

# Development of a Long-life Processing System for Newspaper CTP Plates (LL-6)

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## Abstract

We have developed the “ECONEX NEWS LL-6KIT” for the newspaper printing industry. The LL-6KIT reduces the amount of waste fluid by improving the processing performance of thermal negative CTP processing systems. By installing the LL-6KIT in an existing machine, the processing performance of a conventional newspaper CTP system can be increased by a factor of six. We have decreased the number of waste fluids in two ways. The first is by designing a new circulation that redistributes precipitates in the developer tank; an additive is introduced to control accumulation of aluminum when washing in clear water. The second is a technology that involves distillation to concentrate waste fluids of both developer and washing water. Additionally, some machine parts have been newly designed. Consequently, it is now possible to extend liquid exchange every six months, and the amount of exhaust CO<sub>2</sub> is reduced because of the significant reduction in the amount of waste fluids.

## 1. Introduction

In recent years, the printing industry has been making efforts to reduce its load on the environment. Among those efforts is the encouragement for companies to introduce ecological printing systems, such as the Green Printing certification scheme of the Japan Federation of Printing Industries.

FUJIFILM started to support environmentally friendly products for the printing industry in the early stage of that movement and has widely engaged in environment-conscious design and the development of manufacturing technology through product life cycles of offset printing plates. The following are green products we developed particularly for the newspaper printing market.

Environment-conscious systems for the FUJIFILM graphic market (newspapers)

- Energy-saving and space-saving, ovenless thermal negative CTP system, HN-N (2004)<sup>1)</sup>
- HN-N II computer-to-plate (CTP) system that enables resource saving and waste reduction without requiring prewashing and interleaf paper insertion (2007)<sup>2)</sup>
- XR-2000/5000 that reduces liquid waste by concentrating waste developers among industrial waste (awarded the 2009 Encouragement Prize for Technology by Nihon Shinbun Kyokai)<sup>3)</sup>
- HN-NV CTP plate that intends to reduce lost printing sheets to the minimum by improving printing performance (2009)
- PLATE to PLATE System that recycles aluminum used in

CTP plate supports to make new ones (awarded the 2012 Encouragement Prize for Resource-recycling Technologies and Systems by the Japan Environmental Management Association for Industry)

- LP-940 NEWS automatic processor for 4 × 1 printers that saves resources by downsizing (2012)

As a new member of the above lineup, we have developed the ECONEX NEWS LL-6KIT, a kit that extends the lifespan of automatic processors for newspaper printing, and gives eco-friendliness to the thermal negative newspaper CTP system, HN-NV, by improving processing performance (Fig. 1).

## 2. Development concept

In the field of Japanese newspaper printing, the following have been significant issues: the improvement of print surface



Fig. 1 ECONEX NEWS SYSTEM & LL-6KIT

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quality and resource saving (reduction of materials, workload, energy, the amount of CO<sub>2</sub> emission and water used, etc.)

Normally, we recommend replacing mother solution for newspaper CTP plates every month or 3,000 m<sup>2</sup> (whole tank simultaneous replacement) when they are used in combination with the LP-1310 NEWS II automatic processor. However, in the case of newspaper companies that own several printing plate manufacture lines, solution replacement should take place very frequently (almost every week if they have four lines) and that has been a great burden on-site. If it becomes possible to achieve the same level of processing performance as the ECONEX II environmentally friendly CTP system for commercial printing (solution replacement every six months or 30,000 plates), the reduction of environmental load, liquid waste disposal cost and chemical cost can be expected, in addition to the reduction of workload of solution replacement, by reducing the mother solution waste produced when it is replaced and primary washing waste. If that is possible by a simple upgrade without changing the current plates and processing solution or replacing the existing auto processor, customers can introduce the alteration at ease without considering capital investment or the disposal of waste deriving from the upgrade. Moreover, because the workload of the staff members involved in the solution replacement process is reduced, they have more time to engage in other work and that also contributes to the increase of overall work performance.

