# Thermal Transfer vs. Direct Thermal:
## Key Considerations

By SATO New Zealand

What are the differences between direct thermal printing and thermal transfer printing? In the simplest terms, thermal transfer printing utilizes a thermal ribbon and direct thermal printing does not. Thermal transfer involves the thermal printhead elements (dots) heating the backside of a thermal transfer ribbon to melt and transfer the compounds on the front side of the ribbon to the label material, thus creating the printed image. Direct thermal printing requires a heat sensitive label material.

The printhead elements come into direct contact with the heat sensitive material where the heat from the elements causes a colour change in the material to create the printed image.

Knowing the difference between thermal transfer printing and direct thermal printing is only the first step in evaluating the two alternative technologies for use in a company's label printing application. Below is a snapshot of the advantages and disadvantages of direct thermal technology vs. thermal transfer technology.

| TYPE OF LABEL | METHOD | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|
| **Thermal Transfer** | Thermal Transfer involves the printhead elements (dots) heating the backside of a carbon-based ribbon to transfer the carbon onto the media as a printed image | • Long life of printed image<br>• Printed image does not fade in direct sunlight and is more heat tolerant<br>• Availability of colour ribbons<br>• Typically, longer printhead life<br>• Wide selection of label materials<br>• Good chemical resistance with some materials | • Operators must perform ribbon changes<br>• More mechanical parts in printer means potential for more downtime and mechanical failures<br>• Opportunity for print quality problems due to mismatched labels and ribbons<br>• Opportunity for print quality problems due to incorrect ribbon adjustments |
| **Direct Thermal** | Direct Thermal media is heat sensitive and reacts to the heated printhead elements (dots) to create an image. A thermal ribbon is not required. | • Simplified operator intervention; no ribbon to load or ribbon adjustments to make<br>• No ribbon wrinkle problems<br>• No mechanical failures associated with ribbon drive mechanisms<br>• Fewer inventory items due to lack of ribbon and fewer spare parts<br>• Eliminates potential for mismatched labels and ribbons<br>• No ribbon wrinkle problems | • Typically, slower print speeds<br>• Typically, reduced thermal printhead life*<br>• Will fade or 'yellow' over extended periods of time*<br>• Label will darken when exposed to extreme heat and direct sunlight*<br>• Speciality substrates (i.e. films) can be costly<br>• Limited selection of substrates<br>• Limited chemical resistance |

* SATO New Zealand offers direct thermal materials that are more resistant to abrasion, direct sunlight, UV light and chemical contamination than traditional direct thermal media.

**SATO NEW ZEALAND**
30 Apollo Drive, Mairangi Bay,
Auckland, New Zealand
Phone: (09) 477 2222
Fax: (09) 477 2228
sales-nz@sato-global.com

**www.satonewzealand.com**

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