Fingerprinting, Press Characterization, and Material Input Variations

- Presented by Gary P. White

Fingerprinting, Press Characterization, and Material Input Variations

An effective fingerprinting policy fixes problems, not the blame. To fix the problem, you must know what it is. To know what the problem is requires measurement of the materials and the process.

Materials variation is frequently the most frustrating and often least understood component of the printing process.

Fingerprinting, Press Optimization, and Material Input Variations

Fingerprinting is about efficiency and consistency. The only way to consistently and efficiently get the right results in production is to optimize your press. Document your process starting the first time and repeat your documentation and analysis each time you go to press. To evaluate your results and reach definitive conclusions will take more than one time at press.

Fingerprinting, Press Optimization, and Material Input Variations

- When should you Fingerprint/Optimize your press?
  - When you're certain you are ready to control the process
  - When you are certain you will control the inputs
  - When you decide to "fix" (stabilize) your inputs
- How can variables impact changes!
  - Single changes – are they slight, probably not.
  - Multiple changes – can you make accurate compensations?

Fingerprinting, Press Optimization, and Material Input Variations

A common mistake is not taking the time to fully evaluate ink formulas and viscosities at press. If your very first attempt doesn't include measurements to show the range of ink formulas and viscosities at each of those formulas which give you print quality and print problems, then you have not done the most important part of the process. It is vital to determine the conditions under which your inks will print and NOT print. This is the only way to know you are at the optimum viscosity and formula and within the appropriate ranges for acceptable print quality.

Fingerprinting, Press Optimization, and Material Input Variations

If you use the same ink system, do you need to do a "Fingerprint" on each substrate used? Until it is measured, you can't determine, so the answer is YES!

Most often, the ink formulas, viscosities, and other press variables will have optimums or ranges that are dissimilar on different substrates due to differences in absorption rates, press speeds, and drying conditions. <u>This is variation!</u>

Fingerprinting, Press Optimization, and Material Input Variations

- Substrate testing and verification.
  - Board – SBS, SUS, Clay-Coated
  - Paper – Uncoated, C1S, Supercalendered, Tissue
  - Film – Gauge, Type (PET, PVC, Etc.)
  - Foil – Gauge, Type (Supported, Unsupported)
  - Laminated Structures (Adhesive differences)
  - Extruded Structures

  Post-press curing and color measurement

  Preconditioning – moisture control, web stabilization measures
- Substrate as another color
  - Substrates vary in color, gloss, brightness, texture and absorbency
  - The higher the transparency of the ink, the more the ink acts like a filter, and the more reflective the substrate behaves with the unabsorbed light

Fingerprinting, Press Optimization, and Material Input Variations

Ink Measurement

- Standard Ink Proofing Practice
- Measure & record formula taken to press
- Record changes made on press and press viscosity
- Store the readings
- Take wet sample back to ink room with viscosity and temperature data.
- Proof results returned from press on standard substrate.
- Measure and compare results.

Fingerprinting, Press Optimization, and Material Input Variations

- Background Color
- Major areas of variation (Type, Vignettes, etc)
- Color Control of background (reversed areas, type)
- Lay of ink/absorbency
- Opacity or White value, reflectivity over surface

Fingerprinting, Press Optimization, and Material Input Variations

Don’t be swayed from trying a new ink formula because of the wet price per pound increases. True cost is dollars spent to print, which includes downtimes and waste that are often reduced by using an ink that has a higher wet price per pound. Even if all else is equal, the actual dollars spent to print to measured color targets can actually be lower for a higher wet price per pound ink.

Fingerprinting, Press Optimization, and Material Input Variations

- Doctor Blade – setup, blade thickness, backing, blade distance, set angles, blade geometry or type, blade pressure, blade height.
- Effect of ink on blade. TiO_2 for example.

Fingerprinting, Press Optimization, and Material Input Variations

Separations & Engravings:

The most important aspect of reproducing the image you desire is deciding on your engravings.

