

# Overview of Inkjet Media from a “Photo-like” Quality Point of View

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## Abstract

There are many kinds of inkjet media sold in the market. Some of them are promoting “photographic” quality.

In this study, several photo media were compared and given ranks. Then, trials were made to extract performance characteristics which influence people’s preferences.

## Introduction

The past decade has been the period when the image quality of inkjet prints has improved very much. One of the criteria for improvement has been the resemblance to traditional silverhalide photography prints. These efforts for improvement have been made from the viewpoints of printhead technology, ink technology and media technology.

For example, the progress of printhead technology decreased the dot sizes, which changed “coarse” images into sharper images and more detailed tone description. The progress of ink technology expanded the color gamut, and nowadays the gamut volume is even bigger than that of silverhalide photographic prints. Also, combination of “color” ink and diluted “photo” ink helped smoother skin tone reproduction. For media area, efforts for glossier surfaces make prints look more like “photos” and optimized fixing of the dyes in the media contributes to more saturated colors.

In this study, it will be discuss how inkjet media play a role on the “photo” quality in some latest inkjet printing systems. The purpose is to clarify major quality features of inkjet media for realizing “photo-like” images.

## Experimental

### Print Preparation

- 1) Ink/printer system:  
HP photosmart 7960, cartridges 57/58/59  
Canon 990i  
Epson R200
- 2) Media:  
3 kinds of swellable media on resin-coated substrate, 3 kinds of micro-porous media on resin-coated substrate, and 3 kinds of cast-coated media were used.

- 3) Print image:  
4 pictorial images were used.
- 4) Printing mode:  
Instruction from the media suppliers was followed.

### Survey Procedures

- 1) Call for volunteers:  
Around 150 people in Fuji Photo Film B.V. participated. 30 persons among them are familiar to evaluation of prints and the other 120 persons can be considered as normal customers in the market.
- 2) People were asked;
  - a. to “blind-check” the 9 prints without seeing the backside.
  - b. to select the best, second best and third best prints from each printer group and to give them scores so that the sum of scores is 10.
  - c. to select their own criteria (as many as one likes) for selecting prints out of the following list;
    - i. Color reproduction
    - ii. Color saturation
    - iii. Blackness
    - iv. Neutrality of blacks
    - v. Whiteness
    - vi. Skintone
    - vii. Gloss
    - viii. Smoothness
    - ix. Thickness
    - x. Stiffness
    - xi. Defects
    - xii. Relief/leveling
    - xiii. Sharpness
    - xiv. Curling
    - xv. Dryness of prints
    - xvi. Contrast
- 3) Prints were ranked by the total numbers of scores.

## Results and Discussion

### Ranking of Media

Figures 1-3 show the ranking of media based on the procedure described above. Roughly speaking, the following was the ranking for the different printers.

For HP printer;

1. "swellable" >> 2. "micro-porous" > 3. "cast-coated"

For Canon printer;

1. "swellable" > 2. "micro-porous" > 3. "cast-coated"

For Epson printer;

1. "micro-porous" > 2. "swellable" > 3. "cast-coated"

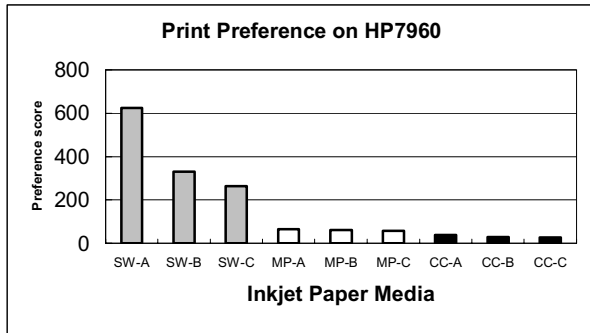


Figure 1. Print preference on HP7960 printer. Note: SW=swellable media, MP=micro-porous media, CC=cast-coated media

