

IPA Digital Print Forum 2009 - Procedures & protocols v3

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Author Abhay Sharma
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Document name Digital_Print_2009_v2.pdf
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Author Abhay Sharma
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Changes Received and incorporated written comments from – HP, Kodak, Konica-Minolta, Xeikon.
Introduced costing for the project - \$5000 project costs + \$3000 Graphic Arts Monthly advertisement + \$374 Resometer
Introduced common paper type - NewPage Futura Laser Gloss
Forum now open to DI offset press technologies
Introduced tolerances based on ISO 12647-7.2
Introduced concept of a certificate for “contract proof” or “validation print”
Introduced test for measurement of productivity at customer sites
Special features topic inserted
De-inking according to INGEDE protocol arranged with FOGRA
Test for visual ranking of images removed
Carbon footprint topic removed
Established a web site for this project

Document name Digital_Print_2009_v3.pdf
Date 30 January, 2009
Author Abhay Sharma
Revision history Version 3
Changes Changes from Version 2 to Version 3 are shown in red
Section 1 Included reference to review of 2008 Forum in Seybold Report
Section 5 Budget - Removed the proposal to have a paid advertisement in GAM
Section 6 – Timeline - Introduced February 13, 2009 deadline to confirm supplier configuration
Section 16 Duplex Printing- proposed a test image
Section 21 Pantone - Described the use of Pantone GoeGuide™
Section 24 Match to GRACoL - Added L*a*b* values of NewPage paper
Section 25 Clarified items relating to ISO validation
Section 27 Clarified the Taber rub resistance and the question of a protective finish, w.r.t Xeikon
Section 31 Clarification on press speed test

1. Introduction

In 2008, the IPA conducted the first Digital Print Forum where we reviewed digital production devices from HP, Kodak, Konica-Minolta, Xeikon and Xerox, and compared these to the same images printed on a Heidelberg XL 105 offset press. The results were provided in a 46-page booklet that included actual print samples from each device in the study.

The 2008 Digital Print Forum was a huge success, many suppliers and end users are using the report. The report was published in April, 2008 and since that time, the results have been publicly discussed at the following events.

Digital Print Forum: A Landmark Study of Digital Print, A Sharma, IPA Technical Conference, Chicago, April 21-24, 2008

2008 IPA Digital Print Forum Results – Webinar, A Sharma, M Habekost, J Walter, C Hura, Presented May 21, 2008 and available as a recording from www.ipa.org

IPA Testing Shifts to Production-Level Digital Color Printing, J Parsons, Vol 8, Number 9, The Seybold Report, 2008

Digital Presses: See How They Run, A Sharma and M Habekost, Graphic Arts Monthly, May 2008, p 64 – 65 in print and also online at <http://www.graphicartsonline.com/article/CA6560228.html>

Digital Press Certification, A Sharma and M Habekost, IDEAlliance Print Properties Meeting, Nov 10-11, 2008, Rochester, NY

Toner Based Technologies, A Sharma and P Crean, Digital Imaging Association Meeting, Nov 19, 2008, Toronto

IPA Digital Press Research Study, A Sharma, PIA/GATF Color Management Conference, presented at the Pre-conference Session: Color Management and Digital Printing, Dec 7-9, 2008, Phoenix, AZ



Digital color printing is the topic at many international events, consider for example a special ICC Digital Print day on March 4, 2009, organized by the ICC with the École Nationale Supérieure des Télécommunications and London College of Communication, and sponsored by Océ. <http://www.color.org/digitalprint09.html>

An exciting development for 2009 is that the procedures and data gathered from the IPA Digital Print Forum will form the basis for the development and implementation of a related IDEAlliance Digital Print Certification process that will be similar in nature to the existing IDEAlliance SWOP/GRACoL certifications for inkjet and monitor soft proofing.

We salute the bravery of the suppliers that entered the initial 2008 survey. The outcome and the results were not known beforehand, and the format and presentation of the data was also unknown. In this environment we applaud the bravery of those suppliers that participated. Reviews of this nature improve our technologies and thus grow the opportunities for everybody in digital production printing. We are now beginning to plan for 2009. We intend to have an expanded Digital Print Forum with more entrants, more tests and systems from new suppliers. *Please participate and become involved in the industry's most important study of digital production printing.*

2. List of Supplier Systems 2008

A list will summarize the details of each system studied in the Forum. The table will include the supplier name and the device/hardware name. The suppliers will be asked to provide an indicative list price for a standard, base configuration including RIP. If greatly different, the price of the device used to produce the data in the report should also be provided. The digital front end (DFE) that was driving the device will be listed, the paper used will be listed, and any relevant configuration options will be described.

The systems studied in 2008 are shown below.

#	Supplier	Hardware	List Price US\$	Digital Front End (DFE)	Printed at	Substrate
1	Heidelberg	XL 105	2,900,000	N/A	-	Sappi Hannoart Gloss 80 lb Text
2	HP	indigo 3050	259,000*	indigo RIP 5.2	Cober Printing	Spicers Supreme Gloss 80lb Digital
3	HP	indigo 5000	349,000*	HP Press Production Manager 2.5.16	North American Color	Sappi Hannoart Gloss 80 lb Text
4	HP	indigo 5500	415,000*	HP Press Production Manager 2.6.1	Cober Printing	Spicers Supreme Gloss 80lb Digital
5	KODAK	NEXPRESS S3000	542,000	NexPress V Front End with System Software v10	-	NewPage Sterling UltraGloss 80lb Text
6	Konica-Minolta	bizhub PRO C6500	75,000	Fiery IC-303 version 1.1	-	Gloss Print 80 lb IT Digital
7	Punch Graphix	Xeikon 6000	795,000	X800 version 1.8	-	130 gsm Arctic Gloss 4DI 500mm
8	Punch Graphix	Xeikon 8000	TBA	X800 version 2.0	-	130 gsm Arctic Gloss 4DI 500mm
9	Xerox	iGen3 110	580,000	Xerox FreeFlow Print Server	-	Xerox Digital Color Elite Gloss Text 120 gsm

* Based on 4-color configuration

3. Digital Presses, DI Presses, Production Inkjet?

The Forum is aimed primarily at toner based, xerographic type, color, digital production presses. For comparison purposes, the forms will also be run on a Heidelberg offset press. In 2009 we expand the Forum to include DI press technology where the plates are imaged on the press (e.g. Presstek 34 DI, Ryobi 3404 DI, Screen TruePress 344, KBA 74 Karat and Heidelberg QM DI) and also where appropriate to inkjet technologies (e.g. production inkjet and large-format inkjet).

