

**HIGH-RESOLUTION INKJET
Vs.
THERMAL TRANSFER LABELS
FOR BARCODING**

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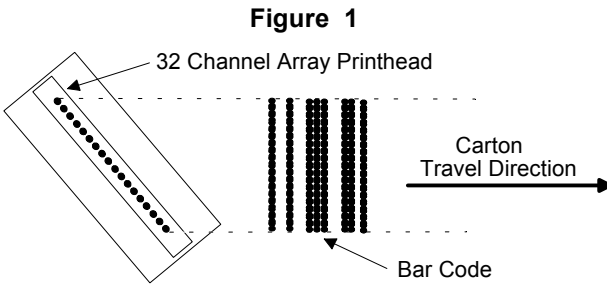


INTRODUCTION

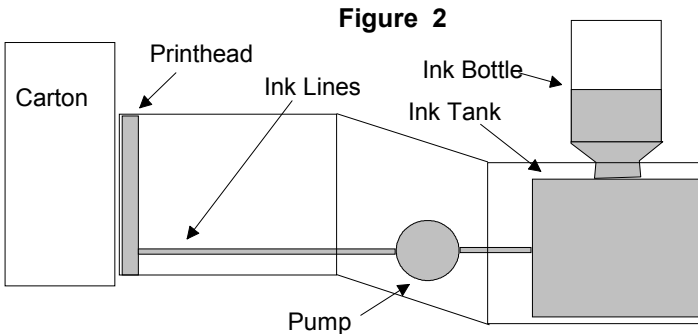
Today, there are many companies using High-Resolution (Hi-Res) Inkjet or Thermal Transfer Labels for barcoding cartons. Following are some of the considerations before selecting an approach.

TECHNOLOGY

Hi-Res Inkjet Printers normally use an array of piezoelectric ceramic transducers to produce and eject small droplets of ink onto a porous surface. The most common Hi-Res Printheads are 32 channel arrays all sharing a common fluid supply. Many array printheads are mounted at an angle so that the drops of ink connect or overlap slightly to produce a continuous image as shown in Figure 1 below.



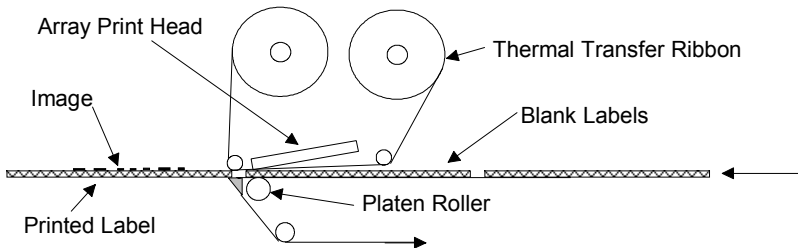
Most Hi-Res Ink Systems include an ink tank, which hold an inkbottle and an ink line that delivers ink to the printhead. Most systems also include a pump to assist in priming the system at start up as illustrated in figure 2 following.



TECHNOLOGY (CONTINUED)

Thermal Transfer Label Printers also use array printheads to transfer wax or resin from a ribbon to the label. The printhead has 200 to 300 elements per inch that are heated selectively to produce an image across the label web as the label and ribbon are moved past the printhead. A driven platen roller is used to move the label and ribbon against the printhead under pressure during image transfer.

Figure 3



Thermal Transfer Labels are printed using a desktop printer or a Label Printer Applicator. The labels produced on the desktop label printer can be hand applied or rewound into rolls for automatic application using a label applicator. Label Printer Applicators automatically print and apply labels.

CONSUMABLE COST

Ink used in Hi-Res Inkjet Printers is much lower in cost compared to Thermal Transfer Labels and Ribbon used for barcoding. Labels and Ribbon can be 5 to 10 times more in cost than Hi-Res Ink.

