

Offset printing becomes a stable and predictable industrial process

STANDARDIZATION IN OFFSET PRINTING (1) ■ The Berlin consultant and offset printing expert Dieter Kirchner has developed Pan4C as a highly comprehensive approach to process and production standardization. An analytical test forme allows any press to be standardized in accordance with ISO/PSO. Printing problems can then be reliably identified and optimal process conditions and printed results achieved.

■ The instability of offset printing is a world-wide problem and day after day it generates additional costs for all printers that the customer will not pay for. Development of the Pan4C analytical test forme should allow all those involved in the printing process to analyse and eliminate the causes of this instability. Kirchner is convinced that for the first time this will turn offset into a stable and predictable process. He reports that in the course of trials spanning six years for Pan4C process and production standardization carried out in printers in Europe and Asia it has been possible to quickly eliminate all printing problems.

By using the analytical test forme to standardize the press it is automatically standardized in accordance with the ISO/PSO standard and constant adjustment using CtP curves is no longer necessary.

Pan4C standardization of the printing process allows the printer or print instructor to demonstrate that the press is printing optimally and

presses within the same company or across the world can be adjusted to the same standard.

OPTIMAL INK SPLITTING. A reliable and industrialized printing process requires optimal and reproducible ink splitting and because of this Dieter Kirchner believes that the conventional method, which unlike Pan4C is subject to constant change, simply provides a snapshot. Furthermore, it also allows all the causes of the following typical printing problems to be analysed:

- Set off
- Drying problems
- Colour fluctuations
- Roller streaking
- Abrasion
- Carbonizing
- Tonal value fluctuations
- Ghosting
- Over emulsification of the ink
- Inconsistencies between printed copies
- Ink trapping problems



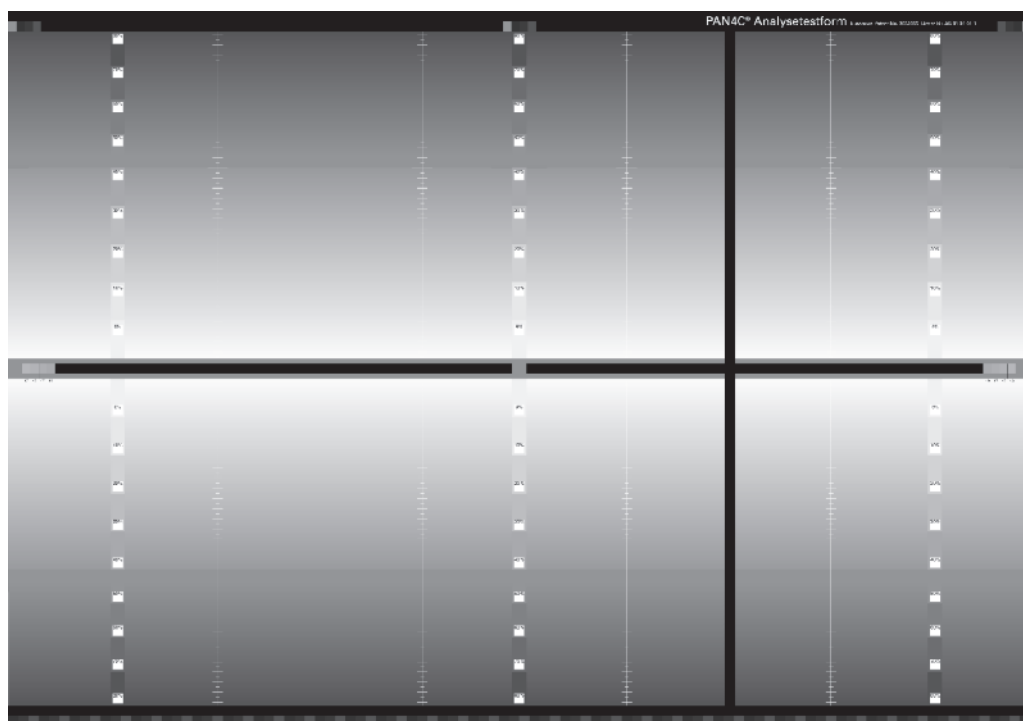
Dieter Kirchner presents his Pan4C analytical test forme project to Deutscher Drucker.

