An Evaluation of SpeedyDry Ink Drying Additive

For

Genesis LLC
And
SpeedyDry Inc.

Performed By

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SpeedyDry Press Test

DATE: July 1, 2004
PRESS ROOM CONDITIONS: Temp: 70.5°F Humidity: 45%
PRESS: Heidelberg 40" Speedmaster Sheetfed
Press speed: 7,000 IPH
Dryer temp: 30°C
Spray powder: 16% for plastic, 12% for Magnostar and 10% for Somerset, Classic Crest, and Tomahawk
Fountian Solution: Prisco 3451 w/ Alkaless 3000
pH: 5.2 Cond: 2000
PLATE: Diamond Western Litho (175 lpi with a 4% bump curve in midtone)
INKS: INX OSF Vision Plus 4 Color Process
INX OSF Vision Plus w/ SpeedyDry 4 Color Process
- 20% SpeedyDry was added to black, cyan, and magenta
- 12% SpeedyDry was added to yellow

PAPER:

Manufacturer	Type	Substrate	Weight	Caliper
Sappi	Magnostar	Coated	80#	.15mm
Sappi	Somerset	Matte	80#	.15mm
Neenah	Classic Crest	Crown	80#	.11mm
Tomahawk	Cool White	Felt	80#	.10mm
Transilwrap	Tipped Polyester	Plastic	----	.21mm

Purpose

The purpose of the test was to evaluate effectiveness of the ink-drying additive called SpeedyDry on a variety of substrates.

Procedure

First we ran all five substrates using the INX Vision Plus ink.
1. 1000 sheets of Tomahawk Cool White Felt
2. 1000 sheets of Classic Crest Crown
3. 1000 sheets of Somerset Matte
4. 1000 sheets of Magnostar Coated
5. 500 sheets of Tipped Polyester

The ink fountains were scooped clean and the INX Vision Plus ink + SpeedyDry was added and run in the following order:
1. 500 sheets of Tipped Polyester

2. 1000 sheets of Somerset Matte
3. 1000 sheets of Magnostar Coated
4. 1000 sheets of Classic Crest Crown
5. 1000 sheets of Tomahawk Cool White felt

Approximately one hundred sheets were run between conditions for make-ready. During each run samples were flagged every hundred sheets and later pulled for analysis. One sample was pulled from each condition to be tested in the lab for setting time. After one hour and 3 hours each condition was checked to see how the samples were drying in the lifts.

	1 hr	**3 hrs**
Tomahawk	Slightly Tacky	Set
Classic Crest	Moderately Tacky	Slightly Tacky
Somerset	Tacky	Moderately Tacky
Magnostar	Slightly Tacky	Set
Polyester	Wet	Wet
Polyester *	Slightly Tacky	Set
Somerset *	Slightly Tacky	Set
Magnostar *	Set	Set
Classic Crest *	Set	Set
Tomahawk *	Set	Set

SpeedyDry had favorable effects on ink setting and drying. These inks were not formulated for printing on plastic, but they dried hard on the polyester with the SpeedyDry additive.

Print Analysis

Using the Tobias SXY scanner, all print analysis readings were taken from the GATF Digital Four-Color Scanning Control Bar located at the tail end of the sheet. In the tables below the substrates with a star next to them were printed with the SpeedyDry in the ink. While scanning these samples some set off was noticed. The Magnostar without speedy dry had blocking in the top of the fruit image on the front and back of the sheets. This was only seen on the sheets that were pulled at 1000 and 1100. The Polyester with SpeedyDry had small amounts of set off on the back of every sheet. The Polyester without SpeedyDry only had set off on a couple of sheets, because these were dried as single sheets in open air.

Density

Average density values for these sheets were compared to the GRACoL guidelines that were used on press. GRACoL guidelines suggest that densities be within ± 0.1 of the

target, with a range of less than 0.20 across the sheet as well as throughout the run. A sheet was pulled every 100 through out the run. Except for the polyester sheets, which had five, all other conditions had at least ten sheets to take readings from.

