SecondSight

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Testing a Multicolor Press

by Kenneth E. Rizzo

More and more printers are recognizing the value of measuring and analyzing the capabilities of the most expensive piece of equipment and the highest cost center in the print production process—their presses. Presses with two to ten printing units and from 17 to 65 inches in size are now being regularly tested for reasons ranging from purchase/installation acceptance to quality control and color management.

Press testing of the kind that will result in real benefits is a comprehensive, methodical undertaking and needs to take into account the print production process as a whole. It may seem intimidating, but the following explanation should help graphic arts companies manage it successfully.

Abnormalities discovered by analyzing press test data may indicate the existence of mechanical problems or even an upcoming press failure. In addition to being used to diagnose problems, press testing is being used as a calibration and process control tool to determine current printing capabilities and to gather color management profile data.

It is possible to take advantage of free test films and fingerprint analyses, but the free reports normally skip preparatory and analytical steps that can reveal whether the abnormalities are truly mechanical or whether the outcome is being affected by materials or something else. Finding a mechanical problem is good, but the instant it is corrected, the fingerprint data from the free test become obsolete, requiring another test. A structured approach that considers the print process as a whole is necessary to reap the benefits of press testing. Equipment maintenance and calibration are part of press testing. In printing, a change in one part of the process upstream will affect the process downstream.

Press testing of the kind that will result in real benefits is a comprehensive, methodical undertaking that may seem intimidating, but the following explanation should help graphic arts companies manage it successfully.

Conducting a press test analysis requires using test targets and forms. The process itself consists of three phases that need to occur in the following order:

1. Materials phase
2. Press settings and specifications phase
3. Diagnostic pressrun and analysis

Materials Phase

Since a press test is designed to determine the best printing a press can do—not the worst—the first priority is to choose and use materials that optimize the ability of the press to print. Using substandard materials for the test can produce printing abnormalities that may point to mechanical problems that do not exist. Make sure that the materials used for the press test meet specified requirements for performance compatibility.

Press testing can help optimize the productive life span of a significant capital investment.

Plates

First, test the plates by exposing a plate control target (e.g., the GATF Plate Control Target or one supplied by the plate manufacturer) to determine image resolution, which is the measurable sharpness with which they can reproduce a halftone dot. Second, conduct a register grid test of the vacuum

A press test should focus on answering the following questions:

1. Is there any damage or deterioration to the main printing components of the press—the cylinders and gears?
2. Can the press print to industry-accepted ink densities and tone value increase?
3. Can the press accurately achieve and maintain image register and fit from unit to unit?
4. Can the press hold ink densities and tone value increase throughout a press run?

frame or step-and-repeat equipment to determine if accepted register accuracy is being achieved at this point. Register accuracy should be within ±0.0005 in.

Blankets

Use buffed, quick-release blankets for the sharpest possible dot reproduction on press.

Paper/Board

The paper or board to be run during the press test should be top-quality stock. Commercial printers should run a light to midweight gloss-coated stock such as an 80# or 100# C2S gloss enamel for sheetfed. Folding carton packaging converters should run their tests on natural fiber stock such as SBS or SUS. Heatset web printers may want to use an 80# gloss coated stock.

Ink

Use a good running ink to optimize the capabilities of the press. The ink should be able to produce acceptable dot gain and overprint traps at a reasonable film thickness.

Fountain Solution

Make sure the fountain solution is compatible with the inks and plates; an incompatible solution can cause higher dot gain. It is also important to determine the pH and conductivity of the fountain solution. Ask for help from the fountain solution supplier.

Press Settings and Specifications Phase

Once the materials have been chosen and checked, the next step is to determine if the operating components of the press have been set and maintained to manufacturer and materials specifications, and then to verify that they are operating correctly. This can be accomplished through a series of checks based on specific test forms. The checks and tests to be performed include the following:

- Make sure that ink and dampening roller conditions and settings follow roller and press manufacturer specifications.

