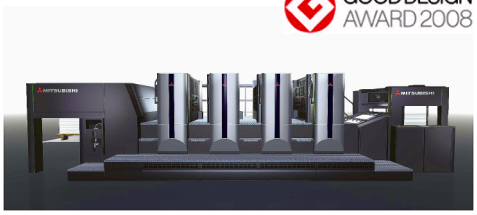
New Sheet-Fed Offset Press Series: DIAMOND V3000

The Gold Award

GOOD DESIGN AWARD 2008



SHINICHI FUJIMOTO YASUHIKO HIRATA
YOSHIRO MATSUURA HAJIME YAGI
YASUHIRO MOCHIZUKI HITOSHI HIROSE

1. Introduction

The development of the high-speed sheet-fed offset press has seen many challenges. Mitsubishi Heavy Industries, Ltd. (MHI) has succeeded in achieving speeds as high as 13,000 sheets per hour (sph) with the MITSUBISHI 3F and 16,000 sph with the DIAMOND 3000. However an increase in speed does not always result in an improvement in productivity under multimix low-volume production conditions. The DIAMOND V3000 was developed for these conditions to achieve a substantial improvement in productivity.

2. Concept of the DIAMOND V3000 series

The design goal of the DIAMOND V3000 series was to achieve a substantial improvement in productivity. Under multimix low-volume production conditions that have been the subject of recent attention, the press downtime is relatively long, resulting in a low operation rate (**Figure 1**).

The causes of press downtime can be categorized into the following five categories: preparation, adjustment, cleaning, maintenance, and miscellaneous. The DIAMOND V3000 series is designed to reduce downtime because it is designed for oil-less production as well as simplified lubrication, cleaning, inspection, and maintenance.

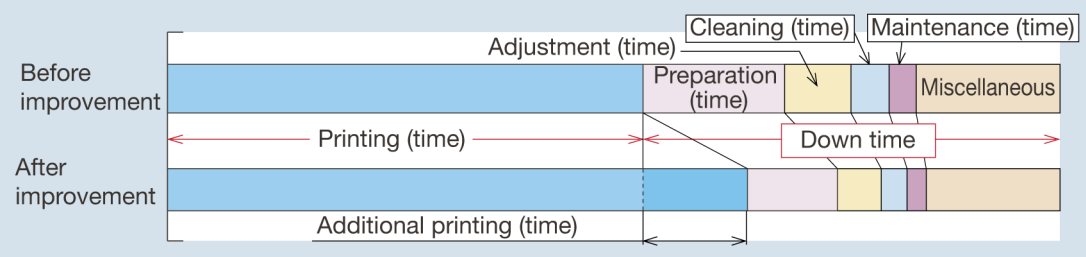


Figure 1 Daily activity breakdown

3. Productivity improvements

Figure 2 shows the major productivity improvements.

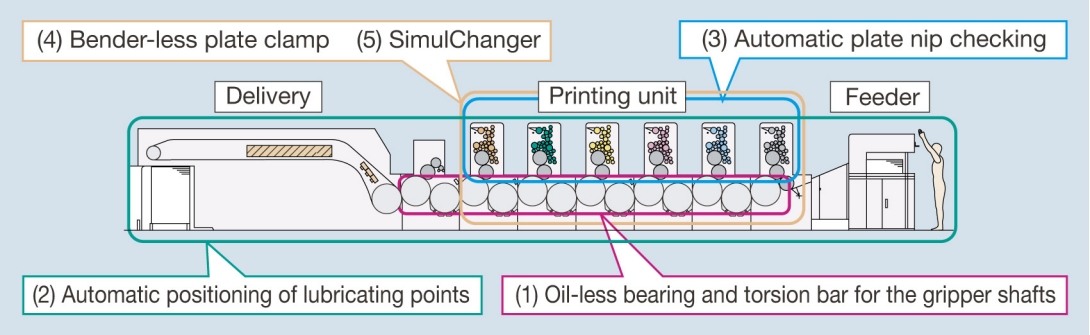


Figure 2 Major productivity improvement items

(1) Oil-less bearing and torsion bar for the gripper shafts

The sheet-fed offset press uses grippers to transfer the sheets from one cylinder (impression cylinder or transfer cylinder) to another. The oil-less gripper shaft bearing and

torsion bar are used in the gripper area to eliminate the requirement for greasing. This saves many man-hours for each grease application (120 lubrication points every two weeks) while eliminating the problem of excess grease scattering on the sheets.

