# Magnet Sales Media Evaluation and Profiling

This report is broken into individual evaluation of each individual printer and ink results with the media as well as a final overview of the media's capabilities and limitations.

## Test Procedure

The ***m*Flex™** media was printed on four printers: the Mimaki JV3-75SPII (mild solvent), Roland SolJet Pro II V SC-545 EX (ecosolvent), the Mutoh Falcon II Outdoor (ecosolvent), and the Seiko ColorPainter 64s (mild solvent). The transport path on the first three printers was non-magnetic so the media transported with no problem, but the Seiko's transport path (front and rear aprons) was ferrous-based (magnetic) and would not allow transport of the media.

On each printer, a color profile (media model) was created with Onyx PosterShop 6.0 or 6.5. Profile creation involved printing four separate targets:

1) Dark restrictions, for determining the optimal amount of CMYK ink to print
2) Linearization, for spacing tints evenly throughout the tone scale, from highlight to shadow
3) Total ink coverage, for determining the percent of C+M+Y+K ink (400% maximum) that the media can hold
4) Profiling target, for making an ICC profile

Additional details about these settings are provided in Appendix A.

The media model was used to print a standard GIA test photo that is used to check all profiles. It was also used to print a GIA test form that is used to take color measurements and check for print quality.

From the media ICC profile, a color gamut in CIE xyY color space was captured using the Chromix ColorThink utility. The gamut illustrates the relative "colorfulness" of inks on each printer and media.

## Results

The results of visual analysis and density measurements are summarized in a table for each printer. Values reported include the following:

1. Printer model, ink set, and media transport path (magnetic or non-magnetic)
2. Profile settings, including heater settings, ink limits (scale, 0–100%), and total ink coverage (scale, 0–400%).

3. Visual observations, including drying time, bleed, mottling, cracking, banding [each on a scale of 0 (none) to 5 (maximum)], and appearance of CAD lines in the test form (sharp or blurred).
4. Density (CMYK, ANSI Status T), including density of the 100% step on the ink restrictions target, density at the selected ink limit (if a value of less than 100% was selected), and density of the color-managed print (with ICC profile applied).

The significance of these measurements is detailed in Appendix A.

**Mimaki JV3.** The first test was performed on the Mimaki JV3-75SPII with SS2 inks. The media worked well with these inks and had only minimal bleeding. The media was dry before it reached the end of the printer's output table. Image quality was excellent. A high head height was required to keep the print head from contacting the media. The printer's media feed path is non-magnetic, so the media traversed through the printer without clinging to the feed path. The JV3 uses front and back heaters to warm the media to an ink-receptive temperature of up to 60°C. Higher heater settings often improve compatibility between the ink and media, but may cause the media to buckle and print unevenly. With the Magnet Sales media, the heaters were wet at 45°C, which was sufficient for proper ink drying but not enough to cause buckling. The media was prone to slight buckling if the temperature was increased past 45°C.

| **Printer Data** | |
|---|---|
| Printer | Mimaki JV3 |
| Ink Set | SS2 |
| Media transport path | non-magnetic |
| **Profile Settings** | |
| Heater settings (front/back, °C) | 45 45 |
| Ink limits (CMYK) | 100 100 100 100 |
| Total ink coverage (C+M+Y+K) | 300% |
| **Visual Evaluation** | |
| Drying time | <1 min. |
| Bleed (0–5, none–max.) | 1 (K into red) |
| Mottling | 0 |
| Cracking | 0 |
| Banding | 1 (direction of printhead travel) |
| CAD lines | Sharp |
| **Density Measurements** | |
| Density, maximum (CMYK) | 1.90 1.30 0.97 1.82 |
| Density, ink limit (CMYK) | (same as maximum) |
| Density, color-managed (CMYK) | 1.30 1.28 0.91 1.56 |

### Seiko ColorPainter 64s

The second test was performed on the Seiko ColorPainter 64. Both the input and output tables were magnetic. Different substrates were inserted between the table and the media in an effort to reduce the magnetic cling, but the media still stuck to the table and would not transport properly. This printer, therefore, was not able to be profiled or tested further.