PROCESS AND PRODUCTION standardization is the foundation for industrial production in the printing process and the foundations for industrial standardization are:

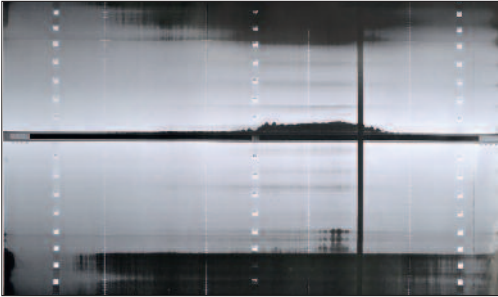
- Target guidelines for the production process. These guidelines lay down the conditions for the industrialized production of top quality print regardless of the press.
- Fault analysis. Fault analysis of the causes of process faults.

PAN4C STANDARDIZATION. Pan4C process and production standardization consists of the Pan4C analytical test forme for process fault analysis and test formes for checking the target guidelines for 4C production. All the test formes are linked together through emulsion measurement.

Previously, it was not possible to measure the quantity of damping solution required for an optimal emulsion. The printer was only able to adjust the quantity of damping solution required very imprecisely on the basis of smearing at the front edge of the printed sheet. Since he didn't know his pan roller profile he could only make these corrections at the points where there was smearing. There might, however, have been a considerable inflow of water to left and right of the points where there was smearing and this would lead to differing and unreproducible tonal value increases.



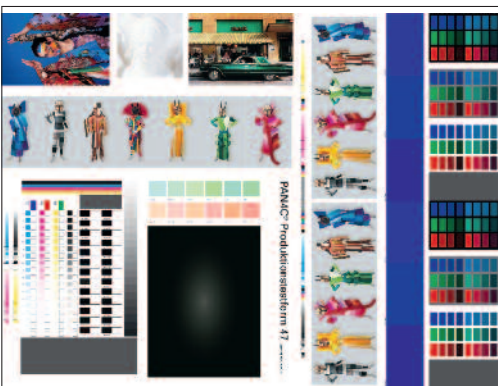
The patented Pan4C analytical test forme is the foundation stone of Pan4C production standardization. It is used for the fine adjustment of damping and ink units and each forme identifies incorrect adjustment and poor or less than ideal ink/water balance. It also identifies all the faults stemming from the interaction of ink, damping solution and chemical additives. Ink splitting faults are immediately apparent.



Roller defects (here a pan roller) form one of the main classes of fault. Possible printing problems can include poor drying, increased tonal value differences, ink trapping problems, colour fluctuations, increased streaking, increased ghosting, increased set off etc.

Pan4C fault analysis means that the pan roller profile is set to within a defined tolerance. Three measurement patches then allow the optimum quantity of damping solution to be set for the emulsion of the individual inks. Since all known process faults are overwhelmingly due to the type of damping solution, the quantity of damping solution or impurities in the damping solution, the Pan4C analytical test forme allows process faults to be eliminated or reduced to a minimum. The test formes for checking the target guidelines monitor all the target guidelines for 4C production by providing evidence for analysis.

THE PROCESS BECOMES INDUSTRIAL. The production test forme and the paper test formes determine the time required before printing the verso or starting the finishing. This allows the production process to be planned like a piece of industrial production. Operators learn to master the printing process through Pan4C stan-



All test formes measure emulsion. This picture is of the production test forme.

dardization and this automatically leads to increased productivity. Should faults arise, these can be quickly and objectively examined, which is important with complaints about materials.

Many complaints about materials are based on suspicion rather than the presentation of evidence. New, unknown materials can be examined for their properties, which prevents use of the wrong material leading to substantial production costs.

