Technology of Media Capability for Color POD Printers

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Abstract

Much more media variations are required for color POD (print on demand) printers for production printing use than printers for office use. We have been focused on media capability since the launch of its 1st color POD printer in 2008. This paper introduces technologies for media capability on RICOH Pro C751EX/651EX.

1. Introduction

In the commercial printing market, small jobs with wide variety of media are in trend. Color POD printers can supply small number of copies with low cost. Because demand of color POD printers is expanding.

Also, for corporate reproduction divisions, color POD printers are effective tools to reduce outsourcing cost for printing.

For above reasons, color POD printers are becoming popular in recent years.

As a result, request of media variations is expanding. We have been focused on media capability since the launch of its 1st color POD printer in 2008. This paper introduces technologies for media capability on RICOH Pro C751EX/651EX.

2. Outline of Product

Fig.1 shows photo and the specifications of RICOH Pro C751EX/651EX are listed in table.1

***Figure 1**. Photo of RICOH Pro C751EX/651EX*

Table1. Specification of RICOH Pro C751EX/651EX

Productivity	PPM (A4 or Letter)	52.3～220.0gsm : 75/65 220.1～300.0gsm : 52/45
Media Capability	Media Size （Maximum Image Area）	"Post Card" to 13in. x 19.2in. （323 x 480mm）
	Media Weight	52.3～300.0gsm
	Maximum Paper Capacity	7,000 sheets
Image Quarity	Printing Resolution	1200dpi x 4800dpi
Registration	Both Sides Registration	equipped Magnification Correction System
Media Handring	equipped Integrated Media Setting System	
Dimension	W x D x H : 1,320 mm x 910 mm x 1,230 mm	

Media width range from post card to 13inch and its weight range from 52.3gsm to 300gsm can be support by RICOH Pro C751EX/651EX.

Even in 52.3gsm we made media separation successfully. Even in 300gsm we achieved high productivity.

3. Technologies for Various Media Support

3.1 Supports for Thick Media

From business cards and postcards to package print, applications for thick media are fairy wide. Color POD printers are required thick media support from 200gsm up to 300gsn or more.

When thick media enters into and exits from PTR (paper transfer) nip, it shakes ITB (Intermediate Transfer Belt) and causes shock jitter (velocity jitter of ITB).

When shock jitter is occurred, misregistration of dot position on ITB is happened at image transfer. Therefore, stripes parallel to the main scan direction appear in halftone image on media. (See Figure 2.)

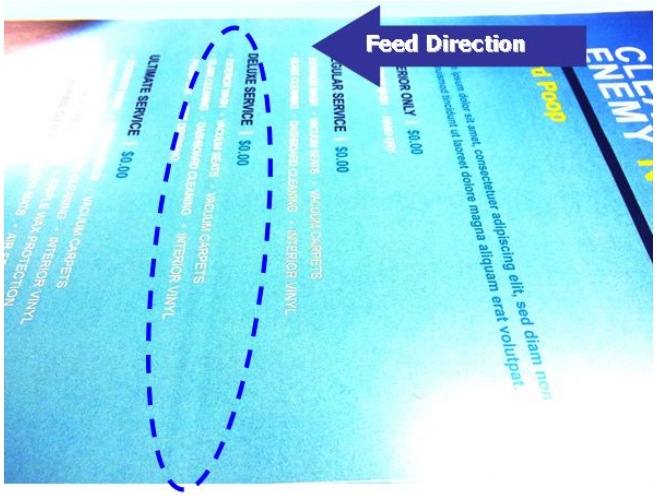

***Figure 2**. Stripes appeared on halftone image by shock jitter*

Troubleshooting of there problem is increasing distance between the medias. However, it causes a side effect for decreasing productivity.

To improve this problem we developed active control mechanism for press and release PTR roller quickly. It is possible to reduce shock jitter by lowering PTR nip pressure at media entering and exiting. In image area, it can be get sufficient transfer condition with normal PTR pressure.

Figure 3 shows a comparison of ITB jitter by off or on of active control mechanism.

