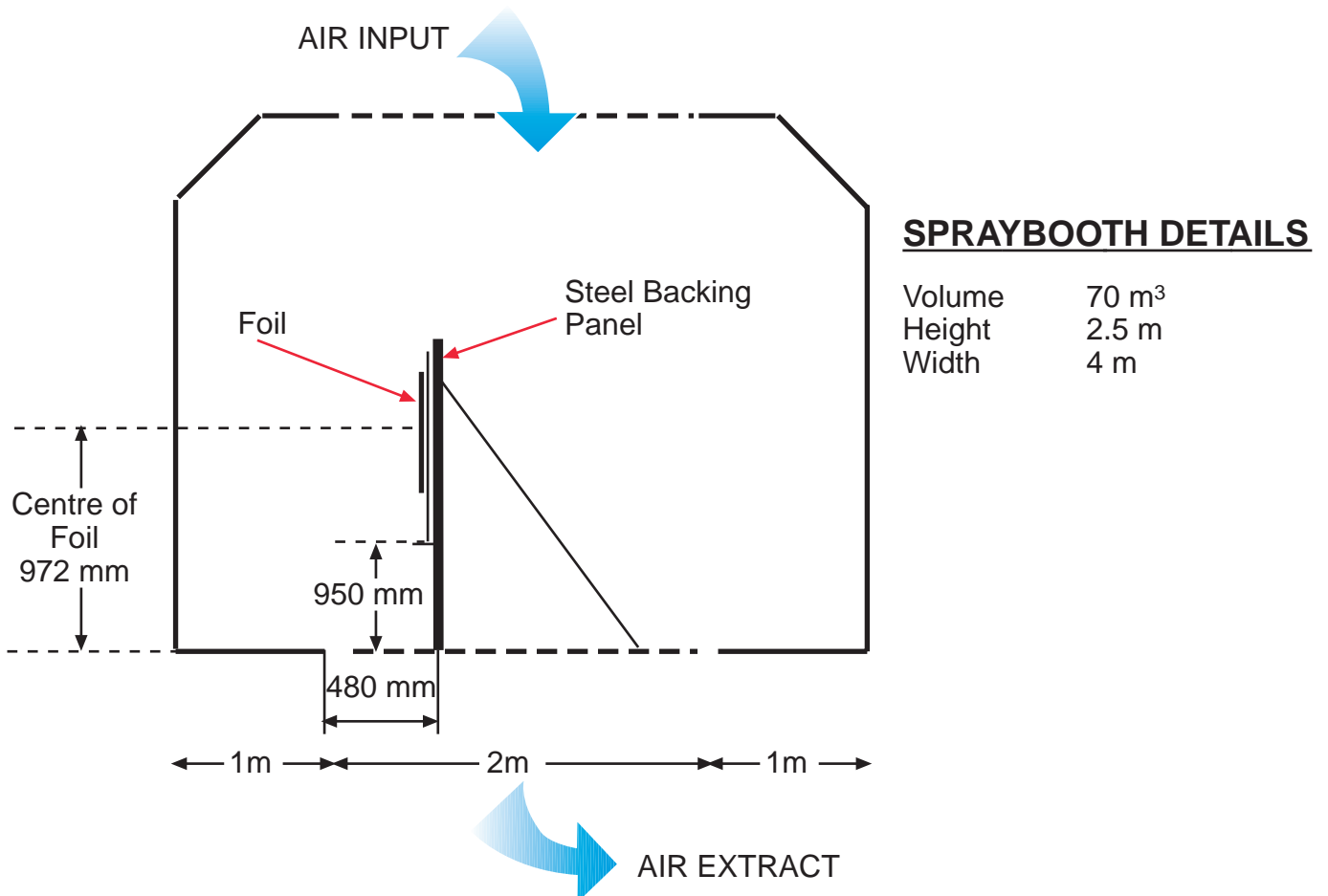
MATERIAL	AZ3 HTE			
	Gun Distance 15cm		Gun Distance 20cm	
	1.75 Bar	2.0 Bar	1.75 Bar	2.0 Bar
Primer (1.8)	97,2	97,3	93,8	94,2
Water Basecoat (1.5)	86,7	84,1	81,5	79,4
Lacquer (1.5)	81,5	80,6	77,9	77,5
Direct Gloss (1.5)	85,8	83,7	78,4	77,3