We therefore started to develop the ECONEX NEWS LL-6KIT, aiming to realize a long life of six months (or 18,000 m<sup>2</sup>) not only in commercial CTP but also in newspaper CTP processing systems and thereby contribute to eco-friendliness and resource saving in this domain.

### 3. Characteristics and issues of newspaper CTP processing systems

The current newspaper processing system generates blue precipitation (Fig. 3) in the developer tank of the automatic processor (Fig. 2) and, according to the amount of accumulated precipitation, its lifespan is set to one month (or 3,000 m<sup>2</sup>).

The newspaper CTP plate has a radical polymerization-

type photosensitive layer consisting of infrared-photosensitive sensitizing dyes, radical generators, polymerizable monomers, alkali-soluble binders and colorants. Excited by IR laser exposure, the sensitizing dyes transfer electrons to the radical generators. That generates radicals, causing a radical chain reaction between polymerizable monomers. Images are thus developed. Colorants, which lack polymerization inhibition properties, are used to enable the printing plates to be effectively inspected. However, the colorants are not soluble in alkaline developers and will precipitate in them.

To clarify the issue, we carried out a long-term processing test with the current system. According to the results, precipitation occurred most easily at a position where the circulation flow inside the developer tank becomes weak and where the printing plate transport line comes close to the bottom of the tank. The results also revealed that in a two-month (6,000 m<sup>2</sup>) operation, precipitation nearly reached the height of the transport line. At that point of time, no degradation due to precipitation was observed in appearance or printing performance in our internal assessment. However, there was still concern about adverse effects on the processing plate as well as washing performance degradation by the accumulation of dirt inside the automatic processor if precipitation became more severe.

In the meantime, we also conducted a market survey. The results revealed that, in addition to precipitation accumulated inside the developer tank, clogging occurred sporadically in the piping for the rinsing section of an automatic processor that had been used for a few years.

Based on the above findings, we set the following three items to be our goals for the development of technology to extend the lifespan of the current processing system: homogenous dispersion of the photosensitive layer inside the developer tank; inhibition of precipitation inside the washing tank circulation system (as well as inside the drain pipes); and suppression of the drying and adhesion of fatigued developers inside the automatic processors.



Fig. 2 The plate processor & developing process for newspaper CTP plate



Fig. 3 Precipitation in a present developer tank

## 4. Technology employed in the ECONEX NEWS LL-6KIT

### 4.1 Technology for the homogenous dispersion of the photosensitive layer inside the developer tank

In the past, we carried out research on the removal of the precipitation of non-soluble colorants. However, we were unable to make the expected improvements with filtration-method or precipitation-method removers and abandoned the project. This time, we invented a simple removal mechanism that inhibited precipitation by enhancing the dispersion properties of the colorants inside the developer tank and discharged any precipitation together with the overflow liquid waste. The design concept is illustrated in Fig. 4.

