1. Thermal Transfer Ribbon At A Glance

One thing in the history of human society that is never static is science and technology. In fact the evolution of human society is strongly related and linked with the development of science and technology. Scientists and technologists are never satisfied with the status. They are making effort on regular basis in order to better the lot of man on earth.

Significant improvements have been made in the area of printing industry. Printer ribbons were introduced when people relied only on typewriters. But typewriters are no longer used for printing in the word today. However, the old forms of printing ribbons are no longer used today. A new form of printing ribbons has been introduced to meet the new printing technology that is in vogue today. Thermal printing is one of the reigning printing technologies today. It was introduced during the World War II. The technology has been improved greatly today.

Thermal transfer ribbons are similar to thermal printing because the two use heat for printing. However, unlike thermal printing, the thermal printing ribbons used in thermal transfer printing helps in transferring print to the media or any material that is to be printed on. In thermal printing no ribbon is required while in thermal transfer printing the ribbon is very essential.

The thermal transfer ribbon is a thin polyester film which is impregnated with wax-resin. It can also be coated with pure resin ink at the label side. The print is fixed between the label and the print head. As implicit from the name, the function of the ribbon is to transfer the print on the media.

The mechanism of thermal transfer printing and ribbon is similar to that of thermal printing and thermal papers. In thermal printing, the coated thermal paper changes color when it is exposed to heat as a result of the reaction of chemicals that are used in coating it. The same thing is applicable in thermal transfer printing. The ribbon is coated with chemicals that can react to bring about change of color when they are exposed to heat. The images will be transferred to the media to be printed on through the ribbon.

Thermal ribbons are available in different types. Normally, there are three types of thermal ribbon depending on the chemical that is used to coat the ribbon. There is a type coated with wax. The second type is coated with wax-resin while the third type is coated with only pure resins. The ribbons are available in several colors such as red and blue. However, it is commonly available in black. Each of these types of thermal ribbon can only print on specific type of media. However, today, there are some thermal transfer ribbons that can be used on a number of label materials. It is also good to note that some combination of ribbon does not result in any print.

Prints done through thermal transfer ribbon are more reliable than the one done with thermal printing. So, it is normally utilized when the print is expected to be used for a very long time.

2. The Many Uses of Thermal Labels

There are many kinds of labels that are used for a variety of purposes in day to day life. The main purpose of using labels is of course to identify, tag, categorize and give information about the product. The different types of labels have different characteristics because of the different materials with which they were generated.

There are primarily two types of thermal labels – the direct thermal labels and the thermal transfer labels. Both types of labels have a wide variety of uses. But they are mostly suitable for creating bar codes. That is because, bar codes require a long lifetime, and both of these labels are usually very good in that aspect. The direct type of label is made in a very simple manner. The words or images that are to be printed on the label are done so with the help of a heating element that is shaped like the words or the images to be printed. This way, the printing is very prominent and as such the lives of such labels are very high. The barcodes obviously require printing the exact same bars and they are to be printed in a very prominent manner. This is where the thermal labels come in really handy.

However, both of the types of labels cannot be used in all locations. The direct thermal label cannot be used in locations where there will be too much heat. In fact, if there is another heat source present near the DT or direct transfer type labels, then the printing will become damaged or blurry or obscured. Also, these types of labels tend to fade over time. That is because they have sensitivity towards light, heat and friction or abrasion. So in applications where there will be too much exposure to these things, it is preferable not to use the direct thermal type of labels.

The thermal transfer types of labels, on the other hand, are ideal even in situations where there will be heat. They do not fade over time due to exposure to heat or light. So their durability is also better. They have to be made in special thermal label printers. The TT or thermal transfer type labels use ribbons on which the printing is done. On the other hand, the DT type labels do not use any ribbons and the printing is done directly on the printing material.

The DT type laser printers are much less costly to use, because they do not require any ink, ribbon, toner etc. Despite the fact this type of label usually has a lesser lifespan than that of the TT type label, it still lasts long enough to find application in making barcodes, in wristbands, in distribution centers, shipping, pick tickets, compliance label uses, coupons, passes for visitors, parking tickets, tags etc.

On the other hand, the thermal transfer label can be used in applications like product identification, in laboratories, freezers and cold storages, asset, file and inventory tagging etc. Both these technologies can produce high quality labels with precise finishing, and that is why there are used in barcode printing.

3. Thermal Label Buyers Guide

For the buyers looking for the best thermal labels that suit their requirements, there are number of types and the qualities that are being observed with them. The buyers are mostly encountered by the bundles of questions in their minds while they are looking to find the best product for them. The customers should take a good care and incorporate a good amount of research and time in finding the appropriate product so that there is no issue to be faced while the products are being used prospectively. A comprehensive knowledge of the product and the relevant facts would let a customer come up with a product that suits the requirements of the customer.

There are many types of the thermal labels that are quite common within the markets. These are being discussed hereunder so that the customers might become competent enough to know what they need in fact and what product can satisfy their needs to the maximum.

The first one that we are going to discuss is the Direct Thermal Coated Labels that deal with heat. Using the effects of the heat the images or the characters are made available to appear on the labels I a way that last for a good time. Whatever, the quality of such labels is, ultimately, there are no ways for the images and the characters imposed to stay for a long time. With the passage of the time, these are prone to vanishing.

