MAKING ITS MARK

Eric Hensen introduces the concept of 'tattooing' in aluminium – the technique of durable printing in anodised aluminium that leaves a colourful lasting impression

Eric Hensen is Commercial director at Polychromal

You read that correctly: 'tattooing in aluminium'. This article describes the technique and points to consider during full-colour printing in aluminium, also called subsurface printing.

When printing 'in' anodised aluminium, the dye penetrates deep into the pores of the anodised layer, anchoring the impression permanently in the plate and thus not appearing on the surface. In addition to the extremely durable finish, the process is flexible and suitable for one-off productions, e.g. front panels, nameplates, bar code labels and aluminium art objects. This makes it a cost-effective alternative to screen printing or a good addition to existing printing processes. Anodised aluminium itself offers a decorative and modern look and is also lightweight, extremely durable and recyclable.

Compact aluminium printer

THE POWER OF THE ANODISED LAYER

Aluminium printing is done in the open pores of the anodised layer. An anodised layer is built up electrolytically: the surface of untreated aluminium is converted into an aluminium oxide layer, which is transparent and porous. This anodised layer can be partially or completely dyed, and then transformed into a ceramic layer by sealing.

The anodised layer with open pores is vulnerable to damage. When printing the plates, the print-operator has to work carefully; fingerprints or marks are easily made and will then be permanently visible in the surface.

Most important of all is the quality of the anodised aluminium sheet. The anodised layer must be equal across the plate; it must have a high absorption capacity, be burr-free and have a decorative appearance.

BARRIER-COATING FOR THE STORAGE AND PROCESSING

There are anodised aluminium plates with open pores which are provided with a transparent barrier coating also called a 'preservation layer'. This barrier coating, which is present on industry-standard Duraseal plates, offers protection against external factors such as humidity, fingerprints, dust and other ambient influences. Aluminium plates with a barrier coating can be stored much longer and do not show any decrease in the absorption capacity of the open pores.

"A correctly anodised and sealed aluminium sheet is 20 times more wear-resistant than a good epoxy coating"

SEALING PROCESS – AN ESSENTIAL FINAL STEP

In order to make the plates durable, scratch-resistant, solvent-resistant and weatherproof, the still-open pores have to be closed. This is done by a chemical process in which the aluminium oxide of the anodised layer converts

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A flatbed aluminium printer

Image transfer process of anodised aluminium, with or without sealed pores

"Anodised aluminium offers a decorative and modern look and is also lightweight, extremely durable and recyclable"

into aluminium hydroxide by immersion in water at 97°C for 45 minutes. Because the aluminium hydroxide molecules are larger than the aluminium oxide molecules, the pores close and the printed dyes representing text and/or images are captured (tattooed) in the anodised layer. After this the decoration is resistant to solvents and other chemicals unless the anodised layer itself gets affected.

This formed aluminium hydroxide is also very hard and offers a supreme mechanical protection. A correctly anodised and sealed aluminium sheet is 20 times more wear-resistant than a good epoxy coating.

PRINT TECHNOLOGY

In addition to conventional screen printing and photomechanical printing, since 2005 it has also been possible to print full colour images in the anodised layer with a flatbed inkjet printer. There are a limited number of companies who make these specific aluminium printers, all based on existing and proven technologies from Epson, Roland, Mutoh and Mimaki.

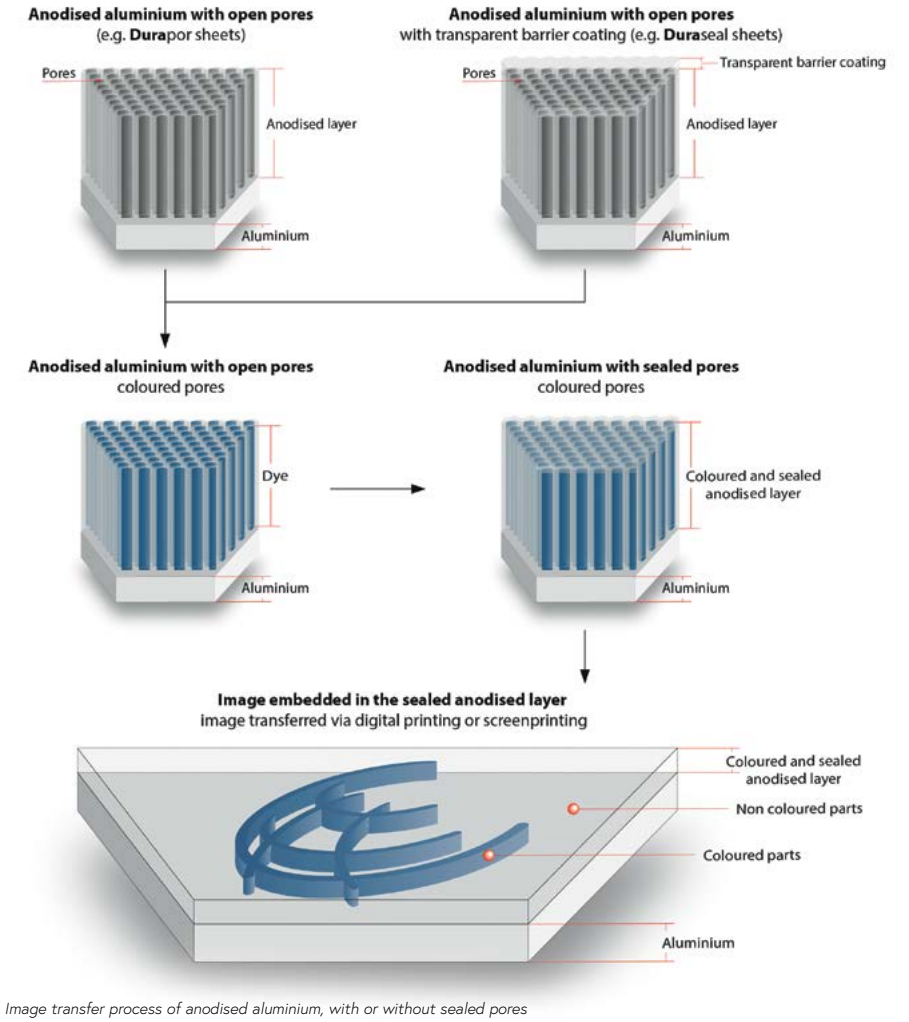

Image transfer process of anodised aluminium, with or without sealed pores

It is important that the printer is completely solvent-resistant as the inks used are solvent-based. Some manufacturers use eight colours and others only five. Using fewer colours offers the advantage that the empty channels can be used as spare. If one of the dye channels gets blocked it can redirect to a spare channel. This guarantees continuity in production and the printhead also lasts longer.

KNOWLEDGE OF PROCESS AND MATERIALS

The quality of the printer is important for an accurate and sharp impression. But just as important is the knowledge of the operator. Not every piece of artwork can be printed with the same settings. For example, printing photos requires a different printer setting than printing texts or logos. Key variables include temperature, print height, print speed, head speed, uni- or bi directional printing, vacuum table, heating, the drying of the printed ink and the colour profile. The operator's knowledge can be increased with training but good support from the printer manufacturer and plate supplier is also essential here. A manufacturer that can supply printers as well as anodised aluminium plate material can offer added value.

CONCLUSION

Aluminium printing is a technique that offers many advantages and produces products that are durable and scratch resistant. However, the process has the necessary points for attention that determine the quality of the end product. With enough attention to the process and materials, you have a technique and a highly flexible in-house tool to create a decorative full coloured (tattooed) aluminium plate that will leave a lasting impression. ■

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Printing in aluminium ensures lasting, vibrant colours

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