Measure the roller shore hardness with a Type A durometer gauge. The shore hardness of new rollers should follow press manufacturer specifications. Roller settings and techniques are extremely important in minimizing roller streaking problems. Follow press manufacturer specifications for correct stripe settings. For example, 25–29-in. presses are frequently set to a maximum 1/8 in. (3 mm). Ink forms for 40-in. presses are usually a consistent maximum 3/16-in. (4-mm) wide stripe across the plate.

- Determine if press bearer rings are in good condition and if they make proper contact when the press is in impression mode.

To check sheetfed presses, make thin ink-film thumbprints at six-inch intervals around the two plate cylinder bearers. Run four to five sheets through the press on impression, then check for consistent ink transfer onto the blanket cylinder bearer rings. Sheetfed presses that don't run on a bearer will need to be checked with feeler gauges; consult the press manufacturer.

Web blanket-to-blanket press bearers can be checked using a special foil cut into strips. Place the strips between

Reasons to Test a Multicolor Press

1. Purchase/Installation Acceptance
Printers can no longer afford to purchase a press not knowing if it can print to the quality they expect. Many companies are including structured testing activities as part of the purchase and installation acceptance criteria for new presses and also for previously owned presses. A diagnostic audit can determine if a press is performing according to its factory-advertised specifications and to industry-accepted quality tolerances. Press testing is the first step in optimizing and lengthening the productive life span of a significant capital investment.

2. Process Audit
Testing a presses for process ink densities and tone value increase (dot gain) helps determine current print capabilities. The graphic arts industry rates press capabilities according to a press's tone value increase characteristics. Companies can compare their test results against industry specifications. Process testing can also be used to examine materials such as inks, blankets, fountain solutions, plates, and paper for better alternatives.

3. Troubleshooting
Press testing can help determine the causes of quality-related problems such as difficulty in matching proofs, mechanical image slurring and doubling, register and fit problems, and color variation problems.

4. Annual Quality System Maintenance and Calibration
In order to comply with accredited quality control requirements such as ISO 9000 and GATF's Total Production Maintenance (TPM) Registry, more graphic arts companies are testing their presses annually and even semi-annually. This testing also provides data for factory technicians to use during maintenance shutdowns.

5. Profile Press Characteristics
Presses differ in their tone value increase (dot gain) characteristics, and this affects how well a job will print. Knowing the dot gain characteristics for a particular press and using this information before outputting to film and plate eliminates a factor that can ruin a job, and it also gives press operators better control over the quality of the run. Press profiles are an integral part of the color management workflow.

the plate and blanket cylinder bearer nip points and engage the impression. Compare the resulting stripe widths on the foil gear and operator sides with a magnifier. If the stripes differ, then the cylinder pressure is not equal on both sides. Equalize the pressures before proceeding.

■ Make sure the plate-to-blanket squeeze is appropriate for the type of blanket being used.

Conventional blankets normally have a 0.002–0.004-in. squeeze; compressible blankets should be 0.004–0.005 in. Blanket-to-blanket pressure on web presses is usually determined by the caliper of the paper.

■ Run a dry solids and breakaway test on each unit, using process cyan ink.

Examine dry solids for streaks and printing pressure. Dry solid breakaways can reveal damaged and patched cylinders. The dry solid ink density should conform either to current cyan densities being run in the plant or to industry-accepted specifications or guidelines. The cyan ink density should be as even as possible across the sheet. Measuring with a densitometer from lead edge to tail will help determine if the ink charge is basically consistent.

On sheetfed presses, print dry solid impression breakaways on each unit to evaluate print pressure, check if the impression cylinder is parallel, and look for impression cylinder abnormalities. Back the impression cylinder away 0.002 in. at a time, running 25 sheets each time.

Keep running breakaways until the sheet is just slapping against the blanket or until the final breakaway. If different units start showing the print breaking away at greatly different pressures, the impression cylinder gauge settings are probably wrong. Reset the gauges to proper calibration to prevent excessive impression cylinder pressure.

■ Print wet solids on each unit to evaluate dampening system capabilities and roller streaking.

