Advanced Display Material for Inkjet Printers

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Abstract

Fujifilm has developed a new technology that has resulted in a breakthrough backlit film product for inkjet printers. Traditionally, such display materials utilize silver halide or screen printing techniques, but new inkjet capable materials provide ease of use and increased productivity. Designed for commercial applications such as retail and outdoor display, Fujifilm's new backlit film product requires no backside (mirror) printing, saving inks, and provides high image quality with or without back illumination, allowing significant savings in energy consumption. The presentation will explore how this product can provide new opportunities for utilizing photographic content in the market for professional display.

Introduction

Large format displays are commonly used in a wide variety of applications in the marketplace. New types of materials are being introduced to the market with the growth of inkjet based products and the expansion of technology to produce inkjet output. When displays are illuminated from behind the material, backlit film (BLF) is typically used. This presentation will describe a new type of inkjet material that provides advantages for backlit display use.

Among the various uses for large format printing, the sign market represents the largest segment, with both low cost types and higher quality signs that are designed for longer term use. Within these segments, there is a wide range of uses for backlit displays. See Figure 1. Some common examples of backlit display applications are: airport displays, retail signs, vending machines and casino gaming machines. Other possible uses for backlit display include museum and fine art galleries, interior design, and industrial use such as signage for factories, transportation, or public spaces. The advantage of a backlit display is that it provides eye catching visual attraction for the intended viewer. Photographic content can be used in combination with text and graphic design elements.

Materials for Display

The physical structure of the backlit display can vary depending on the type of material used to print the graphic and the structure of the display panel hardware. Typically, electricity is used to illuminate the material from the rear. Fluorescent tube lamps have traditionally been used, although Cold Cathode Fluorescent Lamps (CCFL) are commonly used in light panel products. More recently, panels outfitted with Light Emitting Diode (LED) illumination have grown in popularity, and provide many advantages including slim construction as a result of edge lit design, longer life, lower energy consumption and lower cost.

In some cases, the display panel can be installed in a setting whereby rear artificial illumination is used at night, and front lit daylight viewing is intended during hours where sunlight can illuminate the image for reflective viewing. This requires the use of a material that is referred to as 'Day/Night'. An example of this type of display panel would be a transit shelter which requires backlit illumination during night time, but because it is located outdoors in open space, the image can be lit by sunlight during the day. Day/Night display material must possess unique characteristics in order for the image to be viewable under both conditions.

Various processes and materials are used for large format display. In the photo lab market, silver halide (AgX) material such as Fujitrans Display Material is used for backlit display. This is translucent polyester material that has a color paper type emulsion coated on it and is exposed either optically or with laser, and is processed using the RA-4 chemical system. Similar products with a clear base are used in conjunction with diffusion sheets that are sandwiched into the display panel with the finished display print. AgX based display material has very high image quality and is suitable for low volume requirements.

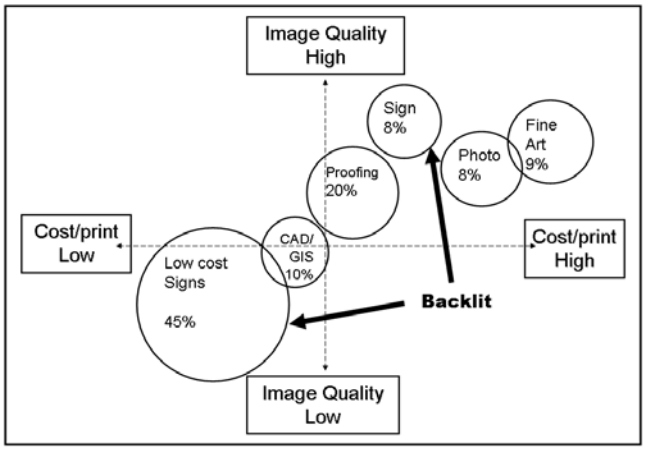

Figure 1: Uses for Large Format Media

For high volume display needs, screen printing processes are commonly used. Screen printing uses a woven mesh to support an ink blocking stencil to produce a graphic on the substrate. Typically offered by graphics providers that specialize in screen printing, backlit display prints can be produced at high volumes, low cost, and have very good light stability characteristics when suitable inks are used. Because the process to create the master template is very specialized, it is not easily adaptable into an operation that is highly active in digital imaging.

Inkjet printing technique affords a very desirable method to produce large format display material. For backlit display, while either AgX or screen processes have been used, new substrates and techniques using inkjet are now available. A wide variety of commercial inkjet systems are now used by both graphics image providers and commercial image providers.