The second one under discussion is the thermal transfer labels that are quite common with the customers and most of the customers rely on the same. These are relied just because these are used to print the images, and the characters that are required to be used for the longer times. You can expect the images printed on these labels to stay fresh for months to years. Owed to the reliability and the durability with these labels, these are used for labeling the bar code, assets, location, etc. the material used in this type of the labels are not affected by the heat.

The 3rd one coming to be discussed is the Direct Thermal Transfer Label that deals with the heat that affixes or transfers the resin on the labels and the ribbons are used to transfer from. The wax is also used to transfer the images to the labels. The images or the characters transferred on the labels are more permanent in nature because the resin or wax is used to affix the same whereas the combination of both of the aforesaid materials can also be used.

If you want the product to be marked for a short time and the need is just temporary

then the Direct Thermal Labels are quite good to go. These labels do not use the ribbon to transfer the images. The most common example of the use of this type of label is the shipping label where the products are marked for a very short time till they reach the destination.

After going through the above information, it is quite expected that the customers would make a wiser decision as to the ordering and the purchasing of the labels.

4. Benefits of Using Thermal Labels in the Life

The whole world is just behind creating the brand name and the image while providing the quality services at every step of the life and the business. When it is the time to talk about the product or the asset identification as well as the marking, there are different choices available to the entrepreneurs. Although, there are many labeling methods under use in this modern era of the technology, there are thermal labels that are widely being used world over in the manufacturing, retail, import and all types of business. The perfect way of labeling in a promotional way delivers a very good impact on the marketing strategy of the company and enhances the credibility and the reliance on the product.

There are certain benefits entailed with the use of this type of labeling. Here are being suggested few of the bundles of the bundles availed in the life of the man:

The first and the foremost thing that is sought for in every type of labeling are the usability and the ease at the same time. While you are using this type of labeling method, you have the option of not using the ribbons. This really adds to the savings of the labeling costs. In this type, such materials are used that produce the quality images and the characters on the paper when heated against the printer head. The labels are coated with such materials and when this material is heated, the label darkens at the place heated which ultimately appears to be a good and visible image.

These labels are ideal for the indoor type of labeling where you want to get the maximum quality with the minimum cost. Moreover, in such a case, the required temperature does not exceed the average level of indoor temperature that adapts to the safety and the security required indoor.

You have the option to use these labels in both the paper and the synthetic formats that creates more adaptability and the ease of use. The use of the paper is a cost saving factor and reduces the labeling costs to a greater extent. Moreover, there are many options as to the formats of the printing are available with the use of the papers. On the other hand, if you go for the synthetic material, there is more durability and the images and the characters can be expected to be long lasting. Moreover, the chances of mutilation against the abrasions and other issues like that are quite few when synthetic

materials are put to use. As these types of the thermal labels produce very good quality printing, you have the option to enjoy a good brand image and the name by satisfying the consumer printing and the images needs as to the ease of use and the readability.

For those businesses that are using the bar code readable labels, they have the choice to go for this type of labeling as it would not only cut short the printing costs but also there would be no issue as to the use of the same because the exact and the fine lines are very easy to be produced with the help of this type of labeling.

5. Thermal Printers and Papers verses Other Printers

Thermal paper is printed on special paper using heat. The whole application is done by the use of a much more accurate technique that uses a heated print head. This method leaves no spaces therefore producing much more clear images or easy to read materials. That is probably another benefit one gets from using the thermal paper in printing.

The use of dot matrix printers often require a better knowledge of their mechanical parts because the parts are complicated and simple breakdown that requires no professional intervention can actually give you nightmares. In simplicity, the use of dot matrix printers gets hectic especially when the ink is finished and one wants to do the refilling of the ink cartridges. By using the thermal paper, such nightmares are withdrawn from your brain. Changing the thermal paper in a thermal printing is much easier task compared to the hectic refilling of ink cartridges involved with dot matrix printing. This is a benefit to those who don't like getting themselves stained with ink all the time.

Dot matrix printers are known to take a lot of time before the resulting printed material is produced. This is because of the technique that they use. It probably takes too long for the dots of ink to get dropped on a specific area of the printing paper before the dropping is then moved to another area to create the end result printed material. With thermal printing it is much faster. This is because the thermal paper immediately reacts to the heat from the print head to change color. What the print head needs to do is just to trace the specific area where the printing is suppose to be done and the heat will make the area change color immediately. This is also one of the great benefits that come with the use of thermal papers in thermal printing. It is probably my last contribution among other many more benefits that are associated with the use of thermal papers.

Reliability is an important thing in business and as explained thermal paper associates itself with reliability. Using thermal paper means fewer problems or disadvantageous occurrences like machine refusing to print correctly because of low or no ink, or the printing paper getting jammed in the machine. When choosing a thermal paper for

printing makes sure it matches the intended use. Thermal papers are widely known to be used in different ways for different purposes that might include financing, gaming, transportation, ticketing etc.

Thermal papers are readily available in stores and can be purchased easily with all other printing materials or printing machines. The thermal printers are way easier to install and that should not be a worry. I am advising business managers to shift to the use of thermal papers which are known to be used mostly in receipt printing. These thermal papers are much cheaper compared to other printing papers, so as a businessman or a businesswoman, why not equip your store with a system that prints receipts more clearly, easily and as quick as possible.

