Gevaproof in use at Carlton Repro International as a control check for the retoucher

Pre-press proofing systems

by Tony Johnson

In a series of articles published last year in this journal I discussed the importance of specification in improving the quality and consistency of printed colour reproductions. In the third article of the series it was described how the specification information from the printing press may be applied by the proofer in order to produce proofs which accurately predict the appearance of the printed job and it was explained what advantages would accrue from such a system. The discussion was almost wholly related to conventional proofing systems, however, and the purpose of this article is to review pre-press proofing systems and discuss how they relate to the sort of approach outlined in those articles.

Economic advantages

Pre-press proofing systems have been growing in popularity during recent years because of the obvious economic advantages they offer over conventional proofing methods. It had always been necessary, until such systems became available, to produce a printing surface before it was possible to properly establish how a set of colour separations would actually reproduce. This meant that a letterpress block, litho plate or gravure cylinder or plate was required and then proofed using conventional ink on paper. If the result was not satisfactory it was necessary either to locally etch the block or gravure cylinder, retouch the separations, or in the worst cases produce new separations and repeat the process.

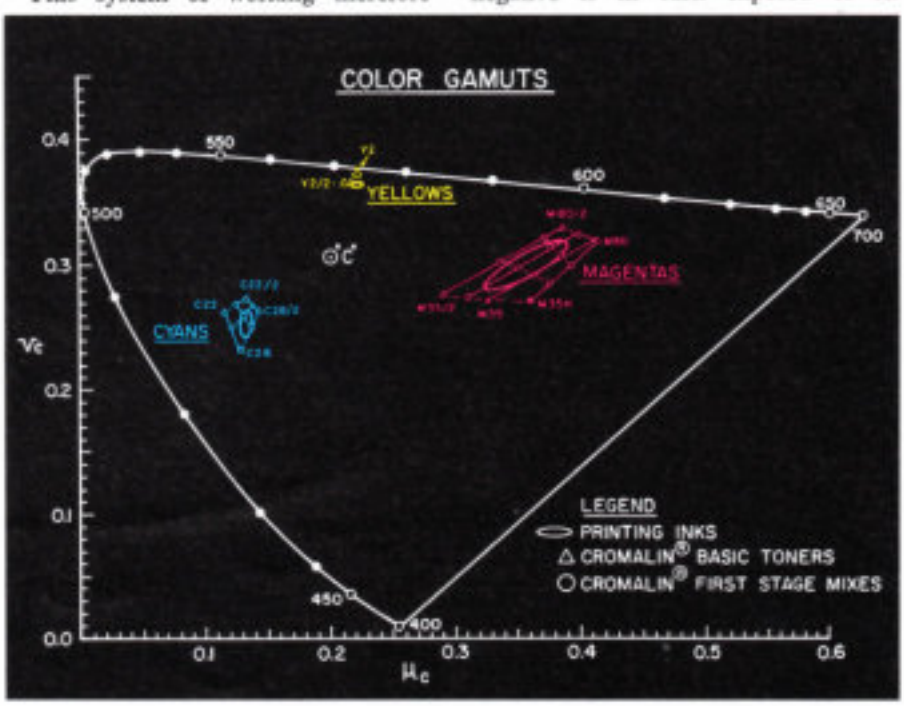
This system of working therefore required considerable skill from retouchers in order to avoid unsuitable separations being passed forward for proofing and hence considerable expense. Even so, despite the excellence of many such retouchers, the costs of proofing were a very considerable factor behind the relatively high cost of colour separation.

It soon became recognised that if some system could be found to achieve a reproduction from a set of colour separations, without recourse to printing surfaces and proof presses, this would be of considerable benefit in assisting the retoucher to ensure that separations going forward for plate or cylinder production and proofing would be as near perfect as possible, and hence require very limited correction on the plate. Since they effectively gave the retoucher a proof prior to that on the press they were given the title pre-press proofs.

The early requirements for a pre-press proof therefore were not a facsimile reproduction of the print on paper. Obviously if the proof were to be of full value to the retoucher it needed to look as much like the printed sheet as possible, but given a little experience he could make allowance for any deviations and indeed in the early days of pre-press proofing this was very necessary! Nevertheless they still proved themselves to be of considerable value and have rapidly become an accepted part of many reproduction establishments.

Colour-Key

One of the simplest of such systems relies on the colour overlay method of which the best known is probably the 3M Colour-Key. These consist of light-sensitive pigmented polyester film which can be exposed to either negatives or positives, and developed, leaving the required coloured image on the clear film base. Each separation positive or negative is in turn exposed to its



CIE Chromaticity diagram showing the colour gamuts of Cromalin toners compared with process inks

appropriate pigmented film and the four resultant images may be superimposed in register to enable the user to view a representation of the reproduction.

