T E C H N I C A L B U L L E T I N

Process C41

Negacolor and EnviroNeg Processing Chemicals

For the processing of films compatible with the C41 Process

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FUJIFILM

CONTENTS

I. INTRODUCTION

This new issue FEB TB C41 / E14 09-11 of the Technical Bulletin "Process C41 Negacolor and EnviroNeg Processing Chemicals" contains all information on FUJIFILM Europe products released since the last issue of the technical bulletin TB/C41/E13/09-10.

EnviroNeg Developer 60 AC is the latest FUJIFILM Europe development to counter the undesirable and unstable film processing quality caused by the low processing volumes increasingly found today. It has been specially designed for use in all types of film processor that are having problems with low throughput. This includes minilabs, professional dip & dunk (hanger) type machines and hand lines (also known as deep tank processing), and even photofinishing processors that are now too big for your current film volumes. EnviroNeg RA Bleach 10 AC is designed as the ideal partner for EnviroNeg Developer 60 AC for use in all types of film processor that employ the C41RA process – typically minilabs.

For C41SM film processors, two new products are available – DIS Film N1 Developer 45 and DIS Film N2 Bleach 10 AC, again designed to reduce the effects of low film throughput on your existing film processor.
More info concerning these latest products and other Minilab related chemicals is to be found in our Technical Bulletin "Minilab Chemical Guide".

FUJIFILM Europe NV continues to further improve its entire C41 product range to remain fully compatible with the changing market conditions. Equally important, FUJIFILM Europe NV fully complies with the Fuji Green Policy. By using the very latest technology available very important contributions to a better environment is achieved.

This Technical Bulletin has been well accepted by the market. It not only tells you a bit more about the individual process steps and functions, but just as importantly it will guide you in more detail through the **FUJIFILM Europe** Process Option chart making it easier for the customer to make his correct choice.

Once you have confirmed your product of choice through cross-checking the chapter "Process Specifications", you will be able to find all process specifications such as the physical parameters, chemical specifications and mixing instructions, including regeneration procedures in the individual chapters. Process Monitoring, Chemical Handling and Storage complete this Technical Bulletin.

Even though this Technical Bulletin does contain a lot of important information, we also realise that additional information may be wanted in your day-to-day operation. If you have any queries, **FUJIFILM Europe NV** has a large and experienced team of Technical Experts available to you.

Do not hesitate to contact your local FUJIFILM representatives; they will be happy to assist you at any time.

II. PROCESS DESCRIPTION

FUJIFILM Europe NV offers a wide range of C41 processing chemicals, of which the Air Control products are unique in their category.

The Negacolor and EnviroNeg Chemical Systems are based on all liquid concentrates designed to process all films compatible with the C41 process. The Negacolor and EnviroNeg chemicals may be used in continuous film processors, automatic batch processors (rack and tank), manual tanks, minilabs, disc processors and in roller transport processors. The EnviroNeg chemicals are state-of-the-art products, reducing the environmental pollution to an absolute minimum.

Options are available covering process C41B, C41RA and other proprietary C41 processes in addition to the standard C41 process. Super stabilizers are also available for washless processors - commonly designated as for processes C41BNP ("Non Plumbed") and C41RANP.

If there are any queries as to which is the most suitable chemistry for your application, please consult your FUJIFILM representative. A comparison table of the various process options may be found in this brochure.

III. PROCESS STEPS AND FUNCTIONS

A. Development

The developer produces a silver image in the film emulsion layers from the latent image produced when the film is exposed. At the same time, the developer - which is locally oxidised by this reaction - combines with couplers incorporated in the emulsion and produces colour dyes. The quantity of dye produced is proportional to the amount of silver image produced.

B. Bleaching

This bath converts the metallic silver image formed during development back into silver halide in order to make it possible for the fixer to remove the silver from the emulsion.

C. Fixing

The fixer dissolves the bleached silver image and the unexposed and therefore undeveloped silver halide originally present in the film emulsion, which can then be washed out by the wash.

D. Washing

A water wash as commonly found in larger processors, works by removing all processing chemicals and by-products from the film emulsion. Correct wash water rate and temperature are critical for long term dye stability.

E. Stabilizing

This contains a wetting agent and other propriety chemicals featuring uniform drying of the film and long term stability.

F. Super Stabilizing

The super stabilizer option, commonly used in minilabs in place of a water wash, works by washing the majority of processing chemicals and by-products from the film emulsion and then reacting with any remaining chemicals to form stable, inert compounds and preventing dye fading. All Fuji Hunt C41 stabilizers are now formaldehyde-free (FF).

IV. PROCESS OPTIONS

1. Developers

A. Developer replenishers

- *EnviroNeg Developer Replenisher 60 AC*

Is a high replenishment rate 3-part developer, with a replenishment rate of 60 ml/135-24 film. It has been designed to give greatly improved resistance to oxidation and low throughput conditions, providing much improved process stability and quality and greatly extending the bath lifetime. Under normal low or even very low throughput conditions, proper use of this new developer will avoid the requirement for regular developer retanking – previously necessary to retain process activity.

- *EnviroNeg Developer Replenisher AC*

Is a standard replenishment rate developer, ideally suited to the lower throughput processors found in professional laboratories, and also for low volume minilabs. This higher replenishment rate leads to improved process stability and cleanliness due to shorter tank turnover time and offers significant advantages where good process control has proved difficult.

