COLOUR KEY

and – because Colour Key is dimensionally stable and, in addition, lies perfectly flat – registration of the colours is a very easy matter. Exposure, which can be made in a conventional vacuum frame with carbon arcs, is the same for all colours; the same developer and development time is used for all colours, thus making it possible (within the limits of film sizes versus vacuum frame size) to expose and process more than one colour at a time.

The primary application of Colour Key is in the intermediate proofing prior to printing down the final plates. No matter whether the colour process method used is from screened negatives retouched and then printed down to albumen coated or presensitised plates, or whether those screened negatives are contacted and made into positives and deep-etch plates made, or whether continuous tone negatives are made and projected to make screened positives for deep-etch plates, Colour Key can be used with a consequent considerable saving in time.

Whilst Colour Key can be used for multi-colour process work within the range of the ten colours already described, for the immediate purpose commercial four colour halftone process will

3M Colour Key positives after swab development being viewed on retouching frame. By placing one Colour Key positive over another in order of printing and in register, the result can be viewed as a normal progressive

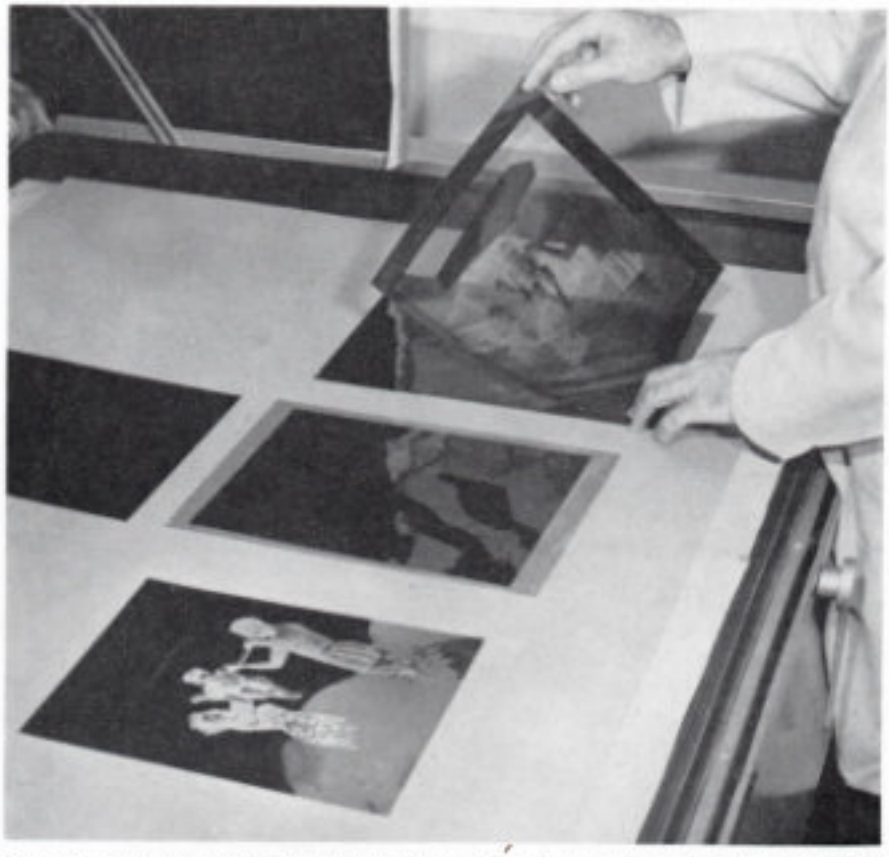
be described, although exactly the same practice would be followed if five, six or more colours were used.

When the screened negatives are made, they are retouched in the normal way to the point where the retoucher requires proofs. At this point, the yellow, magenta, cyan and black Colour Key films are contacted to the negatives in a conventional vacuum frame and, after exposure, swab developed. What is then obtained is a positive screened colour film of each of the four colours and, because the Colour Key film uses exactly the same pigments as are found in lithographic inks, the resulting positive bears the closest possible comparison to a machine proof. The Colour Key proofs are then placed in register on a sheet of white paper in the same order that the colours will be machined.

It must be emphasised here that whilst the clear portions of Colour Key film when developed are apparently glass clear, the act of placing a number of sheets one on top of the other does tend to give a slightly yellow tinge and it is recommended, therefore, that the best method of viewing is to register the Colour Key films with a backing sheet of the whitest paper possible and to place the whole assembly on a light box using diffused light through flashed opal glass.

At this stage, the retoucher can see exactly what adjustments must be made to any particular colour in any particular place. As is well known, in many cases not all the colours need further work on them. Thus, when the extra work has been done on those negatives requiring it, only the matching Colour Key films need to be remade for final checking. Here is a further obvious saving as the complete job does not have to be re-proofed.