The protocols were developed for toner-based technologies, thus the procedures and protocols are often couched in “toner terminology”, however it is very appropriate for other technology areas that serve this market segment to be included in the study.

4. List of Supplier Systems 2009

Nobody is excluded from the Forum, everybody is welcome to participate. In 2009, we invite the following suppliers to participate.

- **Digital Presses**
 - Canon
 - HP
 - Kodak
 - Konica-Minolta
 - Océ
 - Ricoh (IKON)
 - Toshiba
 - Xeikon (Punch Graphix)
 - Xerox
- **DI Presses**
 - Presstek
 - Screen
 - KBA
- **Offset Press**
 - Heidelberg

5. Cost to Supplier - US\$ 5000 per System

There are numerous costs involved in the Forum. There are external costs for the many tests we plan to conduct. There are labor costs – to pay for measuring the press sheets and collating the data, and there are costs involved in producing the final report. The pilot project in 2008 made a huge loss to the organization and was not a viable funding model. The IPA does not seek to make a profit from the Digital Print Forum, the charges being made are intended to cover the costs incurred in this project.

The following is the cost for each system, based on a good faith estimate of our underlying costs.

BASE FEE

Full test protocol, analysis of data, detailed entry in the final report (includes rub tests, cracking test, fading test, productivity survey, colorimetry, Pantone test, INGEDE Method 11, etc.)	IPA Member	\$5000*
	Non-Member	\$7000*

*First system only. Additional systems \$4000.

NOTE: (i) Each participating supplier will receive 50 copies of the published report for internal distribution or for clients and customers. (ii) The non-member rate then gives the supplier one year membership of the IPA and all benefits (iii) Non-members pay \$7000 for the first system, but member's rate after that (iv) The cost of entry will enable "member's rate" at the subsequent IDEAlliance Digital Press Certification process.

~~ADDITIONAL FEES (OPTIONAL)~~

~~Advertise in Graphic Arts Monthly supplement ————— Full page ad — \$3000~~

~~Test results to be distributed as a poly bagged supplement in a
2009 edition of Graphic Arts Monthly. (Fee based on
agreement prior to test submission, post test submission fee for
full page ad: \$4,000.)~~

Henry Freedman's Resometer™

\$374

It is essential that all participants own their own copy of this product before they submit their entry. Suppliers may already own this software tool.

Do you have an uptight manager or director of marketing who only counts pennies and does not see the depth and real value of this work? Are they complaining about their budget? Remind them that SWOP Certification, for non-members costs \$6500, and is valid for 2 years, while Fogra certification for non-members is \$8500 (€6000). If it helps, we are happy to FedEx them a free copy of the full 2008 report with print samples. We will also send them a copy of the article in Graphic Arts Monthly, May, 2008 issue, that was seen by 70,000 subscribers in the US. Just send me their address and we will overnight this material to them. If all else fails, get down on your knees and beg..... try it, I use it all the time, it works!

** For a free copy of the 2008 report send me an e-mail with your manager's mailing address. Abhay. E-mail: sharma@ryerson.ca **

A contract is provided in Appendix A, and suppliers will be invoiced by IPA on confirmation of entry.

6. Timeline (Revised from v1 of this document)

2008

October 10 – *Procedures & Protocols* version 1 document to be published

October 17 – Conference call with all participants to review the draft document

October 29 – Face-to-face meeting at Graph Expo

November 10-11 - Print Properties Meeting, RIT, Rochester – discuss IDEAlliance certification

2009

January 5 - *Procedures & Protocols* version 2 document to be published

January 15 - Conference call with all participants to review version 2 document

January 31 – Final - version 3 of *Procedures & Protocols* document to be published

February 13 – Deadline to confirm supplier systems

February – Work with suppliers to confirm systems for testing, production of print samples

March 13 – deadline for suppliers to submit print samples

April - May – testing and evaluation to be completed, final report compiled

June 8-10 – IPA Technical Conference, Chicago

7. I am not ready to go public.....

Some suppliers may not be ready to participate in the Forum this year but may have a device that is in development and/or testing phase. There is no ability to use an anonymous code system, such as Supplier A1, Supplier A2, etc. Instead there is the ability to do the tests “offline”. In this format, suppliers provide their samples according to the mainstream test procedures, and their samples are measured and evaluated at the same time as all other entrants. The data from these tests, however, will only be provided to the supplier and will not appear in the official published data. The process allows suppliers to be measured and evaluated independently by a third-party and to have exactly the same equipment and test procedures applied to their samples. The cost to do this “offline” evaluation will be the same as the “public” testing. Those systems submitted for "offline" testing are not eligible to be re-categorized as "online" and cannot be submitted for testing in the main Forum this year, but we hope that the data will encourage the supplier to participate in future studies.

A condition of the Digital Print Forum is that each system entered must be shipping and commercially available — R&D, beta devices or development software and products are not permitted, except for the situation of “offline” testing as described here.

8. Do I have to enter all the tests?

If your device can perform a test, then yes, in the spirit of the Digital Print Forum it is required that you submit entries for all tests. Any given device cannot perform best in all categories and there are some categories in which there may be less than stellar results. This can be easily explained by, “we are not aiming for that market segment and have therefore not prioritized our functionality in that area.” When dealing with complex technologies this is an understandable and acceptable position.

If a supplier has a device that can perform a particular test, e.g. light fading, and the supplier refuses to produce the appropriate image for this test, then this will be reported in the published document. Wording that may be used could be “Supplier chose not to enter”, or “Data not provided by supplier – contact your local representative for further information.” It is the intentions of the Forum, that all the submission components will be done on a single device. Suppliers should review all the tests to ensure that the chosen device configuration can create all the required print samples.

9. Which Press is Best?

The report aims to present the findings of the Digital Print Forum 2009, it is not appropriate for us to make recommendations or draw conclusions from the data. The report will, however summarize and consolidate the data for each device. The results for each device will be strewn throughout the report, it will be helpful to put in a single paragraph an overview for each device to paint a general picture for the reader.

The results are intended to allow users to make informed buying decisions about digital printing systems. It is left up to the end-user/future customer to review the data and make purchasing decisions that are relevant to their own printing requirements and priorities.