Thus far, we have increased the circulation flow at the

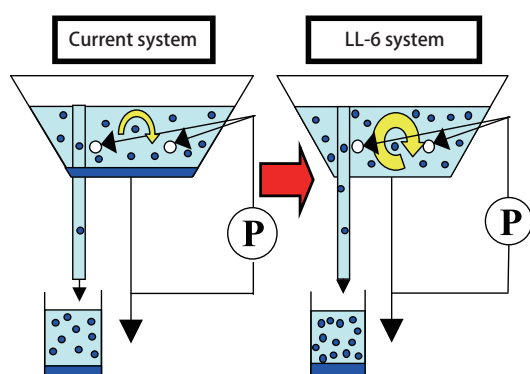


Fig. 4 Model chart of precipitation decentralization

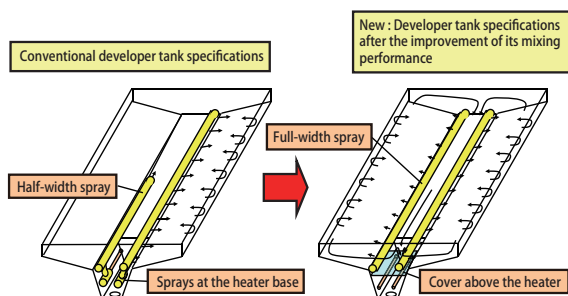


Fig. 5 Re-blueprint on circulation style in developer tank

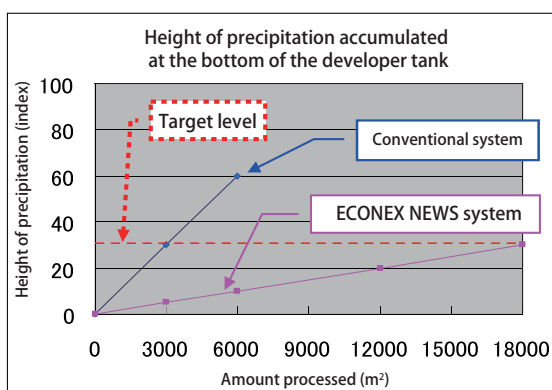


Fig. 6 Amount of precipitation in developer tank

back of the developer tank where the mixing performance is weak, made the overall mixing performance of the tank homogenous and increased the capacity of the circulation pump to slow the precipitation speed. Moreover, we have invented a precipitation guidance circulation channel allowing the replacement of solution most efficiently and redesigned the shape and positions of the submerged sprays (Fig. 5).

Fig. 6 shows changes in the height of precipitation at the center of the developer tank where precipitation accumulates most easily.

### 4.2 Technology for the inhibition of aluminum hydroxide precipitation inside the rinsing tank circulation system (as well as inside the drain pipes)

Having received expressions of concern from several companies about the clogging of the rinsing tank circulation pipes and liquid waste piping, we carried out an analysis and found out that the precipitate was aluminum hydroxide. The solution replacement cycle needed to be extended to achieve a longer-life processing system. Therefore, we studied a method for the prevention of deposits inside the rinsing pipes based on the assumption of its occurrence mechanism: aluminum elutes from the printing plate into the alkaline developer; it solidifies in the developer because it is a highly alkaline solution; however, aluminum that is brought out from the developer into the rinsing section via the printing plate surface precipitates as aluminum hydroxide due to the decrease of pH and clogs the pipe there. To inhibit precipitation even when the pH is decreased in rinsing water, we produced a rinsing water additive with a chelating ability, HN-T, and decided to add it quantitatively to the rinsing tank.

We investigated changes in the concentration of aluminum in rinsing water during the running of the system, identified the minimum amount of chelating ability required, and determined the amount of HN-T to be added. Fig. 7 shows the simulation results for the chelating abilities of the conventional system and the ECONEX NEWS system.

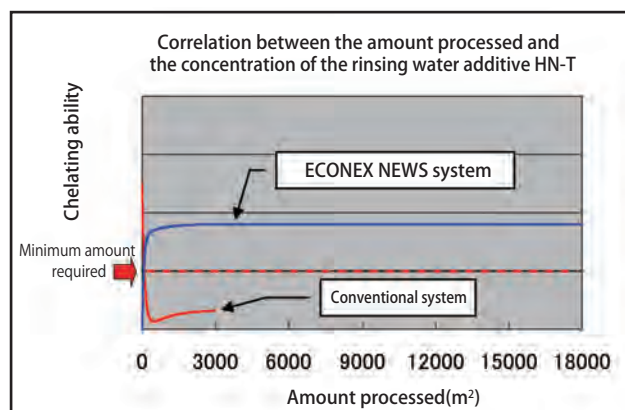


Fig. 7 Change in chelating capacity by HN-T



### 4.3 Suppression of the drying and adhesion of fatigued developers inside the automatic processor

In many cases, under the current solution replacement frequency (every month), intermediate maintenance is seldom performed. Therefore, our goal was the realization of a maintenance-free, six-month (or 18,000 m<sup>2</sup>) lifespan.