The higher the line count, the finer the detail you capture, however, the higher the screen count, the more you compress your color range.

If process work is not an issue, characterize for type and background colors.

The engravings alone have five characteristics that must be determined. These are:

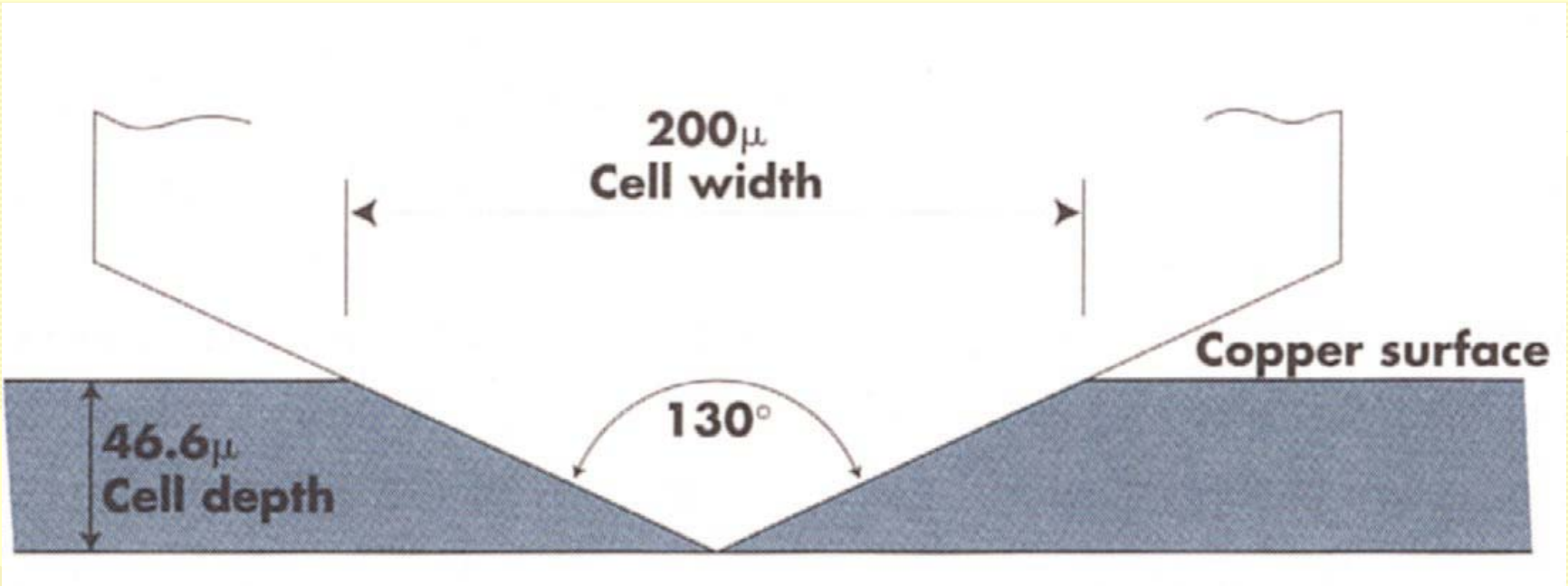
- Line Screen Count
- Compression Ratio
- Engraving Stylus Angle
- Size of Channel
- Size of Wall area (in the solid)

Finally, the finished surface profile must be taken into account to allow the doctor blade to produce an efficient wipe.

Fingerprinting, Press Optimization, and Material Input Variations

- These five areas determine how the ink is released, the related ink strength, and the operating viscosity of the ink. These carry the wet ink film, but the dry ink film is what the eye sees.
- Often, the first set of engravings must undertake a modification requiring another press trial.

