Digital Print Finishing: Special Considerations

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Special Considerations

Much thought is given to the creation and printing of digital color print. Less thought tends to be given to the finishing of the work, yet digital color print has several special characteristics that need to be taken into account when considering finishing. These include bleed trimming, especially of sheets where there may be 'image drift', cracking of toner when folding sheets, set integrity for variable data printing, especially for transactional documents, automatic finishing of documents with differing page counts, merging the output from different print engines and imposition and pagination.

Introduction

Even in the days before digital print, it used to be said that if you were a printer and you found a print designer who understood printing, you should nail one of their feet to the floor. If you found a print designer who understood finishing as well, then you should nail both their feet to the floor. This is even truer in the era of digital print, when anyone with a computer can create a document destined for printing, but often with little understanding of the processes between authoring and finishing.

Full Bleed

At the time of writing there is no digital color production printer capable of printing right to the edge of a sheet. The removal of the unprinted border around a sheet is therefore of importance. One option is to take the output and cut it on an ordinary guillotine/cutter, but this method is not appropriate when there is 'image drift' such that the image from one printed sheet to the next can vary in position by up to 1.5mm in any direction. For accurate finishing in these circumstances sheets need to be four-side trimmed individually, using an optical mark that is read by the cutting device as a constant reference point.

An example of this is the Duplo DC 545 sheet cutter, which reads an image registration mark that is printed during the normal printing process like a crop mark, and monitors the relative position of the image registration mark and the lead- and left-hand edge of the sheet. If the image has moved, the device automatically adjusts its cutting and slitting positions to compensate, so that all the sheets in the output stacker are correctly registered. The print designer needs to know that the finishing department has one of these machines and what the specifications are for the image registration mark.

Cracking of Toner

Partly because of heating of paper during dry toner printing, and because of the chemical and physical properties of electronically applied inks, the output from digital color printers tends to be prone to cracking when folding. A rotary scoring device is ineffective in preventing this. The solution is a creasing device. There are various options available for this, from devices that crease across the direction of paper travel as stand-alone units, to creasers that are integrated in a finishing device such as an in-line booklet maker and creasers that are integrated with slitting and cutting with image drift correction for the most consistent output. The Duplo DC 545 is an example of this type of integrated device. As with offset printing, selection of the correct grain direction will greatly reduce the incidence of cracking, but digital color printers are sometimes more sensitive to grain, so that the ideal printing grain direction is not compatible with the ideal finishing grain direction.

Off-Line, Near-Line or In-Line?

One of the most frequently asked questions by printers is which is better; off-line, near-line or in-line finishing. These are defined in the table below.

Table 1. Finishing Mode

Off-line	Finishing device is completely separate from the print engine. No communication between the two is possible. May be adjacent to print engine, or remote.
Near-line:	Finishing device is not physically connected to the print engine (could be in a different location) but communicates with print engine/server either by means of interface cable or intelligent marks on the document, such as OMR, bar codes or glyphs.
In-line	Finishing device is close-coupled or hard-coupled to the print engine, and there is a high level of communication between the two. In some case, the print engine will set up the finishing device.

Each of the three options has advantages and disadvantages.

Off-line finishing enables the output from multiple print engines to be brought together, and the off-line devices often work at very high speeds. The disadvantages are that there is an increase in the amount of labor required and there is no sheet or set integrity. It is not always possible or desirable to finish variable data/personalized work because of this.

Near-line finishing also enables the output from multiple print engines to be brought together, but with the advantage that dynamic feeding and finishing is made possible, either by means of marks on the sheets or by interface cable. In some case, the near-line finishing devices can be set up automatically by receipt of a job ticket.

In-line finishing enables printing and finishing to take place in one continuous operation without operator intervention, and sheet and set integrity is provided. The disadvantage is that generally it is impractical to use one finishing device for multiple print engines, despite the fact that generally the finishing devices are capable of far greater rates of production than the print engines.