This may be done either by transmitted light, or by placing the superimposed images on a piece of white base stock. Obviously the latter comes closer to the appearance of ink on paper and is therefore preferable, but even so it is readily apparent that the result will not look too much like the printed reproduction. Nevertheless, the pigments used in the system have been quite carefully chosen and the system does give the retoucher a check before progressing to full press proofs which can prove very valuable if he is experienced enough to compensate for the differences. It also has the advantage of being relatively quick and cheap (see Table 1).

Despite the advantage of such a system, however, the need for a method which looked rather more like the printed sheet soon became apparent and various systems have evolved. At the present time there are probably four systems which need to be considered, each of which operates quite differently from the others and generally has its own advantages and disadvantages. Of these four systems one is positive working, two are negative working and one is available for either. To some extent therefore the choice is limited by the method of colour separation and platemaking used by the company.

Cromalin

The Cromalin system developed by Du Pont builds up the image on a sheet of coated paper or board recommended by the manufacturer (we at Pira have tried using other materials but with limited success). The technique is to pass the sheet of base material through a heated roller nip which laminates it with a sheet of film. This film consists of a tacky photopolymer protected on the top by a sheet of thin acetate film. The first separation positive is then placed on top of it and an exposure made to ultra-violet light. This polymerises the photopolymer leaving only the image area tacky.

The protective acetate is then removed and the sheet dusted over with a dry pigment, specially blended to match the colour of the ink, which only adheres where the unexposed photopolymer remains tacky. Any excess pigment is then removed and the base is re-laminated and exposed to the second positive. In this way all four images are built up to produce the finished proof. A matt or glossy finish may be achieved by a fifth layer of laminate and toner.

Recently Du Pont has developed a negative system which utilises much the same equipment as the positive system except that it uses a different film laminate and toners. The base material is laminated in much the same way as for the positive system, and then exposed through the separation negative. After exposure the proof is 'toned' in exactly the same way except that only the exposed areas now accept the toner.

Table 1/Systems Costs*

*These costs were believed correct as at 31 Jan 1977 and are exclusive of VAT.

Cromalin

Equipment:

27″ Laminator, toning console and 'start-up kit' which includes toners, applicator boxes, etc.	£1,483

Materials:

Film prices 20″ × 300′	£248.70
25″ × 300′	£310.87
12″ × 300′	£149.22
Toners (per 8 oz)	£6.39

Light source is extra, if not already available, though it is recommended that a conventional exposing unit should be fitted with special bulb and filter in order to achieve a high degree of ultra-violet relative to visible light. This is likely to cost up to £100.

Recommended base stock is Kromekote paper or board.

Gevaproof

Equipment:

Wetting unit, Transfer Unit, Drying unit and Activator and Wash unit.	£384

Materials:

Base stock (per 25 sheets)	
24 × 30 cm	£12.27
30 × 40 cm	£20.44
40 × 50 cm	£34.07
50 × 60 cm	£51.10
Coloured emulsions (per 25 sheets)	
24 × 30 cm	£7.41
30 × 40 cm	£12.38
40 × 50 cm	£20.61
50 × 60 cm	£30.92
Activator (15 × 5 litre packs)	£12.32
Lacquer spray	£1.17

Transfer-Key

Equipment:
None

Materials:

Coloured emulsions	
11″ × 14″ (per sheet)	£1.36
20″ × 24″ (per sheet)	£4.27
Developer (per litre)	£2.04

Colour-Key

Equipment:
None

Materials:

Negative working colours	
10″ × 12″ (per sheet)	79p
20″ × 24″ (per sheet)	£3.14
Developer (per litre)	£2.04
Positive working colours	
11″ × 14″ (per sheet)	£1.04
20″ × 24″ (per sheet)	£3.14
Developer (per litre)	£2.04
Fixer (per litre)	£2.04

Gevaproof

Gevaproof, marketed by Agfa-Gevaert, is a negative working system which also builds up on a special base stock available from the manufacturer. This is moistened in an ethyl alcohol/water solution and then laminated with a sheet of light sensitive pigmented emulsion of the appropriate colour. This is then dried and exposed in a typical platemaking frame to the appropriate separation negative. After exposure it is developed and washed leaving only the exposed area coloured with the appropriate pigment. The process is then repeated for the remaining three colours and finally dried. If a high gloss finish is required the proof may be sprayed with a special aerosol.

The important practical difference between this and Cromalin is the choice of colourant available. Cromalin enables you to blend dry pigments to obtain the required colour whereas with Gevaproof you are limited to those supplied by the manufacturer. They do market a set which is close to BS 4666 ink colours but the colour strength is rather high in relation to many printing situations. However, as you will see in Table 1 it is initially cheaper and many retouchers find it very satisfactory.

