

7C gravure printing – is it possible?

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Frequent ink changes and multiple spot colours really drive up the cost of packaging printing. Whereas the use of a fixed, usually 7C, palette is now well established in flexo printing for certain applications, this approach to colour separation, which is able to portray over 90% of Pantone colours, has been little used in gravure up until now. However, current developments in press technology mean that expanded gamut 7C gravure printing is now also a possibility.

The advantages are obvious. Shorter and shorter print runs mean that with conventional production (CMYK + spot colours) the proportion of waste ink in the overall process increases. Using the same fixed set of colours on a gravure press (CMYK + red, blue and orange) means that only the gravure cylinders need to be changed for a new job, which considerably cuts cleaning and change-over times and effort.

At job start, standardized and very precise colour definitions in 7C printing don't just mean simplified and quicker colour matching, they also save several hundred metres of start-up waste. To give you an idea

of how the two processes compare, the Windmüller & Hölscher (W&H) Technology Centre printed the same demanding flexible packaging motif using 7C and 4C plus three spot colours. Using 7C separation, the first press proof was in colour, whereas three attempts were required with spot colours before production could start.

A key reason for this is that using mono-pigmented inks with an expanded colour palette contributes to good colour repeatability. At most, it is now only the brightness of these colours that needs to be matched or corrected by adding the right amount of extender to the ink.



What system limitations are currently holding 7C back?

1. Colour consistency

A high level of colour consistency with narrow tolerances needs to be maintained over the print run and with repeat jobs. In order to keep colour densities stable during the production run it is necessary to ensure that the same quantity of ink is consistently applied to the substrate. However, spot colours are fairly insensitive to density fluctuations or, put another way, the impact of fluctuations is not very visible. In contrast, 7C composed special colours react more sensitively to unstable colour densities and this becomes apparent in the form of colour deviations.

The following are possible causes of poor colour consistency on a gravure press:

- Fluctuating ink viscosity and/or ink temperature
- Declining transfer volumes due to ink drying in the cells of the gravure cylinder
- Worsening print-out due to wear of the doctor blade or the gravure cylinder

Given the simple design of the printing unit, the stable, metal forms and their standardized and fully automatic production process, it is easier to master these sources of errors in gravure than flexo printing.

2. Register system

However, the really decisive factor that allows the successful use of an expanded, fixed colour palette on a unit-based gravure press is how

Register accuracy throughout the production run is the decisive parameter that allows a unit-based gravure press to print successfully with a fixed, expanded colour palette



Source: Huhnamaki Flexible Packaging Germany



Current developments in press technology make expanded gamut 7C gravure printing possible

Source: W&H

it holds register during the production run. The register control system must guarantee that the gravure forms print the separated colours precisely in position on top of or alongside each other without any register differences. If this is not the case it becomes apparent in

the form of disruptive, fuzzy reproduction of the packaging motif or as colour deviations. Possible causes of register error include:

- Poorly performing register control system
- Poor web guidance through the press

- Poor substrate quality (lack of uniformity, temperature dependent coefficient of elasticity)

In-register reproduction of spot colours as well as reversed out type and lines in small point sizes in particular pose a major challenge in seven-colour printing, although fine type is less susceptible to register fluctuations than spot colours.

The overwhelming majority of register control systems used on gravure presses today are not suitable for 7C printing because their tolerance range of +/- 75 µm is too large. As in CI flexo printing, it really only becomes possible to print with a fixed colour palette on a gravure press once maximum tolerances of +/- 35 to 40 µm can be adhered to.

"To enable printing with a fixed colour palette on gravure presses, the register control system must maintain tolerances of ± 35 to 40 µm."

Support systems for the successful use of 7C

- **Register control**
Gravure presses equipped with modern technology allow register va-

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lues to be achieved that would otherwise only be possible on CI flexo presses. W&H delivers this by means of a series of support systems and measures. For example, the Twin-Eye sensor keeps the register to within the narrow tolerances required for 7C printing on demanding flexible substrates.

Drive and register control form a single unit and so avoid register variations during the production run.



Source: W&H

Trend displays and recording functions help to deliver seamless quality assurance

It also minimizes the material and time consumed at start-up and during reel changes.

■ Special guide roller technology

The web runs over guide rollers between the press units. On the one hand, these must ensure that the web doesn't move laterally, since this would affect sidelay register, but also that it doesn't vibrate, which would adversely affect longitudinal register.

The high rotational speeds in gravure presses means that the guide rollers need to be well balanced. If their diameter is too small the tension of the web can cause them to bend, leading to creases. Webs can also run badly and unevenly when the distance between the guide rollers is too great or when they are not precisely parallel in the press.

W&H has developed a new guide roller technology that is designed to ensure smooth and stable web travel through gravure presses at high production speeds. The advantages

of this technology really come to the fore when dealing with difficult packaging substrates such as thin and smooth films or films that tend not to stay flat. These and other printing problems are prevented by this technology.

■ Colour stability

With gravure presses, it is difficult to avoid ink residues remaining in the cells when ink is transferred from the printing cylinder to the substrate web. The general rule is the longer the distance the emptied cells have to cover before refilling, the greater the risk that ink residues will dry. Adjusting the inks to accelerate drying also exacerbates this problem.

W&H's answer to this problem, a driven inking roller positioned at three o'clock, has proved effective. This refills the cells of the gravure cylinder with ink after just a quarter of a turn and this in turn noticeably reduces the risk of dried-on ink. By replacing the 'old' ink printed from the cells with 'fresh' ink it prevents the rapid drying of ink in the highlights in particular.

This means that unwanted press halts and waste resulting from poor impressions become a thing of the past. Above all, it leads to higher availability for gravure presses printing with a 7C palette.

In addition, configuring the press unit in this way optimizes inking of the forme with difficult inks and conditions, such as, for example, metallic pigments and very fine gradations. The result is a simultaneous rise in colour consistency, print quality and printing speed. W&H offers an integrated management system that controls ink viscosity and temperature on gravure presses. Besides being given a read out of ink viscosity, the press operator is also notified of any deviations.

Modern viscosity control modules such as the Viscocontrol G automatically restore it to the target

value once a freely defined tolerance limit is reached. This module incorporates all the elements required for automatic process control: display, interpretation, correction. Besides viscosity, temperature control is a key element in ink control when printing with a fixed, seven-colour palette.

The W&H Ink cooler control module ensures that the ink temperature remains constant over the whole print run. Temperature-related effects on ink transfer and other aspects of printing can therefore be avoided.

■ Detecting deviations in good time

Besides adjusting temperature, web tension, blade pressure and corona pre-treatment, the new Ruby data management system from W&H also captures the data that drive the systems controlling viscosity and register accuracy.

This system can be enhanced through a range of optional and freely combinable add-ons such as Ruby Check. This integrates 100% image monitoring and press process data, and feeds all the production relevant data for control and job management into a single system.

Trend displays and recording functions also contribute to seamless quality assurance, allowing substrate and colour deviations to be quickly detected and the appropriate steps taken before tolerance breaches result in unacceptable prints and customer complaints.

Moving into 7C

How can one be sure that a gravure press and the associated processes are good enough to be able to start talking to brand owners about such a move into 7C?

Crucially, the gravure press must be able to guarantee outstanding register accuracy. Modern gravure presses equipped with intelligent support systems and the necessary technical tools are undoubtedly capable of fully exploiting the promising advantages of a fixed and expanded seven-colour palette, and these capabilities can be demonstrated using the records of the values they deliver when printing conventional jobs.