The wet solid plate image should cover the entire sheet except for about one inch of clean paper on all outside edges. If new streaks appear on the wet solids, the dampening system is usually the cause. Check for and correct inadequate dampening roller settings, poor roller conditions, orincompatible fountain solution concentration.

After completing the press settings and specification test, determine if the mechanical parts of the press need any repair or replacement. This must be done before a diagnostic pressrun or the characteristics revealed by the diagnostic run may not point to the correct problem. Once the press settings and specification conditions are adequate, proceed with the diagnostic run.

Diagnostic Pressrun and Analysis

The diagnostic pressrun test described here is a three-step test process that was developed by GATF and refined over the years. The first step involves checking for mechanical ink ghosting. The next step tests the registration of each print unit using register grid films and plates. The final step is to run a test form to determine the register and printing capabilities of the press.

Check for Mechanical Ghosting

This test involves running plates made from the GATF Mechanical Ghosting Form on each unit. Normally, PANTONE® 477 dark brown is run as matched to a PANTONE Color Guide book. If the ghosting form reveals ink density differences of more than 0.10 (measured with a Status-T densitometer) at the intersection of the longest vertical bar and the horizontal bar, some type of mechanical correction may be needed. The ink system vibration drum rollers may need to be reset, or an older press design may prevent it from printing the form acceptably.

Check Press Unit Register

This test uses the GATF Register Grid, a film negative with a precisely

What Is a Test Form?

A test form is a comprehensive diagnostic and measurement tool designed to help printers achieve higher quality color printing with less waste and reduced makeready time.

The test form contains a variety of quality control targets in addition to color reproduction targets. The quality control targets can be divided into three categories according to their use: diagnostic targets, process control targets, and standardization targets. Although some quality control targets can be used for more than one purpose, the functions remain distinct.

Diagnostic targets are used to troubleshoot the printing system. Diagnostic targets include ladder targets, star targets, QC strips, slur targets, and transfer grids.

Process control targets are used to monitor the printing system to keep it operating within set tolerances. Examples of process control targets include the six-color control bar, color reproduction guides, dot gain targets, and the solid color control bar.

Standardization targets are used to measure the attributes of the printing system once it is free of major problems and operating in control. They identify the characteristics of the printing systems to be optimized for the press. Standardization targets include the gray balance chart, the dot size comparator, ink coverage target, and the GCA/GATF proof comparator.

Reprinted from the *GATF Process Controls Product Catalog*, which contains information about quality control devices for the entire production process, from copy preparation and scanning through presswork.

Preparing Test Forms for a Press Test

by Richard M. Adams II, *Research Scientist/Digital Imaging and Color Reproduction Specialist, GATF*

Preparing to print test forms on press will differ depending on whether film or a digital test form is used. If a GATF test form is being used for press diagnosis only, using a film-based test form is recommended. If you use a digital test form, the characteristics of the imagesetter may influence the press test. If you want to analyze electronic output, filmsetter, platesetter, etc., *and* the press, use a digital test form. Following are some guidelines and options.

Film-Based Test Forms

Plate exposure. To prepare for a press test using film test form, make sure your vacuum frame holds register from exposure to exposure by testing it with the GATF Register Test Grid.

Also, monitor your plate exposure using the GATF plate control target or a comparable one. Manufacturers of conventional plates generally specify exposures as a solid step on a continuous-tone step wedge. Exposure can also be verified using the highlight and shadow dot patches and microline elements on the target. At the correct exposure, the plate should maintain a specified minimum and maximum printing dot. A negative-working plate, for example, will tend to fill in shadow dots when overexposed and not image highlight dots if underexposed.

Proofing exposure. You may want to proof the film-based test form. As in platemaking, test the vacuum frame for accurate positioning using the GATF Register Test Grid.

Photomechanical proofing system manufacturers generally specify exposure as a solid step on a continuous-tone step wedge. As with plates, exposures can be verified by checking minimum and maximum printing dots.