APPENDIX A2**TRANSFER EFFICIENCY (T.E.)
CALCULATIONS (WEIGHT)**

1. Weight of Foil Panel
2. Weight of Foil Panel + 'Dry-up'
3. $(2-1) =$ Weight of 'Dry-up'
4. Wet Spray Material
i.e. Gun weighed before and after application – weight difference.
5. Spray Solid = $(4 \times \text{Av. Mat. Solids})$
6. T.E. (weight) = $(3 \div 5) \times 100\%$

APPENDIX A3a

POSITION OF TEST PANELS IN SPRAYBOOTH

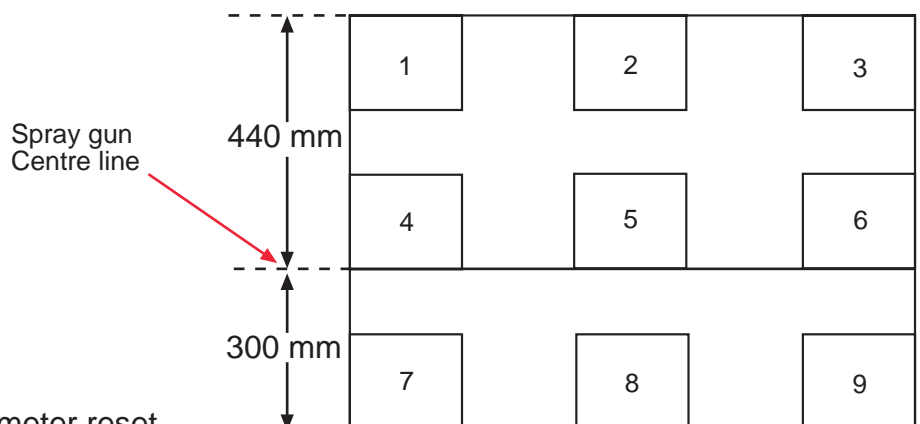


DOWN DRAFT AIR MOVEMENT OVER TEST PANEL

Airflow tests on spray jig. Garmat GSC91, 20°C

Point Average reading

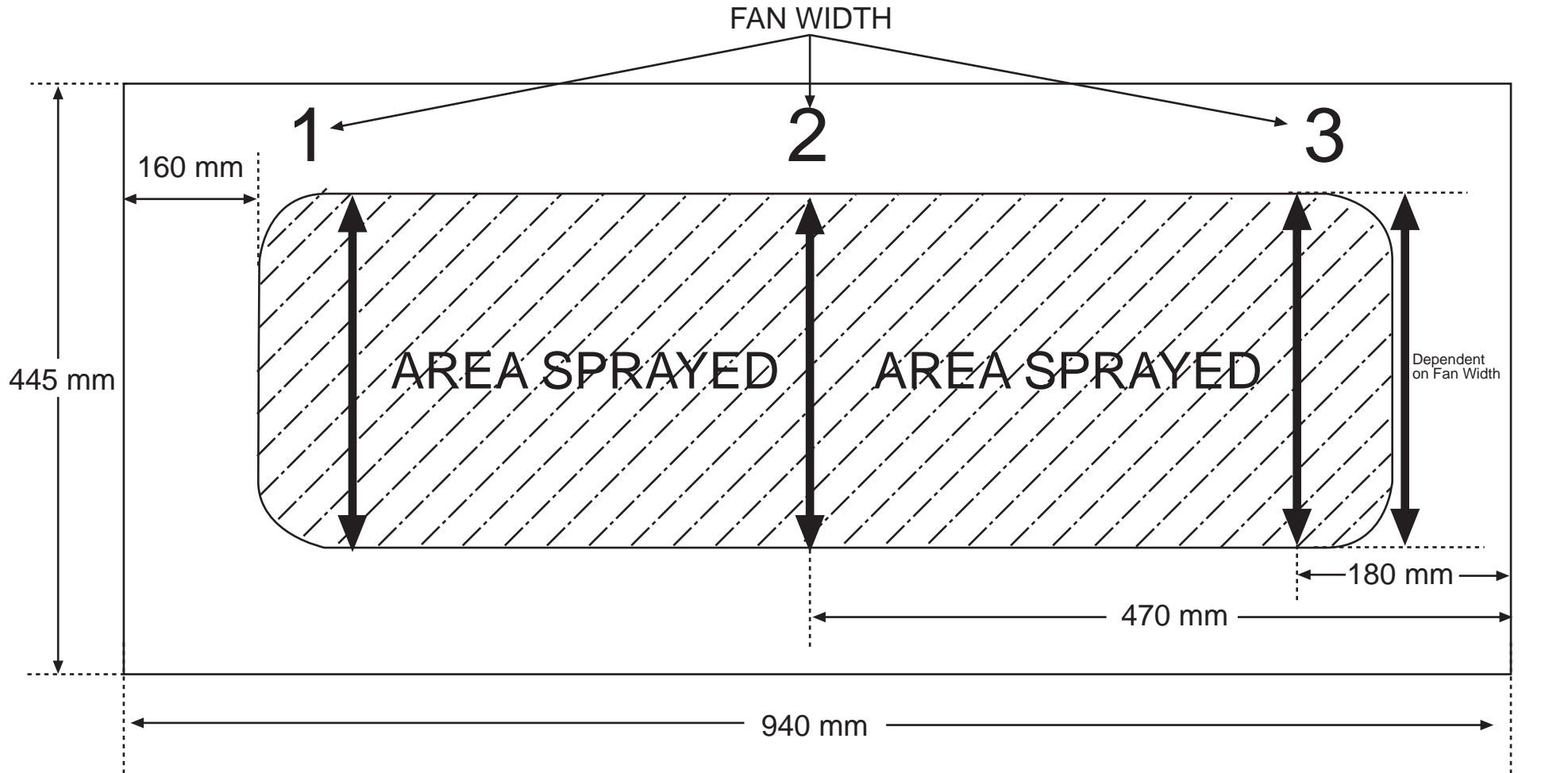
1	0.28 m/s
2	0.30 m/s
3	0.27 m/s
4	0.21 m/s
5	0.34 m/s
6	0.33 m/s
7	0.25 m/s
8	0.24 m/s
9	0.34 m/s