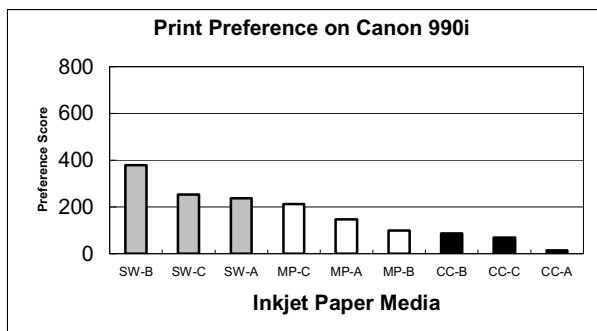


Figure 2. Print preference on Canon 990i

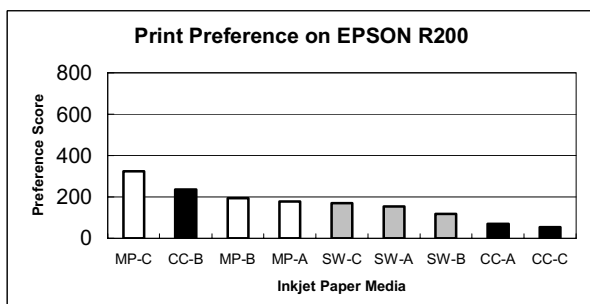


Figure 3. Print preference on Epson R200

At first glance, the ranking for HP printer is understandable, because HP printer should be designed so that HP branded media, major part of which is swellable, match best with it. In the same way, the ranking for Epson printer is understandable, because Epson printer should be designed so that Epson branded media, which is micro-porous, match best with it. What is remarkable, we think, is the ranking for Canon printer, because people showed strongest preference for swellable media even though Canon branded media is micro-porous.

How these tendencies for preference were formed will be analyzed and discussed in the next section.

### Correlation Between Ranking and Technical Features

Figure 4 is the histogram of criteria. The number indicates how many people find that criterion important.

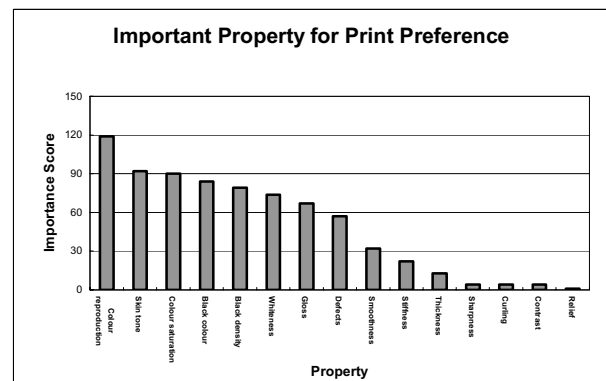


Figure 4. Important criteria for viewers.

Based on the result of Fig. 4, we confirmed if there is any correlation between the ranking and the following features which were measured separately.

- a. Color gamut volume
- b. Black density (visual)
- c.  $L^*/a^*/b^*$  measurement of blacks
- d.  $L^*/a^*/b^*$  measurement of whites
- e. Gloss at 20 degree of blacks
- f. Gloss at 20 degree of whites
- g. Roughness ( $R_a/R_z/Sm$ )
- h. Thickness
- i. Stiffness

Figures 5-8 show some of the correlations. The following statements can be deduced;

- 1) The ranking in HP printer correlates best with the gloss of black areas. Second best correlation was with the color gamut volume.
- 2) The ranking in Canon printer correlates well with black density and gloss on the black areas.
- 3) For Epson printer, there is no correlation found with the performance items mentioned above.