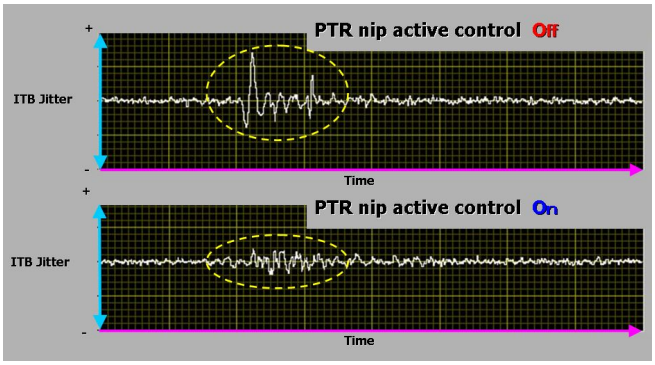

***Figure 3**. Comparison of ITB velocity jitter with active control off or on*

3.2 Supports for Rough Surface Media

Color POD printers are not only used for production customers but also used for corporate customers. Corporate customers commonly use low cost recycled office paper with low smoothness. Typical problem of this case is mottling as shown in Figure 4.

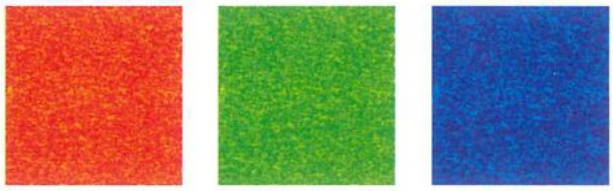

***Figure 4**. Mottling of Solid Image*

Mottling is caused by reduce to transfer efficiency by mechanical stress to toner.

We improved robustness of toner from mechanical stress. Figure 5 shows a comparison of mottling levels by developed and conventional toners.

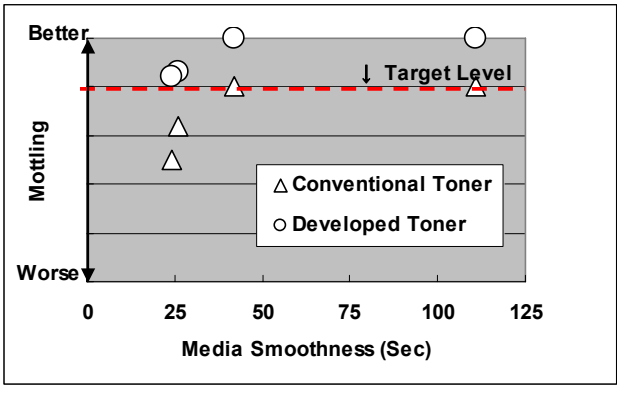

***Figure 5**. Relation between media smoothness and mottling level*

4. Ease for both sides registration adjustment

Production customers require accurate both sides registration.

Both side registration accuracy error causes from heat shrinkage difference between front and back of media. Level of media heat shrinkage varies with media type and heat supply level in fuser. Therefore, it is necessary to adjust both side registrations on a media.

For adjustment of both side registration accuracy errors, we developed magnification adjustment mechanism utilizing 1200 × 4800 dpi laser scanning module with 40ch VCSEL (vertical cavity surface emitting laser) for light source. Schematic of laser scanning module is shown in Figure 6.

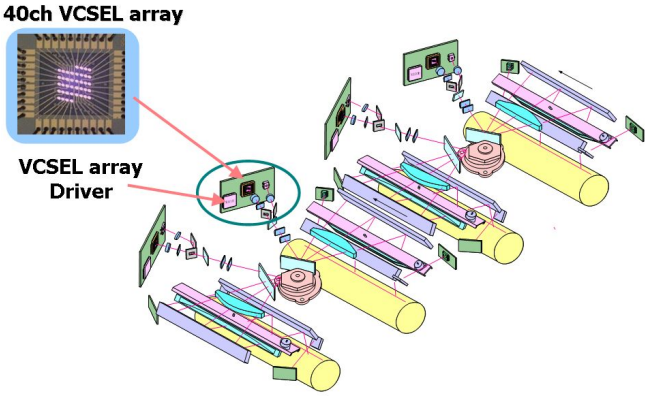

***Figure 6**. Schematic of laser scanning module with 40ch VCSEL array*

The principal of magnification correction is listed below.

- Main scan direction: Conventional dot clock control
- Sub scan direction: Inserting and skipping pixel with a dot pitch of 4800 dpi

Figure 7 shows the case of 17/16 expanding. Discrete pixel insert can expanded image without distortion.