4C production: target guidelines and fault analysis

- 1) Target guidelines for 4C production on matt illustration printing paper, without dispersion coating
 - One standard for the CtP curves for optimal, loss-free transfer of the image data, without step to paper white
 - Optimal ink splitting
 - Optimal clean running behaviour
 - Optimal and fast adjustment of the ink emulsion by adjusting the damping solution quantity to the ink area coverage (emulsion measurement) through the use of measurement devices
 - Maximum tolerance of 2% for tonal value spread over the whole sheet
 - Direct and fast press reaction time to changes in colour density
 - Surface drying of the ink for verso printing in between 10 and 15 min (ISO/PSO)
 - Significant reduction in wastage
 - Very fast progression to finishing in 1 to 3 hours after printing (matt illustration printing paper)
 - Pile of standard paper (matt illustration printing paper) able to withstand loads after 30 minutes without set off
 - No set off even with high overall ink application, smaller spot sizes up to 400 %
 - Minute, invisible tonal value fluctuations during printing, even with very short runs
 - Optimal ink trapping with high image contrast
 - Optimal reproducibility even with several presses
 - Very fast fault analysis of printing problems
 - Very fast fault analysis of roller settings
 - Very fast analysis of the usability and quality of printing materials and aids
 - Preventing printing complaints
 - Predictable, reliable production
 - Optimal production increase
 - Optimal checking of new or used presses
- 2) Fault analysis for the following process faults in 4C printing
 - Set off
 - Drying problems
 - Colour fluctuations
 - Roller streaks
 - Abrasion
 - Carbonizing
 - Tonal value fluctuations
 - Ghosting
 - Over emulsification of the ink
 - Inconsistencies between printed copies
 - Ink trapping problems
 - Analysis of the ink splitting
 - Analysis of the combination of ink and damping solution additives
 - Analysis of print chemicals and aids
 - Analysis of roller settings
 - Analysis of reaction time

Since the standardization of several presses using Pan4C is carried out on the basis of the same analysis, the differences between the presses are scarcely perceptible. This means that it is possible to print a job on several presses at the same time. Limited colour fluctuation also means that Pan4C standardization increases the economic viability of short run production.

UNIFORM QUALITY STANDARD. Pan4C standardization makes the printer independent of external standardization consultants and independent of external firms for the elimination of printing problems. The Pan4C print control wedge and appropriate measurement technology allows the printer to precisely check whether the printing corresponds to ISO/PSO or the in-house standard right at the outset of printing. This is not possible without emulsion measurement. Pan4C's analysis and quality assurance process means that all presses will be adjusted to the same quality standard within the specified tolerances.

As a result, it is no longer necessary to align the CtP curves for different presses or units. There are two main curves and two outer limit curves for coated paper. The main curves differ

by 2% in the mid tone. A measurement patch on the analytical test forme is used to determine which CtP curve suits the press.

PRODUCTION STANDARDIZATION. Production standardization takes place after completion of printing process standardization. This standardization revolves around four key points: high image contrast, consistent copy printing, stability over the run and the time window for finishing.

High image contrast automatically results from optimal ink splitting. Contrast is measured on different black tones. Copy printing and stability over the run are checked by measuring every 50 sheets for a print run of 500. Using this pile the drying and the time that needs to elapse before finishing are determined by means of rub-off patches.

The paper test formes are used to test all other papers for the time window for finishing. Pan4C makes the whole production process predictable and allows top quality industrialized production.

Frank Lohmann

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New standardization method shows what's really going on during printing

STANDARDIZATION IN OFFSET PRINTING (2) ■ Pan4C process and production standardization developed by the offset expert Dieter Kirchner should help printers build up a body of knowledge that will guide them expertly and neutrally in their own work. What's more, the truth of the promises made by the supply industry can be checked.

■ “The present method of standardizing the printing process for ISO/PSO has created a somewhat more stable basis for us than previously but has not solved the real and everyday problems of offset printing”, declares Dieter Kirchner. The printing problems remain unchanged, whilst drying problems are hidden by an additional coating applied by a coater. On top of that there are also energy costs, according to Kirchner.