BARCODE PRINTING CAPABILITY - HI-RES INKJET

Many companies investigating Hi-Res Inkjet vs. Thermal Transfer Labeling are interested in printing UPC-A barcodes for individual items or UPC Shipping Container Codes (UPC-SCC-14 barcodes) for cartons.

Most Hi-Res Inkjet Printers can print UPC-A symbols at 152% or at 205% magnification. Many packages or cartons do not have enough room for this size barcode and require smaller UPC codes at 80% to 100% magnification. Most Hi-Res Inkjet Printers can print UPC-SCC-14





BARCODE PRINTING CAPABILITY - HI-RES INKJET (CONTINUED)

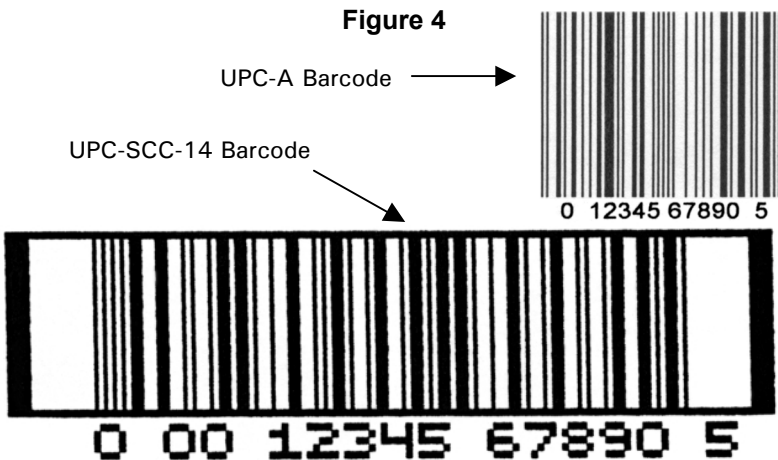
barcodes at 62.5%, 70% or at 100%. All UPC codes and UPC-SCC-14 barcodes printed using Hi-Res Inkjet Printers require a scanner with a 20-mil aperture and a wavelength of 660 nm.

Failure to use a scanner or verifier with a correct aperture and/or wavelength will cause gross errors in the accuracy of scanning and/or verification. Although most scanners used at the distribution level can scan these barcodes, many pen and wand scanners still in use at the retail level will not scan or verify these larger barcodes.

Due to the wide range of virgin and recycled corrugated in the market today Hi-Res print quality can vary considerably. Depending on the quality of corrugated used, a higher level of barcode magnification may be required to counteract the bleed effect of Hi-Res Ink at the lower magnification levels. ***It is strongly recommended that Hi-Res Inkjet samples be printed on representative samples of the corrugated to be used so that scanner and/or verification tests can be conducted at the distribution and retail levels to ensure acceptable accuracy level of scanning and/or verification.***

BARCODE PRINTING CAPABILITY - THERMAL TRANSFER LABELS

Thermal Transfer Label Printers can print UPC-A barcodes at all the acceptable magnifications from 80% to 200% and UPC-SCC-14 barcodes from 62.5% to 100%. Figure 4 following illustrates a UPC-A barcode and a UPC-SCC-14 barcode.



BARCODE PRINTING CAPABILITY - HI-RES INKJET AND THERMAL TRANSFER LABELS

Both Hi-Res Inkjet and Thermal Transfer Label Printing Systems can print other industry standard barcodes. Hi-Res Inkjet can also print I 2 of 5 barcodes, code 39 and code 128 version A, B, and C. In general, High-Resolution Inkjet Printers for printing onto porous materials such as corrugated is limited to printing a narrow bar with an X dimension of 20 mils or greater. In addition, Hi-Res Inkjet Printers are not normally used for any industry standard formats such as AIAG (Automotive Industry) or HIBC (Health Industry).