Fingerprinting, Press Optimization, and Material Input Variations



Fingerprinting, Press Optimization, and Material Input Variations

Cell Depth Chart

Daetwyler

Cell Width in microns	Stylus Angle in degrees: 145	140	135	130	125	120	115	110	105
30	4.7	5.5	6.2	7.0	7.8	8.7	9.6	10.5	11.5
40	6.3	7.3	8.3	9.3	10.4	11.5	12.7	14.0	15.3
50	7.9	9.1	10.4	11.7	13.0	14.4	15.9	17.5	19.2
60	9.5	10.9	12.4	14.0	15.6	17.3	19.1	21.0	23.0
70	11.0	12.7	14.5	16.3	18.2	20.2	22.3	24.5	26.9
80	12.6	14.6	16.6	18.7	20.8	23.1	25.5	28.0	30.7
90	14.2	16.4	18.6	21.0	23.4	26.0	28.7	31.5	34.5
100	15.8	18.2	20.7	23.3	26.0	28.9	31.9	35.0	38.4
110	17.3	20.0	22.8	25.6	28.6	31.8	35.0	38.5	42.2
120	18.9	21.8	24.9	28.0	31.2	34.6	38.2	42.0	46.0
130	20.5	23.7	26.9	30.3	33.8	37.5	41.4	45.5	49.9
140	22.1	25.5	29.0	32.6	36.4	40.4	44.6	49.0	53.7
150	23.6	27.3	31.1	35.0	39.0	43.3	47.8	52.5	57.5
160	25.2	29.1	33.1	37.3	41.6	46.2	51.0	56.0	61.4
170	26.8	30.9	35.2	39.6	44.2	49.1	54.2	59.5	65.2
180	28.4	32.8	37.3	42.0	46.9	52.0	57.3	63.0	69.1
190	30.0	34.6	39.4	44.3	49.5	54.8	60.5	66.5	72.9
200	31.5	36.4	41.4	46.6	52.1	57.7	63.7	70.0	76.7
210	33.1	38.2	43.5	49.0	54.7	60.6	66.9	73.5	80.6
220	34.7	40.0	45.6	51.3	57.3	63.5	70.1	77.0	84.4
230	36.3	41.9	47.6	53.6	59.9	66.4	73.3	80.5	88.2
240	37.8	43.7	49.7	56.0	62.5	69.3	76.4	84.0	92.1
250	39.4	45.5	51.8	58.3	65.1	72.2	79.6	87.5	95.9
260	41.0	47.3	53.8	60.6	67.7	75.1	82.8	91.0	99.8
270	42.6	49.1	55.9	63.0	70.3	77.9	86.0	94.5	103.6
280	44.1	51.0	58.0	65.3	72.9	80.8	89.2	98.0	107.4
290	45.7	52.8	60.1	67.6	75.5	83.7	92.4	101.5	111.3
300	47.3	54.6	62.1	69.9	78.1	86.6	95.6	105.0	115.1
310	48.9	56.4	64.2	72.3	80.7	89.5	98.7	108.5	118.9
320	50.4	58.2	66.3	74.6	83.3	92.4	101.9	112.0	122.8
330	52.0	60.1	68.3	76.9	85.9	95.3	105.1	115.5	126.6
340	53.6	61.9	70.4	79.3	88.5	98.1	108.3	119.0	130.4
350	55.2	63.7	72.5	81.6	91.1	101.0	111.5	122.5	134.3
360	56.8	65.5	74.6	83.9	93.7	103.9	114.7	126.0	138.1
370	58.3	67.3	76.6	86.3	96.3	106.8	117.9	129.5	142.0
380	59.9	69.2	78.7	88.6	98.9	109.7	121.0	133.0	145.8
390	61.5	71.0	80.8	90.9	101.5	112.6	124.2	136.5	149.6
400	63.1	72.8	82.8	93.3	104.1	115.5	127.4	140.0	153.5
410	64.6	74.6	84.9	95.6	106.7	118.4	130.6	143.5	157.3
420	66.2	76.4	87.0	97.9	109.3	121.2	133.8	147.0	161.1
430	67.8	78.3	89.1	100.3	111.9	124.1	137.0	150.5	165.0
440	69.4	80.1	91.1	102.6	114.5	127.0	140.2	154.0	168.8
450	70.9	81.9	93.2	104.9	117.1	129.9	143.3	157.5	172.6
460	72.5	83.7	95.3	107.3	119.7	132.8	146.5	161.0	176.5
470	74.1	85.5	97.3	109.6	122.3	135.7	149.7	164.5	180.3
480	75.7	87.4	99.4	111.9	124.9	138.6	152.9	168.0	184.2
490	77.2	89.2	101.5	114.2	127.5	141.5	156.1	171.6	188.0
500	78.8	91.0	103.6	116.6	130.1	144.3	159.3	175.1	191.8