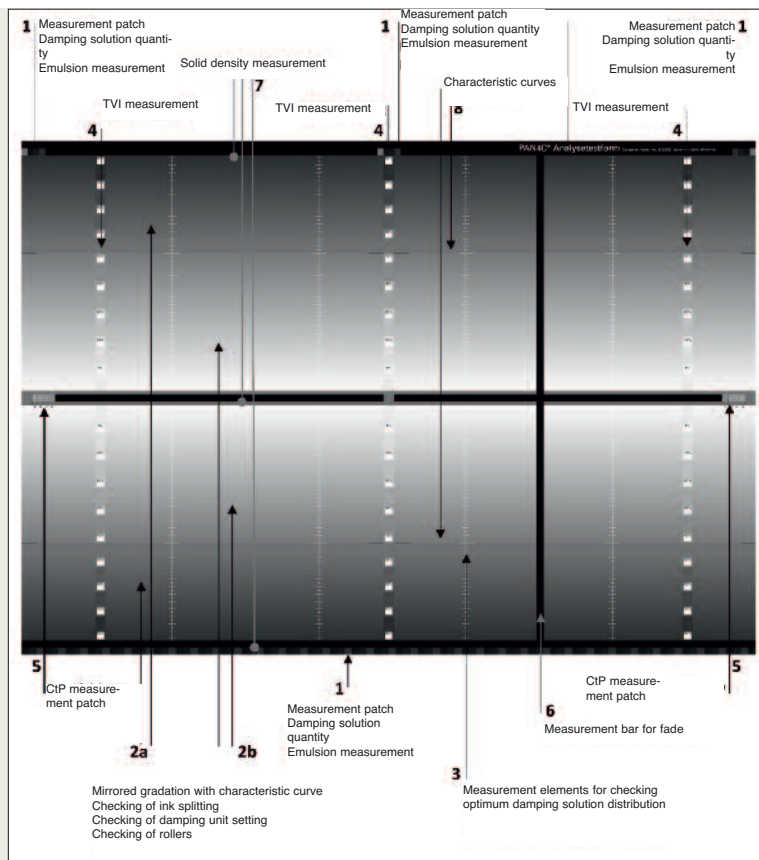
“Here the CtP curves are often modified without any reference to the image data supplied by the customer. The main thing is that the tonal value increase agrees with PSO”, continues Kirchner.

The fact that the image data might be changed as a result is usually ignored, since there may in any case be a number of major differences between proof and print. Then, yet more effort will be expended during matching to try and bring everything into line. “It is only if one can demonstrate that the print is correct and optimal that one check whether the proof is binding for the print. At the moment it's the other way round”, argues Kirchner.

MASTERING OFFSET PRINTING. For the first time Pan4C gives the printer a tool that makes

him independent of opinions and trends, as Kirchner puts it. He can choose the required material without having to spend months testing. He is able to check for himself within a matter of hours whether new materials would interfere with the printing process or optimize it. This allows the printer to build up a body of knowledge that will guide his own work expertly and objectively and that will also allow him to check whether the promises of the supply industry are true. When advising customers, Pan4C offers the security that promises of high quality, problem free and reliable production can be kept, claims Kirchner.

The patented Pan4C analytical test forme is the foundation stone for Pan4C production standardization. It is used for the fine adjustment of damping and ink units. According to Dieter Kirchner, it identifies every form of faulty adjustment or poor or sub-optimal in/water balance. It also highlights all faults in the interaction of ink, damping solution and chemical additives. Ink splitting faults are also instantly apparent, as Kirchner stresses. This test forme makes it possible to identify and to eliminate or reduce to a minimum the following printing problems: set off, ink drying problems, colour fluctuations, roller marks, tonal value fluctuations, ghosting, ink trapping problems, printing inconsistencies between copies, over-emulsification of the ink, excessive abrasion or carbonizing. The reaction time of the press to the optimal ink/water balance is optimized. The press reacts directly and rapidly to changing the ink density. This allows wastage to be reduced to no more than absolutely necessary. All materials and additives such as inks, damping solution additives, chemical additives and plates can be checked to ensure that they are the right quality for the printing process. As a result, it becomes possible to analyse all the processes taking place during printing.

