The Konica Press System: Rapid Color Processing for the Press

報道写真用迅速処理の開発

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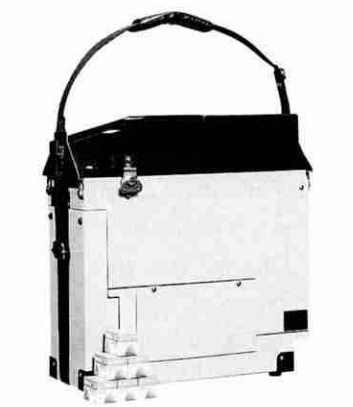


Abstract:

In the press market black and white film has been used for a long time, but recently sports newspapers have started to use color photography, and in general-audience newspapers color has also made rapid progress starting with the Seoul Olympic last year. At the present time, not only use of color but also the quantity and quality of color coverage has an influence newspaper sales.

But color processing takes longer and requires stricter control than black and white. So rapid color processing is demanded when a manuscript's deadline is close.

When sports or news events and incidents occur far from the head or branch office, manual developing has to be done on the spot. In such case the reporter's biggest problem is maintaining strict temperature control.

So there is a demand for a color process that is as easy and rapid as black and white processes.

The Konica Press System accomplishes the following:

(1)Super rapid color negative film and paper processing (CNK-4P, CPK-22QA)

(2)Compact and simple processor
(KP-70 Press, KP-32S, KP-12S, CSP-1740QA, KHP-60QA)

(3)Wide-Temperature tolerance
(Professional Field Kits, CN-HBL, HBP, CP-HBL, HBP)

In the pressent paper we report on trends in press photograohy processing and the Konica Press System.

写真工業社の了承の下、写真工業誌１９８８年９月号「コニカ報道用迅速カラー処理システム」を翻訳して掲載しました。

1 Introduction

With its close relationship to printing, press photography was long limited to black and white negatives and prints. But today, progress in color photography has changed all this.

With today's news coverage restrictions often allowing papers only a single reporter at events, there is no time to shoot both black and white and color. Many newspapers now plan to use color film exclusively, for color negative film can provide black and white prints just as easily as color prints, and color prints can also be sent by wire as black and white prints. Color negative film kills two birds with one stone.

Unlike studio photographs, press photos are often taken under adverse conditions. Moving subjects must be captured instantaneously, which requires high-speed color negative films with a wide exposure latitude. Today, ISO400 and super high speed ISO3200 films are available, so there is no problem with using color negative film exclusively. But on the other hand, color negative films require strictly controlled processing, and their processing takes considerable amounts of time. Electronic color images from video printers can meet deadlines in a crunch, but then print quality suffers greatly. With all of this, there is strong demand for a high-speed, high-quality color silver halide negative-positive process.

Last year, Konica, in cooperation with the Kyodo News Service, responded to this demand with the development of a high-speed system designed specifically for press photography.

2 Trends in press photography processing

2.1 The Marriage of Color and Speed

Newspaper printing is undergoing major changes in an effort to provide readers with news that's both timely and attractive.

In the past, nespapers were more concerned with accurate reportage than with speed. A newspaper was to be read, not viewed, and it was acceptable if the photographs weren't quite up to standard. But today's newspapers have changed considerably. They still aim for accurate news coverage, of course, but they're also after a certain degree of elegance and quality in a quest for aesthetic appeal. This is coupled with a growing awareness that color spreads can be highly effective, especially in establishing the position that newspapers deserve as an advertising medium.

The use of color for color's sake is no longer sufficient, however, and not only the newspapers themselves but their readers as well are increasingly concerned with which newspaper offers the best color. This has had a considerable impact on newspaper sales. For example, the use of color by sports newspapers has become an integral part of their strategy to win a greater share of the market, with the use of color on every page now being studied.

Like color, speed is also an essential competitive factor, a fact easily seen in the high edition numbers their mastheads carry. Newspapers realize that they need not just an attractive product, but timely service, so they are looking for ways to get their color editions to readers faster. The reality they face is that deadlines are determined by subtracting delivery and printing times from the hour at which each edition is to be delivered.

This is a why a newspaper may offer, say, late-night sports results in an edition for one area but not in the same edition for another. To rectify this, there is a strong movement toward the dispersal of printing plants, establishing them in the suburbs of major cities, where traffic congestion means long delivery times. In the past, such areas received editions with articles restricted to relatively early deadlines, but deadlines are now being pushed back by using lacal printing plants, facsimile film sent over communication lines, and photosensitive plates. In addition, the continuing switchover to offset printing is facilitating the move to color spreads.

2.2 The needs for rapid color processing

In the days when color was used only in Sunday editions, almost all color print processing was entrusted to outside processing labs. As the use of color spreads increased, however, many newspapers installed compact minilab systems in their head offices and even in branches, so that the entire process, from film development to printing, could be performed in-house. But even minilab systems required at least thirty minutes for negative development and printung. Reprinting, when necessary, took another ten minutes, and the dodgint that photos often need made the situation even worse. All this put great pressure on writers and editors trying

to make their deadlines. The natural result has been a focus on the reduction of printing time.

It seems that sports events and incidents always occur far from the head offices and branches, with never enough time to get the film back for processing. In such cases, local labs can be used and the photos sent in by wire, but normally the deadline can't be met unless the entire process-from film development to printing-is performed in, say, a hotel bathroom using a color film hobby kit. This is why most photographers pack developing chemicals, an enlarger, developing and thermostat trays, and other such equipment into a large aluminum trunk to take along on field assignments.

One problem with this, of course, is equipment weight, the thermostat trays being especially heavy. Another problem lies in the long hours of laboring in total darkness. Finally, there's the difficulty of temperature control; in the winter, accurate temperature control is virtually impossible. These adverse conditions, because of deadlines, can be the same even when close to the head office. For example, when covering a baseball game at Yokohama Stadium, film may have to be sent in by messenger before the end of the game to meet a deadline, and-sure enough-there's a major upset at the bottom of the ninth inning. The need for a simple, rapid color processing system here is clear.

When covering distant events, photographs are normally sent in by wire. Sending in negatives is fine from the viewpoint of speed, but there is a serious drawback involved: the uncertainty of color balance. The problem is that neither the writer sending in the photos nor the colleague receiving them have any way of knowing if the photos' true colors will find their way into print. The writer must be able to control the processing from negative through print, so a system that can provide finished prints in one or two minutes is the product that is needed.

Hobby kits are the obvious solution, but they are not without their complications. For example, kits offer a choice of liquid and powder chemicals. The liquid chemicals are easier to dissolve and handle, but they are heavy to carry on assignment, and carrying them without special packaging is prohibited by law when flying on overseas assignments. For scheduled events they can be shipped ahead by air, but when assignments arise suddenly, powder chemical kits must be used. Either liquid or powder, the benefits of full-color coverage cannot be had unless color processing is easier and faster than for black and white photographs.