	Black	Cyan	Magenta	Yellow
GRACoL	1.60	1.30	1.40	1.00
Somerset	1.49	1.20	1.38	1.01
Somerset *	1.53	1.30	1.35	0.97

	Black	Cyan	Magenta	Yellow
GRACoL	1.70	1.40	1.50	1.05
Magnostar	1.59	1.35	1.38	0.99
Magnostar *	1.65	1.36	1.43	0.98
Polyester	1.74	1.38	1.33	0.93
Polyester *	1.55	1.26	1.30	0.92

	Black	Cyan	Magenta	Yellow
GRACoL	1.25	1.00	1.12	0.95
Classic Crest	1.05	0.93	0.97	0.82
Classic Crest *	0.98	0.88	0.93	0.77
Tomahawk	1.03	0.92	0.94	0.79
Tomahawk *	1.04	0.90	0.97	0.82

Tone Value Increase

Tone Value Increase (Dot Gain) is the growth of the dots during the printing process. The purpose of measuring TVI is to maintain gray balance, color, as well as highlight and shadow detail. By measuring the dots as you work through the process TVI can be predicted and controlled. To do this successfully, you must set standards that are realistic for your press and proofing systems. Developing internal standards is one solution or you could use an industry guideline such as GRACoL. GRACoL guidelines state that TVI should be measured at the mid-tone using a status T response densitometer. The GRACoL guidelines for midtone tone value increase are based on a 50% dot. We found that the additive did not affect the tone reproduction of the ink.

	Black	Cyan	Magenta	Yellow
GRACoL	24	22	22	20
Somerset	18	14	19	18
Somerset *	20	15	18	18

	Black	Cyan	Magenta	Yellow

GRACoL	22	20	20	18
Magnostar	19	15	19	18
Magnostar *	21	16	20	20
Polyester	29	21	26	25
Polyester *	29	20	26	25

	Black	**Cyan**	**Magenta**	**Yellow**
GRACoL	28	26	26	24
Classic Crest	27	21	25	23
Classic Crest *	27	22	24	24
Tomahawk	28	23	25	23
Tomahawk *	28	22	26	25

Print Contrast

Print Contrast is a comparison between the 75% tint and the solid. This comparison indicates how well details are held in the shadow area. The higher the PC numbers, the more the image stands out. GRACoL recommends that the print contrast values be within ±5% of the guidelines.

	Black	**Cyan**	**Magenta**	**Yellow**
GRACoL	40-45	35-40	35-40	30-35
Somerset	41	39	39	27
Somerset *	41	39	38	25

	Black	**Cyan**	**Magenta**	**Yellow**
GRACoL	40-45	35-40	35-40	30-35
Magnostar	43	41	40	30
Magnostar *	41	38	20	26
Polyester	25	30	22	15
Polyester *	24	25	26	15

	Black	**Cyan**	**Magenta**	**Yellow**
GRACoL	20	17	16	17
Classic Crest	22	26	25	20
Classic Crest *	19	23	22	19
Tomahawk	21	24	25	19
Tomahawk *	20	22	20	17

Trap

Trap is an indication of the ability of printed ink to accept the next ink printed compared to how well paper accepts the first ink. Factors influencing trap include ink film thickness, ink tack, viscosity, ink sequence, and the mechanical adjustments on press such as rollers and impression settings. GATF recommends that the trap value read 75% or higher for the red and blue with green reading above 85%. To optimize trapping ability, tack rated inks with a high pigment load should be used. Maintaining proper ink and water balance will also help trapping ability.

	Blue	Green	Red
Somerset	82	93	64
Somerset *	70	84	65
Magnostar	73	87	64
Magnostar *	72	82	63
Polyester	77	88	88
Polyester *	79	87	85
Classic Crest	61	85	46
Classic Crest *	59	80	48
Tomahawk	60	82	42
Tomahawk *	62	81	42

Lab Testing

INK SETTING

Ink setting was measured using the GATF Ink Setting and Drying Time Recorder. A printed sample was pulled from each condition during the run. A strip of paper was cut from the solid black area on the sheet. The printed sample was attached to a metal bar. An unprinted transfer strip of constant coated paper was placed over the printed strip and the sample was loaded onto the machine. The samples moved forward at a pre-determined speed beneath a set of cam-operated weights. The weights rose and fell pressing the unprinted strip into contact with the printed strip. This created a setoff trail that faded as the ink set. The distance of the setoff trail was measured and the time required for the ink to set was calculated.