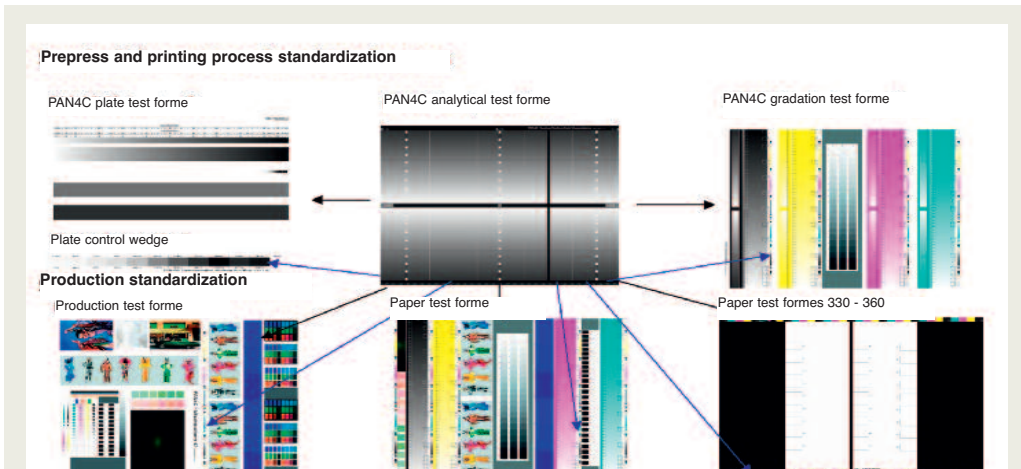


PAPER TEST FORMES allow all papers to be objectively tested for their printing and drying properties. This is because without optimal ink splitting it is impossible to know whether problems stem from the emulsion or poor ink/paper absorption behaviour. Production controllers, who are constantly worrying about their products, can now understand the causes of faults and discuss matters with printers on a common, neutral basis.

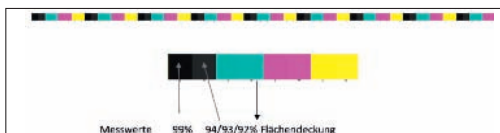
Pan4C process and production standardization is not just a tool for routine ISO/PSO compliant printing. It is also a predictable platform for creative printing processes that go beyond the ISO/PSO standard or for new standards

The task for the printing industry is to produce text and image information. Consequently, the printer must be in a position to print higher ink densities that lie outside ISO/PSO in order to be able to convey more extensive image information without encountering problems. “Nowadays, press manufacturers are offering us technically mature, twenty first century presses but the methods that we use for printing date from the late twentieth. The pressure on the printing industry stems not just from low earnings but from the daily battle to achieve reliable, problem-free production”, believes Kirchner.

PROBLEM AREAS. Roller marks are a common problem. Every press unit has a latent pattern of roller marks but with good ink splitting these are invisible. The worse the ink splitting, the more visible this latent pattern of roller marks becomes. Checks of materials such as inks and damping solution additives. The initial check is carried out using the analytical test forme. This checks whether the ink splitting is faulty. If it is, the



The Pan4C formes: The analytical test forme serves as the foundation and using it for fault analysis allows all press units to be brought to the same reproducible condition. The resulting optimal ink splitting automatically leads to ISO/PSO target values with a maximum tolerance of just 2% for the tonal value increase over the entire printed sheet. This in turn allows the use of predefined CtP curves and emulsion measurement for the printing process. Standardized production is not possible without emulsion measurement. The emulsion measurement patches are configured in such a way on the interlinked formes that the target values, despite CtP curves, are the same on all test formes and in the subsequent printing process (blue arrows above). The other test formes are only used during the standardization to provide evidence and for analysis of the evidence. The gradation test forme provides evidence for ISO/PSO and the production test formes provide evidence for the production targets. The entire standardization package consists of the Pan4C test formes and the handbook. The Pan4C handbook provides a detailed description of all the standardization steps, target values and fault analysis.



Pan4C emulsion strips: These measurement strips are placed at the leading edge if the normal Pan4C print control wedge cannot be integrated into the forme or there is an extreme difference in area coverage from left to right.

damping solution additive must be changed. If the ink splitting is good then the ghosting patch is checked with the gradation test forme. If it displays ghosting then the ink needs to be changed, since too much water has been taken up. If no ghosting is apparent then the production test forme is printed in order to check ink trapping behaviour and the drying time required before finishing. If these correspond to the guidelines then the ink can be used for the printing process. In the clean running test for inks it has been found that black inks generally display poor clean running behaviour. Over the last four years only one black ink has been found that runs clean normally. This means that black is the trickiest ink, since it needs extra water for clean running. With a long black ink ICC colour profiles can result in different ink trapping on the printed sheet.

MULTIPLE UP PRINTS. There are often major problems in ensuring multiple up copies are identical and this can result in considerable press down time. As with other problems, here too the causes lie in faulty ink splitting due to chemical

influences or the inability to monitor the quantity of damping solution. Differing ink tonal value increases and ink trapping behaviour then lead to considerable deviations and to instability.