Thermal Transfer Label Printers can print most all industry barcodes including I 2 of 5, Code 39, Code 128 version A, B and C, Code 49, Coda Bar and two dimension matrix barcodes and more. Thermal Transfer Label Printers not only print more of a variety of industry standard barcodes, but offer narrow bar widths as small as .0033" and print most industry standard formats including AIAG labels and HIBC labels.

PRINT CONTRAST

Print Contrast can refer to how the human eye sees the image and how the scanner or verifier sees the barcode.

Print Contrast Ratio requirements for UPC-A barcodes are much higher than they are for UPC-SCC-14 barcodes using the Interleaved 2 of 5 format. UPC-A barcodes printed with Hi-Res Inkjet on brown (Kraft) corrugated will always yield a "Print Contrast Symbol Warning" (PCS-Warning) message. ***Only oyster white or bleached white corrugated are recommended for printing UPC-A barcodes with Hi-Res Inkjet Printers.***

The ANSI print-quality guidelines used by many barcode verifiers can be useful in measuring various aspects of barcode print quality including print contrast. Acceptable levels for print contrasts are translated into a letter grades of **A, B, C, D** or **F** with **A** being the best and **F** failing. UPC-SCC-14 barcodes can be printed at acceptable grade levels using Hi-Res Inkjet Printers when printing onto oyster white, bleached white and virgin Kraft corrugated. Grade levels range from **A** to **D** depending



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PRINT CONTRAST (CONTINUED)

on the quality of corrugated. Recycled Kraft corrugated can sometimes drop below a **D** level grade. Virgin Kraft corrugated normally produces consistent **C** and **D** level barcodes using Hi-Res Inkjet Printers.

Some customers scanning barcodes require a **C** level or higher on print contrast for UPC-SCC-14 barcodes. Other customers only require a **D** level or higher. It is strongly recommended that you check with your customers, who will be scanning the barcodes, to see if they have a specification for minimum grade levels for print contrast and other specifications before using Hi-Res Inkjet Printers. It is also recommended that Hi-Res inkjet barcode samples be printed on representative samples of corrugated and then submitted to customers scanning barcodes for acceptability and approval.



Thermal Transfer Label Printers with white blank labels produces barcodes with consistent at **A** or **B** level grades for print contrast. If the label is preprinted and the barcode is printed on a color, the contrast level may be reduced. When printing barcodes on a color background using thermal transfer labels it is recommended that barcode samples be printed on representative samples of labels and then tested for acceptable scan grade levels.

PRODUCT HANDLING REQUIREMENTS

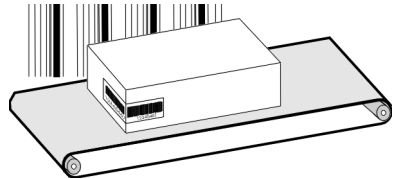
Because Hi-Res Inkjet Printers require that the product is moving during printing, they demand excellent product handling to produce consistent high quality barcodes. Conveyors used to transport cartons are typically smooth running endless belts. Roller conveyors are not used because they promote bounce. Integrated encoders are used to monitor carton transport speeds during printing. Product guide hardware must be designed to present the carton or print surface at a consistent fixed distance from the printhead.

Hi-Res Inkjet Printheads for barcoding are normally mounted with a special assembly that floats the printhead. Cartons with bulges such as those used in the citrus industry may require special product handling to square the carton or print surface to the printhead. Cartons requiring Hi-Res Inkjet Barcodes on two sides of the carton that meet at a corner,

PRODUCT HANDLING REQUIREMENTS (CONTINUED)

may require additional product handling to rotate the carton and additional line space to guide and control the carton. Lightweight cartons used with Hi-Res Inkjet Printers for barcoding may require high friction conveyor belts or additional product handling to ensure positive product control during printing.