- *EnviroNeg Developer Replenisher LR AC*

This has been the most commonly used low replenishment rate developer for the C41 process, used in a wide range of processors and suitable in most situations where there is a reasonable amount of throughput. This developer is particularly suitable for use in high volume laboratories and busy minilabs. However, the days of high film volumes are now generally in the past, and existing users of this product may need to be thinking of changing to either EnviroNeg Developer Replenisher AC, or to EnviroNeg Developer Replenisher 60 AC to maintain tank turnover rates – essential for a good process.

In order to decide if EnviroNeg Developer Replenisher LR AC can be used, please see our developer selection chart below.

- *EnviroNeg Developer Replenisher VLR AC*

EnviroNeg Developer Replenisher VLR AC is a developer with a very low replenishment rate, and can be used if the volume of EnviroNeg Developer Replenisher LR AC used per week exceeds the processor tank volume.

This developer is particularly suitable for use in continuous film processors achieving a minimum recommended tank turnover of 0.5 TTO/week. This developer is not recommended in minilabs or in processors with a high risk of evaporation and oxidation such as Rack & Tank and Roller Transport processors.

- *EnviroNeg Developer Selection Chart - Overview*

The following table can be used to select the most appropriate products for your processor.

C41 Developer Selection and Replenishment Rate Chart

	DeveloperTank Volume							
Films / Week	5	10	15	20	25	30	40	50
200								
150								
100								
80								
60								
40								
20								
10								

Key :
- Use EnviroNeg Developer LR AC @ 21 ml/135-24
- Use EnviroNeg Developer AC @ 41 ml/135-24
- Use EnviroNeg Developer 60 AC @ 60 ml/135-24
- Use EnviroNeg Developer 60 AC @ 70 ml/135-24
- Not recommended

Please note that the recommendations in this chart depend on good working practices by the laboratory, but provide a good starting point. This means a floating lid or balls in the developer replenisher tank, mixing only the minimum volume of developer at one time (no multiple 5 litre packs mixed together, for example), running only normal operating hours, compensation for evaporation, etc. Some processors may be more tolerant of low throughput than others, depending on processor design.

EnviroNeg Developer 60 AC is run at 60 ml 135-24 film under normal low throughput conditions. When use of EnviroNeg Developer 60 AC is indicated for a C41RA process, EnviroNeg RA Bleach 10 AC should also be used. Although it is possible to use EnviroNeg Developer 60AC with high film volumes, you are recommended to use the standard replenishment rate developer EnviroNeg Developer instead if high film volumes are maintained for an extended period – or EnviroNeg Developer LR if indicated in the chart above.

Where use of EnviroNeg Developer AC or EnviroNeg Developer LR AC is indicated above for a C41RA processor (typically a minilab), EnviroNeg RA Bleach 10 AC should not be used. In this case, use the normal EnviroNeg RA Bleach AC and go back to the standard 5 ml/135-24 film replenishment rate specified for this product.

B. Recycled Developers

- *EnviroNeg Developer Regenerator AC*

Is a system that allows 70% of the developer overflow to be reused without the need for ion exchange resins, although an adsorber resin is advisable. It is possible to run this process without recourse to chemical analysis, apart from occasional checks on density, pH and bromide level. The replenishment rate is standard.

- *Negagen Developer Regenerator LR AC*

Negagen Developer Regenerator LR AC requires ion exchange columns and chemical analysis, and is not suited to the smaller laboratory. This developer allows a low replenishment rate of 23 ml/135-24 film in combination with an 80% re-use of the developer overflow.

Development time with all the above developers is the C41 standard time of 3 min 15 sec.

2. Bleaches

Several bleach systems are available for the C41 process to cover the wide number of process variants that have been introduced.

A. Replenished bleaches

- *EnviroNeg Bio-Bleach AC*

EnviroNeg Bio-Bleach AC is odour free, uses a 100% biodegradable complexing agent and is compatible with all emulsions available on the market today.
This product is the recommended bleach for all type of C41 processors with bleach times ranging from 3 min to 6 min 30 sec and having an intermediate wash installed between bleach and fixer. EnviroNeg Bio-Bleach AC can be regenerated by collecting overflow and adding bleach concentrate.

- *Negacolor Ultra Bleach 3*

Negacolor Ultra Bleach 3 is the recommended bleach for all types of C41 processor with bleach times ranging from 3 min to 6 min 30 sec and having an intermediate wash installed between bleach and fixer. And is fully compatible with all emulsions available on the market today. Negacolor Ultra Bleach 3 can be regenerated by collecting overflow and adding bleach concentrate.

- *EnviroNeg RA Bleach AC / Negacolor RA Bleach*

These two products are high-speed one-part bleaches for the C41RA process. They are designed to operate with the C41RA bleach processing time of 45 to 60 sec and also have a very low 5 ml/135-24 film replenishment rate.

- *EnviroNeg RA Bleach 10 AC*

EnviroNeg RA Bleach 10 AC is for use on low throughput C41RA processors (typically minilabs) and is available in 2x5L packs. It should only be used in combination with EnviroNeg Developer 60 AC – see the developer selection chart above.
EnviroNeg RA Bleach AC and EnviroNeg RA Bleach 10 AC are part of the Air Control product range.