6. Thermal Paper Printers and their Benefits

Thermal paper printers are of two kinds, one is the direct printer. This is the type where the energy is transferred to a dot like matrix, which gets heated on electrical conductivity and produces an image. These printers are those which are often found in the ATM's, retail stores, ticketing, information kiosks and the like where the print is on thick paper. The other type of printer is the thermal transfer printer, which works on the mechanism of melting of the wax on the paper and produces long lasting effects of the print. These are more widely used for their efficiency and durability. These are more often used for those tough prints like that on labels, bar codes, clothes like t-shirt prints and on plastic containers for product details.

Commercially these printers are a "hit." They are found in all ATM centres for receipt printing, tags, fax rolls, retail shops, air ticket bookings, dispatch labels, bar code labels, hospitals, on plastic containers and almost in all areas where printing is a necessity. The reason for such wide utilisation is the premium quality printing offered by them. They knock down those age old ink printers which created hazards of ink marks besides their target images, and needed a continuous changeover of the paper. The printers create exclusive images which are durable, clear, not evaded by certain factors like UV rays, oil tans and so on. The image provided is dot clear which makes them very popular among hospitals for generating reports like the scan and ECG.

The printing capacity of these printers is so fast that that the pixels move at the range of 6 to 12 inches per second. As the label and the ribbon roll, the print heads create thermal images which take milliseconds to get impinged and dry at much faster rate. The dots on the heads often vary from 203 to 600 dots per inch.

Thermal printers are available for all purposes. The market has put forth varied sizes of these printers, from counter top models to high end large models. Brands offer printers of different sizes and different advancement in technologies depending on the place of use like thick label printing, retail receipts, plastic printing and so on. Customer

portability is another matter for classification. They have evolved from simple handy instruments to large bulks which makes them even more varied in utilisation. A few are easy to lift and transfer and a few are bulky models.

Increasing the complexity of these printers is an association with enhancement of features. Some of the latest models come with colour features apart from the traditional black, blue and red, where the heads are provided with three or four coloured panels.

Hundreds of brands with varying costs from less than $100 to as high of $2700, with invariable technologies to be selected, these thermal printers are a perfect blend of ease and efficiency in performance. Though they are sensitive to wear and tear a little caution and care makes the day as they are worth all the cost as they make work easier, durable, and reliable.

7. Conveniences of Thermal Printers

A most favored convenience of thermal printers is its usage in health care sectors. For reports of complex technical tests like that of echo, ultrasound, prescription and others, which demand a necessity for sharp, accurate images, these printers become handy. This is why they are a debut for the medical zone. The reports have sharp and clear boundaries making them easier to analyze.

Haven't those olden days of waiting in a line at the retail store at the cashier for a bill vanished? This is because now the printing offers a better and enhanced bill which clearly demarcates between every word it prints making it easier for the consumer. They do not bother the cashier with that clumsy act of changing ink refills every time. These papers ensure fast and accurate services for which they have become popular even among gas stations, ATMs, ticketing agencies, terminal bills and lottery systems. These printers offer barcodes with high agility due to their capability of printing miniature codes with a great clarity. This is the reason why they are used in printing labels for product identification and management.

The sophisticated and miniscule make of the printer makes it more efficient. It does not produce the typing sound like that of the old inkjet printers. It has fewer moving parts which reduce damage and save maintenance costs. Thermal papers provide prints in different colours other than the old black or blue. This is the reason why they are becoming highly popular for printing logos of different colours. They support papers with thickness of around 220 micros, which is more than that of a traditional inkjet printer. These thick papers are used in labelling shipment cargos and on containers.

Ribbons which are used in these printers tend to have a longer shelf life. Generally changing them for once in every six months is sufficient. Another dedicated affect of

these is the quickness with which they print. They print around 6 to 12 inches per second which is multiples of the usual printers. These do not produce any residue due to the print and provide better anchorage of flexographic inks applied to the thermal paper. The cost of the printers is generally high, but it is worth for the benefits it offers and regarding size they are varied sizes. Many of them come in handy sizes for general purposes. The paper used is also economical as it is easily available. Another fetching mark with the thermal papers is that these do not stick to the print heads and so the jamming and fussing around is totally zeroed down. These papers are also eco friendly and help increase the greens.

These papers have been highly flexible and time reductive, the protection they offer to keep the print intact is amazing. Imagine the print is held back on clothes too!

8. What is a Bar Code?

A bar code is a binary coding system, consisting of varying widths of vertical black lines (called bars) and white spaces, that when read by an optical scanner can be converted into machine language. Bars and spaces are just one of many "elements" that make up a bar code.

9. How is a Bar Code Read?

When a bar code scanner is passed over the bar code, the light source from the scanner is absorbed by the dark bars and reflected by the white spaces. A photocell detector in the scanner receives the reflected light and converts it into an electrical signal.

As the wand is passed over the bar code, the scanner creates a low electrical signal for the spaces (reflected light) and a high electrical signal for the bars (absorbed light); the duration of the electrical signal determines wide vs. narrow elements. This signal can be "decoded" by the bar code reader's decoder into the characters represented by the bar code. The decoded data is then passed to the computer in a traditional data format.

Bar Code Symbology Types

Some bar codes are numeric only (such as UPC, Interleaved 2of5, and EAN). Others have a fixed length (i.e., UPC-A is 12 digits, UPC-E is 6 digits, EAN-13 is 13 digits and EAN-8 is 8 digits). Some bar codes also have both numbers and alphabetic characters (i.e., Code 128, Code 39 and Code 93). Code 128 enables you to encode all 128 characters.

