
Development of Environmentally Friendly Thermal CTP System “ECONEX”

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Abstract

We have developed an environmentally friendly thermal CTP (Computer To Plate) system “ECONEX”, which is composed of a positive thermal CTP plate “XP-F”, developer/replenisher “XP-D/XP-DR”, apparatus for reducing waste developer “XR-2000, XR-5000”, and a CTP setter “Luxcel T-9900G CTP”. Rapid dispersion developing technology of XP-F, enabling a highly concentrated replenisher to be used, realized substantial reduction of replenisher usage. XR-2000 and XR-5000, which incorporate decompression distillation technology, realized an 85% reduction of waste developer/rinse water along with low energy consumption. A novel LED (Light Emitting Diode) array in “Luxcel T-9900G CTP”, characterized by a broad depth of focus and non-radiation waiting sequence, has demonstrated both high quality and energy saving. We expect the ECONEX system to contribute in promoting the ecology movement in the printing industry.

1. Introduction

The wave of the global environmental load reduction movement has reached the printing industry. For example, the Japan Federation of Printing Industries, which is an industry-wide organization in Japan, has operated an “green printing” certification system since 2001 with the aim of promoting usage of environmentally friendly CTP (computer to plate) systems and processless plates, and set up in 2009 a voluntary action plan for establishing a recycling society, which aims to reduce the amount of final disposal of industrial waste including developer waste by 24% from the level of 2005 by the year 2010.

The kind of waste generated during the processes by which our customers produce plates for printing (plate making processes) include prepress films, developer liquid waste, and various packing materials.

To deal with prepress film, thanks to the development of digital typesetting (DTP: desktop publishing) and progress in laser and printing plate production technology, use of the CTP system, where the platesetter can output images directly onto a printing plate without using prepress films, is rapidly widening. Thanks to the benefit of cost reduction due to this simplified printing process as well as the contribution to environmental load reduction, the proportion of printing done by CTP systems in the world is currently more than 50%, while in 2001 it was round 20%¹⁾.

Moreover, manufacturers of printing plates including Fujifilm are working on developing environmentally friendly

CTP plate making systems, namely, systems for simplified processing of CTP plates and for processless CTP plates, which reduce the environmental load of developer waste. However, the printing quality of these systems is not as good as those by the conventional printing plate making systems that use strong alkaline developer. Therefore the key for these new systems to become more widely used is attaining more satisfactory image quality.

The waste from packaging materials include card board boxes for external packaging and interleaf paper and card board for internal packaging, and this paper waste can be sufficiently dealt with by existing recycling systems.

Given the situation above, we consider that it is also important to work on the reduction of environmental load generated by the high quality printing plate making systems that use strong alkaline developer, which are currently mainstream, and our R&D is pursuing this goal as well. In this article, we report on our effort for environmental load reduction of the positive thermal CTP system that has a share of more than 90% in the CTP market for commercial printing in Japan.



Photo 1 Positive thermal CTP plate “XP-F”.

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2. The Structure of the ECONEX System and its Technical Features

We launched in 2010 our environmentally friendly thermal CTP system “ECONEX”. This is a system whose major components are the positive thermal plate “XP-F”, the developer waste reduction apparatus “XR-2000, XR-5000”, and the thermal CTP setter “Luxel T-9900G CTP”. The system has been received favorably in the market, as XP-F and XR-2000/5000 achieve substantial reduction in developer waste, and Luxel T-9900G CTP achieves high productivity while saving electricity.

2.1 CTP Plate “XP-F”

The development process of a positive thermal CTP plate consists of developing, rinsing and finishing (Fig. 1). In order to keep the resulting quality uniform, processing solutions are replenished according to the amount used in each process step. Any excess of solution caused by over-replenishment must be processed as industrial waste and becomes a waste of developing process solution. This means that by reducing the amount of solution replenishment, it is possible to reduce the amount of solutions that are wasted.

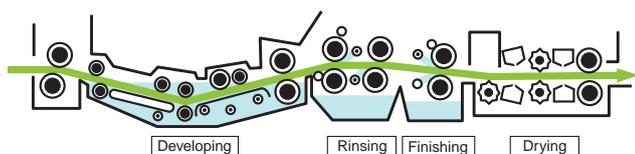


Fig. 1 Developing process of positive thermal CTP plate.

Among the above processes, an approach to replenishment reduction through developer solution can be made chiefly in the developing process. The two types of replenishment in the developing process are the processing replenishment whose amount is proportional to the surface area of the processed plate, and the time-dependent replenishment required due to the pH decrease caused by carbon dioxide in the atmosphere which dissolves into the developer solution as the time passes. The latter accounts for about 70% of replenishment required in the developing process. In order to reduce the amount of time-dependent replenishment, a development system is required that does not depend on the alkaline component (i.e., the pH level) of the developer solution. However, it is generally necessary to add to the developer solution some developing agent such as organic solvent to replace the alkaline component. Use of such organic solvent component, which is also called VOC (volatile organic compound), is problematic and does not qualify as an environmentally friendly solution, because it causes pollution and health hazards when released into the atmosphere or into the water.