All measurements taken with meter reset and 30 secs allowance for inertia

APPENDIX A3b

FOIL TEST SAMPLE SIZE, AREA SPRAYED AND LOCATION OF FAN WIDTH MEASUREMENTS



APPENDIX B1

VARIABLES ASSESSED AND PANEL NUMBERS

SPRAY PRODUCT	GUN	NOZZLE SIZE	GUN AIR PRESSURE	GUN DISTANCE	NUMBER OF FOILS
2K VHS Primer	AZ3 HTE	1,8	1.75 Bar	15 cm	4
			2.0 Bar	15 cm	4
2K VHS Primer	AZ3 HTE	1,8	1.75 Bar	20 cm	4
			2.0 Bar	20 cm	4
Water Basecoat	AZ3 HTE	1,5	1.75 Bar	15 cm	4
			2.0 Bar	15 cm	4
Water Basecoat	AZ3 HTE	1,5	1.75 Bar	20 cm	4
			2.0 Bar	20 cm	4
2K Lacquer	AZ3 HTE	1,5	1.75 Bar	15cm	4
			2.0 Bar	15 cm	4
2K Lacquer	AZ3 HTE	1,5	1.75 Bar	20 cm	4
			2.0 Bar	20 cm	4
2K Direct Gloss	AZ3 HTE	1,5	1.75 Bar	15 cm	4
			2.0 Bar	15 cm	4
2K Direct Gloss	AZ3 HTE	1,5	1.75 Bar	20 cm	4
			2.0 Bar	20 cm	4

1.8 Set Up 1.8 Nozzle 1.8 - 2.0 Needle 318 HA Air Cap
1.5 Set Up 1.5 Nozzle 1.3 Needle Air Cap Not Numbered

Material Used in Transfer Efficiency Tests and Mix Ratio

2K Primer

Standex VHS Fuller	02081938	2200064	038
Standex Fuller Harter	02081555	2868379	068
Standex 2K Thinner	8020541	2020520	026

Mix Ratio

503.7g	VHS Fuller
148.8g	Fuller Harter
	2K Thinner added to obtain the recommended viscosity.

Water Based Basecoat

I.C.I. Aqua Base - Vauxhall Oriental Blue (24L, 248)

Mix No. P965 – 9017B

I.C.I. P935 – 2018 activator 9901 J 39947

I.C.I. P980 – 230 Thinner 9901 J 41103

Mix Ratio

0.6L	Base Coat
60.0g	Activator
66 g	Thinner. Then thinner added to obtain the recommended viscosity

2K Lacquer

ICI P190-670 Lacquer 2902061949

ICI P210-875 Hardener 2909030003

ICI P850-1893 Thinner

Mix Ratio

252g	P190-670 Lacquer
108.7g	P210-875 Hardener
	P850-1693 Thinner added to obtain the recommended viscosity.