To achieve that, we introduced a structure for the suppression of drying inside the automatic processor, such as an automatic washing function for finishing rollers and driving gear drying prevention function. In addition, we incorporated a drying suppression mechanism into components for the parts where the fatigued developer containing photosensitive layer constituents repeatedly adheres and dries, and subsequently redesigned it. We thus enabled six-month, washing-free operation including a three-day continuous stop period.

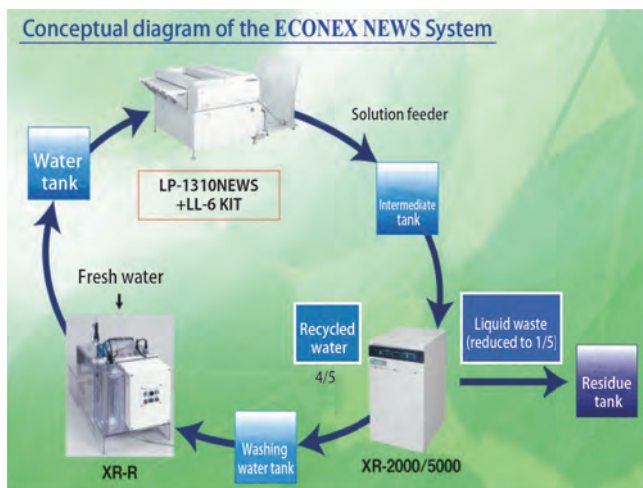


Fig. 8 Image of ECONEX NEWS system

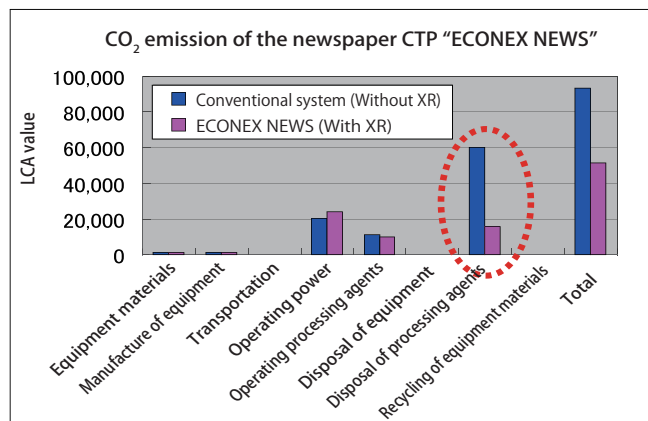


Fig. 9 Carbon-dioxide emissions of ECONEX NEWS system

## 5. Conclusion

The purpose of the development of the ECONEX NEWS LL-6KIT for longer life of processing systems was to give environmental friendliness to the existing automatic processor LP-1310 NEWS II. We have established the ECONEX NEWS System by using the kit in combination with the XR liquid waste reducer and XR-R recycled water reuse system (Fig. 8).

We verified the amount of liquid waste reduced by this system, comparatively, using CO<sub>2</sub> emission (LCA values). The results confirmed that, as intended, CO<sub>2</sub> emission can be reduced substantially in the processing agent disposal process. The details are shown in Fig. 9.

## 6. Afterword

The ECONEX NEWS LL-6KIT described in this paper is an innovative processing system that dramatically improves the environmental performance of newspaper CTP plates. By simply attaching it to the existing automatic processor LP-1310 NEWS II, it reduces CO<sub>2</sub> emission during the disposal of processing agents to approximately one-fourth while maintaining the same quality as before.

We hope that this kit will be introduced into the automatic processors of many newspaper companies and contribute greatly to resource saving in the Japanese newspaper printing industry (reduction of materials, workload, energy, amount of CO<sub>2</sub> emission and water used, etc.)

## References

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