	Without SpeedyDry	With SpeedyDry
Magnastar	3.0 hrs	0.9 hrs
Classic Crest	2.6 hrs	1.9 hrs
Tomahawk	10.4 hrs	2.9 hrs

Polyester	10.7 hrs	2.4 hrs
Somerset	3.5 hrs	1.9 hrs

The SpeedyDry significantly decreases ink setting time for all conditions. The 10.7 hrs you see in the chart is the maximum time for that test. The sheets used for print analysis were left out in open air for 3 days and they were dry. However sheets that would be left sitting in a lift wouldn't dry that quickly, if ever. The ink we used in this test was not formulated to print on plastic. Had we used the right ink, adding SpeedyDry to ink that is formulated for plastic printing may cut down the ink setting time even more.

DUKE EMULSIFICATION

Duke emulsification was performed according to ASTM method D 4942-89. Fifty grams of ink were placed in the mixing bowl. Twenty milliliters of fountain solution were added to the mixing bowl and mixed together at 90 RPM for one minute. Any fountain solution not absorbed by the ink was decanted and the mixing bowl was weighed. Twenty milliliters of fountain solution was added to the mixing bowl again and the test repeated. This was done ten times. An emulsification curve was generated from the data as well as a final emulsification percentage. The pH and conductivity of the fountain solution before and after the test was also recorded. The original ph was 4.11 and the original conductivity was 1752.

	Percent water	Bleed	pH	Conductivity
Black	50	- -	4.55	1950
Black *	48	- -	6.90	2740
Cyan	53	- -	5.20	1190
Cyan *	53	- -	5.14	1674
Magenta	58	- -	6.20	1196
Magenta *	58	Severe bleed	5.43	1659
Yellow	67	- -	6.80	2010
Yellow *	61	- -	4.94	1463

We recommend a water pick-up between 40-80% for process lithographic inks. Speedy Dry has little to no effect on the amount of fountain solution the ink is able to absorb. The low conductivity numbers we believe to be just noise of the measurement.

TACK

Tack was performed according to ASTM method D 4361-89 using a Thwing-Albert Electronic Inkometer. A pipet was filled with 1.32 cc of ink. The ink was distributed on the rollers of the inkometer. The inkometer was turned on and the tack values were recorded every thirty seconds for the first two minutes, then every minute to ten minutes. The one minute tack value was reported along with the final tack value.

	1 min	10 min
INX Black	20.4	22.4

INX Black *	20.7	25.1
INX Cyan	21.4	24.4
INX Cyan *	22.7	24.7
INX Magenta	21.0	21.7
INX Magenta *	21.4	23.2
INX Yellow	19.5	19.9
INX Yellow *	20.3	21.8

The difference in tack between the inks with and without SpeedyDry is negligible.

TINCTORIAL STRENGTH

Tinctorial strength was performed according to the NPIRI Bleaching Method. One part ink was mixed with fifty parts white paste (blue for yellow ink). The inks were drawn down next to each other. The stronger ink was bleached further to match the weaker ink. The tinctorial strength of the ink was then calculated.

INX Vision Plus Inks	Tinctorial Strength
Yellow	Same strength as SWOP
Yellow*	9% weaker than SWOP
Magenta	Shade difference to SWOP
Magenta*	16% weaker than INX
Cyan	9% stronger than SWOP
Cyan*	7% weaker than SWOP
Black	9% weaker than SWOP
Black*	25% weaker than SWOP

The amount of SpeedyDry added to the ink appears to be almost directly proportional to the reduction of tinctorial strength. Therefore inks with high pigment loads would be optimal for use with SpeedyDry.

In summary, SpeedyDry had very little impact on the integrity of the ink properties. It has proven to dramatically reduce ink setting times while having no significant impact on the print quality and properties of the ink. We feel that SpeedyDry may improve the rub resistance of the prints and recommend Sutherland Rub testing to verify this. If you have any questions or require further testing you may contact me at (412)741-6860 ext. 614 or ecathie@gatf.org. For print analysis questions you may contact Lindsay Ferrari at ext. 582 or lferrari@gatf.org.

Sincerely,

Eric Cathie
Lab Technician