3 The Konica Press System

Great strides have been made in rapid processing technology since the Konica Nice Print System introd-

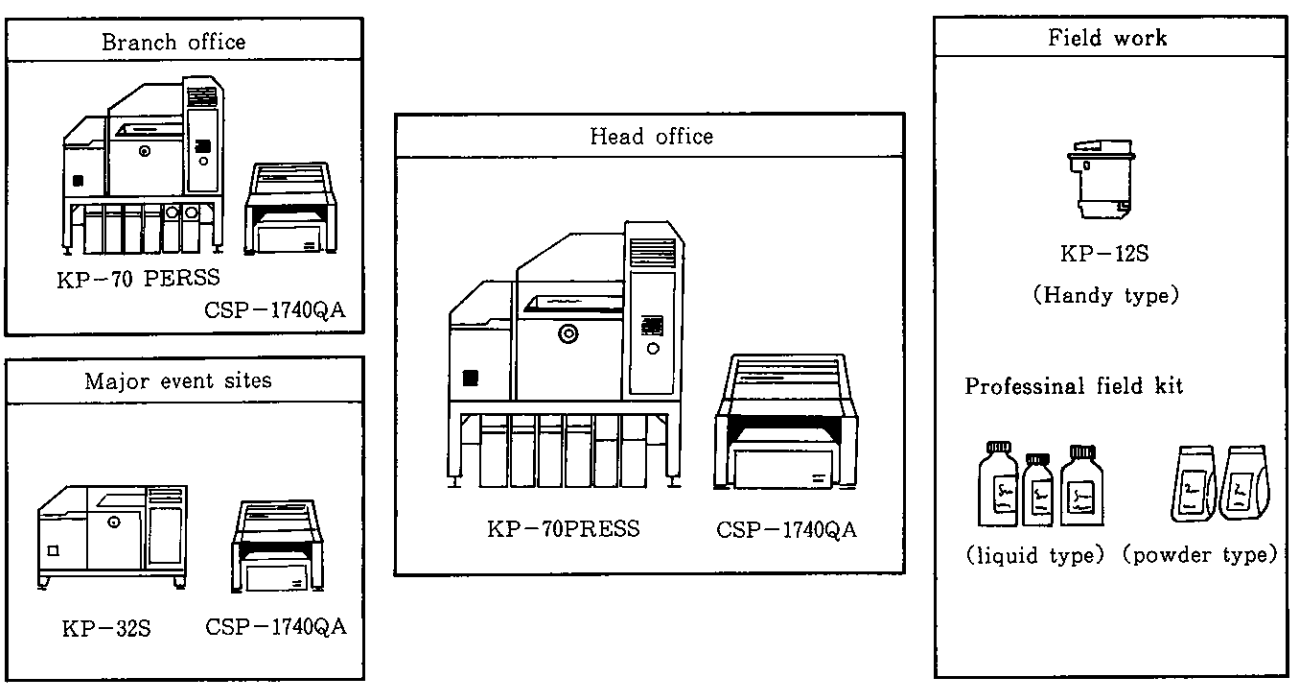


Fig.1 Konica Press System

Table 1 Konica Color Press System

	Processor		Chemical	
Color negative film	Color negative film processor	KP-70 Press	Color negative film press chemical kit	CNK-4P
	Compact color negative film processor	KP-32S	Color negative film press chemical kit	CNK-4P
	Handy color negative film processor	KP-12S	Color negative film press chemical kit	CN-HQ
	Manual processing (reel and mini-tank)	Commercially available	Color negative film professional field kit (liquid and powder type)	CN-HBL CN-HBP
Color paper	Table-top color paper sheet processor	CSP-1740QA (~14×17 inches)	Color paper press chemical kit	CPK-22QA
	Handy color paper sheet processor	KHP-60QA (~11×14 inches)	Color paper professional field kit (liquid and powder type)	CP-HBL CP-HBP

Table 2 Standard processing procedure for Konica color negative process CNK-4P

Processing Step	Color Developer N-1P	Bleach N-2P	Fixer N-3P	Stabilizer N-4P	Dry
Processing Time	1'38"	42"	1'22"	20"×3	74"
Processing Temp.	38.9±0.3°C	35±3°C	35±3°C	30~38°C	40~68°C
Replenishment-Rate (ml/24EXRoll)	55	5	33	40	—

Table 3 Main specifications of Konica press processors for color negative film

Processor	KP-70 Press	KP-32S	KP-12S
Processing steps	CD-BL-Fix-SS	CD-BL-Fix-SS	CD-BL-Fix-Rinse-ST
Processing time (Dry to wet)	4' 42"	6' 37"	7' 21" (50Hz) 6' 07" (60Hz)
Processing speed	829.4mm/min	392.49mm/min	290mm/min (50Hz) 349mm/min (60Hz)
Film size	135, 120, 126, 110	135, 120, 126, 110	135
Processor capacity	68 rolls/hr (135-24)	32 rolls/hr (135-24)	12 rolls/hr (135-24)
Dimensions	530×1210×1550mm	520×1179×980mm	200×460×470mm
Weight	200kg	150kg	18kg
Power source and consumption	100V/776VA 220V/5170VA 50Hz/60Hz	100V/1336VA 100V/1400VA 50Hz/60Hz	100V/500VA 50Hz and 60Hz
Auto-replenishment	Yes	Yes	No

used the world's first washless process in a minilab system that can be used anywhere. One such advance is the Konica Press System, a highly reliable, rapid processing system developed specifically to help the press meet its important public functions. The system meets the minimum requirements for full-color newspaper spreads. Its processing of color film and paper is easier than for black and white, and it is being improved to make this even easier. **Fig.1** shows a typical system configuration, and **Table 1** provides details which enable selection for head office, branch office, or field assignment use.

3.1 The color negative film rapid processing system

(1) CNK-4P color negative film chemicals

Table 2 shows CNK-4P processing steps and times, and **Table 3** shows the specifications and characteristics of the Konica press processor for color negative film

KP-70 Press, KP-32S, KP-12S. Extrapolating from past progress in color negative film rapid processing technology(Fig.2), the total processing time of four minutes and forty-two seconds achieved with CNK-4P, excluding drying time(Fig.3), is at a level that wouldn't have been expected until 1955, making it years ahead of its time.

CNK-4P processing chmeicals can process any color negative film on the market, but were designed especially to give optimum results with Konica Color GX films. The biggest feature is that a pushed, fine-grain type rapid color developer is used, so high image quality can be achieved under almost exactly the same printing condition as conventional processing.