Direct Gloss

ICI HS+ Ford Provence Green XSC 2638

Mix No. P471 – BD59 10/02/98

ICI P210–875 Hardener 2909030003

ICI P850–1893 Thinner

Mix Ratio

0.3L	HS+ Provence Green
159.6g	P210-875 Hardener
	P850-1893 Thinner added to obtain recommended viscosity

FAN WIDTH RESULTS
GUN DISTANCE 15 cm

		Fan Width					Width Average
		Gun	AZ3 HTE			Width	
			Position (cms)				
Material	Setup	Foil No	1	2	3	Average	
Primer	1,8	53	21,5	22,0	22,0	21,5	
		54	21,5	22,0	22,0		
	1.75 Bar	55	22,0	21,5	21,0		
		56	21,0	22,0	21,0		
	1,8	49	19,5	19,5	20,0	20,5	
		50	20,5	20,5	20,0		
	2.0 Bar	51	21,0	20,0	21,0		
		52	20,0	21,0	20,5		
Water Basecoat	1,5	29	18,0	17,0	18,0	17,5	
		30	17,5	17,5	17,0		
	1.75 Bar	31	17,5	16,5	17,5		
		32	18,0	17,0	17,0		
	1,5	25	17,0	16,5	17,0	17,5	
		26	18,0	17,0	18,0		
	2.0 Bar	27	18,0	17,5	17,0		
		28	18,0	17,5	18,0		
Lacquer	1,5	37	21,0	20,0	19,5	20,5	
		38	22,0	21,5	20,0		
	1.75 Bar	39	21,0	21,0	20,0		
		40	20,5	20,0	19,5		
	1,5	33	22,5	21,5	20,5	21,0	
		34	22,0	21,5	20,5		
	2.0 Bar	35	21,5	21,0	21,0		
		36	20,5	21,0	20,5		
Direct Gloss	1,5	45	18,5	18,5	17,5	18,0	
		46	18,5	19,0	18,5		
	1.75 Bar	47	18,5	18,5	18,0		
		48	17,5	17,5	17,5		
	1,5	41	16,5	17,0	17,5	17,5	
		42	17,5	17,5	18,0		
	2.0 Bar	43	17,0	17,5	18,0		
		44	17,5	17,5	17,0		

FAN WIDTH RESULTS
GUN DISTANCE 20 cm

		FAN WIDTH					Width
		Gun	AZ3 HTE			Average	
			Position (cms)				
Material	Setup	Foil No	1	2	3	Average	
Primer	1,8	61	24,5	24,0	23,0	24,5	
		62	25,0	25,0	24,0		
	1.75 Bar	63	25,5	25,0	26,0		
		64	25,0	25,5	24,5		
	2.0 Bar	1,8	57	24,5	24,0	23,0	24,5
			58	25,0	25,0	24,0	
2.0 Bar		59	25,5	25,0	26,0		
		60	25,0	25,5	24,5		
Water Basecoat	1,5	5	20,5	20,5	20,5	20,0	
		6	19,0	19,5	20,5		
	1.75 Bar	7	19,5	20,0	20,0		
		8	19,5	19,5	20,5		
	2.0 Bar	1,5	1	21,0	19,5	20,0	20,5
			2	19,5	19,5	19,5	
2.0 Bar		3	20,5	21,5	21,0		
		4	20,5	20,5	21,0		
Lacquer	1,5	13	23,5	24,0	24,5	23,5	
		14	23,5	23,5	24,0		
	1.75 Bar	15	23,0	23,5	23,5		
		16	23,5	24,0	23,5		
	2.0 Bar	1,5	9	24,0	24,0	24,0	24,0
			10	24,0	23,5	24,0	
2.0 Bar		11	24,5	24,0	23,5		
		12	23,0	24,0	24,0		
Direct Gloss	1,5	21	20,5	20,5	21,0	20,5	
		22	21,0	21,0	20,0		
	1.75 Bar	23	21,0	21,0	20,0		
		24	21,0	20,5	20,5		
	2.0 Bar	1,5	17	20,5	21,0	21,0	21,0
			18	21,5	21,5	21,0	
2.0 Bar		19	21,0	21,0	21,0		
		20	21,0	21,0	21,0		

FLUID FLOW AND AVERAGE FAN WIDTH

Material	AZ3 HTE				
	Nozzle Size	Gun Distance	Gun Pressure	Fluid Flow (g/min)	Fan Size Av. (cms)
Primer	1,8	15	1,75	278	21,5
	1,8	15	2,0	284	20,5
	1,8	20	1,75	268	24,5
	1,8	20	2,0	289	24,5
Water Basecoat	1,5	15	1,75	166	17,5
	1,5	15	2,0	174	17,5
	1,5	20	1,75	170	20,0
	1,5	20	2,0	174	20,5
Lacquer	1,5	15	1,75	163	20,5
	1,5	15	2,0	176	21,0
	1,5	20	1,75	165	23,5
	1,5	20	2,0	163	24,0
Direct Gloss	1,5	15	1,75	182	18,0
	1,5	15	2,0	177	17,5
	1,5	20	1,75	156	20,5
	1,5	20	2,00	175	21,0