Maximum Depths
High Frequency head is 65µ
High Output 130 head is 130µ
Mega I head is 275µ

For cell widths over 500 microns:
1. Divide cell width in half
2. Find cell depth for ½ cell width
3. Double cell depth

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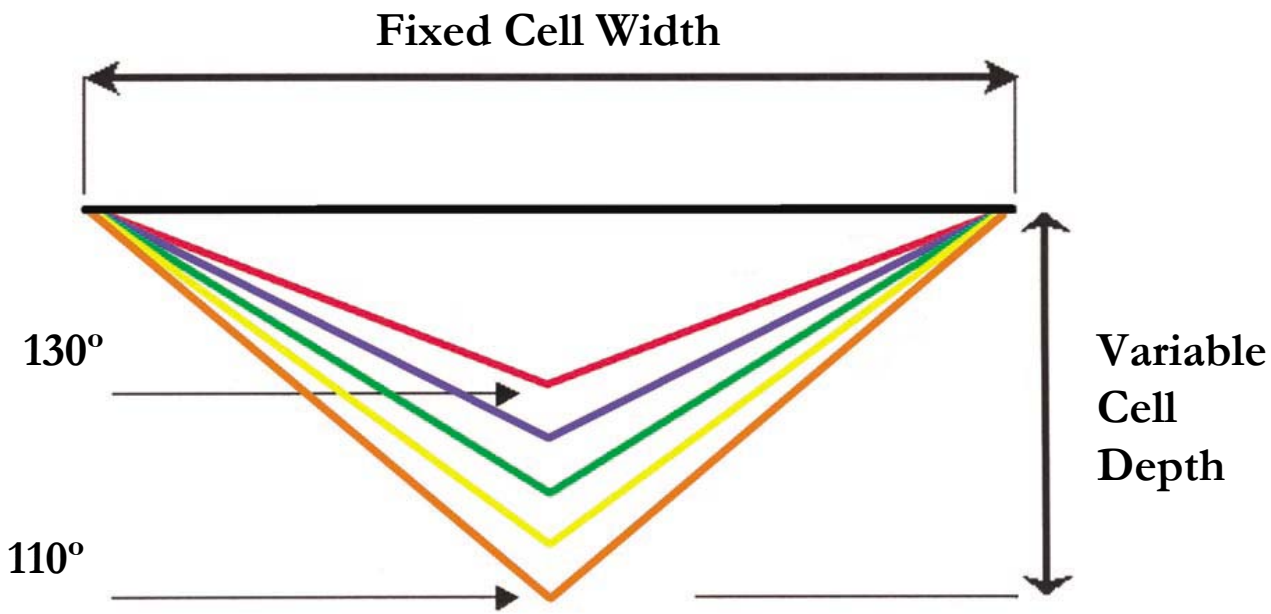
Fingerprinting, Press Optimization, and Material Input Variations



Fingerprinting, Press Optimization, and Material Input Variations

- Water vs. Solvent Inks (speed related issues)
- Solvent Blends & Environmental change-over (summer or winter)
- Effect of Chill rolls – substrate, ink temp; cylinder temp; ink transfer issues
- Driers, tensioning, web aligners, pumps, etc (Process Engineers)
- The "List"

Fingerprinting, Press Optimization, and Material Input Variations

- **Fingerprinting:** Normalization; commitment; doing the same thing the same way each time; measuring and controlling what is done at press.
- **Characterization:** Applying this press consistency to separations and engravings in order to utilize the capabilities of the specific process, inks, and equipment.
- **Optimization:** Continual application of a process in control and its refinement to continuously improve quality.

