High Speed and High Performance A4 color LED MFP equipped with Open Platform Technology : MC700 Series

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MC700 series is a line of A4 color LED multi-function printers that pack high-speed printing and high-performance into compact A4-size equipment. The MFPs come equipped with open platform technology, which enables interaction with various applications to improve business workflow. This newly developed MC700 series is introduced below.

Photo 1. MC780dnf A4 Color Multi-Function Printer

Target Market and Product Concept

(1) Market Trend

Market segment for printers/MFPs shared by 20-100 users is generally referred to as the Work Group (WG) segment. This WG is further divided into the Small Work Group (SWG) segment for a group of 20-50 sharing users and the Middle Work Group (MWG) segment for the high-speed printing realm of 50-100 sharing users. Until now, OKI Data's A4 color MFP lineup has been able to cover the SWG segment, but unfortunately the lineup was inadequate to serve the MWG segment. Market-wise, shipment of A4 color MFPs (faster than 31ppm) for the MWG segment is showing steady expansion, and from 2012 to 2016, the world's compound annual growth rate (CAGR) is expected be a high 33%, which makes it a promising market segment (**Figure1**). To expand sales and share in the MFP market, it was desirable to quickly introduce new products to the A4 color MWG segment.

Furthermore, in recent printer/MFP market, there is increasing demand to reduce printing cost and improve work productivity. Functions that support solutions for integrating print management, document management and business workflow are required from this class of MFPs.
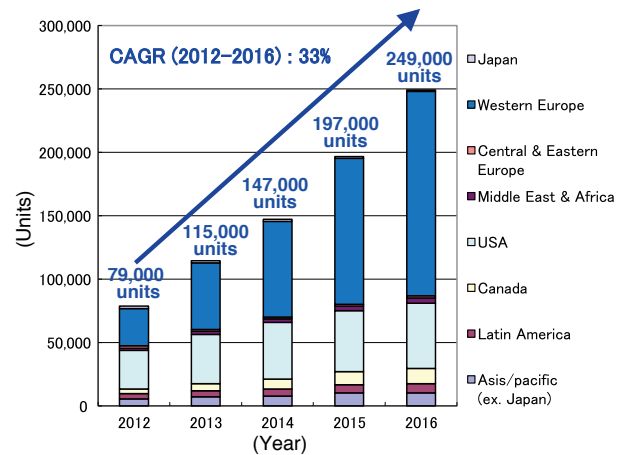

Figure 1. Estimated Worldwide Shipment of A4 Color MFPs (faster than 31ppm)[1]

(2) Product Concepts

As products geared toward the MWG segment, achieving high-speed printing/copying, increasing customer productivity by packing high solution functions typically demanded from center machine class A3 MFPs for the office work group into an A4-size unit, and reducing printing cost were the concepts behind the MC700 series development.

1) Print Speed

The main target being the MWG, print speed of 40ppm (color/B&W) (MC780) was achieved, the highest speed to date from an OKI Data A4 color MFP. Additionally, to enhance the SWG segment product line, 34/36ppm (color/B&W) (MC770) and 28/28ppm (color/B&W) (MC760) model variations were also prepared.

2) Work Productivity Improvement

To improve customers' work productivity, model equipped with a finisher (post processing unit) was developed. In order to ensure the compactness of the A4 machine is maintained, a built-in type finisher was adopted. A shorter height model without a finisher to enhance compactness was also made available. This gives customers an option to choose a model that best fits their usage environment.

Also for the first time, OKI Data has equipped an A4 color MFP with open platform technology. As a result, interaction can be accomplished with various applications to create a highly efficient business workflow.

3) Printing Cost Reduction

Costs of consumables such as toner cartridge and image drum were reduced to lower printing cost.

Key Technologies for Realization of Product Concepts

Key technologies behind the realization of MC700 series' product concepts are presented below.

(1) High-Speed

1) Printer Engine

In order to cut development time and maintain stable product quality, development was based on proven existing equipment making extensive use of common parts. Design improvements to the drive system, fuser and power supply enabled print speed to reach 40ppm. The image drum drive system was redesigned without enlarging the compact equipment size. Power supply unit was newly developed to support the faster paper transport, the resulting power consumption of the fuser, and the scanner drive power that was added. Power unit is also compatible with 100V~230V power sources.