The solution to this issue that we have been working on since the release of the positive thermal CTP system is to reduce the amount of solution waste by using smaller

amounts of a concentrated solution for replenishment. At this moment, there are two factors enabling this low-amount high-concentration replenishment: one is a developer solution composition that allows concentration to a very high level, because it does not contain VOC and uses sugar instead of silicate as pH buffer. The other is a precise replenishment management system based on monitoring the conductivity of the developer solution. By combining these two factors we were able to achieve solution waste reduction and printing quality improvement at the same time.

In the case of ECONEX, we took the above ideas even further and succeeded in building a system using the developer replenisher liquid “XP-DR”, which is 30% more concentrated than the previous solution used.

In order to use XP-DR, it was necessary to design plates according to this liquid’s developing characteristics. In the case of positive thermal CTP plate, exposure to light enhances the developability of the photosensitive layer, and then after the processes of penetration of the developer solution and dissolution and dispersion of the photosensitive layer into the developer solution, the development process is completed. In comparison with the existing product (DT-2R), XP-DR has a higher rate of penetration while the rate of dispersion is lower. Due to these characteristics, the image area of the photosensitive layer was more susceptible to damage from the developer solution and also there was a tendency for the non-image area to have residues of photosensitive layer that did not disperse away cleanly. This led us to develop a new plate, XP-F, whose image area has improved developer solution resistance and non-image area has improved developer solution dispersion (Fig. 2)²⁾.

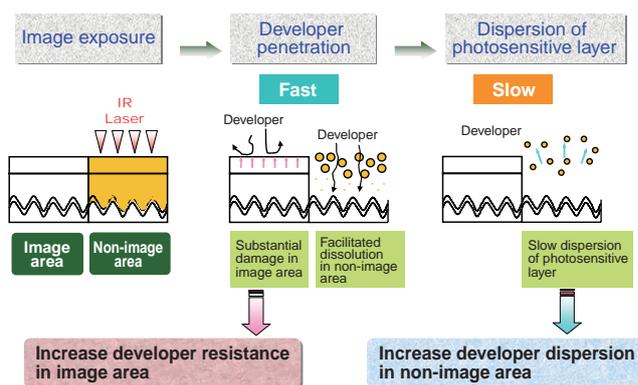


Fig. 2 Assignment of highly concentrated replenisher.

As for the image area, which is the non-exposed part, since the main resin component of the photosensitive layer determines its solubility in developer solution, we used two kinds of resin with different solubility mixed together to control the solubility. The developer solution resistance of the image area was greatly improved by this, and even against XP-DR it was possible to achieve developer solution resistance equivalent to that against the existing replenisher

liquid (DT-2R), and also achieve solubility when exposed that was equivalent to the existing plates (HP-F) (Fig. 3).

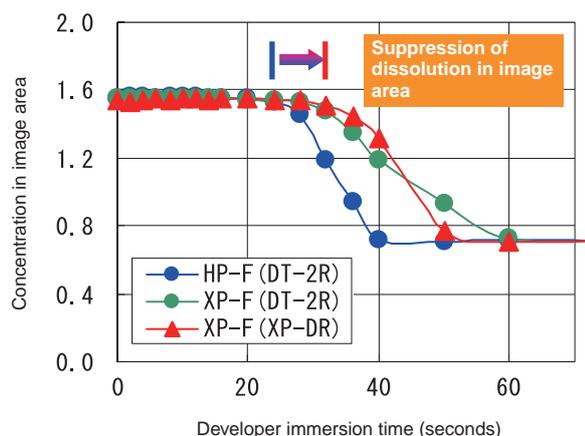


Fig. 3 Effect of solubility control of main binder.

On the other hand, at the non-image area, which is the exposed part, we adopted the RDD (rapid dispersion developing) method to facilitate the dissolution and dispersion of the photosensitive layer. With this method, by adding a small amount of resin that has different developability and an excellent dispersion rate to the main resin component, it is possible to enhance the dispersion in the entire photosensitive layer while sustaining the developer solution resistance of the non-exposed part (Fig. 4).

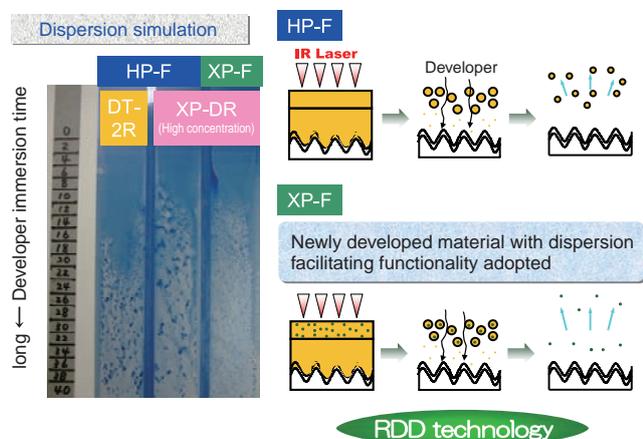


Fig. 4 Effect of RDD technology.