It would be impossible to declare the “#1 car” in the world. What criterion would be used to arrive at that statement? What is the most important issue - gas consumption, safety rating, pulling power, acceleration from 0-60 mph? Everybody will weigh these parameters differently, in the same way it is difficult to declare the “#1 digital press”, it is however possible to help the user identify the “#1 digital press for you”.

This report provides information so that users can identify the right press for them and begin to ask the right questions as they understand the challenges and opportunities of short-medium run print production and sales.

10. Delta E

Throughout the Forum report, traditional ΔE^*_{ab} will be used, in order to provide a benchmark for backward comparisons. In recognition of the newer equations and to provide compatibility with the other IDEAlliance certification procedures, data will also be expressed in ΔE^*_{00} .

11. Substrate

It is possible to source a common paper for all participants. In fact, that approach was used when similar studies were conducted by PIA/GATF in 1999 [1] and 2003 [2]. In those studies the same paper was provided to all suppliers. In the IPA Digital Print Forum 2008, all suppliers were instructed to use a coated, gloss finish, 80lb/120 g/m² text stock for all tests, but we *did not* supply a common stock to all participants. To eliminate a major variable (paper) from the evaluation, in 2009, *we will* supply a common stock to all participants. We have been approached by NewPage who are able to provide the following stock to all participants:

NewPage Futura Laser gloss, 100lb text, gloss coated, 12 x 18"



The paper is available in different sizes – 8.5 x 11”, 11 x 17”, 12 x 18”, and 14.3 x 20.5”. For all sheet-fed devices we will attempt to use a single size – 12 x 18”. For our friends at Xeikon, and others, we will source a roll from the same batch. If appropriate this stock may be used by offset and DI technologies, otherwise an alternative product may be used by those suppliers.

Suppliers can sometimes prefer paper types that work best with their machines. In addition to the NewPage paper type described above, suppliers at their own discretion may seek to submit the tests on a substrate of their choosing. This is allowed and is considered another “system”, which will incur another system fee.

We thank NewPage for their generosity in providing paper for this test. **The order for paper will be coordinated centrally by the IPA, suppliers are requested to not contact NewPage directly.** Specific questions can be addressed to Dennis Essary. Contact: Dennis Essary, Director, Digital Business Development, NewPage Corporation, 23 Quaker Lane, Trumbull, CT 06611. E-Mail: Dennis.Essary@newpagecorp.com

12. Visual Images

Each supplier will be required to print visual images chosen for the usual characteristics of flesh tones, memory colors, etc. The reproduction style will not be specified, suppliers will be asked to produce good output quality as if for a typical customer job. The size of the images will be considered. The book is to be produced 8.5 x 11”, but attempts should be made to include images with large detail to better enable color comparisons.

In version 1 of this document there was a proposal to rank visual imagery. To do this properly, there are enormous logistical challenges, so after discussions with all parties, the visual ranking experiment has been dropped from the Forum.

13. Sheet to Sheet Variability

In this test we will measure the sheet-to-sheet variation over a press run. Suppliers will submit 1000 printed sheets. From these sheets, # 1, 100, 200, 300,1000 will be pulled. The density value of the C, M, Y, K solid will be measured for these 11 sheets using an X-Rite 530 or 939 spectrophotometer. The experiment seeks to measure any variation of the print process over 1000 sheets. After measurement, the remaining sheets will be used to produce the sample booklets.

14. Variability from Day to Day

Suppliers will be asked to provide a print sample from two consecutive days. The date and time stamp should be in a “slug line”, imprinted via the machine/RIP. Solids and mid-tone patches will be measured to quantify the repeatability of the device. Target values are in accordance with ISO 12647-7.2 and are summarized in Section 25

15. Sheet Variability within a Page

In this test we will have a target repeated at different positions on a page. We will measure the value of the same patch at different positions on a page and determine the uniformity of printing within a page. This is considered in Section 25.

16. Sheet Variability with Duplex Printing



Figure: These two pages when printed duplex will each have a white backing.

In this test the same digital original will be printed on the front and back of a sheet. The difference between the same image printed on different sides will be measured. The image may be printed against a white background.

17. Variation of a Tint

This test seeks to quantify a well known issue in digital printing. Can the digital production press reproduce a tint evenly across a page? Does digital printing have more variability than an offset press? An image will be specially constructed, with two areas of constant CMYK pixel values; 50, 40, 40, 0 and 0, 0, 0, 50. We will visually judge any distortion or patterning across these large near-neutral image blocks. We may also use Roy Rosenberger’s Verity IA, scanner based technology, to quantify the mottle or perturbation across the image area by scanning the sample and using digital image analysis to quantify the variation.



Printing uniformity is also evaluated in the certification process, Section 25.

18. Measurement of gloss

We seek to measure the gloss of the print in solid ink areas. We will use a Novo-Gloss glossmeter at 75⁰ incident angle and 75⁰ measurement angle to report the gloss for informational purposes. **We aim to measure the gloss vs. dot area coverage on the print.**

19. Color of the Colorants

ISO 12647-2 is an international standard that describes conditions for offset printing, including the color of the printing inks [3]. The color of the digital press colorants (toner, liquid ink) will be compared to ISO standard inks as specified in ISO 12647-2. From the standard we chose the color of the printing inks based on paper type 1, gloss-coated, measured with white backing - this best represents the configuration used in the Forum.

It is not necessary that the colorants of a digital print process correspond to offset printing inks. It is interesting to see if the suppliers attempted to match offset inks in their choice of colorant. If there happens to be a good correlation between digital toner and offset inks, then the work of a color management system is made easier, any pixel value, for example, 70% cyan on the digital press will look similar to 70% cyan on an offset press. It would be possible to obtain a good color match, for example, using only the GRACoL G7 calibration process, if the digital colorants are similar in color to offset inks. (It is necessary to ensure that the patch being measured is 100% pure solid and not, for example, 100% Cyan + 10% Magenta, due to color management and RIP parameters.)

It is widely accepted that the color of the colorants is NOT a requirement for a good color match, nevertheless with DI presses in the review, it is relevant to evaluate this parameter, as it requires no extra printing or tests.

This test is for informational purposes only, and therefore will be reported in the Appendix, and not in the main body of the report, in order not to give the reader the impression that this test is an important requirement for accurate color reproduction.