2) RADF (Reversing Automatic Document Feeder)

Increasing copy speed means speeding up both the printer engine and document scanning. Therefore, a new high-speed RADF, which automatically scans both sides of multi-page document, was developed. Additionally, high-speed scanning, increased paper feed/discharge capacity and noise reduction measures were implemented.

With regard to scanning speed, previous models managed only 20ppm for color, but this has been improved to 40ppm in the new models. Anticipating a demand for greater document feed/discharge capacity

with the higher speed, the capacity has been increased from the previous models' 50 sheets to 100 sheets. Document separation performance and stability have also been improved by switching from separation pad to the retard roller method.

Furthermore, gear drive of the document transport drive system was replaced with a belt drive to combat the extra noise that would have been produced by the faster drive system.

Retard Roller Paper Separation Mechanism

Document Discharge Section

Figure 2. Cross-Sectional View of RADF

3) High-Speed Scan Head

To speed up copying, a new scanner CIS (Contact Image Sensor) was adopted, which utilizes a maximum drive clock driven up to a frequency range three times higher than the previous sensor.

For ensuring high-speed and quality signaling between CIS and scanner control circuit with the higher scan drive clock, AFE (Analog Front End) was implemented on the CIS side to digitize the image data at the CIS. Also, the CIS uses LVDS (Low Voltage Differential Signal) for signaling to further cope with the high speed.

LVDS required the use of impedance-controlled FFC (Flexible Flat Cable) for high-speed signaling. However, normally used impedance-controlled FFC with two-sided shielding has low flexibility. Therefore, it is unsuitable for use in moving sections such as the scanner's reading unit, which would require repeated bending and stretching. This problem was studied taking into consideration the effects on EMI (Electro Magnetic Interference), and the result was to adopt OKI's own impedance-controlled FFC.

For these models, a large legal-sized flatbed scanner was developed. This expanded the maximum scannable document size from A4 to legal, and the ability to scan those large-sized documents at high speed improves document handling capability, hence differentiating OKI's model from the rivals.
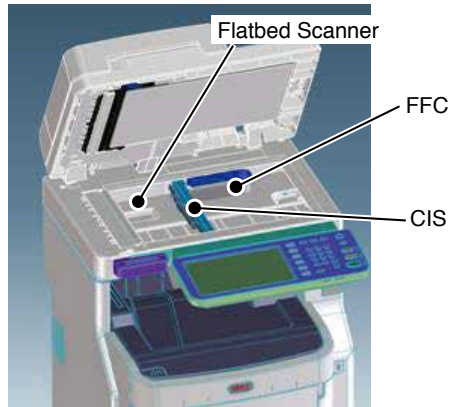
Figure 3. Flatbed Scanner

(2) Image Drum

Extending the life of consumables, such as the image drum unit, is an effective means to reduce printing cost. The image drum units in the new models have 50% longer life processing about 30,000 sheets (A4, 3 Page/Job) compared with 20,000 sheets of previous models. This was accomplished by first reexamining the photosensitive layer formed on the photosensitive drum surface. Then each printing process parameter bias was optimized accordingly for longer life all while maintaining print quality and holding down cost of material changes.

Higher linear velocity of the image drum surface was necessary to achieve high-speed printing. To ensure print quality with the higher velocity, cleaning blade upgrade and other performance enhancements were made to the cleaning mechanism that scrapes untransferred toner remaining on the photosensitive drum.

Longevity required preventing degradation of printing quality over time. Therefore, the developing roller and charge roller, which are processing rollers inside the image drum unit, have been refined.

The new image drum unit shares a high degree of parts with exiting models. This was done to reduce the cost of the unit itself and maintain stable product quality.

(3) Toner Cartridge

Use of large-capacity toner cartridges is another way to cut printing cost. However, volumetric constraint of equipment limits the size of the cartridges. Therefore, effort was focused on enlarging the black toner cartridge since black toner is used much more frequently than the other colors. Study was conducted for a toner cartridge that makes maximum effective use of the equipment's interior without altering the chassis size or compromising toner fluidity/supply. The resulting black toner cartridge holds enough toner for 15K pages (ISO/IEC 19798

compliant) as opposed to the previous models' 11.5K pages, a capacity increase of approximately 30%. Similar to the image drum, the cartridge parts have a high degree of commonality with existing models to reduce cost and maintain quality.
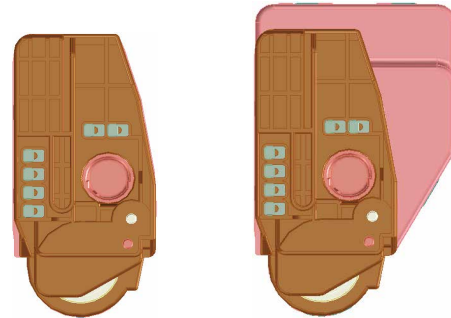