Digital Test Forms

Imagesetter. A digital test form will need to be output on an imagesetter for conventional platemaking, or on a platesetter for computer-to-plate (CTP) applications. The imagesetter should be calibrated using a transmission densitometer to check minimum and maximum densities as well as to linearize halftone dot values to within ±2% dot area.

Platesetter. First, calibrate the platesetter using a plate-reading densitometer. Depending on how a platesetter is used in the workflow, there are three approaches to calibration:

1. Digital and analog workflow. When a platesetter is used in tandem with an imagesetter and conventional plates, the platesetter can be calibrated to have the same tone value increase (dot gain) characteristics as the conventional plates. Even when CTP and conventional plates have the same tone values, as measured with a plate-reading densitometer, the plates may print slightly differently due to ink/water balance characteristics. Minor adjustments in CTP plate dot area may have to be made based on measurement of printed sheets.
2. Digital workflow to specification. CTP plates tend to print sharper than conventional plates. When printing to SWOP, SNAP, or GRACoL, CTP plates may need to have an idealized plate gain curve built in to meet dot gain specifications. Such a curve might include a 5% gain at the 50% dot value, tapering down to 0% gain at 0% and 100%. This type of workflow might be encountered when editions of a magazine or newspaper are printed in different plants, each required to meet the same print specifications.
3. Digital workflow with color management. Platesetters used in a color-managed environment can be linearized for accurate dot reproduction. Color management profiles will account for the lower dot gain of the CTP plates. The plates can be run to ink densities in published specifications, but dot gain values may be lower.

Soft proofing. Photos in digital test forms are generally supplied in CMYK mode for a specified print specification such as SWOP or SNAP, or a guideline like GRACoL. To display the photos accurately on a color monitor or to check soft-proofing capability, calibrate the monitor to the desired white point (e.g., 5,000 K or 6,500 K) and gamma (e.g., 1.80 or 2.20). Calibration can be performed with a visual calibration utility or with a monitor colorimeter. For accurate soft proofing, you need (1) an ICC color management profile of the monitor, which is specified in the image-editing software used to view the test photos; and (2) an ICC profile of the press, which is also specified in the viewing software. The software will reference the press and monitor profiles and render on-screen photos that accurately reproduce those printed on press.

Color management conversion. To test color conversion, the GATF ColorSync™ Test Form, designed for color management profiling on press, is supplied with CMYK photos for SWOP, SNAP, and GRACoL-coated conditions. RGB photos are also supplied. Users can convert the RGB photos to CMYK mode prior to imaging, using an ICC profile for their press.

Scanning. To extend the press test to scanning, you must scan one or more GATF test photos, which are available as transparencies and prints. For the most accurate reproduction, the scanner should be profiled using an IT8 scanner target (transparent or reflective) and a color management profiling program. Before profiling, determine the optimum settings for your scanner, including highlight density, shadow density, midtone (gamma), and resolution. Most scanners today are self-calibrating, using an internal reflective or transparent patch for calibration of CCDs (charge-coupled devices) or PMTs (photomultiplier tubes). Some scanners, mostly PMT models, still require manual calibration by setting the PMTs on the transparent drum.

ruled pattern of line and highlight tint patches. Plates made from this film should also have original color control bars burned in. This test can detect misregister as slight as 0.001 in.

Mount the print units in accordance with the pin register system. Test a different color ink on each unit: process black, cyan, magenta, and yellow; and PANTONE Warm Red and Green solids. Run the press until the ink densities are even across the sheet and then print a minimum of 50 sheets. The first-pull register should be within ±one grid line at the gripper edge of the sheet. If the grid lines exceed the ±tolerance, check the pin register system, the plate clamp integrity, and the plate cylinder zero set.

Move the plate/cylinder to register and fit the lead edges. There are no standards for image fit accuracy for presses. Half-size sheetfed presses (25–28 in.) can achieve dot for dot register at the lead edge and up to one 2% dot difference at the tail edge of the sheet. Larger 40-in. presses normally exhibit up to a one-and-half 2% dot difference at the tail. If the vertical fit at the tail edge of the grid is excessive, the cylinder circumference may not be consistent on all cylinders. A plate and blanket packing change may be required to bring the register and fit into acceptable tolerances. Used presses could have replacement cylinders due to some previous mishap.