Press photographers often use high-speed films, with ratings of from ISO400 to ISO3200, and negatives are almost always enlarged. The use of telephoto lenses is also frequent; for example, when shooting night baseball games. Enlargemnt ratios can be from 10 to 50 magnifications, and the resulting coarse grain is intolerable. With conventional high-temperature rapid

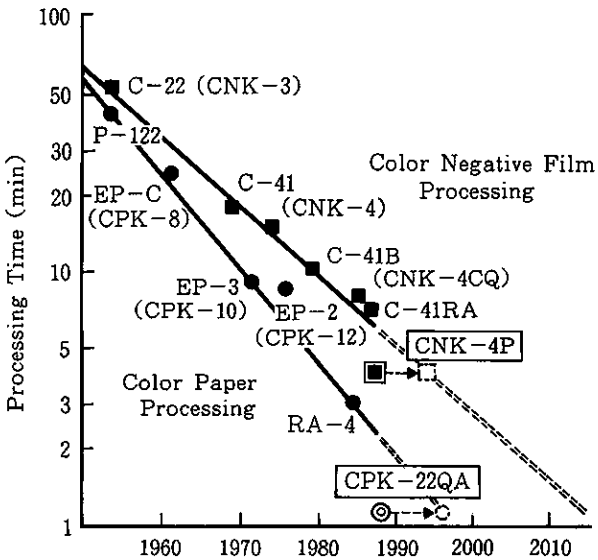


Fig.2 Progress in color processing speed

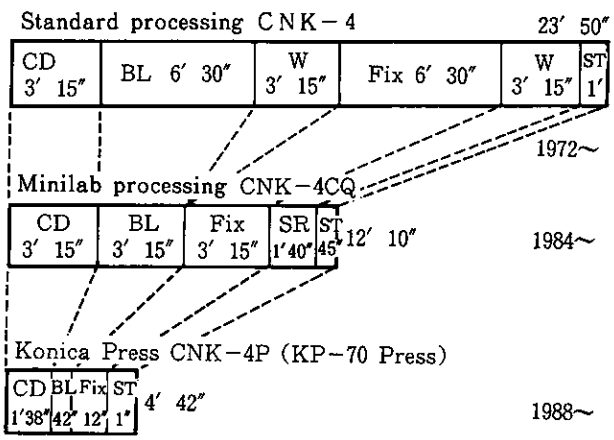


Fig.3 Progress in color negative film processing steps and times

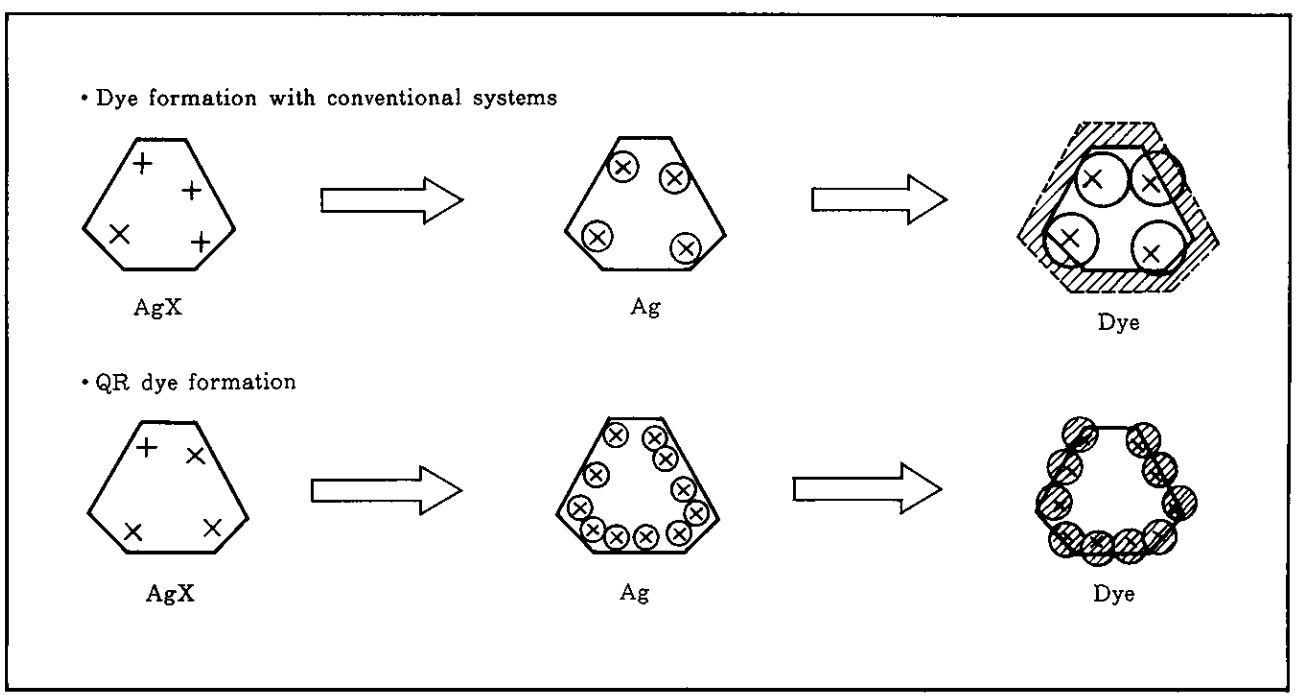


Fig.4 Quality revolution development system

processing, it has been common that the grain normally becomes coarse[1], but QR(Quality Revolution) color development technology(**Fig.4**) has overcome this limitation to achieve both rapid development and fine grain. In the processes adjusted to the same developing level as those used for thirty seconds to three minutes fifteen seconds(**Fig.5**), the more rapid the development, the finer the grain was(**Fig.6**). The fact was proved by means of spatial frequency component, i.e. noise wiener spectrum[2](NWS). In the QR System, grain is improved through a marked increase in the number of color picture elements and maximum suppression of the growth of individual dye particles, which cause undesirable dye clouds. It was observed on large silver halide grain with optical microscope that the size of dye clouds formed during rapid processing was smaller than in conventional processes. **Fig.7** shows part of prints(cabinet size enlarged though 135 nagative film:

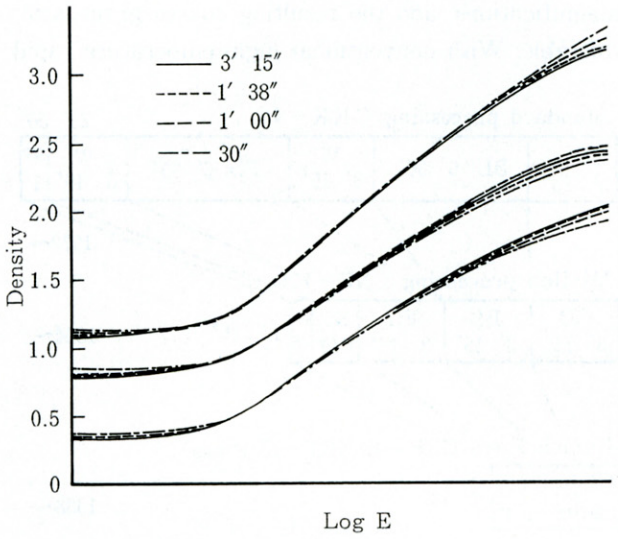
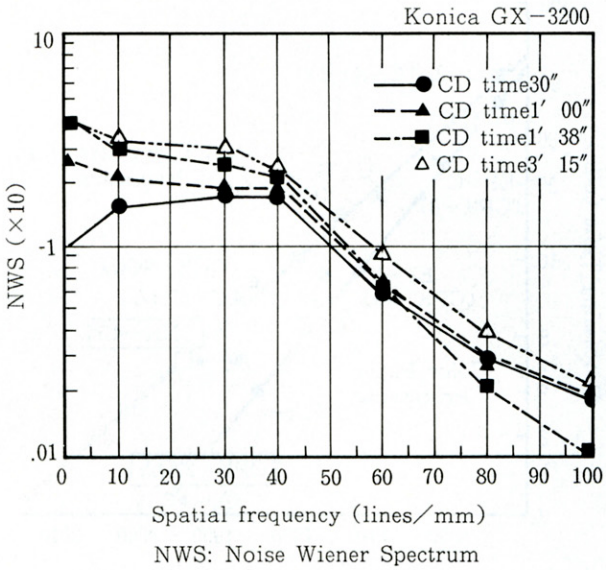