B. Regenerated bleaches

- *EnviroNeg Bio-Bleach AC*

EnviroNeg Bio-Bleach AC can be regenerated by collecting overflow and adding the same concentrate as being used for the preparation of tank and replenisher *(ref. replenished bleaches, page 5)*.

Conversion from Negacolor Ultra Bleach 3 or Negacolor Ultra Bleach 2 to EnviroNeg Bio-Bleach AC is possible by regenerating on top of the existing bleach with the EnviroNeg Bio-Bleach AC concentrate. A conversion procedure needs to be followed. For further details on how to convert from your old bleach system to EnviroNeg Bio-Bleach AC, ask your local FUJIFILM representative for the separate Technical Information Sheet on EnviroNeg Bio-Bleach AC.

- *Negacolor Ultra Bleach 3*

This bleach can be regenerated by collecting overflow and adding the same concentrate as being used for the preparation of tank and replenisher *(ref. replenished bleaches, page 5).*

3. Fixers

FUJIFILM Europe has several fixer systems available to cover the wide range of needs that can arise with the C41 process. The whole subject of fixers is covered more fully in the FUJIFILM Europe technical bulletin "Fixing Systems".

A. Replenished fixers

- *Super Unilec Fixer*

Super Unilec Fixer is the most commonly used fixer in the non-minilab environment, covering many requirements. This fixer can not only be used as a normal replenisher in standard C41 processors operating at a fixing time in the range 4 min 20 sec to 6 min 30 sec but can also be used in a closed loop continuous electrolytic desilvering system at a reduced replenishment rate. In addition, Super Unilec is also suitable for batchwise electrolytic desilvering and fixer regeneration.

- Negacolor RA Fixer

Negacolor RA Fixer is a high activity fixer, specially designed for the very short 1 min 30 sec fixer time of the C41RA and C41RANP processes, and also suitable for use in the C41B process.

B. Regenerated fixers

(FUJIFILM Europe Technical Bulletin Fixing Systems / E7 / 08-10)

- Super Unilec Fixer

Super Unilec Fixer is the recommended concentrate for “closed loop continuous electrolytic fixer desilvering” and also for use when electrolytic desilvering and Fixer Regeneration is installed.

This system may require correction for specific gravity and pH at regular intervals. This fixer is also suited for use in paper processing where a separate bleach and fixer cycle is employed. Full details may be found in the Fixing Systems Technical Bulletin.

4. Stabilizer and Superflo Stabilizer

- EnviroNeg FF Stabilizer AC

EnviroNeg FF Stabilizer AC is a one-part formaldehyde-free stabilizer for use as a final bath after the wash water in a standard C41 process. This product has excellent drying characteristics and replaces the previous **Negacolor Stabilizer LR**.

- EnviroNeg FF Superflo Stabilizer MB AC

EnviroNeg FF Superflo Stabilizer MB AC is a 100% "formaldehyde free" film stabilizer and film super stabilizer for use in all processors. This product can be replenished on top of existing C41 Stabilizer.

5. Additives

Banstatic Plus

Banstatic Plus is an anti-static film process additive for stabilizer and final washes that reduces the surface tension on processed film by virtually eliminating static charges that build up during processing.

Dosing : - All processors except Rack & Tank : 5 ml per litre stabilizer
- Rack & Tank processors : 2.5 ml per litre stabilizer

For full details on the usage of **Banstatic Plus**, please ask for the separate **FUJIFILM Europe** Technical Information Sheet "**Banstatic E1 01 02-07**".

V. PROCESS OPTION CHART

Bath	Time	Replenishment Rate (ml/m 135 film) (1)	Replenishment Rate (ml/135-24 film) (1)
EnviroNeg Developer 60 AC	3'15"	56 †	60 †
EnviroNeg Developer AC	3'15"	38	41
EnviroNeg Developer LR AC	3'15"	19	21
EnviroNeg Developer VLR AC	3'15"	13.5	15
Negagen Developer Regenerator LR AC (2)	3'15"	20	23
EnviroNeg Developer Regenerator AC (2)	3'15"	41	45
EnviroNeg Bio-Bleach AC (3)	3' - 6'30"	30	35
Negacolor Ultra Bleach 3 (3)	3' - 6'30"	30	35
EnviroNeg RA Bleach 10 AC	45" - 60"	9	10
EnviroNeg RA Bleach AC	45" - 60"	4.5	5
Negacolor RA Bleach	45" - 60"	4.5	5
Super Unilec Fixer(3),(4)	4'20" - 6'30"	30	35
Negacolor RA Fixer	1'30"	30	35
EnviroNeg FF Stabilizer AC (5)	40" - 1'05"	18 (Continuous) 32 (Dip & Dunk)	20 (Continuous) 35 (Dip & Dunk)
EnviroNeg FF Superflo Stabilizer MB AC (5),(6)	2'20"	30	35
EnviroNeg FF Superflo Stabilizer MB AC	1'40"	35	40
+ EnviroNeg FF Stabilizer AC (5)	40"	16.5	18
or + EnviroNeg FF Superflo Stabilizer MB AC (5),(6)	40"	30 (7)	35 (7)

(1) **Processing APS films** : When processing APS films, the recommended rep. rates given for ml/m 135 film, can be reduced by 30% for all chemical baths.