Transfer-Key

Transfer-Key, marketed by the 3M company, differs from the two previous systems in that it does not require a special base material but may be built up on any required stock. At present it is only available in negative-working form. It comes in four sheets each of which contains a light sensitive diazo pigment designed to match the appropriate standard ink colours. The principle is quite simple in that the pigmented layers, each having a pressure sensitive adhesive surface, may be simply adhered to the base stock by means of a hand roller.

The first layer is thus applied and exposed to the appropriate negative using an ultra-violet light source. After exposure the proof is developed using a one solution developer to remove the unexposed material, and then dried. The subsequent layers are then applied, repeating the same procedure.

This system differs from the previous ones in that no initial capital equipment is required, and also in that it may be applied to any stock. On the other hand the choice of colourants is somewhat limited, as is the Gevaproof. Also, as may be seen from Table 1, the cost of the materials is relatively high.

Remak

Finally there is the Remak system, marketed by NV Tools Ltd, which may also be applied to any stock. This relies on the electrostatic principle and is positive working only. The principle is

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to place a sheet of paper, coated with zinc oxide, in a charging unit which builds up an electrostatic charge uniformly over the stock. This is then exposed to light, in contact with the appropriate separation positive, and the effect is to discharge the zinc oxide in the areas upon which light is incident.

The sheet is then immersed in a liquid containing pigments in dispersion, with a charge opposite to that of the unexposed paper stock, and the effect is to attract the pigment to the still charged areas only. This sheet may then be washed and dried, and the procedure repeated for subsequent colours.

If on the other hand it is desired to transfer the image to the stock on which the job is to be printed this is possible before drying. At this stage a sheet of the printing stock is wetted by a solvent and placed in a transfer unit in contact with the image bearing master. A roller is then passed over the two, bearing a charge of opposite polarity to the pigment, and the pigment is thus transferred to the paper. The procedure is then repeated for the subsequent colours, after drying.

A range of colourants is available, which basically simulate British Standard inks at a range of densities. This combined with the ability to transfer to any stock makes it quite an attractive system, but as may be seen from Table 1 the initial cost is relatively high.

The discussion thus far has been concerned with systems for litho and letterpress, the requirements of which are, of course, quite different from gravure. In fact a number of systems are available for this latter process but this article is primarily concerned with the former. However, the Remak and Cromalin systems may both be adapted for gravure and another is produced by Ciba-Geigy which consists of a silver-halide colour material and operates on the silver dye bleach principle.

Advantages and limitations

The primary advantage of these systems has already been stated, namely the speed and cheapness with which a very limited number of proofs may be produced. This is particularly valuable for assessing the separations prior to plate or cylinder preparation. However, these proofs are increasingly being used, or at least considered, for presentation to customers and it is here that some of the limitations become more apparent.

If more than one proof is required the relative cost per proof may start to become higher than those produced conventionally. Since each colour proof takes between 30 minutes and one hour to produce, and the cost of the materials is quite high, it follows that the production of, say, 12 proofs is costly. In Table 2 the approximate cost per proof is given for each system and if the labour cost is added to this it soon becomes apparent that this is becoming uneconomic for more than a very small number.

However, cost is by no means the only limitation. In the introduction it was pointed out that ideally the proof should fairly accurately predict the finished job and this is another consideration. It could be argued, with considerable justification, that very few conventional proofs do this anyway and customers are already prepared for the seemingly inevitable differences between proofs and production prints.

In such circumstances they may be just as willing to accept the differences between pre-proofs and production prints and indeed this is already occurring. Nevertheless this relationship between proofs and prints has long been a problem area and since, with sufficient care, conventional proofs can be made to closely simulate the production job it is only fair to discuss how well the pre-press proofs can achieve this similarity. Pira have recently undertaken a study of this and hope to have the full report available later this year.

Probably the major problem areas lie in the effects of dot gain, simulating the ink colour and the differences in base stock, and on these three criteria the limitations of each of the systems soon become apparent.

Dot gain is best simulated on the negative working systems since it is possible by over-exposure, or by using diffusing sheets, to increase the dot area and hence this is probably the biggest weakness of the Remak system. However, even then there are problems since the dot gain achieved by over-exposing the negatives is somewhat different from that occurring by ink on paper in that the former has a more pronounced effect in the highlight end, when achieving similar mid tones to the printed result. How far it thus becomes possible to match the press sheet will depend on the degree of dot gain normally occurring.

With respect to ink colour all of the systems perform quite well, at least when compared to BS 4666 inks. However, the Gevaproof and Transfer-Key, both of which have a fixed colourant density, tend to be stronger than those often printed. In cases when special process colours are required, however, only the Cromalin system really proves suitable.