Fig.5 Characteristic curves compaired (Film : Konica GX−3200)



NWS: Noise Wiener Spectrum

Fig.6 NWS on rapid d development

(GX−3200)

Conventional processing (3′ 15″)

Rapid processing (30″)

Fig.7 Comparison of fineness of grain between convention processing and rapid one

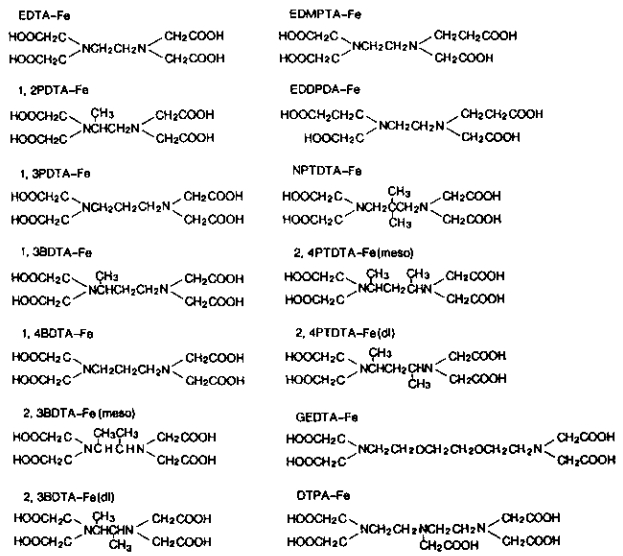


Fig.8 Structure of ferric chelate used

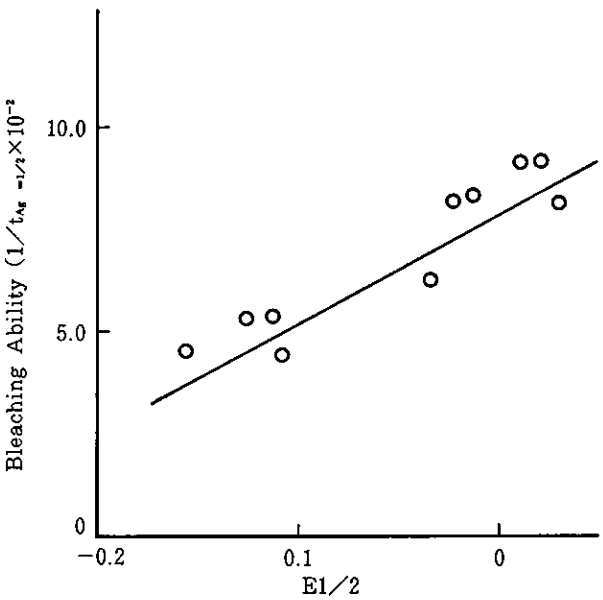


Fig.10 Correlation between bleaching speed and E1/2

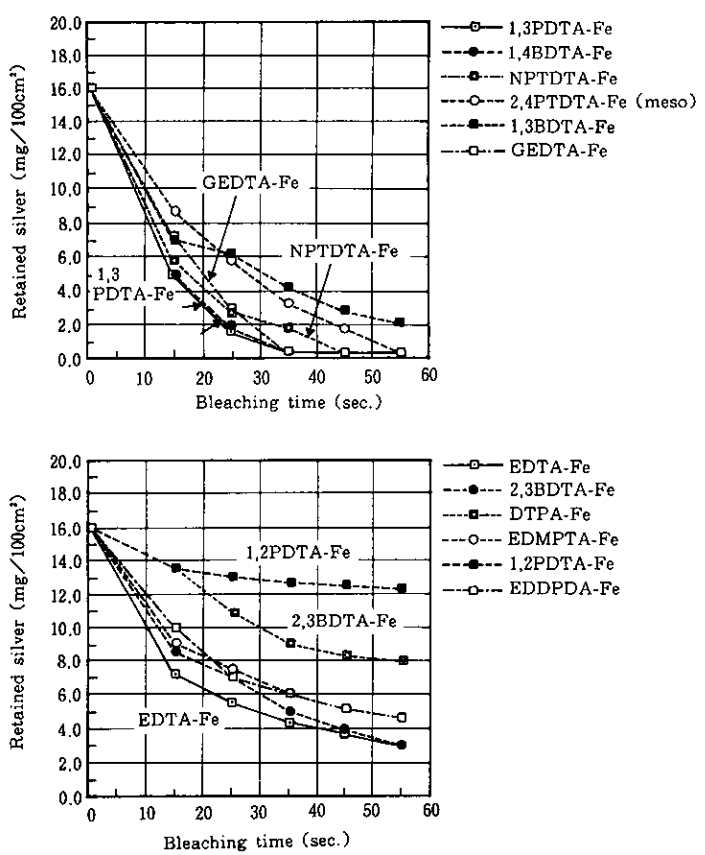


Fig.9 Bleaching speed of various bleaching agents

E1/2 (V)	
+0.020	GEDTA-Fe (11)
	1,3PDTA-Fe (6)
	1,4BDTA-Fe (7)
0.000	
	NPTDTA-Fe (6)
−0.020	1,3BDTA-Fe (6)
	2,4PTDTA(dl)-Fe (6)
−0.040	
−0.060	
	2,4PTDTA(dl)-Fe (6)
−0.080	
−0.100	2,3BDTA(meso)-Fe (5)
	EDMPTA-Fe (5)
	1,2 PDTA-Fe (5)
−0.120	
	EDTA-Fe (5)
	DTPA-Fe (5)
−0.140	
	2,3BDTA(dl)-Fe (5)
	EDDPDA-Fe (5)

(number of member in ring involving N atom)