(2) These are all regenerated systems. The replenishment rates given are those directly set on the processors; actual overflow rates to the drain are far lower.

(3) These products can be regenerated. In case of regeneration, the actual overflow rates to the drain are far lower.

(4) For Super Unilec Fixer, when used in a recycled fix system, please see either the **FUJIFILM Europe** brochure "Fixing Systems" or your **FUJIFILM** representative.

(5) Professional films must be stabilised for a minimum of 60 seconds to ensure adequate dye stability. Alternatively increase concentration of replenisher by 50%.

(6) **EnviroNeg FF Superflo Stabilizer MB AC** is normally used in a 3-tank counter current cascade system. This can however be used in a minilab in place of conventional **EnviroNeg FF Stabilizer AC** following a water wash. In this case, bath time is 40".

(7) 30 ml/m (=35 ml/135-24film) if preceded by a single bath chemical rinse or 20 ml/m (=24 ml/135-24film) if preceded by a 2-tank counter current chemical wash.

† EnviroNeg Developer 60 AC was designed for normal replenishment at 60 ml/135-24 film, or 56 ml / linear metre 135. Under normal low throughput conditions, this will provide an excellent process. Under extreme low throughput conditions, as low as 3 films/day for a 10 litre development tank, developer replenishment rate should be increased to 70 ml/135-24 film. Developer temperature and other processing conditions should remain unchanged.

VI. PROCESS SPECIFICATIONS

1. General C41

	Developer	Bleach	Wash	Fixer	Wash	Stabilizer
Time [1]	3'15"	3'00" to 6'30"	1'05"	4'20" to 6'30"	3'15"	1'05"
Temperature [2]	37.8°C ± 0.15°C	37.8°C ± 3°C	35.0°C ± 5°C	37.8°C ± 3°C	35.0°C ± 5°C	24°C - 40°C
Circulation and Filtration	Required	Required		Required		
Agitation	Nitrogen or turbulation	Oil-free air		Nitrogen or oil-free air turbulation		
Wash rate			1250 ml/ 135-24 film		2500 ml/ 135-24 film	
CONTINUOUS (CINE TYPE) PROCESSOR WITH EFFICIENT SQUEEGUEES [3]						
			135-24 film		135-24 film	
RACK AND TANK PROCESSOR OR CINE WITHOUT EFFICIENT SQUEEGUEES [3]						

(1) Processing latitude can be increased by extending the bleaching and fixing times to 6 minutes and 30 seconds. The extra processing time will substantially reduce the possibility of leuco cyan and/or retained silver in processed film.

(2) Due to the relatively high temperature of the processing solutions, evaporation can occur resulting in lower tank levels. Therefore water, not replenisher, should be added to restore tank levels.

(3) The wash water rates given are for a two-tank counter current system as commonly found on most processors. If a third wash tank is installed, these wash rates may be halved.

2. C41B

Bath	Time	Temp. (°C)	Replenish. Rate (ml / 135-24 film)
EnviroNeg Developer LR AC	3'15"	37.8°C ± 0.15°C	21
or EnviroNeg Developer AC	3'15"	37.8°C ± 0.15°C	41
or EnviroNeg Developer 60 AC [1]	3'15"	37.8°C ± 0.15°C	60 †
EnviroNeg RA Bleach 10 AC	3' - 4'20"	38°C ± 3°C	5
Negacolor RA Fixer	4' - 4'20"	38°C ± 3°C	35
Wash	1'40"	35°C ± 3°C	1250
EnviroNeg FF Superflo Stabilizer MB AC [2]	40"	38°C ± 3°C	35

(1) For low or very low film throughput.

(2) Professional films must be stabilised for a minimum of 60 seconds to ensure adequate dye stability. Alternatively increase concentration of replenisher by 50%.

† EnviroNeg Developer 60 AC was designed for normal replenishment at 60 ml/135-24 film. Under normal low throughput conditions, this will provide an excellent process. Under extreme low throughput conditions, as low as 3 films/day for a 10 litre development tank, developer replenishment rate should be increased to 70 ml/135-24 film. Developer temperature and other processing conditions should remain unchanged. Please see film throughput chart on page 4 for details.

3. C41BNP

Bath	Time	Temp. (°C)	Replenish. Rate (ml / 135-24 Film)
EnviroNeg Developer LR AC	3'15"	37.8°C ± 0.15°C	21
or EnviroNeg Developer AC	3'15"	37.8°C ± 0.15°C	41
or EnviroNeg Developer 60 AC (1)	3'15"	37.8°C ± 0.15°C	60
or EnviroNeg RA Bleach 10 AC	3' - 4'20"	38°C ± 3°C	5
Negacolor RA Fixer (2)	4 '- 4'20"	38°C ± 3°C	35
EnviroNeg FF Superflo Stabilizer MB AC (3),(4)	2'20"	38°C ± 3°C	35
EnviroNeg FF Superflo Stabilizer MB AC	1'40"	38°C ± 3°C	40
+ EnviroNeg FF Stabilizer AC (3)	40"	38°C ± 3°C	18
or + EnviroNeg FF Superflo Stabilizer MB AC (3),(4),(5)	40"	38°C ± 3°C	35