■ Gear streaking on web presses

Gear streaking on web presses can be tested using a special form made of a 30% screen tint using a four-color process at appropriate screen angles and covering all but one inch of the outside edges of the paper. Make sure the plates have color bars so the run can be checked for normal ink densities for black, cyan, magenta, and yellow. Print all four colors simultaneously at optimum press speed. Any gear problems that exist will show up on the screen tints.

Print the Test Form

Plates made from the GATF Press Test Form can now be installed for the actual press test run. Targets on the test form are designed to collect information for press diagnostics, process capabilities studies, process control, and standardization.

■ Makeready

Makeready begins with mounting the inspected plates on the press. First check the matching register and fit specifications of all colors on the first-pull sheets, using the transfer grids on the test form to determine pin register accuracy.

Adjust the inking system to achieve a production ink profile. Initial density profiles for process black, cyan, magenta, and yellow, and for PANTONE Warm Red and Green solids can be based on the typical ink densities of the press or on industry-accepted specifications or guidelines (e.g., SWOP, GRACoL).

■ Print

When the ink/water balance has been adjusted, print the test form. Use the color control bar across the tail of the test form to target the consistency of the ink film density consistency to within ± 0.05 on a Status-T handheld or scanning densitometer.

The press speed (impressions per hour) during the test should be between 80 and 85% of the rated speed. For example, a sheetfed press rated at 15,000 iph should run the test at a minimum of 12,500 iph. Allow the press to run at the test speed for about 500 to 750 impressions to assure that ink and water balance for all colors reaches the target densities across the test sheets. Continue the run, and print another 2,000 sheets for sheetfed presses and another 4,000 impressions for web presses with minimum operator intervention.

Analyze the Diagnostic Targets

The diagnostic targets are analyzed when the run is finished and when the ink has had a chance to complete the early drying stages. Targets on the GATF test form are designed to reveal both mechanical system characteristics and print characteristics. The following explanation concentrates on mechanical system characteristics. For a brief explanation of the print characteristics data that can be collected, see the sidebar on the following two pages.

■ Ladder targets are located on each side of the test form, from the lead edge to the tail edge of the sheet or signature. The key elements of ladder targets are the vertical and horizontal lines covering 50% of the area. Vertical movement will cause the horizontal lines to gain or slur, resulting in a darker horizontal image. Horizontal movement will likewise affect the vertical lines. Ladder targets will reveal sensitive physical printing and mechanical problems such as excessive ink dot gain, poor sheet register infeed and transfer, loose blankets, gear deterioration streaks, gear eccentricity, inconsistent cylinder bearer contact, and dot transfer doubling and slurring. Measured with a Status-T densitometer, the density difference between the vertical and horizontal lines at the same location should be equal to or less than 0.07 for CMY colors and 0.10 for blacks and very dark colors.

■ Star targets give a quick visual diagnosis of potentially excessive tone value increase (dot gain) problems. Under good printing conditions, the star targets display a small round dot at the center. An abnormally large round dot at the center indicates excessive ink film or high dot gain ink. A football-shaped center dot shows dot slur, perpendicular to the direction of the slur. A figure eight or bow tie in the center of a star target indicates doubling of the dot.