(2) Automatic positioning of lubrication points

The automatic positioning of lubrication points that would normally have to be done manually by visual checks is now performed automatically. A simple touch of a button in each unit makes the lubrication points appear automatically and reduces the lubrication time required.

(3) Automatic plate nip checking

The nip produced when the ink form rubber roller (water form roller and ink form rollers X, Y, and Z) is compressed on the plate cylinder is extremely important to maintain the print quality and stabilize the ink transfer to the plate cylinder. While checking the nip width of the ink form roller was generally a manual procedure performed after a problem occurred, that is now performed automatically on a regular basis so that the ink form roller nip width of each printing unit will be printed on the sheet (**Figure 3**). This improves the control of the press nip width.

(4) Elimination of the plate bending

The plates in an offset press are mounted on the plate cylinder job-by-job to change the image to be printed. In the past, it was necessary to bend one side of the plate before mounting; however, this has now been eliminated because the plate-locking device has been improved (**Figure 4**). This means that the time required for plate bending (30 s/unit) can be eliminated, and plate benders are no longer necessary.

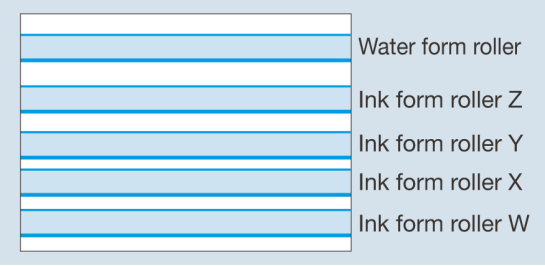


Figure 3 Result of printing on sheets with automatic plate nip checking function

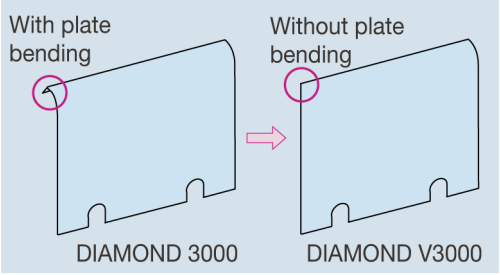


Figure 4 Plate bending

(5) SimulChanger

With conventional presses, it is necessary to change the plate for every color unit because the phase of the cylinders for each color printing unit differs when printing. However, full-color simultaneous plate changes are now possible by matching the phases of all plate cylinders when changing the plate. This reduces the time required to change the plate from 4 min to 75 s for a four-color offset press. The 75-s time required for the plate change does not depend on the number of printing units, and thus increases the time efficiency of the multi-color offset press (**Figure 5**).

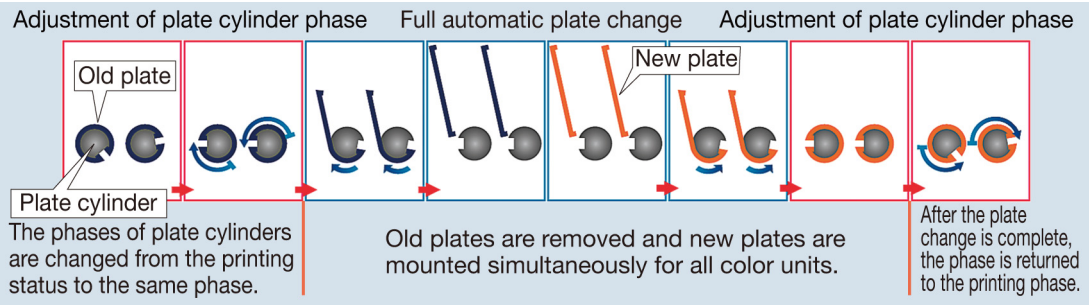


Figure 5 Full color simultaneous plate changing sequence

4. Updated design

The DIAMOND V3000 has light-emitting diodes on the operator side of the printing unit that indicate the status of the press. These were added at the same time as the above improvements (**Figure 6**).