### Mutoh Falcon II Outdoor

The third test was done on the Mutoh Falcon II Outdoor with the Eco-Sol inks. The test revealed that this ink set was not as compatible with the media as the Mimaki SS2 inks, as revealed by lower ink densities and excessive bleeding. In such cases, compatibility can sometimes be improved by slowing down the printer and/or increasing heater temperatures to enhance drying. Printing can be slowed by putting a delay between print passes, or using unidirectional printing, both of which reduce throughput. In this case the printer speed needed to be drastically reduced to allow for an acceptable output. Unidirectional printing with a 1 sec. delay between passes was needed to slow the printer down to a point where the ink dried without excessive bleeding. Some coalescence still occurred even at these slow print speeds. Mutoh will be updating their inks to a new more aggressive inks (EcoUltra) that are equivalent to Roland's Eco-Sol MAX and that should help with these issues.

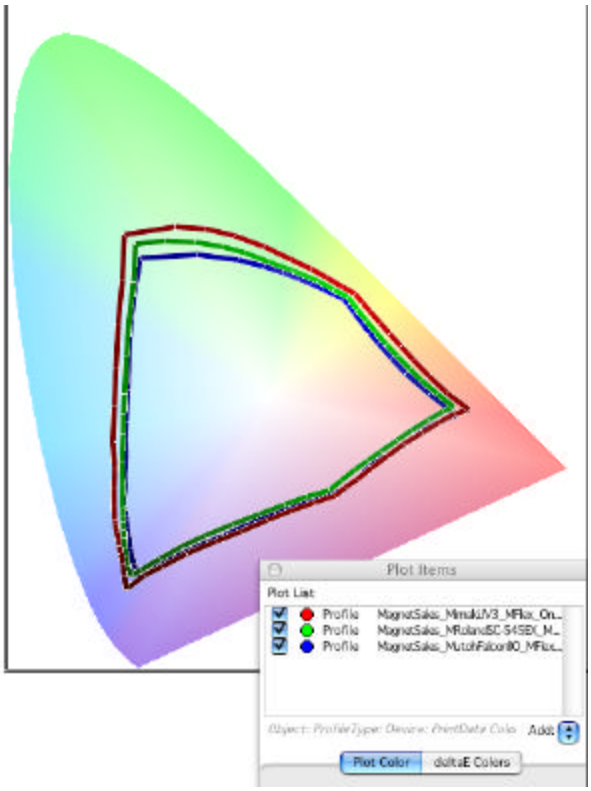
| **Printer Data** | |
|---|---|
| Printer | Mutoh Falcon II Outdoor |
| Ink Set | Eco-Sol |
| Media transport path | Non-magnetic |
| **Profile Settings** | |
| Heater settings (back–front, °C) | 48 52 52 48 |
| Ink limits (CMYK) | 78 80 64 60 |
| Total ink coverage (C+M+Y+K) | 300% |
| **Visual Evaluation** | |
| Drying time | <1 min. |
| Bleed (0–5, none–max.) | 2 |
| Mottling | 1 |
| Cracking | 0 |
| Banding | 2 (direction of printhead travel) |
| CAD lines | Sharp |
| **Density Measurements** | |
| Density, maximum (CMYK) | 1.77 1.32 0.99 1.79 |
| Density, ink limit (CMYK) | 1.64 1.18 0.84 1.41 |
| Density, color-managed (CMYK) | 1.35 1.29 0.84 1.45 |

## Roland SolJet Pro II V SC-545 EX

The fourth tests involved the Roland SolJet Pro II SC-545 EX with the Eco-Sol MAX ink set. This ink set will be replacing the current Eco-Sol inks on the Mutoh. Roland switched to this new ink set, but was previously using the same ink set as Mutoh. The Roland print test produced the best results of any of the printers. The inks dried rapidly and did not require slowing down the printer or adjusting the heat or quality settings to facilitate ink drying. The entire path through the printer is non-magnetic. There were no problems with loading the media or its transport through the printer.

| **Printer Data** | |
|---|---|
| Printer | Roland SolJet Pro II V SC-545 EX |
| Ink Set | Eco-Sol MAX |
| Media transport path | Non-magnetic |
| **Profile Settings** | |
| Heater settings (°C) | 50 |
| Ink limits (CMYK) | 100 100 100 100 |
| Total ink coverage (C+M+Y+K) | 300% |
| **Visual Evaluation** | |
| Drying time | <1 min. |
| Bleed (0–5, none–max.) | 1 (K into red) |
| Mottling | 0 |
| Cracking | 0 |
| Banding | 1 (direction of printhead travel) |
| CAD lines | Sharp |
| **Density Measurements** | |
| Density, maximum (CMYK) | 2.06 1.65 1.12 2.10 |
| Density, ink limit (CMYK) | (same as maximum) |
| Density, color-managed (CMYK) | 1.37 1.07 0.86 1.51 |

**Color gamuts.** The color gamuts show that each printer and ink reproduced a relatively large color gamut on the media. The gamut was largest on the Mimaki JV3 and smallest on the Mutoh Falcon II Outdoor, where a lower ink density was required to reduce ink bleed. It should be noted from the graph below that the performance differences are insignificant with a correctly grnerated and applied profile.