Figure 4. Color Toner (left) and Large-Capacity Black Toner (right)

(4) Finisher (Finisher equipped models only)

Models with built-in finisher offer stapling and offset sorting functions. Implementing the finisher between the facedown stacker and the scanner unit only added 136mm to the height keeping the equipment compact.
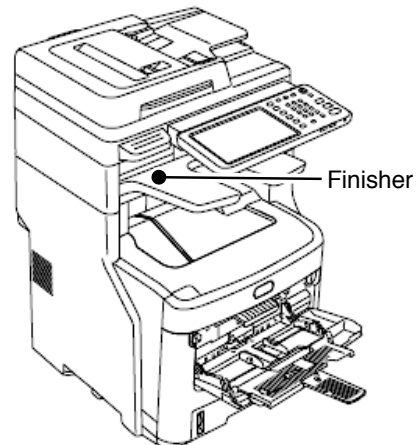

Figure 5. Finisher

(5) Optional Tray

In addition to the optional 530-sheet feeder tray, a 2,000-sheet large capacity feeder (LCF) tray was also developed for the new models. Customers that require mass printing can now avoid the hassle of stopping work to reload paper, thereby leading to better productivity.

(6) Open Platform

Open platform is a technology that enables equipment to communicate with various external server applications. In the overseas market, there is already an active move to

improve work efficiency through the use of open platform and not use equipment merely as a copier or printer. To respond to this market need, OKI Data has for the first time equipped its A4 color MFPs with open platform technology. Using this newly equipped technology, solutions that interact with various server applications, such as print management, document management and business work flow integrated with a system integrator (SIer), can be developed and provided. An example of a store adopting a solution to perform customer registration is illustrated.

In the example, the MFP is used as an input/output terminal that interacts with the application. Traditional workflow required information on the registration forms to be entered into the PC manually. Then, the paper forms needed to be sorted before being filed away. With an application that utilizes open platform, single push of a panel button on the MFP will digitize the paper information without the use of a PC. Furthermore, a system can be configured to automatically sort the information to achieve a more efficient workflow.
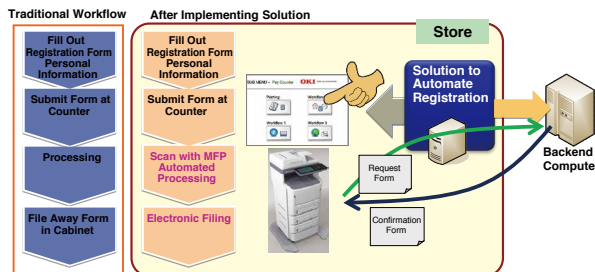

Figure 6. System Utilizing an Open Platform

(7) Large 9-Inch Color Touch Screen

The large 9-inch color touch screen improves legibility and operability enabling previews of scans and faxes on panel. It also simplifies operation of applications interacting with the MFP via open platform. The panel angle on models without the finisher is adjustable for even better legibility and operability.

Figure 7. Large 9-Inch Color Touch Screen

Summary

The MC700 series described above provides high-speed printing, reduces costs and improves work productivity, which is all demanded from the MFP market. OKI Data will continue with the development of products that are even easier to use and have enhanced solutions support to further improve workflow efficiency for customers. ◆◆

■References

1) IDC, Worldwide Quarterly Hardcopy Peripherals Tracker, 2013Q2

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【Glossary 】

ppm: pages per minute
Number of A4-sized pages that can be printed/copied per minute.

CIS: Contact Image Sensor
Scanning sensor that utilizes photoelectric conversion elements.

AFE: Analog Front End
Circuit that adjusts the analog signal from the signal detection device (sensor) and sends it to the digital signal processing device.

LVDS: Low-Voltage Differential Signaling
Differential interface standard for high-speed signaling of data at low voltage.

EMI: Electromagnetic Interference
Disruption in operation of an electronic device caused by electromagnetic waves radiated from other electronic devices.