Bar codes are also grouped into two types of symbologies: linear or two-dimensional.

Linear Symbologies

A linear (or one-dimensional or 1D) symbology bar code is made up of one single row of various widths and lengths of predefined black bars and white spaces. Ordinary bar codes are "vertically redundant," meaning that the same information is repeated vertically. The heights of the bars can be truncated without any loss of information. However, the vertical redundancy allows a symbol with printing defects, such as spots or voids, to still be read. The greater the bar heights, the more probability that at least one path along the bar code will be readable. Examples of one-dimensional bar codes are shown below as Codabar, Code 39, and Interleave 2of5.

The most common 1D symbologies are Code 39, pioneered by the defense and automotive industries; the Universal Product Code (U.P.C.), first employed by the supermarket industry in 1973; Codabar, used early on by blood banks, Interleaved 2-of-5 (ITF), Code 128. Another is Code 93.

Two-Dimensional Symbologies

The ever present need for increasing amounts of information represented in smaller spaces, has lead to more compact and higher density symbologies found in two-dimensional or stacked symbologies. A two-dimensional symbology is either a "stacked" (referred to as matrix) or "multi-rowed". Each type allows more information to be stored in a smaller amount of space. Initially, two-dimensional symbologies were developed for applications which only provided a small amount of space for an automatic ID symbol. The first application of a 2D symbol was for unit-dose packages in the healthcare industry. These packages were small and had little room to place a bar code. The electronics industry also showed an early interest in very high density bar codes, and two-dimensional symbologies--since free space on electronics assemblies was scarce. More recently, the ability to encode a portable database has made two-dimensional symbologies attractive in applications where space is not at a premium. One example is storing name, address, and demographic information on direct mail business reply cards.

For examples of 2D symbologies, refer to the PDF417 bar code symbology listed below.

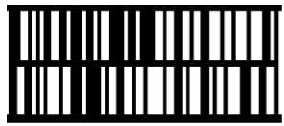
Matrix symbologies include Datamatrix, Maxicode, Dot Code A, Code One, QR Code, and Aztec Code.

Multi-rowed symbologies include PDF417, Code 16K, Code 49, Codablock F, Micro PDF417 and SuperCode.

10. Codabar

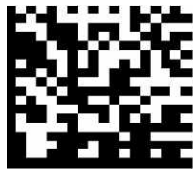
11. Code 39

12. Code 16K

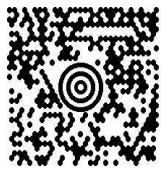


13. Code 128

14. Datamatrix



15. MaxiCode



16. The Universal Product Code

(UPC) was the first bar code symbology widely adopted. Its birth is usually set at April 3, 1973, when the grocery industry formally established UPC as the standard bar code

symbology for product marking. Foreign interest in UPC led to the adoption of the EAN code format, similar to UPC, in December 1976.

There are now five versions of UPC and two versions of EAN. The Japanese Article Numbering (JAN) code has a single version identical to one of the EAN versions with the flag characters set to ``49".

17. Applications for Bar Codes

Bar codes are used in any applications where data needs to be automatically identified and captured efficiently and accurately in real-time. Bar codes are useful for purposes of inventory control, asset tracking, product identification, patient information, warehouse picking and packing. Bar codes are used in many industries such as healthcare, packaging, transport, retail, apparel and textiles, automotive, government and defense, and more. Standards for many industries are defined by Industry Standard Organizations. Some of the major organizations obtaining bar codes application, label and product standards are identified in the next section.

18. Bar code Usage in the Healthcare Industry

The use of Bar codes in the healthcare industry has simplified everything from patient care to hospital wide inventory. Bar codes have ensured the absence of any chance of human error, especially at the point of care and prior. Making sure that the patient is accurately identified, and all of their records are on hand, guarantees a successful start of a procedure and allows for patient and product tracking throughout each day. By capturing everything from linens and patients, to office supplies and medication, even validating actions taken during patient care, bar codes are valuable in their ability to organize actions and supplies throughout an entire hospital or place of practice. Such organization allows medical practices to efficiently access any information needed and streamline their customer service with error free patient point of care, and sales of medication and procedures. An accurate and efficient healthcare industry promises increases in quality and the assurance of competent customer service.

Bar codes and Their "Real-Time" Application to Manufacturing

The applications for the bar code are numerous. The ability to capture information and relay it back to a computer have deemed the bar code as a perfect label for anything that needs to be identified, organized or kept track of wherever that item might be. During the manufacturing process, it is essential to know where inventory is being used and how much inventory there is to work with. Hand labeling and manual inventory makes keeping track of countless parts and products a hassle, but through the use of bar codes, having an omnipresent accounting on manufacturing inventory is just a scan away. Manufacturers have the ability to label separate parts and products,

enabling them to not only organize, but catalogue their entire inventory-- providing them with an on-hand and comprehensive list of all parts being used in the manufacturing process. Eliminating the need for manual inventory, identifying all parts and products via bar codes, reduces the time spent on physical inventory as well as promises a nearly error free inventory which encourages a more efficient and accurate manufacturing process.

