New vs adapted technology

Digital packaging decoration: specifically developed technology or adaptation of an existing one?

We live in a dynamic world where constant change is the norm. This reality requires continuous technological innovations to enable it. In many aspects of our lives, digital solutions answer this growing need, replacing lengthy, cumbersome processes with agile, quicker and cost-efficient methods. Packaging decoration for rigid cylindrical containers is no different.

Digital decoration solutions have only recently begun showing up in this mature, analogue-dominated world. However, as a relatively new domain, an interesting question arises in terms of the right approach to developing a digital direct-to-shape (DTS) decoration technology for cylindrical packaging: is it better to use an existing printing technology platform and adapt it to digital DTS application, or is it better to start from scratch and develop a totally new technology?

On first thought, it makes sense to take an existing analogue printing platform and simply integrate it with digital printheads. After all, the platform is already well-established, has proven performance, has been mastered by most of the industry, and as such is perceived as low risk. However, when we dig a bit deeper, it appears that these advantages are not enough to ensure a truly robust industrial digital printing solution suited for the rigid packaging industry.

Consider the speed

When creating an industrial DTS digital decoration solution for rigid cylindrical packaging, both the system architecture and the inks should be examined. In regard to the system architecture, using existing analogue DTS architecture and simply replacing the printing plates in each colour station with printheads is very challenging. In analogue decoration technologies, each container must go under the same set of printing plates to achieve consistent decoration results on the total batch. Therefore, the entire concept is based on the ability to print containers one by one at the required printing speed. Achieving the decoration speed requirements is met by simply rotating the carousel faster; but when going digital, this approach is limited. The limiting factor is no longer the rotational speed of the carousel, but the ink-jetting capacity of a single printhead, which, by definition, is limited.

A more robust approach would be to create a parallel architecture, in which the decoration speed is not dependent on the ink capacity of a single printhead per colour, and speed scalability is delivered by multiple printheads jetting at the same time.

Decoration features and colour scalability

In addition to meeting the decoration speed requirements, a solution must also meet the decoration feature requirements, meaning the number of simultaneous colours. Analogue decoration is based on pre-mixed spot colours and on average, a decoration solution consists of four process colours and four spot colours. Going digital – truly digital – one would like to eliminate the need for spot colours and cover the entire gamut with process colours, which means a need for far more colours.

So a second consideration would be feature/colour scalability. In the analogue carousel architecture, to increase the number of simultaneous colours, one must increase the diameter of the carousel. This translates immediately to a challenge in the ratio of R^2 regarding the ability to rotate the bigger carousel at the required speed and required indexing accuracy.

To mitigate this point, one should consider different deposition architecture, one that is designed for multiple colours (and desirably, also embellishments), that can hold as many as 12 or more different inks at any given time.

Inks vs substrates

With regards to the ink, it is also important to consider whether or not the same digital ink can be used for all digital decoration solutions.

Printing on shaped rigid containers is by nature different from printing on flat surfaces. In shaped containers, the decoration is applied as the container rotates in relation to the printheads. Also, rigid containers are made of non-absorbent materials such as metal, aluminium and high-density polyethylene. Therefore, using an existing digital ink that was originally developed to print on flat paper or corrugated substrates to print on shaped rigid containers is not the right approach.

The ink for digital printing on rigid containers must be specifically developed to meet this medium's unique challenges and provide the quality required. Companies that understood this from the very beginning and developed not only the system architecture but also the inks that go with the system, have a much higher chance at succeeding.

So, what is the right approach?

There are no shortcuts when it comes to creating a robust DTS digital decoration solution that will move the rigid packaging world forward and provide a true replacement for analogue decoration. Only dedicated technology for the system architecture and family of inks, designed for mass production of direct-to-object inkjet printing can reach the high-quality, desired speed, and quantity independent economics required. Only when these three essentials are achieved can a replacement take place.

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