ROLLER FAULTS. Many roller faults are not visible to the eye and lead to printing problems without the printer noticing. Printing the analytical test forme will also reveal these hidden faults. For example, in the case of a defective damping forme roller the printer needs considerably more damping solution for the plate to run cleanly.

DISRUPTED INK SPLITTING. Possible causes: damping solution, ink and damping solution combination, press chemicals, mains water, contaminated IPA. Printing problems: poor drying or no drying at all, substantial set off, marked tonal value differences, serious ink trapping problems, marked colour fluctuations, marked streaking, marked ghosting, large differences between multiple up copies, very poor ink/water balance, increased matt/gloss ghosting. It is a very common phenomenon and it can result in serious problems in the pile even with a top coat of a dispersion coating.

RECALIBRATION. A Pan4C standardized press should have an 'MOT' every six months, during which each of its units will print the analytical test forme, the rollers will be adjusted and any defective rollers swapped. **Frank Lohmann**

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How have the early adopters found Pan4C?

Five of the first printers to use Pan4C standardization talk about their experiences.

Over the following two pages we offer a selection of the first impressions and experiences of Pan4C standardization users.

BENATZKY-MÜNSTERMANN DRUCK GMBH, Hanover; Karl-Heinz Benatzky, Managing Director: “We were the first printer to use Pan4C standardization. At the time, the system was still being developed and all the internal test prints were carried out by me. When Dieter Kirchner explained the goals of the development to me in 2004, I thought it was an impossible dream. By 2006 development of the print standardization with emulsion measurement was ready and we immediately adopted it. As a printer and company boss it was important for me that for the first time I was able to identify which factors made the printing process so unstable and what the resulting problems were. Up until then, such problems has just been part of normal everyday life and when we talked to our fellow printers it was clear that we were not alone in having such technical problems during printing.



Karl-Heinz Benatzky

Since we have spent a very large number of years printing high densities with special colour profiles and we are always working at the limits of the possible, it is very important for us to have grip on the printing process in general and tonal value increase in particular. It is only then that we are able to viably produce outstanding printed results. Now it is possible to make the damping unit setting visible and therefore accessible to monitoring, and to print with the minimum quantity of water. The quantity of damping solution becomes measurable and it becomes apparent how the tonal value increase is affected by the quantity of damping solution. Without Pan4C process and production standardization we would not be able to print Skia photography, where we achieve densitometric densities of 3.0 that exceed the photographic print itself. It was this Skia process that we used to print the calendar that won us the 2010 Sappi International Printer of the Year Award.

It has become very clear that a Pan4C standardized press reacts much more precisely, is quickly ‘in colour’ and we are therefore able to satisfy our customers’ intentions more rapidly and more reliably.

Makeready and wastage times are clearly reduced, which is becoming increasingly important given the trend to shorter run lengths. Less waste also means lower CO₂ emissions. This takes us a good deal further along the way to conserving resources, which is something that is important to us.

The analytical test forme is not only a tool for optimizing the adjustment of the press. We have found it very helpful in analysing faults. For example, all of a sudden we were having problems with set off, colour fluctuations, poor drying and all the other things that makes a printer’s life so very difficult. After spending some time searching in vain for the cause we printed the analytical test forme and the print revealed a major chemical problem. The cause was a container of contaminated IPA.

The emulsion measurement is a massive step forward for assessing and adjusting the ratio of ink to water. It gives us an absolutely secure and logically understandable platform and it sweeps away so much of the barking up the wrong tree in discussions about roller marks, drying, colour fluctuations and ordinary ghosting.

What is important for me is real customer satisfaction with the print contrast that we are also able to achieve in the ISO standard. Pan4C is the foundation stone for our entire production. When accepting new presses using these test formes will reveal all the faults.”

H. HEENEMANN GMBH & CO. KG, Berlin; Jörg Teinz, Works Manager: “Our main reason for opting for Pan4C process and production standardization was because it offered us the chance to optimize our quality assurance and to differentiate ourselves from this or that rival. We have been PSO certified for years for both autotypic and frequency modulated screening. There is no great difficulty in demonstrating this on a daily basis but we want more, we want an even more reliable, fast, stable and, above all, reproducible production process.