APPENDIX B5

MATERIAL SOLIDS

Paint was weighed into a pre-weighed round aluminium foil dish (approx. 16 cm diameter). By tipping the dish the paint was allowed to run and cover the bottom. After stoving at 130°C for 120 minutes (see Result Sheet 5, Appendix B6 for details of base coat stoving), the dishes were allowed to cool and re-weighed.

Calculations:

1. Aluminium dish weight
2. Wet material weight
3. 'Dry-up' material & dish weight
4. 'Dry-up' weight = (3 – 1)
5. Material solids = (4 ÷ 2)

Note

All paint was mixed by weight. This was considered a more accurate way of mixing than by volume.

VISCOSITY

The viscosity was tested using a DIN 4 Cup

PAINT FLUID FLOW THROUGH THE GUN

After setting up the gun, it was weighed, the paint sprayed for 20 seconds in the booth and the gun re-weighed. Weight difference gave paint fluid flow for 20 seconds.

APPENDIX B6

RESULT SHEET 1

Date: 31.01.00

1. Materials: **Standex VHS Primer**

Viscosity Start: **24s DIN4 @ 19°C** Finish: **31s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **60% RH**

Fan Width Average: **21.5 cm**

Stoving Schedule - Foil: **70°C for 70 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
EE	9,63	5,90	14,43	4,80	0,8136	0,8139
FF	9,69	9,85	17,74	8,05	0,8173	
GG	9,70	5,34	14,03	4,33	0,8109	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
53	AZ3 HTE 1,8	3.5 Turns Out	1.75 Bar	15cm	Vertical	1	278	13,66	23,34	9,68	12,27	9,99	96,9	97,2
54	"	"	"	"	"	"	"	13,59	24,03	10,44	13,20	10,74	97,2	
55	"	"	"	"	"	"	"	13,61	24,72	11,11	14,04	11,43	97,2	
56	"	"	"	"	"	"	"	13,65	25,07	11,42	14,39	11,71	97,5	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 2

Date: 31.01.00

1. Materials: **Stadox VHS Primer**

Viscosity Start: **25s DIN4 @ 19°C** Finish: **32s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **57% RH**

Fan Width Average: **20.5 cm**

Stoving Schedule - Foil: **70°C for 70 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
BB	9,72	5,96	14,61	4,89	0,8205	0,8224
CC	9,72	5,87	14,55	4,83	0,8228	
DD	9,61	5,91	14,48	4,87	0,8240	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
49	AZ3 HTE 1,8	3.5 Turns Out	2.0 Bar	15cm	Vertical	1	284	13,65	22,10	8,45	10,60	8,72	96,9	97,3
50	"	"	"	"	"	"	"	13,69	23,34	9,65	12,03	9,89	97,6	
51	"	"	"	"	"	"	"	13,70	23,84	10,14	12,67	10,42	97,3	
52	"	"	"	"	"	"	"	13,62	22,78	9,16	11,46	9,42	97,2	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 3

Date: 31/01/00

1. Materials: **Standex VHS Primer**

Viscosity Start: **25s DIN4 @ 20°C** Finish: **32s DIN4 @ 20°C**

Spray Temp: **20°C**

Spray Humidity: **60% RH**

Fan Width Average: **24.5 cm**

Stoving Schedule - Foil: **70°C for 70 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
KK	9,59	4,94	13,65	4,06	0,8219	0,8217
LL	9,58	5,49	14,08	4,50	0,8197	
MM	9,51	5,67	14,18	4,67	0,8236	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
61	AZ3 HTE 1,8	3.5 Turns Out	1.75 Bar	20cm	Vertical	1	268	13,63	23,12	9,49	12,31	10,12	93,8	93,8
62	"	"	"	"	"	"	"	13,68	23,00	9,32	12,12	9,96	93,6	
63	"	"	"	"	"	"	"	13,89	24,39	10,50	13,57	11,15	94,2	
64	"	"	"	"	"	"	"	13,86	23,30	9,44	12,25	10,07	93,7	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 4

