



## COLOR INVERSION WITH ACRYLIC

The colorful world of light transmission in signage.

**C**reating a sign that appears dark by day and glows white at night, also known as color inversion, can be a laborious multi-step process.

Pairing a white diffuser layer with a perforated film is a typical way to create color-inverting signs.

These films, however, can add unnecessary costs and limit the visual impact of the sign, raising the questions: What are the costs and limitations of the industry's film solution? And is there another option to produce color-inverting signage?

### Looking at Light

When creating a color-inverting sign using perforated films, a black perforated film is placed on top of a white diffuser layer, such as 2447 acrylic.

The film's dark surface creates higher visibility of the sign face during the day. When backlit at night, the light source illuminates the white diffuser layer and diffuses the light through the perforated film creating a lit surface.

However be aware that this option

only transmits 8 percent of light, which is extremely low for a sign shining brightly at night.

Additionally, when a light source—such as LED—is used to illuminate the diffuser in combination with a perforat-

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ed film, more light is needed to achieve uniform illumination, because the light must pass through both layers. Adding more light sources will inevitably result in higher energy expenses.

Various alternative color-changing backlit acrylic solutions achieve a similar color-inverting appearance for sign visibility by day and night thanks to a special pigment formulation in an all-in-one, simple-to-use acrylic.

When unlit, this extruded material has a glossy, dark surface appearing smooth and flawless for a bold and prominent sign during the day. When lit, the acrylic illuminates evenly in bright white, providing the strong color inversion needed to stand out in the dark.

Illumination is not limited to white LEDs as the light source. Sign builders can make the acrylic radiate in whatever color light is desired (and even formulated to a custom color combination).

Understand that, when working with a color-changing backlit acrylic, there is no need for a perforated film. This means that less light will be needed to achieve a bright-looking sign, thanks to light-diffusing additives within these [types of] acrylics.

Proper spacing of the backlighting is important in order to illuminate to maximum capacity. When using LED modules



with light-spreading lenses, the distance between each light module should be the same as the distance each light module is to the backlit acrylic sheet.

### Long-term Weatherability

Perforated films are usually best for short-term applications, as they have an expected lifetime of one to three years.

The substrate layered underneath the film does not protect it against deterioration, which can actually add to the aging process if you're not using a quality material.

For example, using a non-warranted white (2447) acrylic—a substrate commonly paired with perforated film—can age the sign through yellowing of the acrylic.

Although acrylic sheet is one of the most weatherable plastics available in the industry, there are varying degrees of quality necessary to consider. The results of an accelerated weathering test prove this to be true.

When this test was performed, LED color-changing backlit acrylic showed its color visibly to be imperceptible after 5,000 hours of Xenon arc exposure; this is a rough equivalent to five years' outdoor exposure—its reflected  $\Delta E$  (a measure of the apparent color change) only 0.4 units after such intense exposure.

To sum up, when selecting a material for color-inverting signs, it is worth considering its weatherability and aging characteristics, in order to get the highest return on investment.

### Conclusion

No doubt, perforated films are still a tried-and-true option when it comes to color-inverting signs.

Keep in mind, though, that color-changing backlit acrylic can be fabricated with various techniques (including thermoforming) without losing any sheet attributes—a key benefit of working with a flexible extruded acrylic substrate and one that can open the door for new possibilities in design.

In conclusion, sign professionals should know the pros and cons of each material option available—perforated film and color-changing acrylic—when creating color-inverting signs. ●

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