**Conclusion**

The media reacted well with the more aggressive inksets, i.e., those from Mimaki and Roland. The upcoming switch from Eco-Sol to EcoUltra (equivalent to Roland's Eco-Sol MAX) inks on the Mutoh should produce results similar to the Roland's. The current Mutoh Eco-Sol inks do show the type of results users could expect from the old Roland Eco-Sol (non-MAX) inks. The media also has unique heating properties. Due to its thickness and heat conductivity, the material required a longer time for the heat to penetrate the media. In production this may require that the print speed or temperature be adjusted to compensate for the specific qualities of this media. The media core length was much longer than the media itself. This proved to be an issue if the media was not able to be slid to the end for proper alignment in the printer. A core length closer to the media width would alleviate this issue. All of the printers, due to the thickness on the media required print head and media feed adjustment.

## Appendix A • Explanation of Test Measurements and Observations

### Profile Settings

**Heater settings**—Number in degrees Celsius to which the printer's heaters were set. Heaters range from two (Roland, Mimaki) to four (Mutoh) and can be set on a scale of off to 50° (Roland), 65° (Mimaki), or 70°. Higher heater settings improve drying time and ink compatibility with the media, but can alsocause the media to buckle and strike the print heads.

**Ink limits**—Number from 0–100% to which solid CMYK ink densities are individually limited. Onyx's "darkrestrictions" target is used to print the maximum amount of ink (100%) on the media. Higher levels of ink increase density and color gamut, but at some point density may level off or even decrease, or bleeding and slow drying may occur. The user therefore visually selects an ink level that produces good density but does not bleed or take too long to dry.

**Total ink coverage**—Number from 0–400% representing the sum of CMYK inks printed in overprints. Theoretical maximum total ink coverage is 400% (100% of each color), but generally ink bleeds, takes too long to dry, or is wasted (produces no increase in density) at levels above 300%. The total ink coverage chart is used to visually select an ink coverage above which density increase is minimal and/or bleeding becomes a problem.

**Drying time**—Refers to the time after printing at which the ink is dry to the touch. Should generally be less than 10 min. for solvent- and ecosolvent-based inks.

**Bleed**—Creep of ink from one image area into another, resulting in a blurry image. Bleed occurs as the ink spreads by capillary action over the media, or from one ink to another. Can sometimes be reduced by increasing print heat.

**Mottling**—Uneven appearance of solids or tints, which may be caused by media unevenness or incompatibility of the inks.

**Cracking**—Effect in which dry ink contracts on the media, leaving minute white lines where the media shows through.

**Banding**—Lines of darker or lighter printing that can occur in the direction of print head travel or the direction of media transport. In the print head travel direction, banding can be caused by dirty or clogged print nozzles, insufficient heater settings, incorrect distance adjustment (distance between passes), or incompatibility between the print and media.

**Measurements**

**Density, maximum**—ANSI Status T reflection density of the Onyx "darkrestrictions" target at 100%. This is the maximum ink that was printed on the media in the particular test run. Additional ink may be available by selecting multiple strikes (printings) in the RIP. Indicates how much ink the printer can print with the selected number of passes and strikes.

**Density, ink limit**—Density of the "darkrestrictions" target at the ink limit visually selected by the operator. If the operator selected, e.g., 80% as the ink limit based on visual evaluation, this is the density of the 80% patch. This density will be equal to or slightly lower than the above, and represents the maximum achievable without wasting ink or causing excessive bleeding, slow drying, or other effects.

**Density, color-managed**—Density of the CMYK solid patches on the GIA Test Form printed with the completed ICC profile. This indicates the solid density achievable with the profiled media and with the "U.S. Web Coated SWOP" input profile selected for the test chart. This density will generally be slightly lower than the ink limit density and indicates how colorful a print can be expected from that printer and ink on the media.

**Color gamut.** Shown in the CIE xyY chromaticity or "horseshoe" diagram, which represents the colors visible to the human eye. A larger area indicates a bigger gamut and more colorful prints.