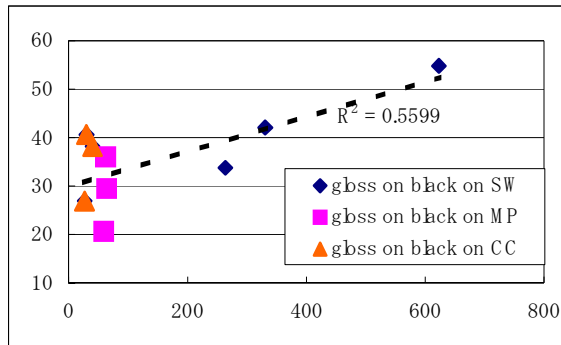


Figure 5. Correlation between the scores (horizontal axe) and the gloss of black printed areas (vertical axe) for HP printer

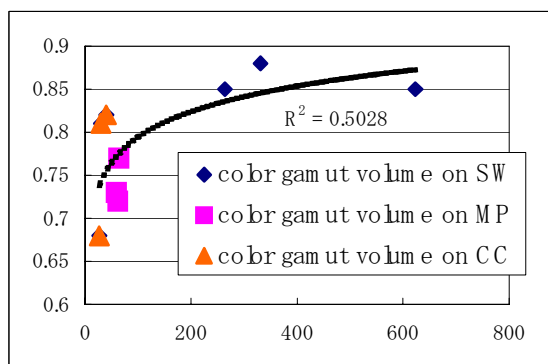


Figure 6. Correlation between the scores (horizontal axe) and the color gamut volume (vertical axe) for HP printer

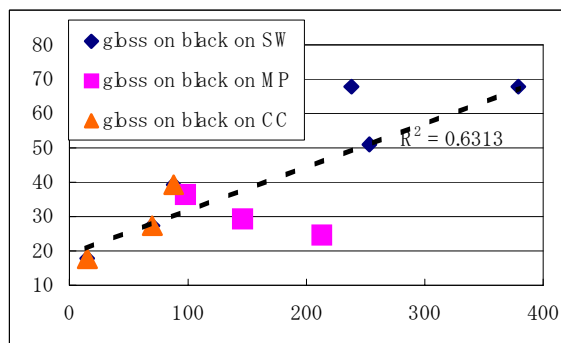


Figure 7. Correlation between the scores (horizontal axe) and the gloss of black printed areas (vertical axe) for Canon printer

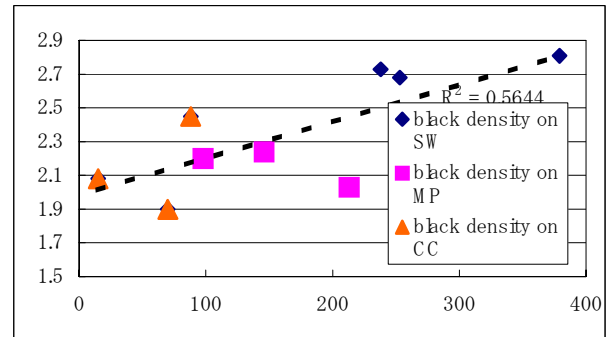


Figure 8. Correlation between the scores (horizontal axe 0 and the black density (vertical axe) for Canon printer

## Conclusion

1. 3 swellable inkjet photo media, 3 micro-porous inkjet photo media and 3 cast-coated photo media available in the market were compared in 3 representative inkjet printer systems by the "blind check" method.
2. The ranking for HP printer was;  
1. "swellable" >> 2. "micro-porous" > 3. "cast-coated".

The ranking for Canon printer was;

1. "swellable" > 2. "micro-porous" > 3. "cast-coated"

The ranking for Epson printer was;

1. "micro-porous" > 2. "swellable" > 3. "cast-coated"

3. Trials were made to find out the performance characteristics which influence people's preferences by confirming correlation between the characteristics and the ranking. For HP printer, the gloss of black areas and color gamut volume were found to be influencing factors. For Canon printer, black density and the gloss on the black areas were extracted as influencing factors. For Epson printer, however, no such characteristics have been found yet.

## Biography

**Hiroyuki Temmei** received his B.S. in organic and polymeric materials from Tokyo Institute of Technology in 1986, when he joined Fuji Photo Film Co., Ltd. He is now working at Tilburg Research Laboratory, Fuji Photo Film B.V.