Many technically related factors continue to have an influence on offset printing. Over recent years the press manufacturers have been continually introducing improvements, particularly in terms of speed, makeready times and measurement technology. Nevertheless, there is still instability in the production process because we are of course continuing to work with natural products. We now have a handle on a whole series of problems that continue to crop up, such as ink splitting problems, over-emulsification, tonal value fluctuation, drying problems, carbonizing, ghosting, ink trapping problems, etc.



Jörg Teinz

Often the printer ‘solves’ the problem job by job on the basis of experience and feeling, adding a bit more or less ink, a bit more or less water, cleaning the roller frame and following the adjustments laid down in the press manufacturer’s handbook, adding more powder, and coating everything just to be on the safe side.

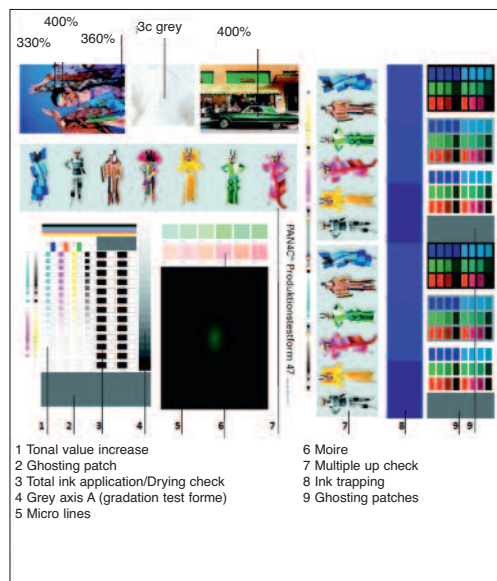
If we are honest, one printer solves a problem one way, another solves it differently just so long as the result is something that is saleable. Then you can find that a problem crops up with one job but not with the next. The very human reaction is, ‘Thank God, it’s working’, but it’s no real reassurance. However, there is often not the time for lengthy tests and elaborate, open-ended analysis.

Dieter Kirchner’s Pan4C process and production standardization now offers us the possibility of reacting rapidly and comprehensively. The profiles integrated into the data calculations ensure a brilliant, almost photographic quality print without any image greyness (in the skin tones, for example). Colour can be held without emulsification over the entire print run, even at high densities. Customer requests (including ones that sometimes deviate from the proof) can be implemented without any problem.

The Pan4C analytical test formes provide the printer with a tool that allows him to precisely and reliably analyse any faults arising in the press within a matter of minutes. Faults in the damping units in particular (in our case diagonally crossed damping units) can be identified in detail and eliminated without having to schedule an entire maintenance shift.

Other points to stress are a substantial cut in wastage, rapid drying of the printed sheets even without coating and, consequently, the ability to finish rapidly after just two or three hours with matt illustration printing papers.

There is a clear improvement in the reproducibility of printed products, even when produced by different printers or on different press-



What is tested and how? The production test forme with test and measurement elements.

es. It is also easy to analyse and take into account the constant switching between types of paper that is normal nowadays. If convinced of the merits and trained, this way of working is readily accepted by our printers.“

GRIEBSCH & ROCHOL DRUCK GMBH & CO. KG, Hamm (Westphalia.); Rainer Grobe, Managing Director: “We standardized our presses at the start of 2011 with Dieter Kirchner using Pan4C. For us it was a logical, end-to-end process standardization that optimized the press. It brings us enhanced process stability and top quality in PSO. Pan4C is a neutral quality assurance process delivering high quality and consistent print.

Reductions in the quantity of damping solution have shortened drying times to the extent that we can start finishing more quickly. Rapid emulsion formation has also made it possible to substantially reduce wastage, whilst print contrast has clearly been improved.



Rainer Grobe

We check all the materials used in the printing process with Pan4C and the test forme allows us to analyse and limit problems to an extent that was not previously possible. Pan4C standardization provides us with a platform from which to offer our customers new developments in the future.“

H. RADEMANN GMBH, Lüdinghausen; Andreas Schnieder, Managing Partner, Christoph Rössing, Technical Director for offset printing: “We brought Mr Kirchner in six years ago to reduce the level of complaints and to deliver an improved production workflow. We achieved our goal. We have achieved a high standard of quality as a result of the analysis and quality assurance process and we are able to consistently produce jobs in accordance with PSO to the considerable satisfaction of our customers.