5. DIAMOND V3000 series

In addition to the straight printing press (LX series, **Figure 7**), a dedicated one-pass perfecting press (TP series, **Figure 8**), and a convertible perfector (R series, **Figure 9**) have been added to the DIAMOND V3000 series lineup to meet the demands for various printing needs.

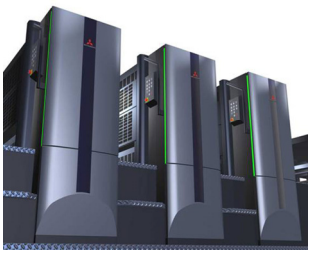


Figure 6 Indication of press status using light-emitting diodes

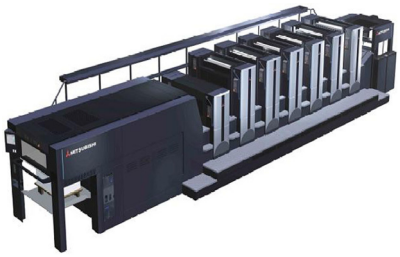


Figure 7 DIAMOND V3000LX

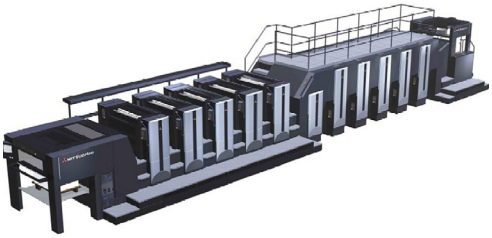


Figure 8 DIAMOND V3000TP

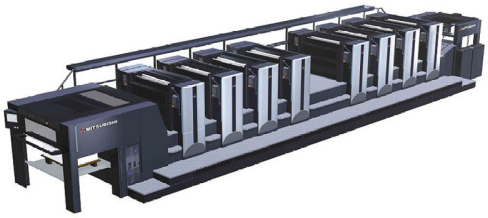


Figure 9 DIAMOND V3000R

6. Conclusion

The straight printing press was rolled out as a part of the DIAMOND V3000 series at the International Graphic Arts Show 2007 (IGAS 2007) held in Japan in September 2007. The dedicated one-pass perfecting press and the convertible perfector were exhibited at the world's largest printing equipment exhibition, DRUPA2008, in Germany in June 2008. This equipment was very well received because of its innovative productivity improvements and styling.

This equipment received the Japan Society of Industrial Machinery Manufacturers Prize at the 38th Industrial Machinery Design Award ceremony sponsored by the Nikkan Kogyo Shimbun, Ltd., on July 29, 2008. On November 6, 2008, the equipment also received the Gold Award at the 2008 Good Design Award ceremony sponsored by the Japan Industrial Design Promotion Organization, as well as placing 5th out of 3023 in the Good Design category.

MHI will continue to be sensitive to market needs so it can provide new products to its customers as their requirements develop.

Authors

Shinichi Fujimoto
Deputy General Manager,
Printing Press Engineering Department,
Paper & Printing Machinery Division

Yasuhiko Hirata
Manager,
Production Department,
Paper & Printing Machinery Division

Yoshiro Matsuura
Manager,
Printing Press Engineering Department,
Paper & Printing Machinery Division

Hajime Yagi
Manager,
Printing Press Engineering Department,
Paper & Printing Machinery Division

Yasuhiro Mochizuki
Printing Press Engineering Department,
Paper & Printing Machinery Division

Hitoshi Hirose
Printing Press Engineering Department,
Paper & Printing Machinery Division