Bar codes and Their Application to Distribution

When shipping a product there is a certain peace-of-mind that comes with knowing where your product is at all times. However, such a hefty request can be difficult to promise when most warehouses and distribution centers are bustling with many other products and customers demanding the same thing. Bar codes offer a state of the art and accurate answer to anyone who is interested in where their product is at any given moment. Through the use of Bar codes, and asset management systems, products can be identified and logged at every stop from its point of origin to its destination. Just as manufacturing warehouses can keep track of physical inventory with a Bar code labeled inventory, distribution centers can promise the same sort of security with Bar code labeled traffic, making sure that each product being shipped is not lost and is on track to its final destination.

19. Barcode Thermal Transfer Printing Overview

What is a Thermal Transfer Ribbon?

Thermal Transfer Ribbons are comprised of a polyester film – "the support medium," which is coated with a wax-base ink, resin-base ink or a combination of wax and resin. The application, substrate, and environmental conditions will ultimately determine what type of thermal transfer ribbon is required. The non-ink side of the ribbon, called the back coating, is generally made of a silicone-base compound that serves as a lubricating agent. The back coating comes in direct contact with the printhead and enhances the thermal transfer printing process by preventing wear or damage to the printer's printhead. A leader tape precedes the imaging components, while a trailer tape may or may not appear at the end of the roll.

Explain the Process of Thermal Transfer Printing.

Thermal transfer printing is a process that requires a thermal transfer printer, thermal transfer ribbons, software and a substrate (i.e., label or tag stock). Each printer uses a self-contained print head. A printhead consists of up to 600 micro hot spots per inch. The hot spots are actually energized matrix print head wires. As the ribbon passes between the printhead and the substrate, the wires are turned on and off to melt the wax, midrange, or resin based ink off of the polyester coating to transfer the image onto the substrate.

What are the Market Trends for Thermal Transfer Ribbons?

- Annual market growth is 10-15% per year in India
- Faster printer speeds (up to 12 inches per second)
- Increased use of film media for harsh environments
- Lower cost ribbons and commodity papers
- More specialty applications

20. Barcode Printing and its role in Automatic Identification Technologies - "Auto-ID"

The evolution of the bar code as the predominant source for identification of product, inventory, people, and numerous other assets drives our industry and is the life source for our place in the labeling markets. The use of bar codes dominates auto-id technologies, accounting for approximately 75% of applications requiring immediate "asset" identification. Competing/complementing technologies include: Radio Frequency Identification (RFID), Magnetic Stripe, "Smart Card" ID and Biometric Identification.

21. IMPACT PRINTING

Advantages	Disadvantages
• **Oldest Technology** • **Extremely user friendly** • **Reliability** • **Inexpensive** • **Minimal software requirements**	• **Maximum resolution 360-400 dpi (Most are under 200 dpi)** • **Monochrome only** • **Not "variable friendly", batch oriented** • **Limited resolution does not allow for newer bar code schemes** • **Declining number of installations**

LASER

Advantages	Disadvantages
• **Best for "batch oriented" applications; Prints full page at a time, standard width is 8.5"** • **High resolution** • **Low operating costs** • **Continuing hardware cost decline will spur growth**	• **Slow** • **Limited durability** • **"Hot Fusing" technology limits range of media** • **High cost of entry** • **High maintenance costs**

INK JET

Advantages	Disadvantages
• **High integrity bar codes** • **Easy loading of consumables** • **Color capability/flexibility** • **High print speeds – Large Character 250-400^2/min, Small Character 600-1200^2/min**	• **Durability questionable** • **Limited media compatibility** • **Quality decreases over long runs** • **High cost of entry**

DIRECT THERMAL

Advantages	Disadvantages
• Single consumable requirement • High speed capability • Extremely portable • Improving image durability and stability	• Media tends to discolor • Poor durability • Poor UV stability over long term

THERMAL TRANSFER

Advantages	Disadvantages
• Exclusive to bar code labeling markets • Excellent durability • High bar code integrity/quality-achieves highest scan rates • Capable of printing extremely small images/bar codes • High print resolutions • Portability • Up to 12 ips print speed • Longer printhead life due to ribbon back coating process (over dt) • Pricing has matured and is near cost of direct thermal on a per unit basis • Low cost of entry	• Cost of consumables (media & ribbons) is high relative to ink jet & direct thermal • Media/Ribbon loading process is not always "user friendly"

22. Thermal Transfer Vs. Direct Thermal

Thermal Transfer

- Uses a ribbon to create the image
- Ribbon and label move together through the printer and the used ribbon is wound on a take up spindle or core
- Ribbon that is coated with a wax or resin based ink advances between the printhead and the substrate, transferring the image from the ribbon to the substrate.
- Various ribbon grades provide a solution for diverse print applications
- Thermal transfer label materials are less expensive than direct thermal materials
- Thermal transfer label materials are more sensitive than direct thermal
- Thermal transfer label materials have a longer shelf life and are more durable than direct thermal materials, especially when exposed to heat and solvents
- Thermal transfer process enables the user to get more life out of the printhead than the direct thermal process
- Thermal transfer enables customer to use a variety of scanners unlike direct thermal

Direct Thermal

- Heating elements in the printhead are selectively heated to create an image when they fire against the label material and activate a chemically coated dye within the substrate itself to form an image

- Single consumable requirement
- Poor durability
- Media tends to discolor
- Material must be matched to the printhead of the printer
- Reduced variety of scanner options when compared to thermal transfer
- Printhead life is reduced and user spends more money on printheads because:
  1. Printers must run at a higher temperature because the materials are often less sensitive than thermal transfer
  2. Higher degree of friction is created by label running against the printhead

23. Why Thermal Transfer Printing?

High Volume Printing Requirements
Thermal transfer printers are designed to complete a full label-printing job in one run. They can print up to 60 linear feet of labels per minute. This assists with long run labeling assignments.