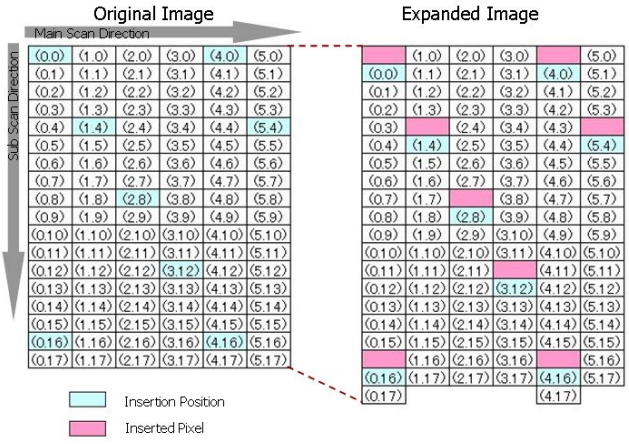

***Figure 7**. Principle of Magnification Correction: Sub Scan Direction*

Adjusting magnification correction is possible in every media setting. Setting for magnification correction values (%) can be adjusted for each scan direction (main / sub) and surface (front / back) from operation panel.

5. Media setting system supporting for media variety

The optimum engine parameters are different depending on brand names or conditions of medias.

For example, optimum gap of releasing PTR is varied with media thickness. (Mentioned in 3.1) Both side registration accuracy errors are varied with media types and storage conditions. (Mentioned in 4)

Therefore, items listed below are request for media setting system for color POD printers that output high quality on variety media.

- Value of engine parameters that can be set for each media, and can be adjusted by users.
- Value of engine parameters for each media can be correlated to color settings for each media by color controller.
- Value of engine parameters for each media can be correlated to each printing job on user interface in printer driver or color controller.

To achieve above listed items, we developed integrated media setting system. Schematic of integrated media setting system is shown in Figure 8.

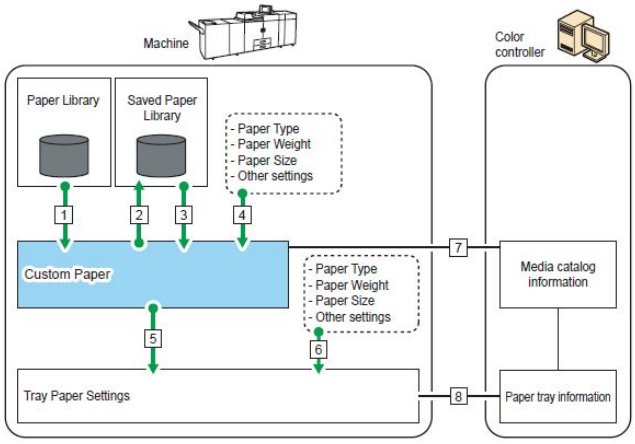

Figure 8. *Schematic of integrated media setting system*

Core module of integrated media setting system is "Custom Paper". That can be entering up to 100 medias. To entering "Custom Paper" you can call from "Paper Library" with specified value of engine parameters. To decide specified engine value for each media, Ricoh evaluates many brand names of media. And we provide engine settings for each brand name of media as "Paper Library".

"Custom Paper" can be adjusting a wide variety of engine parameters such as media feeding, magnification, transfer, fuser, and finishing. Fine adjustment based on the specified settings, can supported the condition of media and customer's favorite.

"Custom Paper" automatically synchronizes with media catalog information in color controller. Therefore, value of engine parameters for each media can be correlated to color settings of each media by color controller. And, users can correlate value of engine parameters of each media to each printing job.

6. Conclusion

Technologies for media capability enhancement listed below are developed for color POD printers.

- Supports for thick media:

To reduce shock jitter of ITB by PTR nip active control.

- Supports for rough surface media:

To reduce mottling by new developed toner.

- Ease for both sides registration adjustment:

Magnification correction control utilizing laser scanning module with 40ch VCSEL array is developed.

- Media setting system supporting for media variety:

We developed integrated media setting system.

Ricoh will continue to pursue developing technologies for media capability and improving controller features for media.

References

[1] H. Chikano, K. Maeda, H. Fujiya, H. Ishibashi, K. Tsuda, S. Kawahara, and A. Tano: Color Production Printer RICOH Pro C751EX/651EX, Ricoh Technical Report No.37,144-149 (2011). [In Japanese]

[2] K. Sakai, D. Ichii, N. Watanabe, M. Ishida, A. Omori, T. takesue, T. Suga, S. Mikajiri, N. Kaima, and H. Yamashita: Laser Scanning Module Adopted with VCSEL array, Ricoh Technical Report No.37, 81-86 (2011). [In Japanese]

[3] Ricoh Pro C651EX/751EX Pro C751 Operating Instructions Paper Settings Reference, 6 (2011)

Author Biography

Hiroshi Inenaga has been with research and technology division at RICOH since 2009. He has focused on the development of process of electro photographic printers.