Exactly the same procedure is followed on indirect colour halftone work, and although this means contacting the screened positives and making negatives from them and then contacting those negatives to Colour Key, despite this extra effort, Colour Key is still more than a worthwhile procedure.



Colour Key films are exposed to a source of ultra-violet light, such as a carbon arc, through the negatives. Because each colour has approximately the same exposure time, as many as four colours may be exposed simultaneously. Here, the negative is being removed from the sheet of Colour Key after exposure

It often happens that while the retoucher submits his final proofs knowing that the result is, on four colour commercial halftone, a commercial facsimile of the original, the customer will, rightly or wrongly, insist on further alterations. If the printer is fortunate enough to have customers (and, believe it or not, some do!) who can visualise the printed result, then the final Colour Key films can be submitted without going to the extent of printing down the plates and machine proofing them.

If the normal progressive proofs are accompanied by final Colour Key proofs, the job of the machine minder is made considerably easier because Colour Key using as it does the same pigments as found in lithographic inks, can be used as overlays for checking the tonal values and depth of colour of the previous printings. For example, the machine minder can run up the yellow, pull off a few sheets and, by using the magenta

Colour Key, register it on the yellow and compare it with his progressive: and the same practice can be applied equally to the cyan and the black.

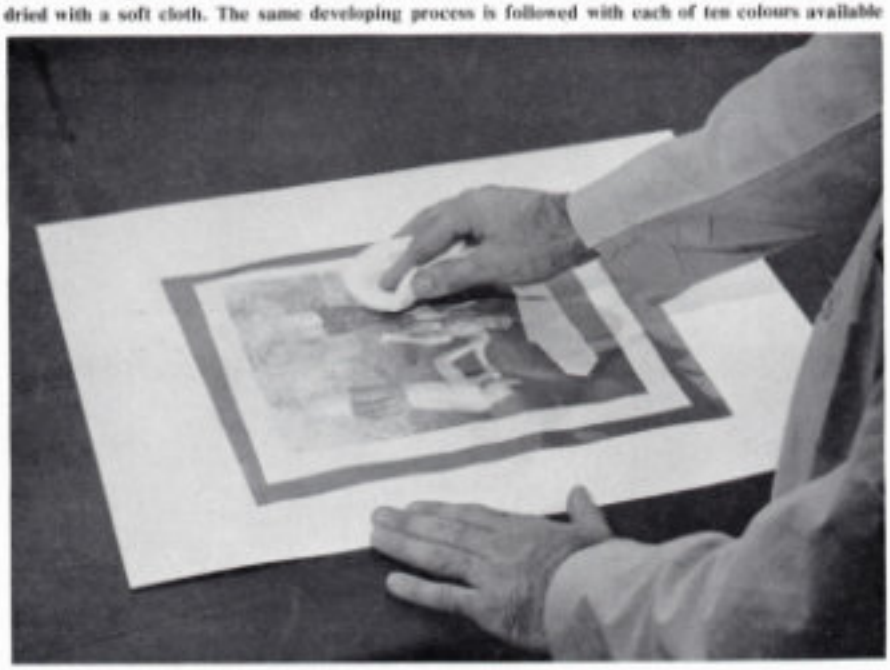
Much colour work for halftone colour reproduction is produced from black-and-white artwork colour separated by the artist. The assessment of the tonal range for each colour when the original is in monochrome wash or air-brush, or both, with the possible addition of line drawings as well, taxes the skill of the artist to the full. It is in the preparation of this type of artwork that Colour Key is invaluable. When the artist reaches the stage beyond which it would not be safe to go with guaranteed certainty, this is the stage at which Colour Key proves its worth. The artist can have screened negatives made of each of the separated monochromes and from these make Colour Key positives which, when registered, will provide a clear indication of what alterations, additions, and adjustments to the monochrome tonal values on the artwork are required to achieve the desired result.

Not only colour retouchers, but also artists and machine minders would find it invaluable to have at their disposal a quick and easy method of ascertaining, visually, the accurate percentage or fractional values of tones that can be obtained in commercial four-colour process. Such a comparison scale can be obtained by making a screened halftone negative of a step-wedge, using the correct screen angle for each of the four colours, and making Colour Key positive proofs from those negatives. The laying of any combination of the four colours in the required position on any of the others in the desired printing order allows the resulting colour and percentage value to be seen readily. For example, it becomes a matter of moments to find the colour that would be obtained from a combination of 80 per cent yellow, 40 per cent magenta and 10 per cent cyan. The total percentage combinations obtainable is dependent only upon the number of steps made in the wedge.