Reliability
Thermal transfer printers have one moving part – the paper feed roller. Printers are very reliable and are designed to operate in harsh conditions, including both warehousing and manufacturing environments.

Bar Code Legibility
Thermal transfer printers create bar codes with good scan quality. Read rates (98%-100%) are far better than those produced on a dot matrix printer.

Durable Print Images
Thermal transfer ribbons have the capability of printing images that can resist extreme temperatures. In addition, thermal transfer ribbons allow for varying degrees of smear, scratch and solvent resistance.

On-demand Printing Capability
Thermal transfer printing gives the user printing flexibility. Users can print on demand and don't have to pay the extra costs associated with working with an outside supplier to create pre-printed labels.

Are There Different Types of Thermal Transfer Ribbons Available?

There are three basic categories of thermal transfer ribbons. They include wax, midrange and full resin formulations. Below are examples of the characteristics of each ribbon and possible applications for each.

Formulation	Qualities	Applications
WAX	• Low Cost Solution • Excellent Barcode Integrity • Primarily for paper Labels • Some Synthetic Films	• Compliance • Inventory Control • Product Indentification (PIL) • Document Tracking • In Line Printing • Apparel Tags & Labels
WAX/RESIGN	• Increased Scratch/ Abrasion Resistance • Solid Cost/Value • Increased Heat Resistance • Some Chemical Resistance	• Shelf/Bin Labeling for Label Life Requirements • Apparel Tags & Labels • Nursery Tags • Beef/Poultry Processing
FULL RESIN	• Excellent Heat Resistance • Excellent Chemical Resistance • Scratch/Smudge Proof	• Drum Labeling • Electronic Process Labeling - (Circuit Board) • Product ID • Medical • Credit Card

24. Thermal Transfer Ribbons

- What is the current annual/monthly usage of thermal transfer ribbon?
- Who makes decisions regarding thermal transfer ribbon purchases?
- From whom does your company order thermal transfer ribbons?
- Are thermal transfer ribbons and labels/tags ordered together?
- If not ordered together, who buys the label/tag stocks?
- From whom are the label/tag stocks purchased?
- Are there other facilities within the company that use thermal transfer ribbons and labels/tags?
- What is the thermal transfer application?
- What is the application environment?
- What is the print environment?
- What type of information will appear on the label (i.e., barcode, words, etc…)?
- What is the brand and model of the thermal transfer printer?
- What is the length of the ribbon?
- If it is a current application, is the customer using wax, midrange, or resin ribbon?
- What is the label stock being used?

- What is the width of the label/tag stock or ribbon?
  * It is important to note that the ribbon must always be at least the same width as the label; otherwise the label will be in direct contact with the printhead. The resulting friction will wear out the printhead.

- What is your current lead-time?
  * Stock product from ITW Thermal Films ships the same day the order is placed (if the order is placed by 4p.m EST). Drop shipping is also available.

Additional Thermal Transfer Ribbon hints

Ribbons are manufactured with the ink coated on either the inside of the film carrier or the outside of the film carrier. You will learn that certain printers require coated side in (CSI) ribbons, while others require coated side out (CSO) ribbons. Refer to the following:

✓ Coated Side Out (CSO): Zebra, Intermec, Monarch, TSC
✓ Coated Side In (CSI): Sato, Datamax

25. Thermal Transfer Labels (Use the following to identify the appropriate label stock)

- What is the brand and model of the thermal transfer printer?
- What is the size of the label (width first, then depth)?
- Do the labels have perforations?
- Are the labels on a roll or fan-folded?
- How many labels per roll?
- What is the maximum outer diameter of the roll?
- What is the core size of the roll?
- What is the winding direction (wind out – copy on outside; wind-in – copy on inside)
- How will the labels be used?
- Describe the surface that to which the labels will adhere.
- What is the application temperature?
- What are the temperatures that the label will need to withstand (both hot and cold)?
- Will the label need to withstand any other unusual conditions after it is applied?
- Is the surface dry or wet?
- What is the face stock for the application?
- What type of adhesive is required?
- How are the labels applied (hand applied, machine applied)?

26. Additional Thermal Transfer Label Hints

- It's important to match the application to the appropriate ribbon/label combination.

Thermal transfer labels are made from a wide variety of label stocks. They include coated and uncoated face stocks to synthetics like vinyl, polyolefin and polyester. The objective is to match the chemistry of the label to the chemistry of the ribbon formulation so that the proper bonding is achieved.

- When talking with your customer, it is important to gather the appropriate label specifications.
  1. Specify a label by width first and then by depth (i.e., 4" x 6").
  2. Specify the number of rows of labels there are across the width of the label stock.
  3. Identify all perforations, both vertical and horizontal.
  4. Note that the standard space (gap) between labels is .125 (1/8") unless indicated differently

27. The printer warranty will be void unless I use the manufacturer's brand of ribbons.

Thoughts to consider: Printer manufacturers may threaten to void printer warranties if ribbons are bought through another channel. An equipment manufacturer likely cannot require, verbally or in writing, that you buy supplies exclusively from them. If they require this, they may be in violation of LAW. They would likely have to conclusively demonstrate and prove that other products are incompatible with their printer in order to have a valid argument.