■ Vernier target measurement and evaluation helps determine print length differences between the units and paper stability. Paper fan out and print length stretch is measured at both the lead and tail edges of the form. Transfer register between print units is measured within eight inches of the

Collecting Print Characteristic Data from the Press Test

by Chuck Koehler, GATF/PIA Solutions OnSite Consultant

The first step in collecting meaningful print characteristic data from a press test is to determine your internal standard target values. If your printing conditions are not covered by a published, industry-accepted specification (e.g., SWOP for web commercial printers and SNAP for newspaper printers) or guidelines (GRACoL for commercial sheetfed printers), you can establish your own optimum ink densities using print contrast, as described in the *User's Guide to the GATF Sheetfed Test Form*. Once the system and press data have been collected, and specifications or standards determined, print a diagnostic test form to obtain print characteristic data. The following print characteristic data should be reviewed:

Solid Ink Density. The first aimpoint is solid ink density. Solid ink should transfer evenly across the entire press sheet. It is suggested that density not vary more than ±5% across the color bar. Density data for each color should be read with a densitometer and logged. Data such as high density, low density, and average density need to be analyzed and noted. If desired, an ink density profile chart can easily constructed. Print characteristics should not be taken unless the solid ink density of all colors is within accepted tolerances.

Register. Although not extremely critical to print characteristics, register should be as close as possible, and as close as would be accepted in daily work. Register can be analyzed with a magnifying glass and recorded if so desired. Misregister could possibly affect the gray balance results that will be analyzed later.

Hue Error/Grayness. These values should be read with a densitometer and the data recorded. Since hue error/grayness depend on the ink and substrate, data about these materials should also be recorded along with these readings.

Mottling and/or Ink-Water Balance. Areas of large solid coverage and large screened areas of each color should be visually inspected for mottle or unevenness. Many times ink and substrate are not compatible and will cause uneven drying. Improper ink and water balance can also cause uneven ink distribution.

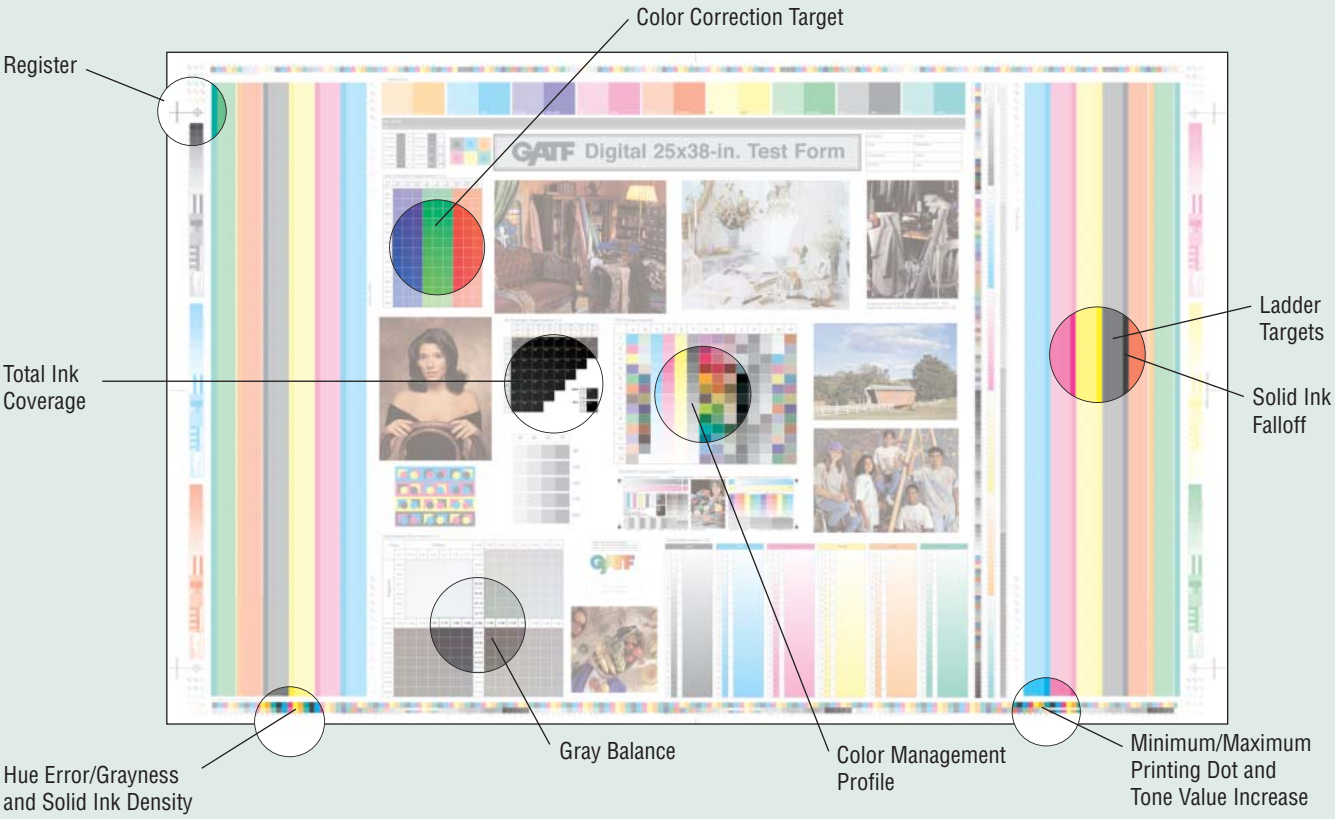
Solid Ink Falloff. Where the color bar is used to adjust even ink coverage across the sheet, falloff is used to determine the capability of the printing press to distribute an even ink film from gripper end of the sheet to the tail end. Use a densitometer to read falloff bars at numerous points from gripper to tail on both sides of the sheet. As with solid ink density, high density, low density and average density should be recorded from both sides of the sheet. It has been suggested that the density range of falloff should be no more than 0.10.