Because printing of the label is independent of the product or carton, product handling for barcoding with thermal transfer label printer applicators is much less demanding than Hi-Res Inkjet Printers. Label Printer Applicators



commonly use standard tabletop chain conveyors, driven roller or belt conveyors. Label Applicators can automatically apply the label with the product stopped or moving on a conveyor. Labels can be applied at high speeds with the product very close to the label application device or at slower speeds with the product away from the labeler using a robotic tamp label applicator. Normally there is no need for encoders or special guide hardware using label applicators to apply thermal transfer printed labels. Reorienting or turning the carton is not required for barcoding on two sides of the carton that meet at a corner (side and leading or trailing side of the carton).

PRINT FORMATS

Because Hi-Res Inkjet Printers print images using a vertical array of overlapping dots, the print format from a single printhead is limited to the number of vertical nozzles or orifices (normally 32) that expel ink droplets to form characters, barcodes or graphics.

Because of this restriction, it is common for Hi-Res Inkjet Systems to use two or more printheads to print one format on one side of a carton. Hi-Res Inkjet Printers can not print two barcodes with one barcode rotated 90 degrees from another barcode.

Thermal Transfer Label Printers have much more capability because of the higher resolution (up to 300 Dots per inch) and printing over 6 inches across on thermal transfer labels. Thermal Transfer Label Printers can also print multiple barcodes on one label with one or more barcodes rotated.





VISIBILITY AND SCANABILITY IN A WAREHOUSE

Many companies are concerned with image size and image contrast. These companies want labels that can be read by people if the carton is on the top shelf in a dimly lit warehouse. Many of these companies need to scan barcodes at a distance of over 40 inches. High-Resolution inkjet images printed on white oyster or white bleached corrugated would provide good contrast for reading by people or for scanning at a distance. Kraft corrugated should be tested using print samples on representative corrugated samples.



Thermal transfer printing onto white labels provides excellent contrast for excellent visibility at a distance and for scanning barcodes at a distance.

EQUIPMENT MAINTENANCE

The maintenance required for both Hi-Res Inkjet Printers and Thermal Transfer Label Printers includes daily printhead cleaning. Hi-Res Inkjet Printers allow ink to be added during operation.

High volume Thermal Transfer Label Printing Systems require printhead cleaning after each ribbon roll change for maximum print quality and to extend the printhead life. Thermal Transfer Label Printers require that the system go off-line for adding labels and ribbon and for printhead cleaning.

EQUIPMENT COSTS

Equipment cost for Hi-Res Inkjet Printers range from about \$5,000 for a single printhead system to over \$50,000 for a multiple printhead system. The cost depends on the number of printheads, print image height (.5" to 2.0" per printhead), product handling required and the number of sides of the product that require printing.

Thermal transfer printed labels can be applied using a standard label applicator for labels printed on a desktop printer or they can be printed and applied on-line using a Label Printer Applicator.

Label Applicator cost range from \$5,000 to over \$ 20,000 depending on label size, speed and the number of sides that require labels. Label Printer Applicators range in cost from \$13,000 to over \$20,000 depending on print speeds, label sizes and the number of labels required per carton.

SUMMARY

The first consideration should be to review your customer's barcode specifications and minimal grade levels acceptable for scanning. For example, if the customer requires a UPC-A barcode at 80% to 100% magnification on Kraft corrugated, Hi-Res Inkjet should be ruled out in favor of Thermal Transfer Label Printing.

Assuming Hi-Res Inkjet is not ruled out, samples should be printed onto representative corrugated samples for evaluation and scan tests by the customer. This may require several print formats to produce an acceptable format for marketing and the end use customer. Assuming the scan test pass and the print format is acceptable to all concerned, a Hi-Res Inkjet Printing System can be configured and priced. If not, a Thermal Transfer Label Printing System may be the better solution. Another possible solution may be a combination of both a Hi-Res Inkjet Printer for low cost high quality text and Thermal Transfer labels for barcoding only.

ABOUT THE AUTHOR:

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ID Technology has nationwide sales, service and stocking facilities providing a full range of labeling, coding and marking systems, equipment and supplies.