Practical experience has indicated that Colour Key is no gimmick. It is a tried and thoroughly tested process of which those applications dealt with are but a few. They are, however, more than sufficient to adequately demonstrate that in Colour Key the industry has been provided with a process that can save considerable time, and the manifold uses to which it can be put will, in course of time, prove to be limited only by the ingenuity of the user. ✦

Colour Key sheets are placed down in the same order that the inks will be run, and employ the same pigments as are used in lithographic inks. Each sheet has registration marks for exact alignment

After removing the coating in the non-image areas the sheets of Colour Key are rinsed with water and dried with a soft cloth. The same developing process is followed with each of ten colours available



SIMULATING THE LOOK OF THE PRINTED IMPRESSION

'The movement today in colour offset has been towards greater realism.' This is reflected in the quality of pre-proofing. Gerry Withers examines two systems.

It was the adoption of the colour scanner that first provided the impetus for the development of a four-colour proofing system that did not involve the use of a proofing press.

Those printers and the occasional trade colour separation houses who invested in scanners in the early days would almost always be equipped with flatbed proofing presses which largely continued as satisfactory machines for proving separations.

Later the market broadened to include houses, often quite small and under-capitalised, who did not want to get involved in machine proofing. For these people, mainly in the larger UK printing centres, the trade proofing house was an essential service.

However, delays which resulted from buying-in trade services worked against the scanning houses' need for prompt methods of checking the results of the four-colour scanned sets.

Work began at the R&D departments of several graphic arts suppliers to perfect systems which could photomechanically simulate, via four screened separations, the inked impression from a set of plates. The theory was clear. Since the necessary halftone dot data existed on film it should be possible to convey this data to some form of photosensitive base which could take toners matched to standard process colour inks.

There was, however, a considerable divergence between theory and a useful practice. First developments took place in the early Seventies but it was more recently, notably in 1982, that non-mechanical colour proofing systems began drawing nearer to the standards required.

The system today represents not what is theoretically possible from a set of colour seps, but what this set will look like when plates are made and running on the press and experiencing the variables of a long run.

The Cromalin system: 'standard acceptable proofs for the graphic arts industry.'

Among early efforts towards a non-press colour proofing system was 3M's Transfer-Key system, which involved the separation of four-colour screenings on four separate sheets of clear film. These, when placed to register over punch studs, simulate the four-colour result.

Such systems did not make much headway in the graphic arts business in the UK. The transfer method was considered rather inflexible, the contacted dot being sharp, which means it does not reflect what will happen on a production press. Furthermore, the customer was probably used to the single-sheet printed proof. The fact that this did not really contain information that would be paralleled during the production run on the press was somehow largely overlooked by the end user/buyer.

The movement today in colour offset has been towards greater realism. Many attempts, some very successful, have been made to bring a framework of control to the often subjective area of four-colour repro. Later developments of non-mechanical proofing clearly reflect this tightening of procedure and aim to produce colour proofs which mirror what will happen on the web or sheet and take account, to some degree, of the less than perfect nature of the paper stocks now in common use.

Embellishments

Two systems seem worthy of consideration: Du Pont's Cromalin and 3M's Matchprint. The latest embellishments to the Cromalin system are the Eurostandard Cromalin (1981) including the availability of the ATM 2900 automatic proof processor (1980) and the Cromalin Press Finish System, a post-toning surface treatment which has the effect of converting the high surface finish of the standard Cromalin to something resembling more closely the customers' stock.

The Matchprint Colour Proofing System is interesting both as a single-sheet, four-colour proof system and for its relative simplicity and economy. The system requires only electrical and plumbing connections to be made and needs no specially controlled environment, whereas the Cromalin ATM system, a very elegant conception, should be installed in a 'clean-air' room holding a temperature of 23°C and an RH of 50 to 60 per cent for best results.

3M provided a full test mar-

Matchprint: simple and economic proofing system.

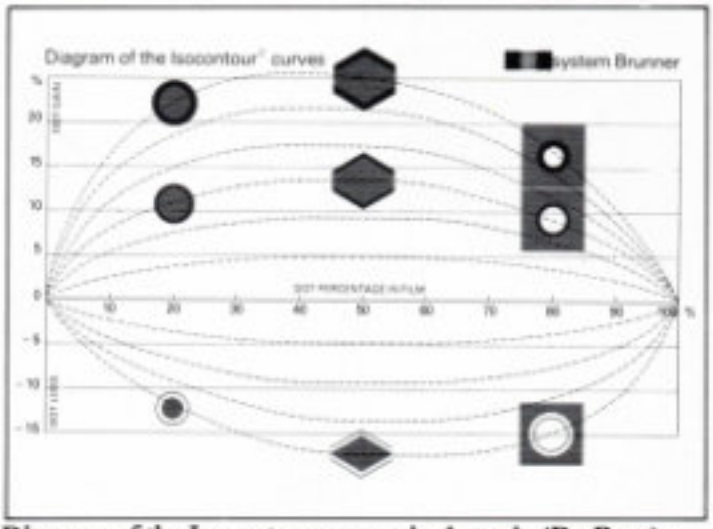


Diagram of the Isocontour curves in dot gain (Du Pont).

keting for Matchprint in European trade repro houses and large commercial printers prior to the official UK launch at last autumn's Pre-Press show in London.