20. Darkest Patch

In digital printing the darkest patch may or may not be 100% K. A “black” color on paper can be made from black toner only, i.e. a single-color black or the printing system may decide to create black from black and other colors. Rich black or 4-color black may consist of C, M, Y and K. In digital printing a black overprint may improve uniformity and mask any unevenness in print quality. The addition of CMY to K can either make the black patch darker or it can introduce a tint and appear lighter, so that CMYK black may produce a black that is less dense than 100% K.

In this study, data from measurement of the IT8.7/4 target (Section 23) will be examined to determine the patch with the lowest L^* and least color (minimum a^* and b^*). We also seek to record the L^* of 100 K.

21. Pantone® Colors – Test I

Special colors are a necessary part of many print jobs today. The Pantone® system may be used to specify special colors in a design or page. In Pantone Colors - Test I, it is useful to confirm that the RIP in a digital print system is able to detect spot color objects (either as $L^*a^*b^*$ values or Pantone names) and produce a good match to the Pantone Formula Guide. The supplier is free to use the Pantone name, digital library or any other internal iteration system they chose to reproduce the color.

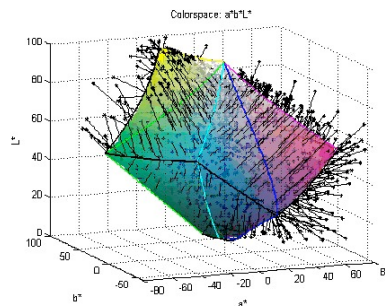
A digital file will be made available, containing 10 Pantone Goe colors. These specially chosen colors are expected to be in-gamut of a commercial offset print process, as represented by GRACoL 2006 characterization data. Each press supplier will be asked to print these colors so that they match the Pantone Formula Guide. All participating suppliers will be provided with a formula guide. The printed samples and the Pantone book will be measured using CIE $L^*a^*b^*$, D50/2⁰, black backing and an X-Rite 530 or 939 device. The difference will be expressed as Average and Maximum Delta E.

In 2008 we specified conventional Pantone colors, in 2009 we will specify colors according to the new Pantone Goe system. The IPA will coordinate with Pantone, who will send to each supplier the Pantone GoeGuide™ coated swatchbook. With each guide, Pantone will include the Goe digital library CD that installs the coated, uncoated and GoeBridge digital libraries in Adobe CS3/4. Should you want to download and install them immediately for testing, just go to:

http://www.pantone.com/pages/MYP_mypanone/mypanInfo.aspx?pg=20576&ca=75

22. Pantone® Colors – Test II

How many Pantone colors can a digital press reproduce? A percentage of Pantone colors are likely to be outside the gamut of a digital print device. In general, most digital print systems will be able to reproduce a useful number of Pantone colors via CMYK simulation. In Pantone Colors - Test II we will use the Pantone Digital Library from Adobe Photoshop CS3 and test to see how many of these colors are within the gamut of each device.



We will make an ICC output profile for each device from a “full gamut” IT8.7/4 target printed by the supplier. Next using Graeme Gill’s Argyll color management library and CMM [4], we will use command line instructions to determine how many L*a*b* values would be clipped and thus outside the color gamut of the device. It may be useful to introduce a Delta E tolerance to the experimental results to better match what we see in real-life. We will compare this data with data provided in sales literature, where available.

If a supplier offers extended gamut technology using hardware or software tools, then the supplier is allowed and encouraged to utilize that system, and have it measured and reported.

23. Digital Characterization Data – Printing the IT8.7/4



We request IT8.7/4 targets for each entry. We request targets that are printed with “full-device gamut”, described here, and separately printed again to meet a reference printing condition, see Section 24.

An untagged, CMYK tiff image will be provided. Suppliers are required to print this image with substrate calibration and ink limiting, but no color management. The form has the words "FULL GAMUT" on it to distinguish it from the test in Section 24. Suppliers are requested to submit 2 targets at 0° and 2 further targets printed by rotating 180°. Do not remove crop marks. The printed size of each patch should measure 6 x 6 mm. This form will be measured on an X-Rite Eye-One iSis XL, UV excluded.

The print density of the pure CMYK patches is not specified, each supplier should choose an optimum setting that creates the largest gamut for their device. The supplier can use CMYKOVG or CMYKcm if available, to increase their color gamut. The characterization data gathered from measurement of this target will be used to determine the blackest black and also to create an ICC profile and thus to compute color gamut, reproducible Pantone colors, etc.

A long-term goal of this work is to develop a digital reference printing condition. The data gathered here provides data for that initiative.

24. Matching a Printing Condition – GRACoL and SWOP



It is interesting to know if suppliers have a process to achieve a colorimetric match to a given characterization data set, and how well they can achieve it. It is not generally necessary that a digital press match an offset press, however there are many commercial situations where digital may be placed alongside offset printing. In general it is useful to know if the supplier is able to create any required “look and feel” on their press. We choose as our “targets”, three well known printing conditions, and ask the suppliers to match these conditions on their digital device. This test will be based on a colorimetric (CIE L*a*b* Delta E) correlation of the supplier’s print to a chosen characterization data set. There will be three reference printing conditions

- GRACoL 2006, Coated #1
- SWOP #3 coated paper
- SWOP #5 coated paper

We will supply an untagged, CMYK tiff image. Suppliers are required to print this image with substrate calibration and color management. When measured, the supplier’s target should match as closely as possible the GRACoL (or other) characterization data set. The form will have the words "GRACoL", “SWOP #3”, “SWOP #5” on it to distinguish from other tests. Should you need them, characterization data and ICC profiles are available, for free, from www.idealliance.org.

We request IT8.7/4 targets for each entry. For each printing condition, the supplier will submit 2 targets at 0° and 2 further targets printed by rotating 180°. The measuring instrument will be the iSis XL, UV excluded. Do not remove crop marks. The printed size of each patch should measure 6 x 6 mm.

If you look in the reference file header of the GRACoL, SWOP characterization data files, it says, no filter, which means UV included. After the January 15, 2009 conference call, the majority of participants would like UV excluded, the vote was 11 UV excluded to 5 UV included. So the characterization data was measured with UV included, but we will measure with UV excluded. Of course if the paper being measured has no OBAs then UV included = UV excluded!

The test for matching a printing condition will be determined using an X-Rite iSis XL with “UV excluded”.

The white point of the chosen paper type (NewPage Futura Laser) is compared to reference printing condition white points in the following table. WE NEED TO ACKNOWLEDGE THE DIFFICULTY IN HITTING GRACoL #1 PAPER WHITE POINT WITH THE CHOSEN NEWPAGE STOCK.