(1) For low or very low film throughput.
(2) Two tank counter current cascade flow.
(3) Professional films must be stabilised for a minimum of 60 seconds to ensure adequate dye stability. Alternatively increase concentration of replenisher by 50%.
(4) **EnviroNeg FF Superflo Stabilizer MB AC** is normally used in a 3-tank counter current cascade system. This can however be used in a minilab in place of conventional **EnviroNeg FF Stabilizer AC** following a water wash. In this case, bath time is 40".
(5) 30 ml/m if preceded by a single bath chemical rinse or 20 ml/m if preceded by a 2-tank counter current chemical wash.
† EnviroNeg Developer 60 AC was designed for normal replenishment at 60 ml/135-24 film. Under normal low throughput conditions, this will provide an excellent process. Under extreme low throughput conditions, as low as 3 films/day for a 10 litre development tank, developer replenishment rate should be increased to 70 ml/135-24 film. Developer temperature and other processing conditions should remain unchanged. Please see film throughput chart on page 5 for details.

The alternative recommendation is for machines using two tanks of super stabilizer followed by one tank of conventional stabilizer.
Fuji Hunt EnviroNeg FF Superflo Stabilizer MB AC is a mono-bath stabilizer incorporating the functions of a super stabilizer and a traditional stabilizer.

4. C41RA

Bath	Time	Temp. (°C)	Replenish. Rate (ml / 135-24 Film)
EnviroNeg Developer LR AC	3'15"	37.8°C ± 0.15°C	21
or EnviroNeg Developer AC	3'15"	37.8°C ± 0.15°C	41
or EnviroNeg Developer 60 AC (1)	3'15"	37.8°C ± 0.15°C	60 †
EnviroNeg RA Bleach AC	45"- 60"	38°C ± 3°C	5
or Negacolor RA Bleach	45"- 60"	38°C ± 3°C	5
or EnviroNeg RA Bleach 10 AC (1)	45"- 60"	38°C ± 3°C	10
Negacolor RA Fixer (2)	1'30"	38°C ± 3°C	35
Wash (3)	1'40"	35°C ± 3°C	1250
EnviroNeg FF Superflo Stabilizer MB AC	1'30"	38°C ± 3°C	35

(1) For low or very low film throughput.
(2) Two tank counter current flow, equal times in both tanks.
(3) Follow manufacturer's recommendation.
† EnviroNeg Developer 60 AC was designed for normal replenishment at 60 ml/135-24 film. Under normal low throughput conditions, this will provide an excellent process. Under extreme low throughput conditions, as low as 3 films/day for a 10 litre development tank, developer replenishment rate should be increased to 70 ml/135-24 film.

Developer temperature and other processing conditions should remain unchanged. Please see film throughput chart on page 5 for details.

5. C41RANP

Bath	Time	Temp. (°C)	Replenish. Rate (ml / 135-24 Film)
EnviroNeg Developer LR AC	3'15"	37.8°C ± 0.15°C	21
or EnviroNeg Developer AC	3'15"	37.8°C ± 0.15°C	41
or EnviroNeg Developer 60 AC (1)	3'15"	37.8°C ± 0.15°C	60 †
EnviroNeg RA Bleach AC	45"- 60"	38°C ± 3°C	5
or Negacolor RA Bleach	45"- 60"	38°C ± 3°C	5
or EnviroNeg RA Bleach 10 AC (1)	45"- 60"	38°C ± 3°C	10
Negacolor RA Fixer (2)	1'30"	38°C ± 3°C	35
EnviroNeg FF Superflo Stabilizer MB AC (3)	1'00"	38°C ± 3°C	40

(1) For low or very low film throughput.
(2) Two tank counter current flow, equal times in both tanks
(3) Three tank counter current flow, equal times in all tanks.
† EnviroNeg Developer 60 AC was designed for normal replenishment at 60 ml/135-24 film. Under normal low throughput conditions, this will provide an excellent process. Under extreme low throughput conditions, as low as 3 films/day for a 10 litre development tank, developer replenishment rate should be increased to 70 ml/135-24 film. Developer temperature and other processing conditions should remain unchanged. Please see film throughput chart on page 5 for details.

6. C41 Low Throughput

EnviroNeg Developer Replenisher 60 AC is recommended for all low or very low throughput C41 processors – including minilabs, professional dip & dunk and roller transport processors, and hand lines. For the C41RA process, use of EnviroNeg RA Bleach 10 AC is recommended for use with EnviroNeg Developer 60 AC.

In low throughput – and especially in very low throughput – situations, it is recommended that you increase the fixer and stabiliser replenishment rates by 50% compared to replenishment rates quoted above.

On a typical minilab, this will therefore mean a Negacolor RA Fixer replenishment rate of 50 ml/135-24 film, and a EnviroNeg FF Superflo Stabilizer MB AC replenishment rate of 60 ml/135-24 film.

For professional laboratories, where use of EnviroNeg Developer 60 AC developer is indicated (see above 4), bleach regeneration (if practised) should be stopped immediately, and the system changed back to a replenished-only system. Any collected bleach overflow waiting for regeneration should be discarded. Please see the Technical Information Sheet “TIS EnviroNeg Developer AC 60 Prolab E02 09-08” for further information.