Date: 31/01/00

1. Materials: **Standex VHS Primer**

Viscosity Start: **25s DIN4 @ 20°C** Finish: **34s DIN4 @ 20°C**

Spray Temp: **20°C**

Spray Humidity: **60% RH**

Fan Width Average: **24.5 cm**

Stoving Schedule - Foil: **70°C for 70 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
HH	9,71	7,30	15,74	6,03	0,8260	0,8303
II	9,59	7,17	15,57	5,98	0,8340	
JJ	9,66	5,97	14,62	4,96	0,8308	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
57	AZ3 HTE 1,8	3.5 Turns Out	2.0 Bar	20cm	Vertical	1	289	13,60	23,48	9,88	12,54	10,41	94,9	94,2
58	"	"	"	"	"	"	"	13,73	24,72	10,69	13,71	11,38	93,9	
59	"	"	"	"	"	"	"	13,67	26,34	10,67	16,18	13,43	79,4	
60	"	"	"	"	"	"	"	13,73	25,22	11,49	14,74	12,24	93,9	

Fan fully open

Foil 59 disregarded. Variation too great from other results

APPENDIX B6 (CONTINUED)

RESULT SHEET 5

Date: 25/01/00

1. Materials: **ICI Aquabase**
 Viscosity Start: **27s DIN4 @ 18°C** Finish: **27s DIN4 @ 18°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **35°C for 20 mins / 70°C for 40 mins**
 Spray Humidity: **42% RH**
 Fan Width Average: **17.5 cm** Solids Temp/Time - Foil Tray: **40°C for 45 mins / 130°C for 70 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
P	9,60	5,86	10,39	0,79	0,1348	0,1374
Q	9,27	5,51	10,03	0,76	0,1379	
R	9,44	5,45	10,20	0,76	0,1394	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E.
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	T.E. Av %
29	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	15cm	Vertical	1	166	13,65	14,75	1,10	9,29	1,28	85,9	86,7
30	"	"	"	"	"	"	"	13,60	14,71	1,11	9,22	1,27	87,4	
31	"	"	"	"	"	"	"	13,66	14,81	1,15	9,62	1,32	87,1	
32	"	"	"	"	"	"	"	13,65	14,73	1,08	9,11	1,25	86,4	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 6

Date: 25/01/00

1. Materials: **ICI Aquabase**
 Viscosity Start: **25s DIN4 @ 19°C** Finish: **26s DIN4 @ 18°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **35°C for 20 mins / 70°C for 40 mins**
 Spray Humidity: **42% RH**
 Fan Width Average: **17.5 cm** Solids Temp/Time - Foil Tray: **40°C for 45 mins / 130°C for 70 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
P						
Q			AS RESULT SHEET 5			
R						

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
25	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	15cm	Vertical	1	174	13,68	14,60	0,92	7,80	1,07	86,0	84,1
26	"	"	"	"	"	"	"	13,59	14,57	0,98	8,57	1,18	83,1	
27	"	"	"	"	"	"	"	13,63	14,72	1,09	9,30	1,28	85,2	
28	"	"	"	"	"	"	"	13,58	14,68	1,10	9,55	1,31	84,0	

Fan fully open

Foil 25 - Disregarded. Variation too great from other results

APPENDIX B6 (CONTINUED)

RESULT SHEET 7

Date: 13/01/00

1. Materials: **ICI Aquabase**
 Viscosity Start: **28s DIN4 @ 18°C** Finish: **28s DIN4 @ 19°C**
 Spray Temp: **21°C** Stoving Schedule - Foil: **35°C for 20 mins / 70°C for 40 mins**
 Spray Humidity: **42% RH**
 Fan Width Average: **20.0 cm** Solids Temp/Time - Foil Tray: **40°C for 45 mins / 130°C for 70 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
A	9,69	5,60	10,41	0,72	0,1286	0,1305
B	9,78	4,83	10,41	0,63	0,1304	
C	9,75	4,08	10,29	0,54	0,1324	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
5	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	20cm	Vertical	1	170	13,59	14,53	0,94	8,90	1,16	81,0	81,5
6	"	"	"	"	"	"	"	13,61	14,40	0,79	7,39	0,96	82,3	
7	"	"	"	"	"	"	"	13,59	14,47	0,88	8,21	1,07	82,2	
8	"	"	"	"	"	"	"	13,55	14,42	0,87	8,26	1,08	80,6	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 8