Printer manufacturers generally offer a 180-day warranty period. If the printheads are properly cleaned, they should last one to two million inches. This is longer than the typical printhead warranty period. If the printhead burns out within the warranty period, the manufacturer or VAR must prove, conclusively, that the cause of the failure is related to the ribbons. This is a long and difficult process with questionable results.

Ask your customer if they would like to explore how much money they would save if they purchased from your company.

My current supplier ties free replacement printheads to my ribbon and label contract.

Thoughts to consider: Today, printheads can cost more than $400 dollars to replace. But, printheads are never truly free, no matter what you hear! The cost of the printheads is spread throughout the consumables your customer buys. Companies have been known to give away cheap printheads that burn out quickly, and at the same time, charge an unreasonably high price for ribbons and labels to help them come out ahead. In the end, the customer loses. Ask your customer to let you find out how much money you could save them on consumables.

The printer service contract is with the company who supplies the ribbons and labels.

Thoughts to consider: Companies may threaten to pull their service contracts if ribbons are bought through another supplier. It may be illegal for them to require this, either verbally or in writing. Consumers can buy service contracts from approved and nonapproved servicing companies. In many cases, only if the contract price was explicitly tied to the agreement to purchase ribbons or other supplies can the contract be terminated.

If this happens, many times they must continue servicing your customer at an adjusted price. Besides, ribbon and label savings will likely exceed the extra costs. Another way to help your cause is to suggest to your customer that they tell their current printer supplier that they have other options and can send their business elsewhere. Printer companies don't want to lose your customers' printer business.

I am happy with my current supplier.

Thoughts to consider: Ask your customer if ribbon availability has ever been a problem? Ask your customer if they ever experience challenges with ribbon/label compatibility?

28. CALCULATIONS

How Do You Calculate the Number of Rolls of Ribbon that is required for a Specific Label Job?

To determine the number of ribbons needed to print a specific number of labels, follow the steps below:

Metric Conversions to Review before Calculations:

- 25.4mm = 1 inch
- 1 meter = 3.28 feet
- 1 meter = 39.37 inches

1. Determine the label repeat length.

Measure from the top of one label to the top of the next label. This measures the label depth plus the gap between the labels. The standard gap is .125" (1/8).

2. Multiply the label repeat length by the number of labels to be printed.

3. Divide the sum by the ribbon roll length in inches.

*(Note that 1 meter = 39.37 inches)

Example: Customer wants to print 1.5 million 4" x 6" labels on a Zebra 140 XIII printer. The ribbon dimension is 110mm x 450m, or 4.33" x 1,476 feet.

Label Repeat: 6.125" (6" label plus .125" gap)
Number of Labels: 1,500,000
Ribbon Roll Length: 450 meters x 39.37" (inches in a meter) = 17,717 inches long

1,500,000 x 6.125 (repeat) = 9,187,500 inches of label to print

9,187,500 inches divided by 17,717 inches (ribbon length) = 518.57 rolls of ribbon required to print this job. Ribbons are sold in full case quantities so the number of ribbons required to fulfill the order is 528, or 24 cases of ribbons for this size.

How Do You Determine How Many Labels Can Be Printed with One Roll of Ribbon?

Metric Conversions to Review before Calculations:
- 25.4mm = 1 inch
- 1 meter = 3.28 feet
- 1 meter = 39.37 inches

1. ***Determine the ribbon length in inches.***

2. ***Determine the label repeat length.***

Example: Customer wants to know how many 3" x 3" labels can be printed from a 410-meter long roll of Sato ribbon.

Ribbon roll length: 410 meters x 39.37 inches/meter = 16,141 inches
Label repeat: 3" label height plus .125" gap, or 3.125" label repeat.
16,141 roll inches divided by 3.125" (repeat) = **5,165 labels can be printed.**

How Do You Determine the Number of Ribbons Required to Print a Specific Number of Labels or Tags?

Label/Tag Repeat (inches) x # Labels/Tags ÷ Ribbon Length (feet) = # Ribbons

29 Thermal Transfer Printing Problems & Quality Improvement

Bar Growth

- Print speed too high – Reduce speed
- Old or inferior ribbon media – Replace media
- Use fresh (not older than one year) ribbon; use premium-grade consumables.

Insufficient Print Contrast Signal (PSC) or Light Image

- Print head overheats – Reduce print speed and or print energy
- Faded image - Ribbon and media incompatible
    - o Consult supplier for compatible ribbon/media combination.

Unable to Sustain Proper Wide/Narrow Ratio

Under burn (not enough ribbon transfer) - Raise energy setting; use a ribbon with higher sensitivity.

Over burn (too much ribbon transfer) - Reduce energy setting; use a ribbon with lower sensitivity.

Bars too thick - Reduce energy setting; improve ribbon/media quality.

Streaks or "Dead Spots" in Labels

- o Wrinkled ribbon
    - Printhead misalignment – Realign printhead
    - Guide bar misalignment – Realign guide bar
    - Adjust printhead pressure
    - Reduce print energy
    - Make sure ribbon width is only slightly wider than label media
    - Adjust rewind tension

Pits and/or Voids, Inconsistent Image Quality

- Dirty print head - Clean print head with Isopropyl alcohol or specialty cleaning solution & cleaning card
- Dust on label media
- Dots missing or warn on print head – Replace printhead

Poor Edge Definition

- Printing too fast – reduce print speed, consider "picket fence" format
- Ribbon and media incompatible - Consult supplier for compatible ribbon/media combination.