VII. STANDARD REPLENISHMENT RATES (1),(2)

EnviroNeg Developer Replenisher AC (3) **Typical rates for ASA 100-200 films**				
Machine type :	Continuous with efficient squeegees ml/*m*	Rack & Tank *ml/roll or sheet*	Roller transport	
			ml/m	*ml/roll*
Standard Rolls				
135-12	38	23	38	23
135-24	38	41	38	41
135-36	38	60	38	60
120	85	69	85	69
220	85	140	172	140
Sheet Films				
10.2 x 12.7 cm		20		
12.7 x 17.8 cm		34		
20.4 x 25.4 cm		75		
27.9 x 35.6 cm		205		
Typical EnviroNeg Developer Replenisher AC replenishment rates for ASA 400-1600 films				
Standard Rolls				
135-12	54	32	54	32
135-24	54	59	54	59
135-36	54	87	54	87
120	122	99	122	99
220	122	201	247	201
EnviroNeg Bio-Bleach AC, Negacolor Ultra Bleach 3, Super Unilec Fixer(4) (5)				
Standard Films				
135-12	30	29	30	22
135-24	30	48	30	36
135-36	30	66	30	49
120	63	66	63	51
220	63	134	63	103
Sheet Films				
10.2 x 12.7 cm		15		
12.7 x 17.8 cm		29		
20.4 x 25.4 cm		59		
27.9 x 35.6 cm		110		
EnviroNeg FF Stabilizer AC				
Standard Films				
135-12	18	21	32	21
135-24	18	35	32	35
135-36	18	48	32	48
120	38	48	67	48
220	38	98	67	98
Sheet Films				
10.2 x 12.7 cm		11		
12.7 x 17.8 cm		21		
20.4 x 25.4 cm		43		
27.9 x 35.6 cm		80		

(1) Recommended replenishment rates are nominal; actual replenishment rates for each processor should be determined by photographic quality and behaviour as indicated by the processed control strips.

(2) **Processing of APS films:** When processing APS films, the recommended rep. rates given for 135 film in ml/m can be reduced by 30% for all chemical baths.

(3) Replenishment rate for **EnviroNeg Developer LR AC** is 50% of the quoted figures for **EnviroNeg Developer AC**. Replenishment rate for **EnviroNeg Developer 60 AC** is 150% of the quoted figures for **EnviroNeg Developer AC**.

(4) Fixer replenishment rates are for replenished process. For closed loop electrolytic fixer, replenishment rates can be reduced by 35% from the above rates. See the **FUJIFILM Europe** brochure "**Fixing Systems**" for further details.

(5) For **Super Unilec Fixer** at 1+3: Use half of the above fix replenishment rates.

VIII. STARTERS

1. For Developers

There is one universal starter to prepare all developer tank solutions : **EnviroNeg Universal Developer Starter AC**.

2. For Bleaches

Ensure that the correct starter is used for the following tank solutions :

Bleach tank solution	**Starter**
Negacolor Ultra Bleach 3	Negacolor Ultra Bleach 3 Starter
Negacolor RA Bleach	Negacolor Ultra Bleach 3 Starter

Remark :

For **EnviroNeg Bio-Bleach AC**, **EnviroNeg RA Bleach AC**, and **EnviroNeg RA Bleach 10 AC** tank solution, no starter is required.

For the following fresh replenisher solution, an addition of acid is also required, as below :

EnviroNeg Bio-Bleach AC	Nitric acid (20% solution)

3. For Fixers and Stabilizers

No starters are used for the fixer and stabilizer baths.

IX. MIXING INSTRUCTIONS

Working or tank solutions must be prepared when initially filling a processor or when using chemicals on a "one-shot" basis.
They may be prepared by the more convenient of one of two routes - either directly from replenisher concentrates or from already mixed replenisher. The choice whether to mix directly from concentrates or from mixed replenisher is for the laboratory to decide; as long as the correct amount of water and/or starter is added, the end result is the same.
Generally it is necessary to add a starter with developers and some bleaches; other solutions are normally used either at replenisher strength or just with simple dilution of the replenisher.

1. Developers & Developer Replenishers

EnviroNeg Developer Replenisher 60 AC

To make 1 litre	Water	Part A	Part B	Part C	Rep	Starter (#)
TANK	876 ml	80 ml	11 ml	18.2 ml	/	15ml
REPLENISHER	864 ml	100 ml	13.7 ml	22.7 ml	/	/
Tank from Rep	185 ml	/	/	/	800 ml	15ml

Required starter is **EnviroNeg Universal Developer Starter AC**.

EnviroNeg Developer Replenisher AC *(small packs up to 50L)*

To make 1 litre	Water	Part A	Part B (*)	Part C (*)	Rep	Starter (#)
TANK	892 ml	68 ml	8.5 ml	17.34 ml	/	15ml
REPLENISHER	890 ml	80 ml	10 ml	20.4 ml	/	/
Tank from Rep	135 ml	/	/	/	850 ml	15ml

* **EnviroNeg Developer Replenisher AC Part B / Part C** are now different products from **Polyneg B / Polyneg C**. Developer packs of 50 L and smaller use EnviroNeg Developer Replenisher AC parts B and C. Larger pack sizes use Polyneg B and Polyneg C.
# Required starter is **EnviroNeg Universal Developer Starter AC**.