Job Integrity and Remote Set-Up Possibilities

With the increasing demand for near-line and in-line finishing, it became clear that a new, open, communication standard was required. A group consisting of Oce, Xerox, IBM, Strålfors, Hunkeler and Duplo has developed the UP3I (Universal Printer, Pre- and Post-Processing Interface. UP3I is intended, among other things, to shorten set-up and preparation times, to enable remote set-up, to enable implementation with job tickets, to support both continuous form and cut-sheet printers, and to enhance job recovery in case of paper jams. It is compatible with and complementary to CIP4 and JDF. A consideration for printers who are planning to invest in new finishing devices should be whether the vendor is compliant with UP3I, because for future up-grading of equipment it will become highly desirable. More information can be found on the UP3I website www.UP3I.org.

Set Integrity for Variable Data Printing

A key application for digital color printing is the production of documents, and especially booklets, that are personalized for a named individual. Sometimes, for example in the case of financial statements, the content of these documents is highly confidential. Furthermore, in a run of documents there may be substantially different page counts from one document to the next. Providing for these contingencies in an off-line finishing device is virtually impossible. Few digital color production printers have in-line finishing available, and this option may be undesirable for some of the reasons previously discussed.

The solution then is near-line finishing, using marks on the paper (which are subsequently trimmed off) to identify the feeding sequence and to report the correct feeding of the sheets in a set back to a management information system. A reader at the delivery of the finishing device can read a mark to confirm and report that not only have the sheets been fed in the correct sequence but that the set of sheets has been completed and delivered. This kind of workflow management is of crucial importance in variable data printing. Duplo are co-marketing with Heidelberg a unique near-line finishing solution for the NexPress 2100 which provides a solution to the issues of closing the workflow loop and the use of JDF job tickets.

Merging Output from Different Print Engines

Until the cost-per-copy of color falls to the same level as black and white, splitting pure color and pure black and white pages in a document between two dedicated print engines will continue to be desirable, and there are several server manufacturers such as EfI (with the Velocity™ suite) that provide automated solutions for this. The requirement then is for finishing devices that can automatically reunite, in order, the color and black and white sheets. In order to do this, there are several solutions. If booklets are the finished product, colored sheets can be pre-printed and loaded into an auxiliary feed tray in a black and white printer. In case of a paper jam, however, there is no integrity system to re-order sheets or in the worst case re-print. An off-line solution again lacks the integrity, especially where the color/black and white mix varies in sequence from one set to the next. A near-line device with set integrity will provide the best solution. Similarly, for reassembling the book blocks for perfect binding or mechanical binding, a near line sheet feeder or collating system is the best solution.

For all of these cases, it is essential that there is an awareness firstly of the need for a bar-code or machine readable mark to be printed, and secondly of what kind of finishing device is to be used so that the right kind of mark is printed in the right location on the sheets. Not all datastreams for digital color production printers have the ability to generate the bar codes automatically, so owners and operators should ensure that when specifying a new printer it either has or can be up-graded to have this capability.

Imposition and Pagination

The different finishing processes of off-line, near-line and in-line require different imposition and pagination rules.

Offline devices, if flat sheets are being gathered, simply needs piles of all of sheet 1, all of sheet 2, all of sheet 3 etc.

Near-line devices either need a pile of offset-stacked complete sets, or a straight stack of complete sets. In the latter case, they should preferably be printed in the sequence *1-n, face up*, since a feeding device normally starts feeding from the top of the pile. A feeder equipped with an inverter will also permit feeding of sets which are printed in the sequence *1 -n, face down* which is the standard sequence preferred by printers and makes the finishing process compatible with other solutions, so the operator does not have to learn a special procedure.

Conclusion

In the era of digital printing, as with offset, it is clear that expertise is still required between receiving a file and turning out a finished document. Print providers today need to be aware of these issues not just when they convert raw data into something that they can print and finish, but also when they specify new equipment. New digital printing technologies have led to and will continue to lead to new finishing technologies and techniques. Manufacturers of finishing equipment are working hard to provide solutions that are applicable to both the traditional offset market and the new digital print market, and to help to raise awareness of the key issues that will lead to improvements in customer satisfaction, productivity and profitability.

Biography

Dominic Quennell is the Vice President of Global Marketing at Duplo Corporation, Japan. Before that he was responsible for developing Duplo's distribution network in Europe, the Middle East and Africa. With twenty-six years in the print finishing industry, Mr Quennell has been closely involved in developing the markets for in-line and near-line digital print finishing since 1989. Duplo Corporation has been established for forty-eight years and is a leading Japanese manufacturer of print finishing equipment, digital duplicators and bar-code readers.