	NewPage Futura Laser (UV incl)	NewPage Futura Laser (UV excl)	GRACoL #1	SWOP #3	SWOP #5
L*	95.20	95.01	95	93	90
a*	1.14	-0.74	0	0	0
b*	-7.45	-1.53	-2	0	4

25. Certifying a Press



Figure: The Digital Print Forum will measure supplier samples and issue a certificate for Contract Proof and Validation Print according to ISO 12647-7.2 criterion. The certificates are provided directly to the supplier, the supplier may or may not choose to make public one or other of their certificates. Samples shown are draft only.

We will issue two certificates based on measurement of the suppliers samples. The certificates relate to the color measurement and print uniformity only. It is important to define two different tolerance settings. There exist two different needs in the printing and publishing market. The first is the well-established *Contract Proof* that has very tight tolerances (e.g. average Delta E match to a characterization data set = 1.5). This tolerance is used in the SWOP/GRACoL Certification process and is routinely achieved on a single sheet of inkjet and other proofing systems, when printing on specific substrates and using well calibrated and characterized systems. When a Contract Proof is made according to a specific referenced printing condition it provides a good simulation of the final print product and therefore acts as a contract between the customer and the printer. The Contract Proof may travel with the job docket, providing a visual match for the press OK, and everybody else in the printing workflow.

For everyday production printing it is not practical, neither desirable to ensure such high tolerances. Every sheet in a medium length press run does not need to meet such exacting standards to meet customer expectations. The industry has therefore been developing a reduced, less-stringent set of requirements called *Validation Print*. This methodology has been used by the Fogra [5]. to certify the following systems: OCE CS 650, Xerox DC 700, Xerox DC 260 and Canon Image Press C1 [6].

The IPA Digital Print Forum will measure supplier samples and tell the supplier if they, according to ISO 12647-7.2 criterion [7], meet the Contract Proof and/or the Validation Print standard. The supplier then has some understanding and feedback, should they be interested in the applying for the FograCert program (existing) or the IDEAlliance Digital Press Certification process (to come). The certificate will be labeled “IPA Contract Proof Evaluation 2009” and “IPA Validation Print Evaluation 2009”. The certificate will show three columns – the target tolerance, the measured parameter, a Pass/Fail statement. Each supplier will be issued both certificates. The certificates are provided directly to the supplier, the supplier may or may not choose to make public one or other of their certificates.

Note that for certification, a supplier system must “pass” each test to achieve certification. The IPA Digital Print Forum does not offer official certification, and therefore provides feedback on all the tests, and does not define a pass or fail in terms of certification.

In summary:

Contract Proof

This is a higher quality test, aimed at 1-off color proofing
 This uses tolerances that are similar to IDEAlliance SWOP/GRACoL Certification for proofing
 This uses tolerances that are similar to the FograCert Contract Proofing System
 This uses tolerances that are similar to ISO 12647-7:2007 (i.e. original 12647-7)

Validation Print

This is a lower quality level test, **is for a single sheet, but may be used for digital production printing**
 This uses tolerances that are similar to FograCert Validation Printing System
 This uses tolerances that are similar to ISO 12647-7.2 (i.e. the new part of 12647-7)

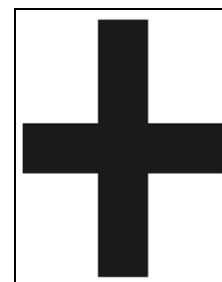
The following tests/tolerances will be used to evaluate supplier submissions.

Based on ISO 12647-7.2	Contract Proof	Validation Print
Substrate		
Substrate (match to the white point of the target ref printing condition)	$\Delta E^*_{ab} \leq 3$	$\Delta E^*_{ab} \leq 3$
Solids		
Color difference between C, M, Y, K of the print compared to relevant ref printing cond.	$\Delta E^*_{ab} \leq 5$	$\Delta E^*_{ab} \leq 8$
Color difference between C, M, Y, K of the print compared to relevant ref printing cond.	$\Delta H \leq 2.5$	$\Delta H \leq 5$
Print uniformity		
Standard deviation between 9 locations on a sheet in L*, a* or b*	$\sigma \leq 0.5$	$\sigma \leq 1.5$
Color difference between any one point and the average of 9 points	$\Delta E^*_{ab} \leq 2$	$\Delta E^*_{ab} \leq 2$
ISO 12647-7 Digital Control Strip 2007		
Color difference between all patches of the control strip and the print	Maximum $\Delta E^*_{ab} \leq 6$ Average $\Delta E^*_{ab} \leq 3$	Maximum $\Delta E^*_{ab} \leq 12$ Average $\Delta E^*_{ab} \leq 3$
Hue angle difference between CMY and K only patches of the control strip	Average $\Delta H \leq 1.5$	Average $\Delta H \leq 1.5$
Outer gamut patches		
A special set of 226 patches from the IT8.7/4 target	Average $\Delta E^*_{ab} \leq 4$	Average $\Delta E^*_{ab} \leq 4$
All patches of the IT8.7/4		

Comparison of all the patches of the ref data set to the print	Average $\Delta E^*_{ab} \leq 4$	Average $\Delta E^*_{ab} \leq 4$
Comparison of all the patches of the ref data set to the print	95 th percentile $\Delta E^*_{ab} \leq 6$	95 th percentile $\Delta E^*_{ab} \leq 6$
Repeatability		
Difference between primary and secondary solids of a print on consecutive days	$\Delta E^*_{ab} \leq 1.5$	$\Delta E^*_{ab} \leq 2.5$
Difference between mid-tones of a print on consecutive days	$\Delta E^*_{ab} \leq 1.5$	$\Delta E^*_{ab} \leq 3$
Resolution and register (See Section 32)		
Registration between any two color separations	≤ 0.5 mm	≤ 0.8 mm
C, M, and K positive, non-serif, type of 2 point size are legibly reproduced	Yes	Yes

26. Fold and Crease Resistance

Output from all presses can create problems during finishing. In digital printing, we may believe that toner sits on top of the paper and does not penetrate the paper like printing ink [8]. When the sheet is folded the toner can crack. This is especially evident in cases of heavy coverage and/or folding across the grain direction [9]. The 2008 Digital Print Forum showed that some digital systems were better than offset, while others were worse. In 2009, this test will again be conducted at the Printing Applications Laboratory, Rochester Institute of Technology according to standardized test method ASTM F 1531. An image of a 100% K, “black cross”, will be printed by each supplier system. The sheet will be folded in the grain direction and at 90° to the grain direction. The cracked area will be digitally analyzed to compute the white paper visible using image processing techniques.