EnviroNeg Developer Replenisher AC *(large packs 300L and more)*

To make 1 litre	Water	Part A	Polyneg B (*)	Polyneg C (*)	Rep	Starter (#)
TANK	900 ml	68 ml	8.5 ml	8.67 ml	/	15ml
REPLENISHER	900 ml	80 ml	10 ml	10.2 ml	/	/
Tank from Rep	135 ml	/	/	/	850 ml	15ml

* **EnviroNeg Developer Replenisher AC Part B/Part C** have been changed to **Polyneg B/Polyneg C**.
# Required starter is **EnviroNeg Universal Developer Starter AC**.

EnviroNeg Developer Replenisher LR AC *(small packs up to 50L)*						
To make 1 litre	**Water**	**Part A**	**Part B (*)**	**Part C (*)**	**Rep**	**Starter (#)**
TANK	885.5 ml	60 ml	8.25 ml	16.5 ml	/	30 ml
REPLENISHER	887 ml	80 ml	11 ml	22 ml	/	/
Tank from Rep	220 ml	/	/	/	750 ml	30 ml

* **EnviroNeg Developer Replenisher LR AC Part B/Part C** are now different products from **Polyneg B/Polyneg C**. Developer packs of 50L and smaller use EnviroNeg Developer Replenisher LR AC parts B and C.
# Required starter is **EnviroNeg Universal Developer Starter AC**.

EnviroNeg Developer Replenisher LR AC *(large packs 300L and more)*						
To make 1 litre	**Water**	**Part A**	**Polyneg B (*)**	**Polyneg C (*)**	**Rep**	**Starter (#)**
TANK	893.5 ml	60 ml	8.25 ml	8.25 ml	/	30ml
REPLENISHER	898 ml	80 ml	11 ml	11 ml	/	/
Tank from Rep	220 ml	/	/	/	750 ml	30ml

* EnviroNeg Developer Replenisher LR AC Part B / Part C have been changed to Polyneg B and Polyneg C for pack sizes of 300L and more.
# Required starter is EnviroNeg Universal Developer Starter AC.

EnviroNeg Developer Replenisher VLR AC						
To make 1 litre	**Water**	**Part A**	**Polyneg B (*)**	**Polyneg C (*)**	**Rep**	Starter (#)
TANK	889.4 ml	52.8 ml	9.1 ml	8.7 ml	/	40 ml
REPLENISHER	893 ml	80 ml	13.8 ml	13.2 ml	/	/
Tank from Rep	300 ml	/	/	/	660 ml	40 ml

* **EnviroNeg Developer Replenisher VLR AC Part B/Part C** have been changed to **Polyneg B/Polyneg C**.
# Required starter is **EnviroNeg Universal Developer Starter AC**.

2. Bleaches & Bleach Replenishers

EnviroNeg Bio-Bleach AC			
To make 1 litre	**Water**	**Conc.**	**Nitric Acid 20%**
TANK	650 ml	350 ml	/
REPLENISHER	582 ml	400 ml	18 ml

Negacolor Ultra Bleach 3				
To make 1 litre	**Water**	**Conc.**	**Replenisher**	**Starter (#)**
TANK	634 ml	350 ml	/	16 ml
REPLENISHER	600 ml	400 ml	/	/
Tank from Rep	109 ml	/	875 ml	16 ml

required starter is **Negacolor Ultra Bleach 3 Starter**

EnviroNeg RA Bleach AC (*)			
To make 1 litre	**Water**	**Conc.**	**Replenisher**
TANK	333 ml	667 ml	/
REPLENISHER	/	1000 ml	/
Tank from Rep	333 ml	/	667 ml

(*) **Environeg RA Bleach Replenisher** AC is supplied ready to use as a replenisher.

No starter is required for **EnviroNeg RA Bleach AC** tank or replenisher solutions.

EnviroNeg RA Bleach 10 AC (*)			
To make 1 litre	**Water**	**Conc.**	**Replenisher**
TANK	333 ml	667 ml	/
REPLENISHER	/	1000 ml	/
Tank from Rep	333 ml	/	667 ml

(*) **Environeg RA Bleach Replenisher** 10 AC is supplied ready to use as a replenisher.
No starter is required for **EnviroNeg RA Bleach 10 AC** tank or replenisher solutions.

Negacolor RA Bleach (*)				
To make 1 litre	**Water**	**Conc.**	**Replenisher**	**Starter (#)**
TANK	265 ml	700 ml	/	35 ml
REPLENISHER	/	1000 ml	/	/
Tank from Rep	265 ml	/	700 ml	35 ml

(*) **Negacolor RA Bleach Replenisher** is supplied ready to use as a replenisher.
Required starter is **Negacolor Ultra Bleach 3 Starter.**

3. Fixers & Replenishers

See the **FUJIFILM Europe** Technical Bulletin "**Fixing Systems**" for full information on the process options available.

Super Unilec Fixer - Closed loop electrolytic silver recovery			
To make 1 litre	**Water**	**Conc.**	**Replenisher**
TANK (=1+4)	800 ml	200 ml	
REPLENISHER (=1+3)	750 ml	250 ml	
Tank from Rep (=1+4)	200 ml		800 ml

Super Unilec Fixer – Non-closed loop electrolytic silver recovery		
To make 1 litre	**Water**	**Conc.**
TANK & REPLENISHER (=1+4)	800 ml	200 ml

Negacolor RA Fixer & Replenisher		
To make 1 litre	**Water**	**Conc.**
TANK & REPLENISHER	750 ml	250 ml

Fresh working or tank solutions for fixing baths (except for **Super Unilec Fixer** used at 1+3, and Super **Unilec Fixer** in a closed loop electrolytic silver recovery system) have the same composition as the replenisher. Simply fill the processor tank with replenisher if it is necessary to replace the tank solution.