While some wide format printers use water-based (aqueous) inks, the majority of professional printing today uses a wide variety of commercial inks that are either Solvent or Ultraviolet

(UV) curable. Solvent inks are most commonly used and require venting of vapors and proper disposal of used solvent. UV inks are cured with strong ultraviolet light after printing. An inkjet BLF display material can be used in a facility that has existing wide format printing equipment connected to a network for direct input of digital files. Figure 2 shows the target position for this type of material in today's market.

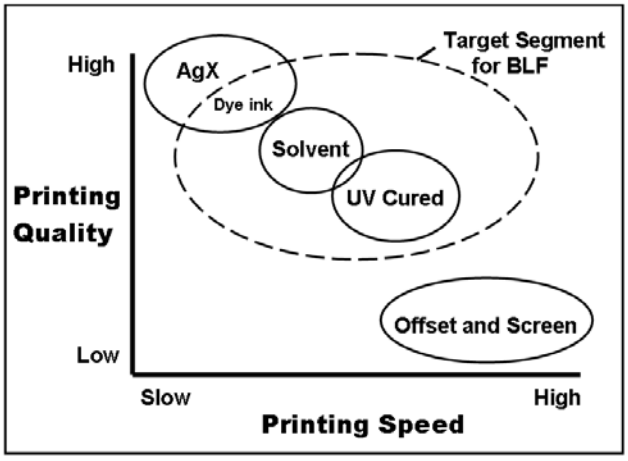

Figure 2: Positioning of Inkjet Backlit Film

Market Structure

Producers of point of sale and other display materials, once the domain of commercial photo labs, are now generally segregated into two groups: commercial and graphic image providers.

Commercial image providers, with the transition into digital processing, offer a greater variety of output services than did traditional pro labs that were primarily using AgX materials. This group is generally supplying regional customers with many services.

Graphic image providers tend to be larger than commercial image providers, are more focused/specialized, can produce larger formats and greater quantities, and deal with large national chains at very competitive prices. They are often full-service providers, with the ability to offer creative, pre-press, preparation of finished kits, fulfillment and display panel fixtures.

In looking at the volume of materials used in the market, this study excludes offset printing and screen printing methods. Focusing on the type of photo based printing that was traditionally the domain of photo labs; the estimated total consumption of inkjet and AgX display material in the U.S.A. market for 2007 is 72.5 million square meters.[1] This is divided between commercial image providers with 32.6 million M^2 (45%) and graphic image providers with 39.9 million M^2 (55%). Breaking down this consumption by material type, these providers utilize Inkjet, AgX Trans display material, and AgX Color Paper in roughly equal amounts. Looking specifically at AgX Trans material which is used exclusively for BLF applications, Commercial providers used 9.7 million M^2 while Graphics providers used 4.1 million M2. The overall consumption of display material is expected to remain relatively flat, with lower expectations due to the economic downturn, coming in at 71.4 million M^2 in 2012.[1]. Use of Trans RA-4 is dropping in favor of inkjet, due to price and the requirement for chemical processing. Therefore inkjet demand will rise significantly in a market that will have modest growth.

Fujifilm offers a wide range of printing solutions. With its legacy in AgX films and printing papers, there are many color paper and display materials offered to the market. Narrow format color paper for retail photo shops and professional portrait labs is widely used. Commercial grade versions of AgX papers are available for wide format printing. Translucent and clear display materials are also offered and are processed in the same equipment as color paper. As inkjet technology expands, there is a trend towards the use of inkjet material rather than AgX. The advantages of inkjet are a wider variety of substrates, excellent color gamut, and improved image stability. Fujifilm is responding to this trend with the introduction of a breakthrough backlit film product for inkjet printers.

Features of Excellight

Excellight is a Fujifilm developed and manufactured inkjet printable backlit film (BLF) for display use. The front print material features new technology that allows backlit illumination for night-time viewing and reflective light illumination during daytime hours without using backside (mirror) or double front-side printing to reach the same high density in both lighting conditions. This is an advantage compared to other display films because of the cost savings provided through reduced ink consumption and greater productivity by eliminating registration issues.

The material is designed for use with UV curable and solvent ink sets which provide exceptional durability for outdoor display. Although it is recommended that printed material be installed in a sealed display panel for protection, print jobs are often placed in outdoor environments and are exposed to light, heat and humidity that can cause degradation over time. Excellight material offers excellent heat and humidity resistance. Image providers can benefit from this by offering a longer warranty to their clients, as long term display installations will not need to be replaced as often.

Excellight provides a higher overall density than conventional BLF materials using the same amount of ink. This is possible due to the new multilayer coating technique. The overall result is higher image quality. In addition, because Excellight is opaque, there is no need for a diffusion sheet to be installed in the light box panel. This lowers cost and complexity of construction.