Only two of the systems, Transfer-Key and Remak, allow the proof to be produced on any paper stock and when producing proofs for jobs to be printed on stocks such as cartridge paper this can be quite important. In our experience even the Transfer-Key, whilst utilising the cartridge stock, does not simulate the ink 'lay' in any way and does not really give the appearance of a cartridge print. Remak is undoubtedly best from this point of view. For most white coated stocks, all four systems give a fairly good rendition, if the correct tonal gradation can be achieved.

Possible future developments

There are two alternatives to these systems which may be suitably developed in the future to be of interest. One is the application of the electrostatic principle used in photocopying machines. Rank Xerox, for example, already produces a copier capable of process colour although the quality is at present not as high as that required for

Remak

Equipment:

28″ × 30″ Frame and charging unit and 'start-up kit' plus drying unit	£2,100
Transfer Unit	£1,380

Materials:

Zinc oxide paper	
21″ × 15″ (per 100 sheets)	£36.99
21″ × 30″ (per 100 sheets)	£73.98
Colorants (6 bottles)	£8.94
Solvent (4 litres)	£14.70
Spray (per 12 aerosol cans)	£29.40
(or in bulk for use with spray gun)	£108

Note: Charging unit includes exposing unit and solvent reclamation unit available at £804.

The following costs for a 10″ × 12″ and 20″ × 24″ proof are only approximate since the consumption of such items as developers, toners, etc, is variable. The capital costs have been depreciated over five years and a throughput of five proofs per day assumed. Any differences from this will affect the capital cost per proof shown in column three. However, it should give some idea of the sort of cost to be expected.

Note: Gevaproof is based on 24 × 30 cm and 50 × 60 cm sizes which is slightly less than 10″ × 12″ and 20″ × 24″.

Table 2/Proof costs

10″ × 12″ proof

System	Material cost per proof	Capital cost per proof	Total
Colour-Key (neg)	£3.30	—	£3.30
Transfer-Key	£6	—	£6
Remak (Transfer)	£1.80	54p	£2.34
Gevaproof	£2	6p	£2.06
Cromalin	£3	23p	£3.23

20″ × 24″ proof

System	Material cost per proof	Capital cost per proof	Total
Colour-Key (neg)	£13	—	£13
Transfer-Key	£18	—	£18
Remak (Transfer)	£7.20	54p	£7.74
Gevaproof	£7.50	6p	£7.56
Cromalin	£11	23p	£11.23

Automatic toner dispenser aids proofing

proofing. However, we could well see developments in this field.

The other possibility is the use of electronically controlled colour monitors. Such systems have already been developed by the Hazeltine Corporation in the US and the Toppan Printing Co of Japan and produce an image direct from the separations displayed on a colour TV monitor. The image is processed in a computer which compensates for ink, paper and press characteristics. It is also possible to modify the image via a manually controlled panel and hence determine what modifications are necessary to the separations. Obviously such systems are likely to prove expensive, but could be very useful where a high throughput is achieved. □

COLOUR KEY LITHO PROOF SYSTEM: AN APPRAISAL

By FRED PHILLIPS
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TO be able to lower costs without sacrifice of quality is a good thing in any industry. To be able to lower those costs with a good chance of improving the quality is a forward step that is even more welcome. And when that particular industry is the lithographic branch of the printing industry and the object is colour halftone process then we, in this industry, must sit up and take notice.

There is little doubt that the print user would buy more colour work were it not for the high costs entailed, particularly where the quantity required is relatively small. In these cases the initial costs, that is the processing, are invariably included in the overall printing price and can – and very often do – greatly exceed the total cost of paper, machining and finishing. It becomes obvious then, that if the cost of processing can be reduced then the final price to the customer can also be reduced, and lower prices to him means that he can either buy new designs more often or buy larger quantities.

Whilst the industry has little or no control over the prices it must pay for labour, photo-sensitive materials, chemicals and metal, when the opportunity arises by virtue of some development that the amount of *time* spent on any of the processing stages can be reduced, then that opportunity should be grasped and the fullest use made of it. Such a development is the Colour Key proofing system invented and marketed by the Minnesota Mining & Manufacturing Co Ltd of which a brief initial announcement was made in the New Machinery, Equipment and Materials section of the January issue of the BP, and now well tried under working conditions.

None know better than those whose job it is to process colour lithographic plates just how much time is spent on intermediate proofing before the final proofs are submitted to the customer. None know better than the machine minders the time and trouble that go into producing on the machine the colour tonal values for each printing. It is these men, in the main, who will – and do – find and appreciate what a great help, time-saver and headache remover is 3M Colour Key. The basis of this technique is a stable, temperature-resistant film made in ten colours: cyan, magenta, yellow, green, orange, red, dark blue, brown, white and black. The shelf-life of unexposed Colour Key film is eight months or more, the colours do not fade