Fig.11 Redox potential of various ferric chelate

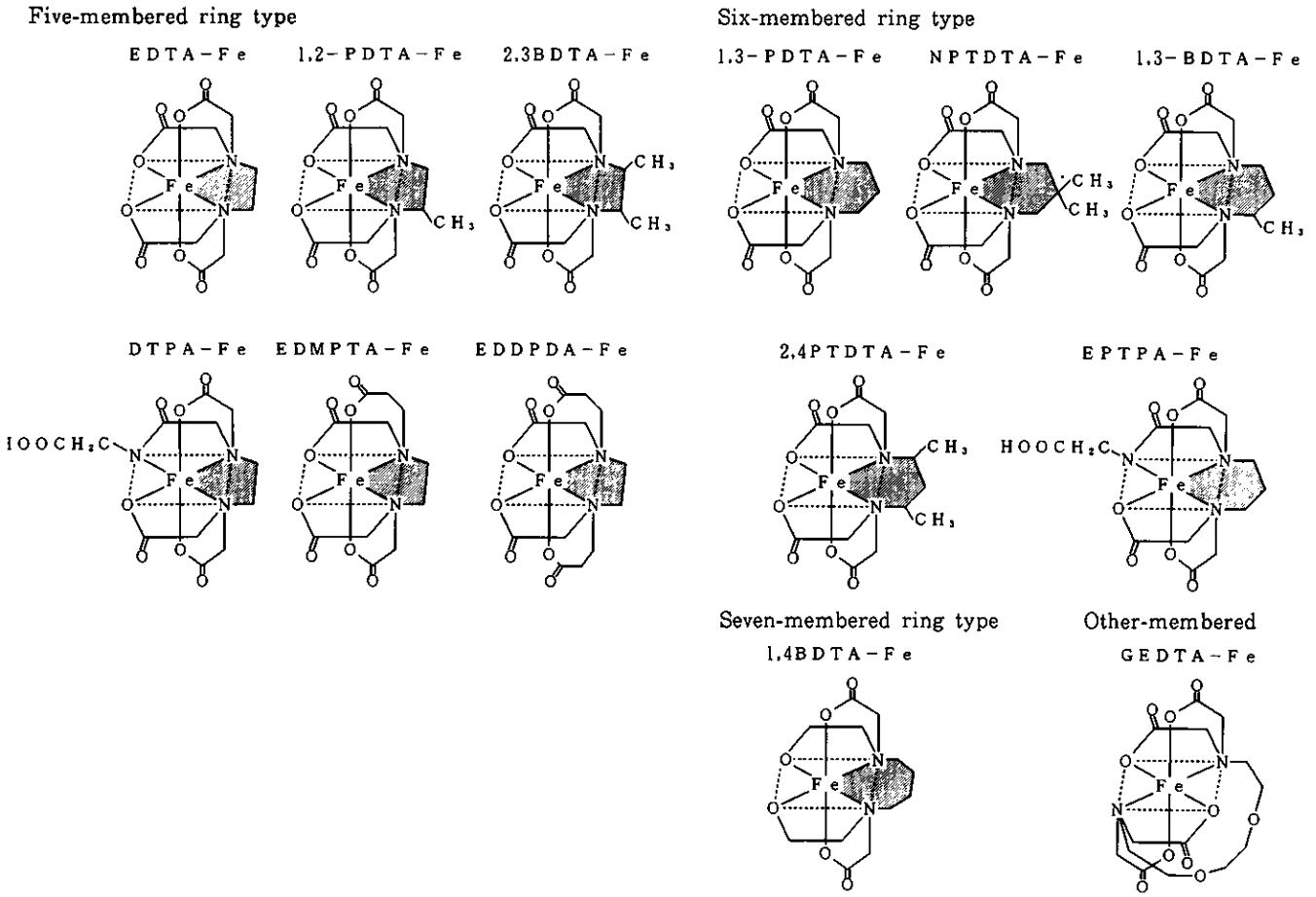


Fig.12 Structure of various ferric chelate

GX-3200) processed by conventional develope(3'15"), and rapid on(30"). These prints were printed by under-exposed negatives because of displaying the definite difference on fineness of grain between both. The grain of rapid processed color negative film is finer than that of cinventional one.

CNK-4P bleaching-the world's first forty-second bleaching process-was accelerated by using an entirely new bleach. Compared to conventional bleaches using ferric EDTA, silver oxidation is greater and solution stability is higher. Several kinds of ferric complexes were tested in the search for a better bleaching agent (Fig.8). Fourteen kinds of ferric complexes were synthesize and several of them were found to be better bleaching agents, ferric 1,3-PDTA, ferric 1,4-BDTA, ferric NPDTA, ferric GEDTA and so on(Fig.9). Bleaching speed is relative to the redox potential of the bleaching solution(Fig.10). It was found that ferric complexes of which the ring including nitrogen and iron atoms was six-membered, e.g. 1,3-PDTA, have high oxidation potentials; on the other hand, ferric complexes which have a five-membered ring, e.g. ferric ED TA, have low oxidation potential(Fig.11,12). It is well known that ferric complexes with five-membered rings are more stable than ferrous complexes, while ferric complexes[3] with six-membered rings are more stable than ferrous complexes though to a lesser extent(Fig.13). This theory is also proved by the fact that ferrous complexes having six-membered rings are oxidzed more slowly than those which have five-membered rings.

It was earlier believed that the limit for fixing of color negatives was between two minutes and thirty seconds and three minuttes. However, a fixing time of one minute and twenty seconds has now been achieved through the use of a new fixing accelerator which is a urea derivative.

Conventional washless processes use a two-step stabilizing process which includes a super-rinse and a stabilizer. Rapid processing has been made much simpler with CNK-4P because only one step-the stabilizer-is now required.

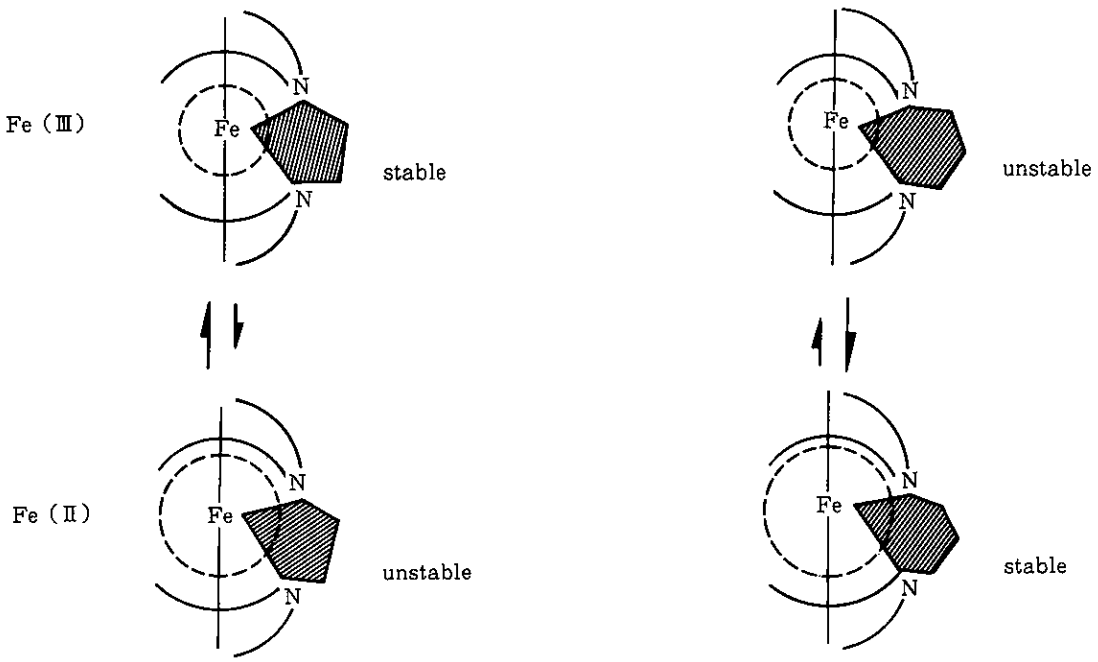


Fig.13 Stability of ferric chlates forming five and six membered rings

All CNK-4P chemicals are highly stable and do not easily deteriorate with passage of time.