Cycle time

The system is fully automated and produces a single-sheet, four-colour proof from the film positives in a cycle time of 15 to 20 minutes. It uses a factory-coated control imaging material formulated to the international colour process standard for offset (CIE 1367), which is comparable to the UK standard BS 4666.

Operation variables are said to be eliminated and each sheet of UV-sensitive Matchprint material reflects the printing densities and variable degrees of dot gain.

Successful installations include those at Crystal Repro, who run a Hell Chromacom system, Mayday Reproductions, who specialise in agency four-colour ad work, and J Howitt & Son, Nottingham, the quality colour printers.

In the BPIF booklet *Standardising Process Colour Printing*, over 60 variables are listed which 'can be present and which may affect the appearance of printed colour reproduction'. Add to this the fact that the human optical system is so refined that it can distinguish differences between four and five million colour variations.

Quite incredibly, the eye's adaptation to existing lightness allows a factor of 10^{11} differences to be registered. No graphic arts system can hope, as yet, to be as responsive as this.

In 1974 Pira constructed a colour printing specification for 'general purposes', reducing the number of colour variables to a more manageable 17. Yet printers, even if they are given a firm specification, have the task of controlling pre-press and on-press procedure so that they can perform to the specification.

The Pira list of variables falls into seven divisions: colour repro (including the action of filters, films, light sources, screen rulings etc); plate characteristics; paper characteristics; water or other dampening solutions and inks; and the standard of operator training and experience. There is also the question of the process itself and the type of machine used to apply it, its running speed and so on.

Late arrival

The Du Pont colour proofing system entered the field in 1972. There came others such as the Agfa-Gevaert Agfaproof and, as mentioned above, the transfer systems which have now largely disappeared from the UK. Curiously enough, as recently as the last Drupa the German company Kalle introduced a transfer-type colour proofing system. Apparently this will not be marketed in the UK.

One of the strengths of the Matchprint system is that it will allow the matching of the colour proof to particular press behaviour. Vital here, and to the ultimate value of any colour proofing system, is the all-important factor of halftone dot gain.

Early non-mechanical photocolour proofing systems had been criticised for not reflecting this common and critically important press variable.

Matchprint's ability to represent dot gain is achieved by variations of exposure on the Matchprint equipment related to what is known of dot behaviour on a particular press.

Dot gain is often thought to be solely a matter of the 'squash' effect at the plate-blanket transfer and at the impression nip. But, as Du Pont points out, there are several other contributors to the effect, such as ink viscosity, plate and blanket characteristics and press settings.

Also very important is the optical dot gain. This is the effect that light reflection and scatter has upon the dot on the printed sheet. It is caused by the light casting a shadow of the dot into the substance of the stock and the shadow of that dot is reflected as a scatter. It is those parts of the shadow reflection which leave the paper vertically that have the effect of broadening the dot, adding an aureole, as it were, around the edge of the printed dot.

There has never been much display of dot gain on proofs produced on a flatbed proofing press, nor can there be. But the two leading colour proofing systems, Matchprint and Cromalin, can in their different ways emulate this and at last offer a colour proof which will largely represent, to buyer and printer, what the production job will look like.

The latest manifestation of the Cromalin system is very elegant. In cooperation with Du Pont, the F Brunner organisation of Switzerland has produced the Eurostandard control strip and test form. Du Pont says that working from measurements made from these two control elements it is possible to prepare Cromalin proofs which can represent 'the standard acceptable proofs for the graphic arts industry'. It is certainly a very tight and well researched control procedure.

To this must be added Du Pont's Press Finish System, which allows the Cromalin colour proof to be treated with four de-lustering toners which will produce simulation of the particular finish of ordinary commercial stock, web offset publication stock and newsprint and supplement stock.

Users of Cromalin include the Tate Gallery (via Balding & Mansell); Conran Habitat; *Woman's Own* offset section and also production staff at the National Magazine's office of *Good Housekeeping* (via Jarrold & Sons).

Significantly, it seems that the print buyer is now beginning to accept the non-mechanical colour proof as proper evidence of what will be produced on the production press. Whilst it remains all too true that the more general print buyer has little knowledge of the existence of pre-press and on-press offset variables, the more skilful and up-market four colour buyer is well aware of them. □