Date: 25.01.00

1. Materials: **ICI Aquabase**
 Viscosity Start: **28s DIN4 @ 17°C** Finish: **28s DIN4 @ 18°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **35°C for 20 mins / 70°C for 40 mins**
 Spray Humidity: **42% RH**
 Fan Width Average: **20.5 cm** Solids Temp/Time - Foil Tray: **40°C for 45 mins / 130°C for 70 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
A	9,69	5,60	10,41	0,72	0,1286	0,1305
B	9,78	4,83	10,41	0,63	0,1304	
C	9,75	4,08	10,29	0,54	0,1324	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
1	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	20cm	Vertical	1	174	13,55	14,40	0,85	8,12	1,06	80,2	79,4
2	"	"	"	"	"	"	"	13,54	14,29	0,75	7,27	0,95	78,9	
3	"	"	"	"	"	"	"	13,58	14,44	0,86	8,28	1,08	79,6	
4	"	"	"	"	"	"	"	13,62	14,47	0,85	8,25	1,08	78,7	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 9

Date: 13/01/00

1. Materials: **ICI HS Lacquer**
 Viscosity Start: **21s DIN4 @ 19°C** Finish: **23s DIN4 @ 19°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **70°C for 40 mins**
 Spray Humidity: **41% RH**
 Fan Width Average: **20.5 cm** Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
S	9,45	4,10	11,81	2,36	0,5756	0,5899
T	9,58	6,72	13,60	4,02	0,5982	
U	9,65	5,74	13,07	3,42	0,5958	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E.	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	T.E. Av %	
37	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	15cm	Vertical	1	163	13,53	17,46	3,93	8,20	4,84	81,2	81,5	
38	"	"	"	"	"	"	"	13,50	17,77	4,27	8,86	5,23	81,6		
39	"	"	"	"	"	"	"	13,54	17,94	4,40	9,14	5,39	81,6		
40	"	"	"	"	"	"	"	13,67	18,21	4,54	9,46	5,58	81,4		

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 10

Date: 25.01.00

1. Materials: **ICI HS Lacquer**
 Viscosity Start: **19s DIN4 @ 19°C** Finish: **21s DIN4 @ 19°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **70°C for 40 mins**
 Spray Humidity: **41% RH**
 Fan Width Average: **21.0 cm** Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids (g)	Average Material Solids (g)
S						
T			RESULTS AS SHEET 9			
U						

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
33	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	15 cm	Vertical	1	176	13,64	17,79	4,15	8,81	5,20	79,8	80,6
34	"	"	"	"	"	"	"	13,66	17,81	4,15	8,68	5,12	81,1	
35	"	"	"	"	"	"	"	13,61	18,03	4,42	9,23	5,44	81,3	
36	"	"	"	"	"	"	"	13,54	17,50	3,96	8,35	4,93	80,3	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 11

Date: 24/01/00

1. Materials: **ICI HS Lacquer**
 Viscosity Start: **20s DIN4 @ 18°C** Finish: **21s DIN4 @ 18°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **70°C for 40 mins**
 Spray Humidity: **45% RH**
 Fan Width Average: **23.5 cm** Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
G	9,64	5,98	13,02	3,38	0,5652	0,5668
H	9,74	3,49	11,72	1,98	0,5673	
I	9,59	5,67	12,81	3,22	0,5679	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
13	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	20cm	Vertical	1	165	13,42	16,47	3,05	6,94	3,93	77,6	77,9
14	"	"	"	"	"	"	"	13,69	16,94	3,25	7,40	4,19	77,6	
15	"	"	"	"	"	"	"	13,58	16,72	3,14	7,08	4,01	78,3	
16	"	"	"	"	"	"	"	13,67	17,17	3,50	7,91	4,48	78,1	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 12

Date: 24/01/00

1. Materials: **ICI HS Lacquer**
 Viscosity Start: **22s DIN4 @ 19°C** Finish: **23s DIN4 @ 18°C**
 Spray Temp: **20°C** Stoving Schedule - Foil: **70°C for 40 mins**
 Spray Humidity: **45% RH**
 Fan Width Average: **24.0 cm** Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
D	9,62	4,00	11,92	2,30	0,5750	0,5810
E	9,83	5,44	13,02	3,19	0,5864	
F	9,68	4,78	12,46	2,78	0,5816	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
9	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	20cm	Vertical	1	163	13,57	16,68	3,11	6,91	4,01	77,6	77,5
19	"	"	"	"	"	"	"	13,54	16,64	3,10	6,94	4,03	76,9	
20	"	"	"	"	"	"	"	13,49	16,59	3,10	6,88	4,00	77,5	
21	"	"	"	"	"	"	"	13,45	16,48	3,03	6,70	3,89	77,9	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 13