KP-32S is the special rapid processor which used CNK-4P chemicals as same as KP-70 Press and has the following merits. First is that it is too compact to carry it by wagon, and the second is to consume lower electric power. Therefore, this processor can be used on site for the events such as sports, topics and exhibition.

(2) Handy type processor KP-12S

Using the above techniques, processing time has been greatly reduced, making it possible to design a ultra-compact processor.

Another factor in reduction of the size and weight of the processor is the elimination of circulation pumps, which are replaced by rack agitation of the processing solution.

One batch of CN-HQ processing chemicals can be used for processing 20 rolls(24 exposures each) of color negative film, at the rate of 12 rolls per hour. The chemicals kits are light, compact and dissolve quickly for convenient carrying and use in the field.

The result is the Konica Handy Type Processor KP-12S, a compact, lightweight and inexpensive processor which can be carried in a shoulder pack, and is therefore highly suitable for on-the-spot coverage of news events.

3.2 The color paper rapid processing system:

(1) CPK-22QA color paper chemicals

Process CPK-22QA is a set of processing chemicals which, combined with QA Paper, offer the highest quality prints for press photos from all types of color negatives. This combination was designed for a total processing time of one minut(**Fig.14**). Processing times are shown in **Table 4**, but these times can very depending on the processor used(**Table 5**).

As with color negatives, the shortening of processing times for color papers has progrressed almost linenearly when expressed logarithmically, both for the standard Kodak process and for the standard Konica process(**Fig.2**). This is due not just to progress in processing technology, but also to innovations in color paper technology. With the silver bromide emulsions of second generation color papers, the theoretical limit for rapid development time was four minutes. Development times of two minutes or less were technically possible, but both processing uniformity and image stability suffered. The alkali content was also high, so there was considerable danger in handling the chemicals, making them unsuitable for general use.

The silver chloride color papers that have now been developed are third generation papers. Silver chloride

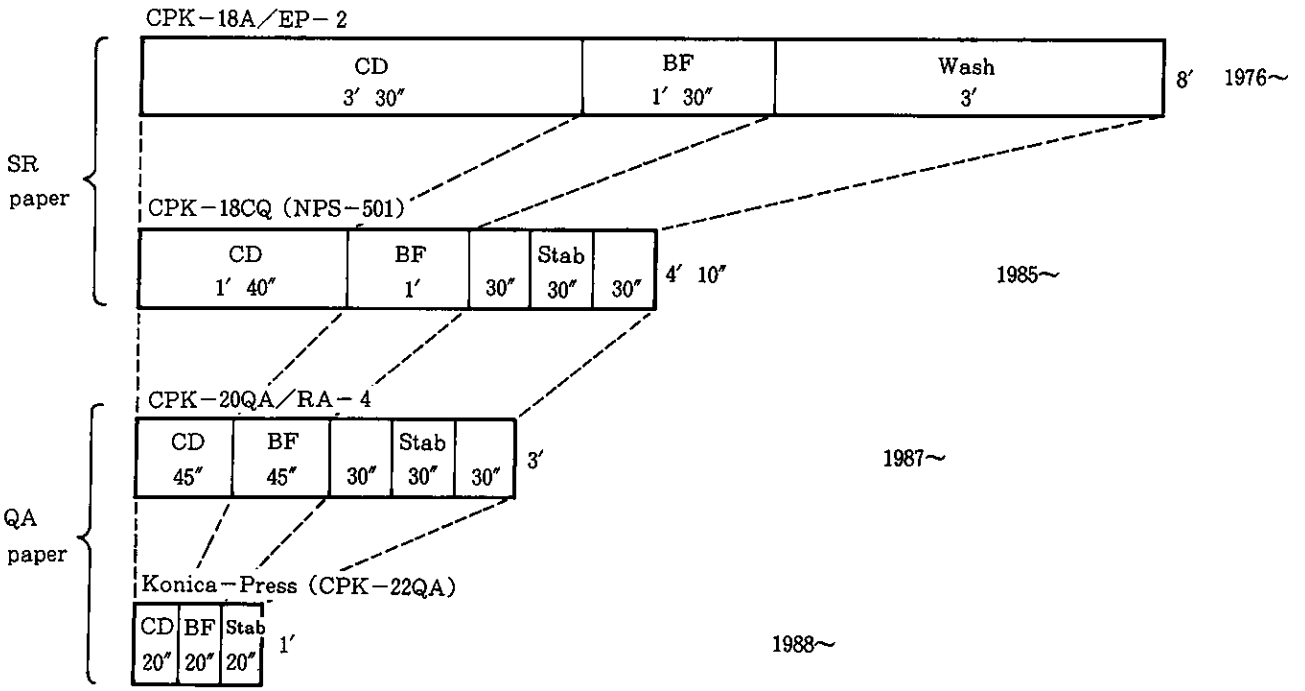


Fig.14 Progress in color paper processing times

Table 4 Standard processing procedure with CPK-22QA

	Developer P-1	Bleach-fixer P-2	Wash or stabilizer P-3
Processing time	20"	20"	20"
Processing temp.	40±0.5°C	30〜38°C	30〜38°C

Table 5 Main specifications of Konica press processors for color papers

Processor	KHP-60QA	CSP-1740QA
Processing steps	CD-BF-SS	CD-BF-SS
Processing time	20"-20"-20" Varies with temp. (20〜40°C) (20"-50")	40"-30"-30" Total 1'40"
Processing speed	55〜660mm/min	425mm/min
Max print paper size	〜11×14	〜14×17
Chemical tank volume	1.8ℓ×3	3.6ℓ, 2ℓ×2
Dimensions	636×550×257mm	550×530×520mm
Weight	24kg	48kg
Power source and consumption	100V 2.5A	100V 15A
Replenisher unit	No	Yes
Dryer	No	Yes

color paper was announced by Kodak in 1986 with a three-minute total processing time using 2001 paper and RA-4 chemicals. After repeated market tests begun in 1987, Konica began sales of QA paper and QA chemicals this April, offering higher reliability than was possible with second generation papers and processing. This system is contributing to the improvement of productivity and quality for minilabs and wholesale labs, which can now offer a total processing time of three minutes. It is expected that third generation color paper will become the market standard in the futuer.