By taking the measures described above, we successfully achieved image development characteristics equivalent to existing systems with the highly concentrated replenisher liquid XP-DR, which makes it possible to reduce the amount of developer waste as much as 40% in comparison with the existing systems, without sacrificing the quality.

2.2 Apparatus for Reducing Developer Waste “XR-2000, XR-5000”



Photo 2 Apparatus for reducing waste developer/rinse water “XR-2000”.

This developer waste reduction apparatus separates the developer waste into distilled recycled water and concentrated waste liquid by vacuum distillation. Except for the finisher which is not suitable for concentration, this apparatus is capable of reducing the volume of all types of waste liquid generated in developing processes and rinsing processes to one eighth, making it possible to construct development systems using alkaline solution with the least liquid waste. Since the distillation is done at around room temperature, the purity of distillation is very high and the pH, BOD, and COD levels of the distilled reclaimed water satisfies the public waste water standards and can be discharged into the water drains. Moreover, the reclaimed water can be used as cleaning water in this apparatus or in a plate processor. This apparatus employs a heat pump system for power saving and it also contributes to carbon dioxide reduction because of reduced transportation costs of developer and reduced incineration of developer waste (Fig. 5)²⁾.

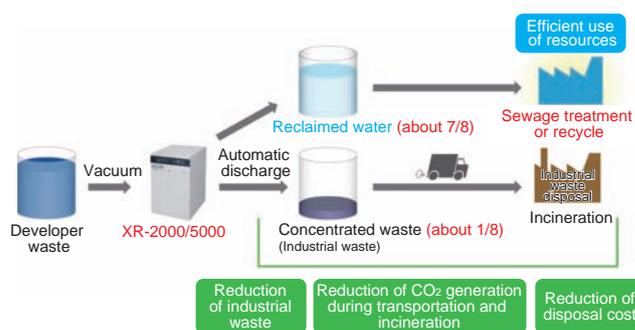


Fig. 5 Systematic view of reducing waste developer/rinse water.

Maximum developer waste processing capability of XR-2000 and XR-5000 is 1500 liters per month and 3900 liters per month, respectively, at the operation rate of 100%. This offers a choice of capacity depending on the amount of plates to be processed.

For example, a customer whose monthly CTP plate consumption is 1000 m² would be able to reduce the amount of waste liquid generated during the developing process from 440 liters using the existing product to about 70 liters by introducing an ECONEX system consisting of XP-F, XP-DR and XR-2000 (Fig. 6)³⁾. Such a high level of concentration is possible largely because the system's developer solution can be highly concentrated, as we detailed in the previous section. This is a significant feature of our system. Since its launch, more than 300 units have been used by customers, and its effectiveness has had a great impact on the market.

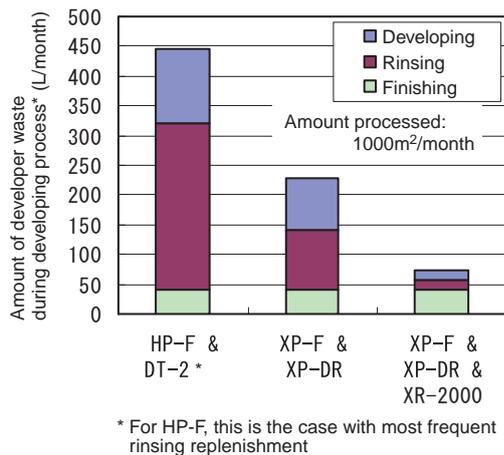


Fig. 6 Effect of reducing waste developer and rinse water by using ECONEX system.

2.3 Thermal CTP Setter “Luxel T-9900G CTP”



Photo 3 Thermal CTP setter “Luxcel T-9900G CTP”.

Equipped with our original imaging head consisting of LED lasers placed in a line for 623 channels, this CTP platesetter is capable of producing 70 plates per hour of the size 1,030 × 800 mm, which makes it the fastest CTP platesetter for commercial printing use. By adopting lasers with deep focal depth (±50 μm), it is capable of consistently high quality image exposure without print blur. The exposure sequence of this system in which the LED lasers radiate only during the imaging process helps extend the laser lifetime and lower power consumption, achieving 10% to 30% power saving in comparison with our existing products²⁾.

Table 1 Specifications of thermal CTP setter “Luxel T-9900G CTP”.

Output system	External drum scanning
Compatible plate	FUJIFILM thermal plate
Plate size	Maximum: 1,160 × 940 mm
	Minimum: 324 × 370 mm
Exposure size	Maximum: 1,160 × 926 mm
Light source	Laser diode (623 ch)
Resolution	1200/1219/1270/2400/2438/2540 dpi
Productivity	70 plates/hr
RIP interface	FUJIFILM WORKFLOW XMF/Valiano Flow 3

3. Conclusion

Our “ECONEX” system that we described in this article is designed for still greater protection of the environment with features such as waste developer use reduction and low power consumption, and is a very effective tool for customers who want more environmentally friendly printing. We are hoping that more customers will choose this system so that we can contribute to the environmental load reduction activities of the entire printing industry.

References

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(In this paper, “ECONEX” is a registered trademark of FUJIFILM Corporation.)