27. Taber Rub Resistance

Ink scuffing or rub off during shipping and handling can spoil the effect of quality printed products. The rub resistance of a sample will depend on many variables such as the choice of media, coating, characteristics of the toner particles, etc. Various instruments exist to determine the rub resistance of a printed sample, the Taber test is well established and accepted. The Taber test will be conducted at the Printing Applications Laboratory, Rochester Institute of Technology according to standardized test method ASTM 1478 [10].



In the Taber test, the sample is mounted on a rotating turntable, specimens are subjected to the rub-wear action of two abrasive wheels. Driven by the test sample, the wheels produce abrasion marks over approximately a 30 cm circular ring. This reveals abrasion resistance at all angles relative to the grain of

the paper. The device simulates the motion of a truck or train during shipping, or processing of high-speed mail by the US Postal Service. At the end of the test, the before and after print will be measured and the % loss of density computed.

~~In 2009, we will solicit two samples from the supplier—one with and one without a protective coating. A coating is defined as any post treatment with water, wax and silicone or a full clear toner layer or a UV lacquer, varnish or laminate, as used in treatment of digital pieces to avoid scuffing and rubbing during postal items. The 2009 version of the test allows a user to see how effective a finish can be in protecting their print sample.~~

In 2009, we continue to request suppliers to provide a sample with no coating or post-print treatment of any kind. The only exception is the Xeikon system that includes as a normal part of the web-printing process, a treatment whereby a specially designed mixture of water, salts, silicon oil and some wax is applied directly after printing. Xeikon have agreed to provide a sample with and without this liquid treatment, for this test.

28. Fade Resistance

The early days of inkjet printing were plagued by dyes that exhibited fading and discoloration. Today inkjet prints show very good permanence. It is useful to use similar analysis to evaluate the stability of digital print processes. It is of interest to see the stability of the pigments used in digital print systems and also to observe if all four colors exhibit similar fade properties. An accelerated aging test exposes print samples to light and heat to determine their resistance to fading. The lamp emits intense UV radiation, which in a matter of hours approximates the destructive effect of a much longer period of ordinary daylight. These tests are an effective indicator of the degree of light stability that can be expected of a printed sample. The fade tests will be done in the Xe1 device that is part of the Q-Sun range of xenon test chambers from Q-Lab (www.q-lab.com).

Samples will be exposed in steps, up to a maximum duration of 160 hours. The test will be performed in accordance to DIN 16525 "Testing of Prints and Printing Inks of the Graphic Industry" and ISO 12040. The Blue Wool scale is comparable to ASTM D 5383-02 and ASTM D5383-97.

In this test it is proposed to measure changes in density and $L^*a^*b^*$ difference between the start and finish as a function of the Blue Wool scale ratings. A visual comparison is also part of the standards mentioned above, therefore a visual evaluation of any perceivable fading will be done.

29. Deinking at Fogra using INGEDE Method 11

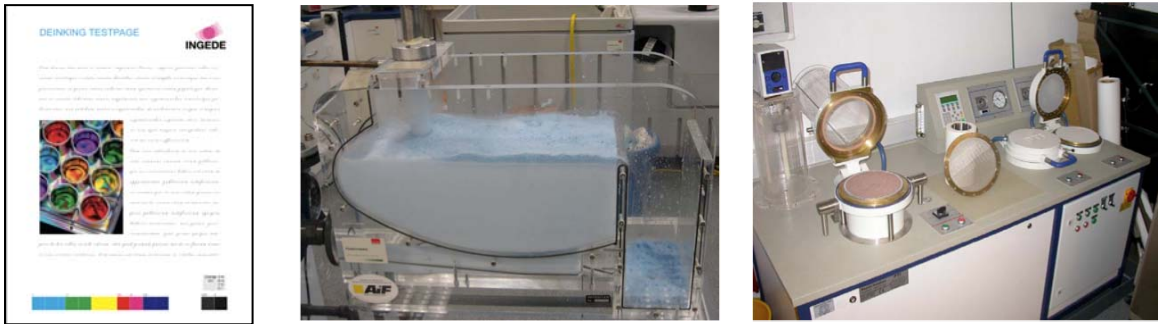


Figure: Approx 500 printed pages (left) will be pulped and de-inked by allowing the toner to separate from the paper by floatation (centre), the pulp will be made into a hand sheet (right) and measured for colorimetry Y or L.*

Green printing and sustainability are becoming important considerations in the market today. Good recyclability of printed products is highly desirable. Processes that improve image quality need to be balanced with the removal of these same particles during the deinking and recycling process. The International Association of the Deinking Industry (INGEDE) has a well documented test developed in conjunction with paper mills, paper research institutes and digital print suppliers. The deinking test is called INGEDE Method 11 [11,12]. In 2009 we will submit samples to Fogra to be tested according to INGEDE Method 11.

We seek to compare dry toner, liquid toner and offset printing technologies. From the 2008 Digital Print Forum we may conclude that liquid toner has some challenges, while dry toners showed no problems. In many cases the deinkability parameters for dry toner were even better than for offset print samples. These findings are in agreement with the general consensus and with findings published by INGEDE (<http://www.ingede.com>). Inkjet continues to exhibit poor deinkability and is an issue if you are considering high-volume inkjet printing.

The test is based on a test form shown above. Each supplier will be required to print 500 copies (1Kg) of this form on their press. Recycling first requires deinking. In deinking the toner particles are detached from the fibers and fillers of the paper. Handsheets will be made using “before” floatation pulp, i.e. undeinked pulp, and a second set will be made using “after” floatation pulp, i.e. deinked pulp. The samples will be measured before and after the deinking process. The toner or dirt in the samples will also be analyzed for total area covered, size and count. Based on the threshold and target values, the deinking results are converted into an overall deinkability score, the final number helps to assess the deinkability of a print product as a whole.

These tests are expensive to conduct, yet they are of great interest to many in the wider print community, so in order to reduce costs and provide further analysis of the data, we are collaborating with Fogra. We will agree to share the data and Fogra may publish a report on the results and findings of this project together with the IPA and Ryerson University.