The one-minute total processing time of new konica press paper processing system was achieved by using Konica QA Paper and the new color paper processing chemicals CPK-22QA. Conventional silver bromide type papers cannot be uses. The basic photograhic characteristics of Konica QA paper are almost exacty the same as those of conventional papers, but processing spead, color reproduction, and whiteness are superior.

CPK-22QA utilizes pre-mixed solution chemicals.A preservative is used to prevent oxidation of the color developing agent, and the oxidation-rduction potential is controlled, so the color developing agent does not oxidize even when it comes into direct contact with oxygen in the air. Solution stability is extremely high and tarring is inhibited, resulting in a silver chloride

developer that is extremely long-lasting and reliable even after long periods of use. This has also been used in the Konica Washless System, which makes it possible to conserve water and heat and still achieve high images stability. High image stability is also a characteristic of prints developed with the Konica Press System's wide-temperature hobby kids.

3.3 Wide-temperature professional field kits

There are several reasons why color processing is said to be difficult. One is the highly accurate temperature control(+/−0.3℃) which is required to maintain color balance and saturation. Another is that processing temperatures and times are highly and longer than with black and white processing. And still another is that a considerable amount of equipment is necessary to maintain a constant processing temperature. The total result is that making color prints with hobby kits is normally a highly frustrating experinence.

The Kyodo News Service asked Konica to develop wide-temperature processing chemicals to meet the needs of field assignments. Research was started using QA paper, and the result is just such a system.

QA paper is highly innovative and of extremely high quality. There is absolutely no loss of performance with rapid processing, so it is a perfect candidate for a wide-temperature processing system. Since last April, this system has been exhaustively tested, and the results have been excellent.

Separate wide-temperature field kits were developed for color paper and for color film, with the same outstanding results obtained with both. The powder chemical kit was used during U.S. President Reagan's visit to Moscow, at the Toront Summit, and at the British Open, and constantly superb color photographs were wired to Japan daily.

One of the best features of the wide-temperature field kits is that they do away with the need to carry heavy thermostat trays on assignments. Films can be developed in a portable processing tank placed at the photographer's feet while taking photograhs, for example, from the stands at a baseball game. All that's needed is to determine solution temperature and select the appropriate development time. This is a truly revolutionary product for color photography. The following is an overview of these kits.

(1) Wide-temperature professional field kits
for color negative film
CN-HBL(liquid) and CN-HBP(powder)

Processing is now possible without any worry about temperature control. It is only necessary to read the proper processing time from the chart for any temperature from 25℃ to 40℃ and proceed accordingly. A major feature is that the characteristic curves show almost no variation, regardless of the temperature. **Table 6** shows the standard processing times. The solutions are also very easy to mix.

The relationship between temprerature and time (**Fig.15**) used as a standard for determining sensitivity and gradation is such that, with standard processing, color balance was lost when processing continued for more than twenty-five minutes at a temperature of 25 ℃ or higher. With the CN-HB kits, however, characteristic curves virtually the same as those for standard processing can be obtained with a processing time of only seven minutes and thirty seconds at 25℃. At 40℃, characteristic curves identical to those for stadard processing can be obtained with a processing time of

Table 6 Standard processing procedure with CN-HBL

	Color Developer	Bleach-Fix	Wash	Stabilizer
Processing temp.	40°C	36°C	18~32°C	18~32°C
Processing time	1'40"	3'	2'	30"

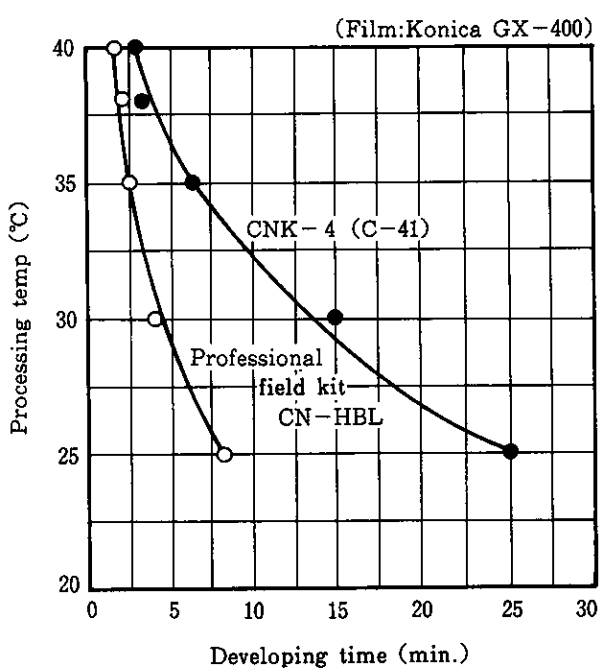


Fig.15 Developing times at various temperature in color negative film processing

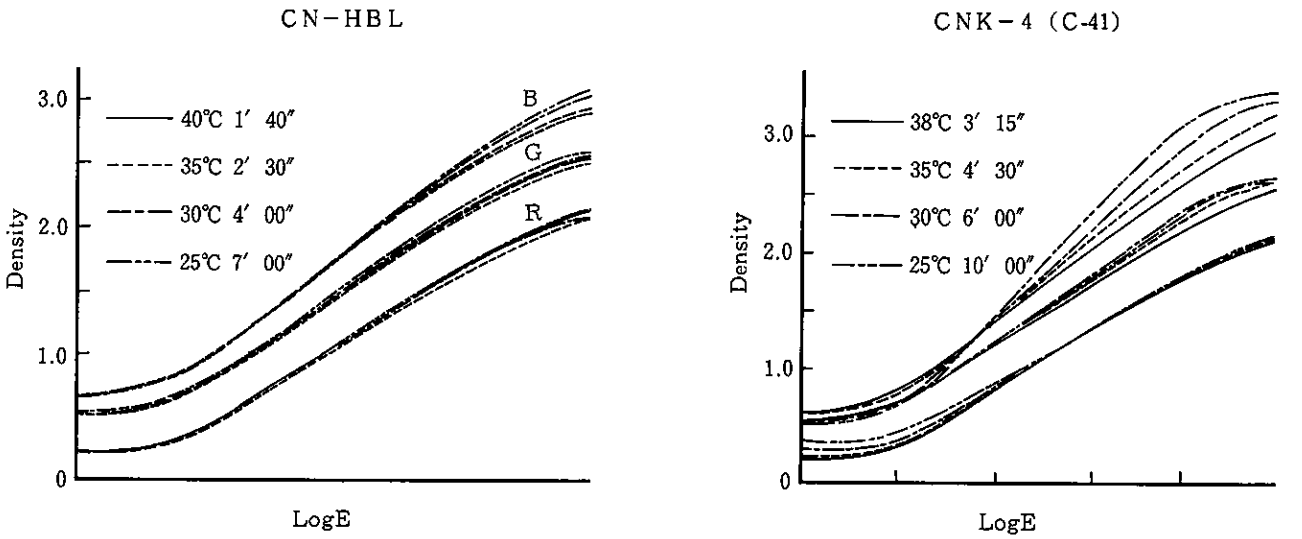


Fig.16 Characteristic curves compared (Film:Konica GX-100)