Date: 25/01/00

1. Materials: **ICI HS Direct Gloss**

Viscosity Start: **21s DIN4 @ 19°C** Finish: **21s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **42% RH**

Fan Width Average: **18.0 cm**

Stoving Schedule - Foil: **70°C for 40 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
Y	9,63	3,26	11,51	1,88	0,5767	0,5780
Z	9,65	4,89	12,48	2,83	0,5787	
AA	9,69	4,84	12,49	2,80	0,5785	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
45	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	15cm	Vertical	1	182	13,89	16,89	3,00	6,06	3,50	85,7	85,8
46	"	"	"	"	"	"	"	13,83	17,35	3,52	7,09	4,10	85,9	
47	"	"	"	"	"	"	"	13,73	17,34	3,61	7,29	4,21	85,7	
48	"	"	"	"	"	"	"	13,73	17,53	3,80	7,65	4,42	86,0	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 14

Date: 25/01/00

1. Materials: **ICI HS Direct Gloss**

Viscosity Start: **22s DIN4 @ 19°C** Finish: **24s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **42% RH**

Fan Width Average: **17.5 cm**

Stoving Schedule - Foil: **70°C for 40 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
V	9,51	4,25	12,14	2,63	0,6188	0,6173
W	9,74	4,42	12,44	2,70	0,6109	
X	9,49	6,46	13,51	4,02	0,6223	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
41	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	15cm	Vertical	1	177	13,71	16,91	3,20	6,24	3,85	83,1	83,7
42	"	"	"	"	"	"	"	13,71	17,08	3,37	6,52	4,02	83,8	
43	"	"	"	"	"	"	"	13,85	17,11	3,25	6,26	3,86	84,2	
44	"	"	"	"	"	"	"	13,93	17,29	3,36	6,52	4,02	83,6	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 15

Date: 25/01/00

1. Materials: **ICI HS Direct Gloss**

Viscosity Start: **23s DIN4 @ 19°C** Finish: **25s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **44% RH**

Fan Width Average: **20.5 cm**

Stoving Schedule - Foil: **70°C for 40 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
J	9,52	7,76	14,29	4,77	0,6147	0,6115
K	9,62	5,27	12,82	3,20	0,6072	
L	9,37	3,77	11,68	2,31	0,6127	

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
21	AZ3 HTE 1,5	3.5 Turns Out	1.75 Bar	20cm	Vertical	1	156	13,67	17,24	3,57	7,46	4,56	78,3	78,4
22	"	"	"	"	"	"	"	13,68	17,32	3,64	7,60	4,65	78,3	
23	"	"	"	"	"	"	"	13,62	17,60	3,98	8,25	5,04	79,0	
24	"	"	"	"	"	"	"	13,69	17,24	3,55	7,46	4,56	77,9	

Fan fully open

APPENDIX B6 (CONTINUED)

RESULT SHEET 16

Date: 24/01/00

1. Materials: **ICI HS Direct Gloss**

Viscosity Start: **22s DIN4 @ 19°C** Finish: **23s DIN4 @ 19°C**

Spray Temp: **20°C**

Spray Humidity: **44% RH**

Fan Width Average: **21.0 cm**

Stoving Schedule - Foil: **70°C for 40 mins**

Solids Temp/Time - Foil Tray: **130°C for 120 mins**

2. Material Solids (Tray)

Panel Dish No	1	2	3	4 (3-1)	5 (4/2)	6
	Aluminium Foil Tray Weight (g)	Wet Material (g)	Dry-up Foil Tray Weight (g)	Dry Up (g)	Materials Solids	Average Material Solids
J						
K			SEE RESULT SHEET 15			
L						

3. Transfer Efficiency (T.E.) on Foil

Foil No	Gun Model	Paint Adj	Pressure at Gun	Spray Distance	Foil Position	No of Gun Passes	Paint Output g/min	1	2	3 (2-1)	4	5 (4x6)	6 (3/5)	T.E. Av %
								Foil Weight	Dry-up & Foil	Dry Up	Wet Spray Material	Spray Solid	T.E.	
17	AZ3 HTE 1,5	3.5 Turns Out	2.0 Bar	20cm	Vertical	1	175	13,70	17,06	3,36	7,05	4,31	78,0	77,3
18	"	"	"	"	"	"	"	13,73	17,53	3,80	8,04	4,92	77,2	
19	"	"	"	"	"	"	"	13,76	17,51	3,75	7,98	4,88	76,8	
20	"	"	"	"	"	"	"	13,58	17,74	4,16	8,81	5,39	77,2	

Fan fully open