Contact: Alexander Schiller, Fogra Graphic Technology Research Association, Streitfeldstraße 19, 81673 Munich, Germany E-Mail: schiller@fogra.org

30. Special topics

What can be done with the machine that is special? Each supplier may offer a number of distinguishing features such as special formats, special screening applications, packaging applications, spot gloss for texture, special transfer applications, etc. It is important to highlight these “added-value” options that make a product offering unique and can assist the customer in marketing digital to their clients.

Suppliers will be invited to provide print samples of any such features that are not already covered in the existing protocols. Suppliers should also provide a description of the feature, its cost and its intended market application.

31. Press Speed

Digital presses are now used for production printing. Of major importance to end-users is the production speed of the device. The production speed is so important that some suppliers include this parameter in the device name, e.g. Kodak NEXPRESS 2100 = 2100 A3 sheets per hour, NEXPRESS 2500 = 2500 A3 sheets per hour.

In this test we ask each supplier to use a stop watch to measure the time it takes to print 1000 sheets. We ask the supplier to use a stop watch to record the start and stop time of the press run. There are a number of tests in this Forum that require the printing of 1000 sheets, so one of those press runs can be chosen to benchmark the press speed. A sheet with known coverage, the INGEDE test form, may be specified. It is required that the test be supervised by the IPA or an independent third-party.

Some technologies can print faster when reducing the number of colors. Customers can choose to print monochrome, 2-color and 3-color jobs. This type of information is typically described in the spec. sheet, so we suggest that each individual print configuration does not need to be validated by IPA, unless there are specific issues in the user community.

32. Henry Freedman’s Resometer™

The Resometer software product [13] and test page allows us to analyze the performance of the digital printing system including the RIP and the print engine. The test page can be used to calculate actual RIP and printing parameters.

Henry Freedman will work with suppliers to understand the procedure to correctly print this form. Henry will also work with us to analyze the data collected from the supplier systems. One of the parameters to be reported is the image register and resolving power of the printing system. The image register should be 0.05mm for a contract proofing system, and 0.08 mm for a validation print. The resolving power of the print system should be such that C, M, K positive, non-serif, type of 2 point size is legibly reproduced (ISO 12647-7.2, Section 4.2.9).



It is essential that all participants own their own copy of this product before they submit their entry. Contact: Henry B. Freedman, Technology Watch, LLC, Box 2206, Springfield, VA, 22152 E-mail: h.freedman@att.net

33. On-site Reliability

In this test we seek to measure the practical “uptime” of the device. We seek to survey printers and ask them to note the number of times and frequency with which there is a paper jam, imaging problem, toner replacement, paper mismatch error, etc. The source and duration of the stoppage will be noted. A simple metric can be

$$\frac{\text{Time running the jobs}}{\text{Total elapsed time}} = \% \text{ Productive time}$$

We aim to find a minimum of 10 customer sites for each device. Appendix B shows the questionnaire that will be used. Suppliers can provide “recommendations” for suitable sites, supplier recommendations may or may not be selected for the survey.

34. TC 130 and ISO 12647-7.2

TC130 - WG3 – ISO 12647 is Technical Committee 130, with Working Group 3 that is looking at process control, proofing tolerances, printing tolerances, and aim points. There have been two meetings of TC130, WG3 in 2008 – in April in Paris [14] and 23-24 September, in Amsterdam [15]. The minutes of the Amsterdam meeting suggest that ISO 12647 may be divided as follows

ISO 12647-7 will deal specifically with a “Contract Proof” – existing standard
ISO 12647-8 will deal specifically with a “Validation Print” – new standard

35. References

- [1] GATF Digital Color Printing Study, P.N. Hutton, F.V. Kanonik, G.M. Radencic, GATFPRESS, 1999
- [2] Digital Color Printing and Direct Imaging Benchmarking Study, J. Lind, GATFPRESS, 2003
- [3] ISO 12647-2, Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 2: Offset lithographic processes, First edition 2004-12-15, Amendment 1, 2007-04-15
- [4] Argyll Color Management System, Graeme Gill, <http://www.argyllcms.com/>
- [5] Extra No. 16, How about the colour reference in digital printing? Fogra, Munich, July 2008
- [6] Fogra Digital Printing Working Group, Meeting Agenda, A Kraushaar, Munich, 2008
- [7] ISO/CD 12647-7.2 Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 7: Off-press proofing processes working directly from digital data, Date of document 2008-05-23
- [8] *Folding and Creasing, Sappi Paper Technical Brochure*, <http://www.sappi.com/SappiWeb/Knowledge%20bank/Technical%20brochures/>
- [9] *Rub, fold, and abrasion resistance testing of digitally printed documents*, N DiSantis, MS Thesis, RIT, 2007
- [10] *Standard Test Method for Determination of Abrasion Resistance of Images Produced from Copiers and Printers (Taber Method)*, ASTM 1478 – 06
- [11] *Assessment of Print Product Recyclables – Deinkability Test*, Method 11, INGEDE, 2007
- [12] *Investigations on Deinkability and Ink-Paper Interactions*, Axel Fischer, IS&T NIP24 Conference Proceedings, September 6-11, 2008, Pittsburgh
- [13] *Technology Watch*, Henry Freedman, <http://www.myresometer.com>
- [14] *Notes from the 35th meeting of ISO TC 130 WG3*, Process control and related metrology, N702, Paris, France, 17-18 April, 2008
- [15] *Notes from the 36th meeting of ISO TC 130 WG3*, Process control and related metrology, N752, Amsterdam, Netherlands, 23-24 September, 2008

APPENDIX A

AGREEMENT – IPA Digital Print Forum 2009 44th Annual IPA Technical Conference – June 8-10, 2009, Chicago, IL

AGREEMENT

This AGREEMENT (this “Agreement”) is dated as of January 1, 2009 (“Effective Date”), by and between Steve Bonoff, President, IPA, 7200 France Avenue South, Suite 223, Edina, MN, 55435 and [Name](#), ([Name](#)) with corporate headquarters at [Address](#).

IPA Digital Print Forum is hereafter referred to as “Forum”.

DETAILS OF EVENT

The Digital Print Forum 2009 is created and coordinated by the IPA – The Association of Graphic Solutions Providers.