The main feature of Excellight is its ability to provide optimum image quality whether it is back lit with artificial illumination or front lit with daylight. This is achieved through proprietary design and coating technology. The opaque material is specially designed to be illuminated from the back as well as from the front, as shown in Figure 3.

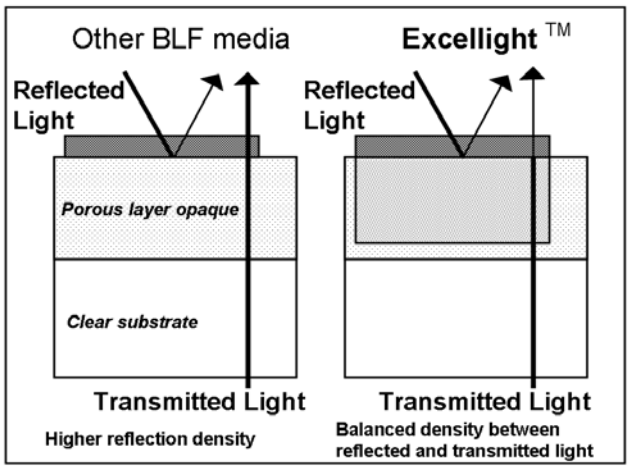

Figure 3: Design of Back Lit Films (BLF)

A new patented coating technology has been developed to provide for the special characteristics of the Day / Night viewing capabilities. First a chemical reactive solution is coated on the surface of the material. This solution receives special treatment and a proprietary coating process is applied in which solvents are evaporated off the surface of the material. The result is an open porous substrate that is ideally suited for receiving UV-curable or solvent-based inks.

Displays that are produced using Excellight have image quality that is comparable with or without back illumination. This provides an energy savings due to the fact that electrically powered lamps can be shut off during daylight hours.

Product Specifications

Excellight is provided in two thicknesses, 7 mil (175 microns) and 9 mil (225 microns), and in multiple widths including 36 inch, 42 inch, 50 inch, and 54 inch, in 100 foot (30 meter) rolls. Opacity is 93% (At primary illuminant D65, Observer 10°) and gloss is 9% at 60° angle of measurement. Black reflection density on the Acuity printing system is ~2.00 and ~2.05 for the Inca Spyder printer. Black transmission density for Acuity is ~2.76 and ~3.30 for the Inca Spyder. Excellight requires less ink to reach same density as other materials. [2]

Excellight possesses impressive aging characteristics, exhibiting no stain increase on the substrate for at least one year under normal daylight and temperature conditions.

Key Benefit: Reduction in Energy Consumption

As a subscriber to the Kyoto protocols, Fujifilm's global goals include the reduction of energy consumption and Greenhouse gas emissions in its operations and the inclusion of environmental considerations in the design of all new and remodeled products.

Excellight provides environmental benefits consistent with these goals including:

Inkjet-produced backlit film display material requires less energy to process compared to silver halide material, which requires heat dryers in extended time RA4 processors for Transparency type display material. The amount of electricity used to heat the chemical tanks to operating temperature, and the electric heat blower fans in the wide format paper processors is eliminated.

The Day/Night feature of Excellight allows backlit display illumination to be turned off during daylight hours, reducing electrical consumption. This is an important consideration given the fact that a Department of Energy study found that lighting represents 59% of electricity consumption by retail and service buildings in the U.S.A.[3]

Excellight performs well with new LED-based light panels for even greater energy savings. The PET film base of Excellight is environmentally preferable to PVC alternatives.

Drying time and technique (i.e., IR heater) may be necessary for roll to roll printing and before lamination can occur. When printing on "high quality mode" additional drying is recommended

Fujifilm Excellight wide format inkjet media is an excellent choice for backlit display usage due to its high image quality, ease of use, and excellent capability for both front and rear illumination. Significant cost savings are achieved when electrical illumination is turned of during the day.

[1] Photofinishing News, Inc.
[2] FUJIFILM Europe NV, Excellight product information
[3] Energy Information Administration, Commercial Buildings Energy Consumption Survey

Author Biography

Thomas Curley is Fujifilm USA's Director of Marketing for lab solutions. He manages digital printers, lab workflow solutions, and Xerox printers for the imaging market. Mr. Curley is a graduate of Rochester Institute of Technology and has been with Fujifilm for 27 years. He has served as a member of the Industry Advisory Board for PPA, ICP's President's Council, and the industry advisory board of the McGhee Distinguished Professor chair for RIT's Imaging Technology curriculum.