Fingerprinting, Press Optimization, and Material Input Variations

Why it's Frustrating

- Separators – Shawk, Vertis, SGS, End-User in-house graphic departments to name a few.
- Engravers – SGS, WRE, IPT, Keating, In-House engraving departments.
- Color Control of Separations – Families of jobs with different sizes arrive in different time frames. Are the separations manipulated for different sizes? Are separations going to same engraver or multiple engravers? Do multiple engravers use the same gamma curve to reproduce the image? Do engravers insert color tone scales as separate file, or do they input scales that reflect the separations?

Fingerprinting, Press Optimization, and Material Input Variations

Why it's Frustrating

- Product & Packaging Printers generally have presses from multiple manufacturers in their facility. Cerutti, Schiavi, Rotomec, Bobst-Champlain, Chestnut, CMR, & ACOM are among the common gravure presses.
- A common practice is some organizations it to mix runs to multiple presses, depending on schedule availability.
- Unless these presses are correlated, the changes resulting from movement, will print and react differently. (see shingles around press)
- Another common practice is to use-up old or "close" substrate to finish a job.

Fingerprinting, Press Optimization, and Material Input Variations

Why it's Frustrating

- Do you "Fingerprint" or Optimize?
- **Fingerprinting:** Normalization; commitment; doing the same thing the same way each time; measuring and controlling what is done at press.
- **Characterization:** Applying this press consistency to separations and engravings in order to utilize the capabilities of the specific process, inks, and equipment.
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Fingerprinting, Press Optimization, and Material Input Variations

- **Optimization:** Continual application of a process in control and its refinement to continuously improve quality.

Publication – Traditional Methods (conditions easier to control)

Product & Packaging – Non-traditional Methods (multiple input sources & cylinder sizes, multiple press manufacturers, many substrates)

1. Vendor Involvement & Partnerships
2. Material input verification
3. Change notices and measurement of effect

Fingerprinting, Press Optimization, and Material Input Variations

Color Density/Spectral Control

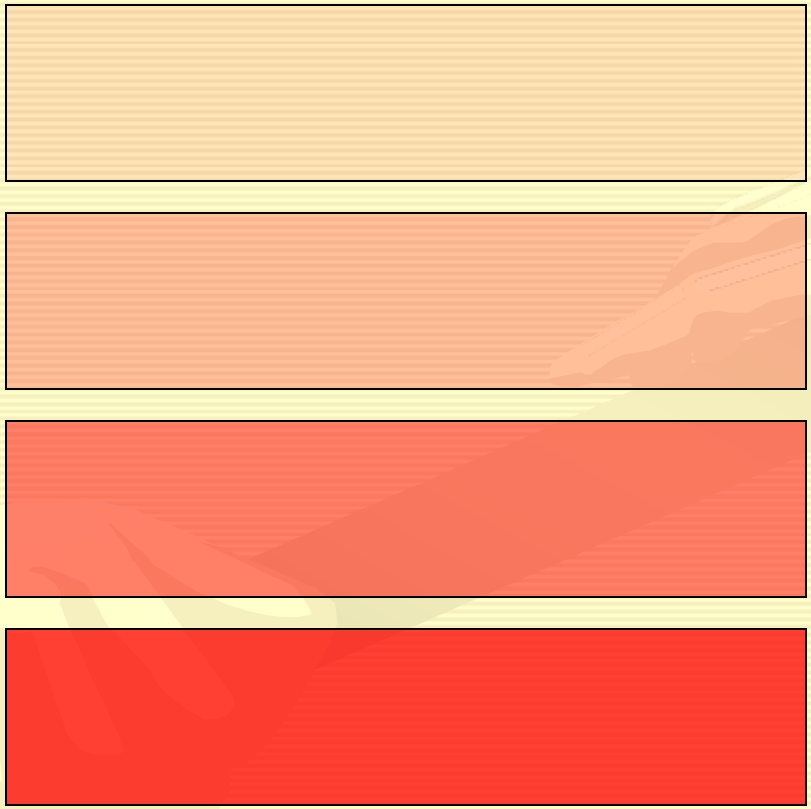
- Line Colors -
- Non Standard Process Colors
- Standard Process Colors
- White/Opaque Colors
- Virgin Ink Formulas vs. Returned Mixes (shear)
- Re-run ink vs. Work-off