- The aim of the Forum is to examine the real-world capabilities of the world's leading digital print devices to help our members and industry make informed strategic and technical decisions.
- The project seeks to collect printed samples from different digital print production systems, analyze these samples and publish the results.
- The project seeks to provide input to the development of the IDEAlliance Digital Press Certification process.

DIGITAL PRINT TESTS

The Forum seeks to evaluate digital printing systems in an educational (non-competitive) environment. The Forum seeks to provide a snapshot of the state of the digital printing industry, from a technical perspective.

Digital production systems are to be evaluated in the following categories

- Color – consistency, GRACoL, Pantone, color gamut
- Physical print properties – rub resistance, cracking, folding
- Environment – Recycling, deinking, emissions
- Production – reliability, jamming
- Cost – ROI, cost per page, costing models

The specific details for each of these test areas are described elsewhere.

REPORTING OF RESULTS

- a. [Name](#) will be invited to participate in developing the test protocols during a series of conference calls and e-mail discussions. The audio recording of these discussions will be made available.

- b. Data will be listed in a non-competitive manner. There will be no league tables, or ranking. The data will be presented “as is”, with no attempt at qualitative analysis. The IPA will not say, for example, the “Xeikon” device is better than the “Canon” device. The IPA will however, explain the data and the implications of the data for the benefit of the end-user.
- c. **Name** is invited to include a written statement in the Forum publication. In general, suppliers are encouraged to comment on any aspect of the Forum in the interest of continuing the debate and discussion around the use of digital printing in production environments. In a written comment, the supplier may use this opportunity to explore the results/data produced by their device.
- d. **Name** is invited to participate in discussion and analysis of the data.
- e. The data will be collected with utmost care. Dr Abhay Sharma is in charge of the measurement of the data, and has conducted these investigations for the last 5 years. Over this time he has developed a series of procedures for “double blind measurements” and double checking to ensure the integrity of the data.
- f. **Name** will provide samples for measurement and will be presented final results, prior to publication.
- g. There is no ability for **Name** to withdraw results once (f) has occurred.
- h. Technical mistakes and genuine misunderstandings can happen (on both sides). All attempts will be made to address and resolve these matters in a timely manner.
- i. Aside from clear-cut technical mistakes, there may remain some issues on which all parties may not agree. The supplier will be allowed to provide a written statement explaining their side, that will be given full, unedited space in the printed volume.

PERMISSIONS AND COPYRIGHT

- A) THE SUBMITTED PROOFS BECOME PROPERTY OF THE IPA AND CAN BE USED FOR STANDARDS WORK, E.G. GRACOL, CGATS, ISO, ETC. THE PROOFS WILL NOT BE USED FOR COMMERCIAL GAIN WITHOUT FURTHER PERMISSION FROM EACH COMPANY.
- B) SUPPLIERS/USERS ARE REQUIRED TO HAVE PURCHASED AND OWN A LICENSED COPY OF THE TECHNOLOGY WATCH™ RESOMETER™ TEST CHART FOR THE LOCATION AT WHICH THE PRINTING TAKES PLACE. THE RESOMETER COSTS US\$ 374.
- C) SUPPLIERS ARE REQUIRED TO OWN THE COPYRIGHT TO ANY IMAGERY USED IN THE TEST FORMS, E.G. ISO SCID IMAGES.

- D) SUPPLIERS ARE REQUIRED TO SEEK APPROVAL FROM IPA, OF ALL PRESS RELEASES, MARKETING LITERATURE, TRADE SHOW MATERIAL, ETC., THAT QUOTES DIRECTLY OR INDIRECTLY ANY OF THE FINDINGS OF THE FORUM.

- E) A CONDITION OF THE FORUM IS THAT EACH SYSTEM ENTERED IN THE FORUM MUST BE SHIPPING AND COMMERCIALY AVAILABLE — R&D OR DEVELOPMENT SOFTWARE AND PRODUCTS ARE NOT PERMITTED IN PUBLISHED RESULTS.

COST

The IPA does not seek to make a profit from this project as it is of educational value. A US\$ 5000 (\$7000 non-members) charge is made for each supplier system. The supplier will be invoiced by IPA, terms 30 days.

ENTIRE AGREEMENT

This Agreement shall embody the entire agreement between [Name](#) and the Company, and, except as otherwise expressly provided herein, this Agreement shall not be affected by reference to any other document.

WITNESS

In witness whereof, intending to be legally bound hereby, the parties hereto have caused this Agreement to be duly executed as of the date and the year first above written.

Steve Bonoff
President, IPA

Signature:

Name:

Title:

Date:

Name:

Address:

Signature:

Name:

Title:

Date:

Supplier system being entered:

Supplier system being entered:

Supplier system being entered:

Appendix B - IPA Digital Print Forum Productivity Survey

As part of the IPA Digital Print Forum 2009, we seek to evaluate the productivity of digital presses. Please help us collect data by completing this survey. The data collected will not identify you by name, all data collected by the IPA remains private and confidential.

Please give us details of your device. Also describe any issues you feel are relevant to your device in terms of productivity. Finally please log a number of jobs for us. **Please try and give us data for a minimum of 24 hours worth of job time.** If you have more than one device, we would LOVE to have data from each one.

To thank you, we will send you free, a copy of the final report in June, 2009.

We really appreciate your support in this project. Thank you. From the IPA Digital Print Forum Team.

Your details

Your name..... Office phone.....

Company name..... Cell phone.....

Address..... E-mail.....

Device and DFE (e.g. Xerox iGen3/Fiery RIP, or HP indigo 5500/Press Production Manager)

.....

Comments on Productivity (Is productivity important to you? Are there any features that make your life easier with this device? What would you improve? Do you have any other comments?)

.....

.....

Send your survey to

Fax your completed survey to 416 850 5216. This is a direct electronic fax number, so no need for a header sheet – just pop all these pages into your fax machine, or if more convenient mail these pages to:

Dr Abhay Sharma, School of Graphic Communications Management, Ryerson University, 350 Victoria Street, Toronto, ON, M5B 2K3, Canada Tele 416 979 5000 x7598 E-mail sharma@ryerson.ca

Please try and give us data for a minimum of 24 hours worth of total running time.

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		

Please try and give us data for a minimum of 24 hours worth of total running time.

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		

Job

Job details (e.g. 4-color, b/w, special finish, 12 x 18", duplex, card stock).....

Date..... Start time..... Finish time.....

	Duration of stoppage	Reason for stoppage
Stoppage		
Stoppage		
Stoppage		
Stoppage		