Ladder Targets. Ladder targets indicate slur and/or doubling from gripper to tail on both the operator and gear sides of the press. Ladder targets are generally inspected visually, but the objective method is to read them with a densitometer. Ladder targets consist of adjacent vertical and horizontal elements. Use a densitometer to read these adjacent elements at several points from the gripper to the tail end of the sheet. Subtracting one value from the other determines both circumferential and lateral slur and doubling. These values should be recorded. A chart is especially helpful in illustrating the results of the ladder targets. Density difference should be less than 0.07 for CMY and less than 0.10 for black and dark spot colors.

Minimum/Maximum Printing Dot. Minimum and maximum reproducible dot percentage are perhaps the most important data to collect regarding print characteristics. Using a magnifier, determine what is the smallest percentage that can print before the dots appear uneven, and which are the largest dot percentages that print before plugging or going solid. This data is indispensable when setting up prepress systems and should be recorded.

Tone Value Increase (TVI). Normally known as dot gain, this reading is now more accurately described as tone value increase. TVI can be read using a densitometer set to dot area or dot gain. Use the recorded results to plot and graph dot gain characteristic curves. Read and plot at least the 25%, 50%, and 75% dot areas. This data is instrumental in correctly calibrating prepress systems.

Gray Balance. As far as the general appearance of color reproduction goes, gray balance is probably the most important factor. A gray balance target should be printed and analyzed to determine the proper dot percentages of cyan, magenta, and yellow that are necessary to make a neutral gray in the different areas of the tone scale. Gray balance targets are generally analyzed visually in corrected viewing conditions. Use a dye-based grayscale to isolate the area closest to neutral gray. To use a densitometer, read the gray balance target through the red, green, and blue filters, and determine which reading results in even density across all three of the filters.



Color Correction. Color correction targets consist of red, green, and blue overprint colors of different percentages. As with gray balance, these targets are generally analyzed visually in corrected viewing conditions. This analysis is very subjective, but its purpose is to determine the proper combinations of process colors that produce the best possible red, green, and blue. These readings can be plotted on a GATF Color Hexagon to find the reading that falls closest to the axis for each color. Optimum combinations need to be determined for red, green, and blue, and these readings need to be communicated with prepress in order to optimize color reproduction.

Total Ink Coverage (TIC). Whatever the system being used, it is a good idea to employ some quantity of UCR (undercolor removal) to maintain detail in shadow areas and avoid problems of excessive ink coverage. One way to determine TIC is to use the maximum black dot percentage for the system and then calculate the cyan, magenta, and yellow percentages that will equal that target value. Target values for TIC can normally be found in the industry-accepted print specifications and guidelines mentioned elsewhere in this article. This is another piece of information that prepress needs in order to optimize color reproduction.