Fingerprinting, Press Optimization, and Material Input Variations

100	100	100	100
95	95	95	95
90	90	90	90
85	85	85	85
80	80	80	80
75	75	75	75
70	70	70	70
65	65	65	65
60	60	60	60
55	55	55	55
50	50	50	50
45	45	45	45
40	40	40	40
35	35	35	35
30	30	30	30
25	25	25	25
20	20	20	20
15	15	15	15
10	10	10	10
5	5	5	5
3	3	3	3

Your Company Name Goes Here

Your Company Name Goes Here



3	3	3	3
5	5	5	5
10	10	10	10
15	15	15	15
20	20	20	20
25	25	25	25
30	30	30	30
35	35	35	35
40	40	40	40
45	45	45	45
50	50	50	50
55	55	55	55
60	60	60	60
65	65	65	65
70	70	70	70
75	75	75	75
80	80	80	80
85	85	85	85
90	90	90	90
95	95	95	95
100	100	100	100

Fingerprinting, Press Optimization, and Material Input Variations

- Line Colors – Select most used colors for backgrounds & tints, measure density and color spectrum.
- Non Standard Process Colors - Select most used colors for backgrounds & tints, measure density and color spectrum
- Standard Process Colors – Insure ink supplier will always provide these base pigments as process set.

Fingerprinting, Press Optimization, and Material Input Variations

Standardize

- Line screens for resolution and ink considerations.
- Engraving Gamma Curve for illustrations and images.
- Engraving edge enhancement setting for type.
- Engraving characteristics for substrate types.
- Engraving surface profile for printability.

Fingerprinting, Press Optimization, and Material Input Variations

Measure & Document

- Ink
  - Formula & color value in ink room.
  - Collect ink batch numbers for traceability
  - Solvent blend used on press.
  - Viscosity and range of useable values on press.
  - Ink temperature on press.
  - Changes in conditions while press is down
  - Running viscosity at optimal printing conditions

Fingerprinting, Press Optimization, and Material Input Variations

Measure & Document

- Blades
  - Type & Manufacturer
  - Size & Backing Used
  - Set & Contact Angles
  - Adjustments & Reasons
  - Blade to nip distance at optimal printing conditions

Fingerprinting, Press Optimization, and Material Input Variations

Measure & Document

- Impression
  - Type & Manufacturer
  - Pressure settings
  - Amount of contact (Flat) at optimal printing conditions

Fingerprinting, Press Optimization, and Material Input Variations

Measure & Document

- Cylinder
  - Type (Process, Line, Type) & Manufacturer
  - Cell photographs
  - Surface Roughness Report
  - Print results under optimal printing conditions

Fingerprinting, Press Optimization, and Material Input Variations

Down The Road

- Resist the urge to blame others if:
  - Work-off ink is introduced on critical jobs without determining their true spectral value.
  - Different style or type of doctor blades are introduced on critical jobs without evaluating the effect using the control cylinders.
  - Cylinder life is reduced due to a change in abrasiveness of inks or blades.
  - Variables that you worked so hard to control get out of control.