Leading and/or Trailing Edges of Image are Translucent ("Ghosting")

- Slew rate to print rate is too high. - Reduce slew rate, one level at a time
- Print head temperature is too low- Increase print head temperature level ("heat factor"), one level at a time.

31. Thermal Transfer Glossary

Wax Ribbon - A thermal transfer ribbon that is coated with a wax based ink formulation. Wax ribbons can be manufactured with a hot melt process or a solvent-based process. Wax ribbons are best for coated and uncoated paper stocks. Wax ribbons will print at higher speeds and lower temperatures than midrange or resin ribbons.

Midrange Ribbon - A thermal transfer ribbon that is coated with a combination of wax and resin ink formulations. Midrange ribbons offer more durable print than wax ribbons. They offer superior scratch and abrasion resistance when compared to wax ribbons, but less than that of a full resin ribbon. Midrange ribbons print on paper and synthetic labels.

Resin Ribbon - A thermal transfer ribbon that is manufactured with a pure resin coating. Resin ribbons create the most durable image and they withstand heat and most chemicals. They must image at slower speeds and higher temperatures. Resin ribbons have the highest degree of scratch, smudge and abrasion resistance. The best print results are on synthetic stocks.

Leader Tape - Uncoated film found at the beginning of a roll of ribbon. It is used for product identification and it protects the ribbon from being damaged. Most leaders are colored.

Trailer Tape - Uncoated portion of ribbon found at the end of a thermal transfer ribbon. The trailer sends a signal to the printer that the ribbon is out. Some printers use a silver trailer that uses reflectivity as a sensor. Others use a clear tape, or no tape to the core.

Back coating - coating that provides heat protection, lubrication and static resistance to lengthen printhead life. The back coating comes in direct contact with the printhead.

Core - The fiber/cardboard or plastic cylinder upon which thermal transfer ribbons are mounted. Most cores have a 1" outer diameter.

Core Size - The inner core diameter (I.D.).

Notched Core - Some printers require notches so that the ribbon will fit properly and snap into place.

Take Up Core - Some ribbons are packaged with an extra core to be used to rewind a thermal transfer ribbon after it has been used.

Coated Side In (CSI) - Indicates that the ink is coated on the inside of the ribbon's film carrier. Examples of printers that use CSI ribbons are Fargo/Datamax and Sato.

Coated Side Out (CSO) - Indicates that the ink is coated on the outside of the ribbon's film carrier. Examples of printers that use CSO ribbons are Zebra, Intermec and RJS.

Printhead - Electronic thermal transfer printing element using individually energized matrix wires to transfer the image from the ribbon to a substrate.

IPS (Inches per second) - Stands for inches per second. This stands for the print speeds at which thermal transfer printers image.

Micron - Refers to the thickness measurement that is used to determine the caliper of the thermal transfer ribbon. A micrometer performs the measurement.

OEM - This is an acronym for Original Equipment Manufacturer.

Ribbon Sensor **-** This is the mechanism on the thermal transfer printer that uses an electronic eye to read the print field area on the label material. Some sensors utilize a gap between labels in order to identify light. Other sensors require a timing mark or a hole punch on the back of the liner.

Burn Temperature **-** The varying heat settings that transfer the ribbon ink to the face sheet. Some materials require a higher burn setting to transfer the ink.

Ink Melting Point **-** The temperature in a thermal transfer printer that melts the ribbon ink into the face sheet.

Void **-** A void refers to the absence of ink in a printing area where ink should appear. Voids create an area of white space that can interfere with the first-read rate of a printed code, and depending on the size and location of the area, may render the code unreadable.

Direct Thermal **-** A specially coated label material that contains microscopic capsules of ink. The ink capsules burst when exposed to heat.

32. Additional Considerations

PROBLEM	POSSIBLE CAUSE	SOLUTION
RIBBON SLIPPAGE – KEY SYMPTOM = "GHOSTING" IN NO-IMAGE AREAS	RIBBON IS MOVING AT A SLOWER RATE THAN MEDIA. COMMON TO GLOSSY LABEL STOCKS	ADJUST UNWIND/REWIND TENSION TO 1:1 RATIO, CHANGE LABEL MEDIA
RIBBON OUT SENSOR DOES NOT SHUT DOWN PRINTER	DIRTY SENSOR	CLEAN SENSOR WITH COMPRESSED AIR IF POSSIBLE
RIBBON BREAKING	PRINTHEAD ENERGY IS TOO HIGH	REDUCE ENERGY LEVEL
	PRINTHEAD PRESSURE IS TOO HIGH	ADJUST PRESSURE
	PRINTER SET IN DIRECT THERMAL MODE	SET TO THERMAL TRANSFER MODE
	UNWIND TENSION IS TOO HIGH	REDUCE TENSION
	POOR BACK COAT	CHECK WITH SUPPLIER/REPLACE RIBBON
PRINTER WILL NOT CALIBRATE DIE CUT LABELS	DIRTY SENSOR	CLEAN SENSOR
	PRINTER SET IN CONTINUOUS MODE	SET TO DIE CUT MODE
	LABEL LENGTH UNDER MINIMUM FOR PRINTER MODEL	ATTEMPT 2 UP FORMAT
	SENSOR OUT OF ALIGNMENT	ADJUST SENSOR