Color Management Profile. Color management targets generally contain patches that are used to determine print characteristics. Some color management programs may even report on a system's conventional data. A color management target does not, however, determine if the system has been optimized, or if the target has been run properly according to a plant's internal standards. It is essential that the results are optimum and repeatable. To assure the integrity of the printed targets used to create color management profiles, reproduction system data and press test/fingerprint data should be collected and analyzed. The system and print characteristics associated with each printed color management target should be available for inspection.

Nothing can replace a well-planned data collection policy. Data collection is part of overall quality procedures and should be implemented carefully at each step in the production cycle. GATF's TPM (Total Production Maintenance) Registry program and the GATF/Apple ColorSync Registry both require data collection and provide guidance for printers who want to establish data collection as part of their workflow.

sheet's lead edge location. A transfer register inaccuracy exceeding 0.00075 in. normally shows up as a visual contrast in the ladder targets.

■ Transfer grids in four areas, two at the lead edge and two at the tail edge, help determine unit-to-unit fit and transfer register accuracy. The transfer grids help pinpoint the unit on which misregister is occurring.

■ Tone value increase (dot gain) data can be measured on the color control bar at the lead edge using a Status-T densitometer. The measurements should preferably be taken from the main screen tint block located in the central area of the test form.

Using a densitometer, double check that the density levels are close to the target densities. If the densities are too heavy or too light, then the tone value will not be representative of what the test is trying to determine. High densities will produce high dot gain, low densities will produce low dot gain. Typical industry specifications for acceptable tone value increase, or dot gain, include SWOP for heatset web, SNAP for non-heatset web, and PROP for offset folding carton work. Guidelines for commercial sheetfed operations are included in GRACoL. A press that is set up properly, that is in mechanically sound operating condition, and that is printing with quality materials should be able to produce acceptable image dot gain.

■ Ink density variation throughout the test run is another factor to analyze. Pull up to 50 consecutive or random sheets during the test run and measure the ink density at the same location on each sheet with a Status-T densitometer.

Analyzing 50 *consecutive* sheets will show if the ink ductor and oscillation roller mechanisms are operating correctly. Analyzing up to 50 *randomly pulled* sheets will help determine if ink/water balance has been achieved. If the ink density variation exceeds ±0.05, the inking system, fountain solution type and concentration, and materials compatibility should be investigated.

Conclusion

The thoroughness of the diagnostic analysis of a press is important for determining if its mechanical system requires restoration or service. The results of a press acceptance test will indicate if a press is printing to an accepted output and if a printer can sign off on a new or used press. Press testing can also help ascertain the quality and compatibility of print materials, and it has become a standard procedure in quality control and maintenance systems. Press testing can also help optimize the productive life span of a significant capital investment.

Finally, process control is essential to a color-managed workflow, and a thorough diagnostic press test can establish a process control benchmark. Many color management efforts fail because they do not take into account the entire process and the upstream conditions that affect the final product. Color management is not a matter of constantly re-profiling presses and other equipment. The key is to bring the mechanical and process elements back to the level that will acceptably match the original profile. ■

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For Further Reading

Alcohol-Free Printing by Lloyd P. DeJidas. GATF SecondSight No. 74.

GATF Practical Guide to Color Management by Richard M. Adams and Joshua Weisberg. GATF Order No. 1548.

Industry standards and specifications, including SNAP, GRACoL, SWOP. See the *GATF Process Control Product Catalog* or *Publications Catalog,* both available free from 412-741-6860. Fax: 412-741-2311; email: info@gatf.org.

Introduction to Color Bars by Peter Brehm. GATF Order No. 1441.

Introduction to Densitometry by Peter Brehm. GATF Order No. 1437.

Statistical Sampling in the Pressroom by Phillip N. Hutton. GATF Order No. 1612.

Total Production Maintenance by Kenneth E. Rizzo. GATF Order No. 1543.