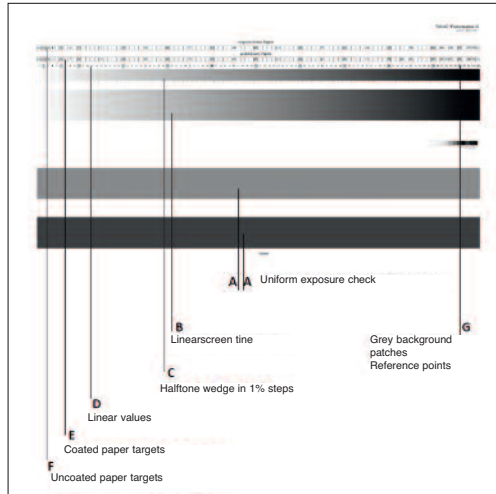
The analysis of the process and production standardization is able to analyse process errors very precisely and to clearly show the cause of the fault. The patented Pan4C analytical test formes are used for making prepress and press adjustments and for fine adjustments of the damping and ink unit.

It recognizes every form of faulty adjustment and faulty or non-optimal ink/water balance, as well as all ink, damping solution and chemical additive faults. These have been clearly documented with photos that clearly show the printer where the fault is to be found on the press.

Optimally adjusted presses mean that it is no problem for us to run the jobs on different presses whilst achieving consistent quality and a reproducible standard for reprints.

In addition, it also delivers smoother production workflow, fast finishing, less wastage and faster in colour printing.

In six years we have had just one complaint about printing, and that was down to human error. The short change-over time (generally, the second sheet is o.k.) together with emulsion measurement



What is tested and how? The Pan4C plate test forme.

means that printing is more consistent without visible colour fluctuations and there is a clear reduction in wastage. Customers are constantly surprised by how quickly we produce a result and how the image contrast is clearly better than that of comparable prints. Since we always print to PSO through Pan4C standardization, the PSO check is printed as a normal print job. The press units are only calibrated every six months and this doesn't involve any special effort. Pre-specified CtP curves mean that there is no longer the constant calibration of the CtP curves and proofing on the press.



Andreas Schnieder

Pan4C standardization has allowed us to significantly improve quality and productivity and the investment has really paid off not just technically but also commercially.

By reducing the time needed for the basic adjustment of the press and taken up by faults, it has been possible to significantly increase productivity and the level of utilization. This advance is reflected in the faster change-over and execution times as well as in the hourly rate. At a time of falling contribution margins we are happy to be able to maintain a high level of offset quality with the help of Pan4C process and production standardization.“

RAFF HOLDING GMBH, Riederich; Dieter Raff, Managing Director: “The Pan4C system developed by Dieter Kirchner is the first clear process for optimizing and standardizing the press that, step by step and logically, results in an optimal printed result whilst allowing continuous monitoring of the result achieved.

The analytical test forme means that printers like us are able to check the settings of the damping and inking rollers, to identify roller wear or defects and so avert possible problems.

Worn rollers are often not apparent at first and it is only with very demanding motifs that ink and water delivery problems arise. Colour fluctuations

over the run might then be the result. To avoid this we regularly use the Pan4C analytical test forme on all press units.

In addition, we are able to rapidly check whether consumables will cause printing problems and, ultimately, disruption of the production workflow. Poor drying, ink set off, excessive anti set off powder and scratches during finishing really reduce machine productivity and increase the risk of complaints. Poor ink application will immediately become apparent through marked streaking and poor halftone dot quality. The only remedy in such cases is to change the ink or the damping solution additives.

After evaluating the analytical test forme it is possible to optimize the characteristic curves in a targeted way. At the end of the day, we claim to print with outstanding dot sharpness and colour brilliance and so to achieve a very fast drying printed sheet with the minimum possible application of powder. By using the Pan4C process we have not just been able to reduce change-over and throughput times as well as significantly reducing wastage, but we have also been able to improve quality.



Dieter Raff

Another positive change is that with all our colour measurement devices we now need one or two fewer adjustment steps per job to be in colour.

Summary: For us, Pan4C is the standard for all things print. In future, no new press will be approved without this test. New additives, blankets, inks, papers and so on are all subjected to this examination.

Only after they have passed will we accept them for use.

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