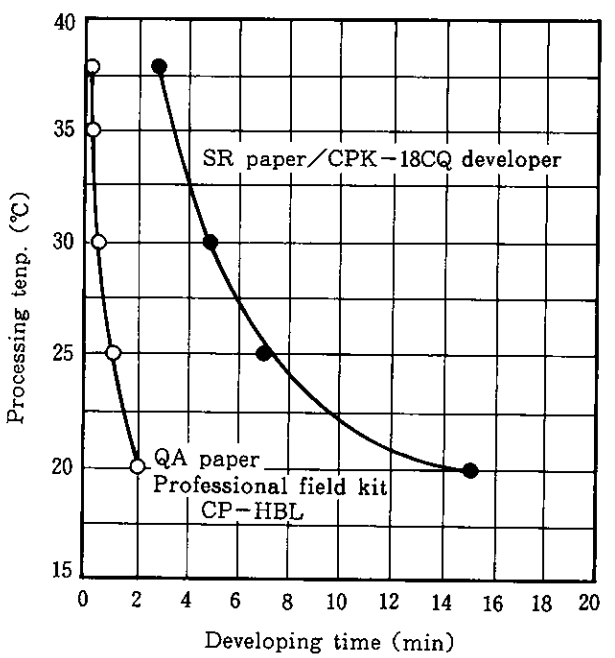


Fig.17 Developing time at various temperatures in color paper processing

Table 7 Processing time at various temperatures with CN-HBL

	25°C	30°C	35°C	38°C	40°C
Color developer	7'30"	4'	2'30"	2'	1'40"
Bleach-fixer	4'	4'	3'	3'	3'

Table 8 Standard processing procedure with CP-HBL or HBP

	Color Developer	Bleach-Fixer	Wash or Stabilizer
Processing temp.	40±0.5°C	36±2°C	18–32°C
Processing time	20"	20"	20"

Table 9 Processing time at various temperatures with CP-HBL or HBP

	20°C	25°C	30°C	35°C	40°C
Color developer	150"	75"	40"	25"	20"
Bleach-fixer	60"	45"	25"	20"	20"
Wash or stabilizer	60"	45"	25"	20"	20"

one minute and forty second(**Table 7**). Fluctuation(**Fig.16**) of the characteristic curves at all tempratures is much lower than with standeard processing.

The bleach-fix(blix) solution is also a new type of rapid processing chemical containg a new bleach which provides outstanding long-team solution stability without worries about residual silver. For the direct wire transfer of negatives, any cyan dye loss and residual silver problems can be eliminated and better results obtained by slightly extending the processing time when temperatures are low. The field kit for color negative films should be extremely easy to use for people who are accustomed to processing black and white filems using belt-type processing tanks.

(2) Wide-temperature professional field kits for color paper:

CP-HB

The processing chemicals in the CP-HB kit have the same basic characteristics as those used in CPK-22QA. **Table 8** shows the processing temperatures and times for

this Kit.

When conventional silver bromide type papers are used at low temperatures, the blue density(yellow dye density) will not increase, regardless of the length of the processing time. When at attempt is made to match the yellow density in high-density areas, the result is an overall yellowish cast and a loss of color balance.

With QA paper and CP-HB processing, on the other hand, when the processing time is varied(**Table 9, Fig.17**) in the temperature range of 20℃ to 40℃, optimum quality preints with almost no change in color balance or density(**Fig.18**) can be obtained under the same printing conditions(**Fig.19**).

Prints can be made in the field under the same filter conditions used at the head office, for example, but processing is much faster than with conventional systems, even at low temperatures. This enables reporters to concentrate on their real work, gathering news.

4 Conclusion

In Japan large newspapers now make use full-color printing, so they have introduced color systems not only at the head office but also at their branch office. Meanwhile, local newspapers realize that they face a choice implies. The Konica Press System cannot yet satisfy every need that a newspaper might have, but its performance and speed already surpass standards that were not expected to be attained for another half decade. In terms of the needs expressed by the press itself, and of the worth. We will continue to seek input from the press and to further improve the system so that beautiful, full-color newspaper many soon become an integral and indipensable part of daily life.

Acknowledgment

We would like to express our deep appreciation to Prof. Hiroshi Ogino(Deparment of Chemistry, Tohoku University) for his helpful discussion and direction, to the Kyodo News Service Photography and Color Lab Departments and to the Sankei Shinbun Photography Department for their instructive and essential cooperation in the development and testing of the Konica Press System.

Portions of this article first appeared in Japanese in the September 1988 issue of the journal Shashin Kogyo.

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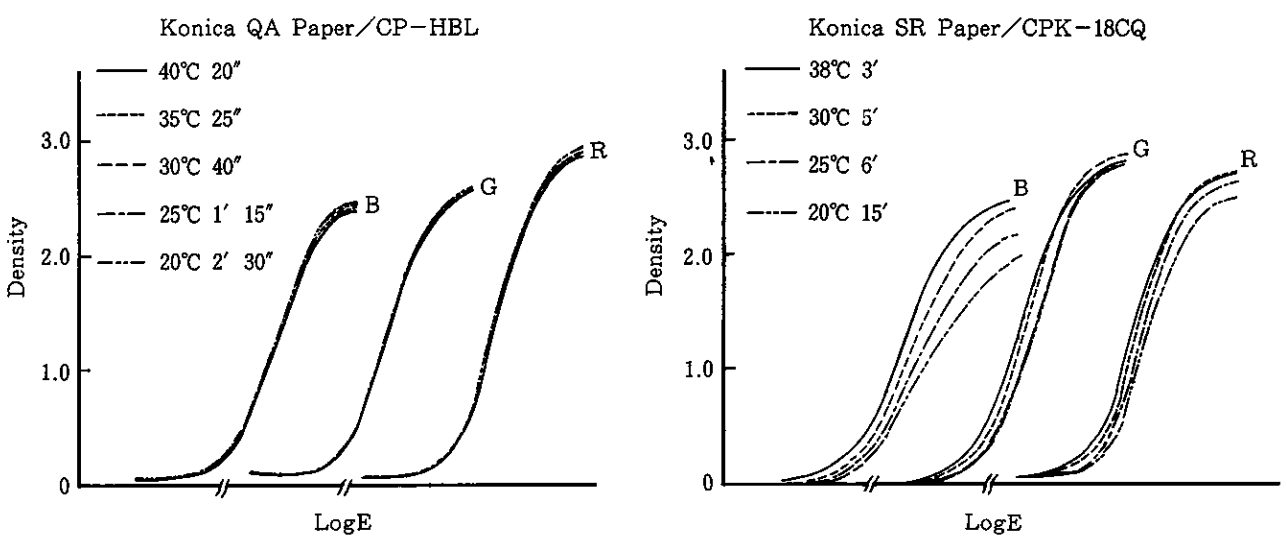

Fig.18 Characteristic curves compared

photo offer:Sankei Sports 写真提供:サンケイスポーツ

Fig.19 Comparisson of color balance at various temperiure between Agce and AgBrCl (AgBrCl Type paper)