For further details of Super Unilec Fixer, please see the Technical Bulletin “Fixing Systems”.

4. Stabilizer & Replenishers

EnviroNeg FF Stabilizer & Replenisher AC		
To make 1 litre	**Water**	**Conc.**
TANK & REPLENISHER	990 ml	10 ml

EnviroNeg FF Superflo Stabilizer MB AC		
To make 1 litre	**Water**	**Conc.**
TANK & REPLENISHER	990 ml	10 ml

Fresh working or tank solutions for all stabilizer and super stabilizer baths have the same composition as the replenisher. Simply fill the processor tank with replenisher if it is necessary to replace the tank solution.

X. CHEMICAL REGENERATION

1. Developer Regeneration

For full details on C41 developer regeneration we refer to the Technical Information Sheet TIS C41 Developer Recycling. You can obtain a copy through our technical **FUJIFILM** representative.

A. EnviroNeg Developer Regenerator AC

Fuji Hunt EnviroNeg Developer Regenerator AC is a system whereby most of the developer overflow can be regenerated without the use of ion exchange resins. For a completely fresh start-up, use **EnviroNeg Developer Replenisher AC.**

In order to regenerate the developer overflow, 700 ml of overflow are collected and rebuilt with **EnviroNeg Developer Regenerator Part A**, plus **Polyneg Parts B** and **C**, to make 1 litre of replenisher. The regenerated overflow runs at a replenishment rate of 45 ml/135-24 film.

Normally it is not necessary to carry out analytical tests whilst rebuilding. If a laboratory wishes to monitor its process analytically, **FUJIFILM Europe** can provide operating concentrations of key ingredients. In particular, the **FUJIFILM Europe OASIS Pro** chemical and process control system is ideally suited to this task. Please consult your **FUJIFILM** representative.

There is an accumulation of dirt and colour from sensitising dyes as the developer is continuously recycled. For this reason the processor developer tanks should be well filtered and it is also desirable to use an adsorber resin.

B. Negagen Developer Regenerator LR AC

Negagen Developer Regenerator LR AC allows a replenishment rate of 23 ml/135-24 film in combination with an 80% recycling of the collected and debromided developer overflow.

For a completely fresh start-up, use **EnviroNeg Developer Replenisher LR AC.**

Regenerator concentrates to be used in combination with a chloride/bicarbonate resin regeneration are the **Negagen Developer Regenerator LR AC Part A** together with **Polyneg Part B & C** and **Negagen Developer Regenerator AC Part D**.

For a complete description of the required techniques and suggested chemical analyses, FUJIFILM Europe will supply all necessary Technical Information as required. Please consult your FUJIFILM representative.

2. Bleach Regeneration

NOTE : Bleach regeneration is not recommended when the laboratory is suffering from low or declining film volumes. Low throughout laboratories should use a standard replenished bleach.

Bleach regeneration is easily carried out and offers significant cost reductions and reduced quantities of bleach overflow into the drains. The volumes given below are typical for a well-run large processing laboratory. It must be recognised that each processing machine has its own carry-over rate and this influences significantly the amount of regenerator concentrate(s) added to the overflow to obtain a rebuilt replenisher within specification. If the process is to run trouble free it is essential that the pH and density specification of the rebuilt replenisher meet the specification.

A. EnviroNeg Bio-Bleach AC

EnviroNeg Bio-Bleach AC		
Overflow	**Conc.**	**Nitric Acid 20% w/w**
1000 ml	38 ml (#)	18 ml (#)
947 ml	36 ml (#)	17 ml (#)

These values are approximate only and very dependent on processor conditions (carry-over, evaporation, etc.).

The tank solution density (at 20°C) must not be allowed to fall below 1.085 g/cm³ except when the processor has a stop bath and water wash between the developer and bleach tanks. In this case the tank solution density (at 20°C) can be as low as 1.082 g/cm³. The tank solution must be continuously aerated while the processing machine is running in order to avoid problems of either leuco cyan dye or silver retention.
The pH of the tank solution shouldn't be allowed to rise above 3.80. If necessary, increase quantity of nitric acid during the regeneration operation to give a pH of 3.40 in the rebuilt replenisher.

B. Negacolor Ultra Bleach 3

Negacolor Ultra Bleach 3		
Overflow	**Conc.**	**Acetic Acid 60% w/w**
1000 ml	38 ml (#)	27 ml (#)
938 ml	36 ml (#)	26 ml (#)

These values are approximate only and very dependent on processor conditions (carry-over, evaporation, etc.).

The tank solution density (at 20°C) must not be allowed to fall below 1.085 g/cm³ except when the processor has a stop bath and water wash between the developer and bleach tanks. In this case the tank solution density (at 20°C) can be as low as 1.082 g/cm³. The tank solution must be continuously aerated while the processing machine is running in order to avoid problems of either leuco cyan dye or silver retention.
The pH of the tank solution shouldn't be allowed to fall below 4.8. If necessary, decrease quantity of acetic acid during the regeneration operation.

3. Fixer regeneration

It is possible to apply fixer regeneration in combination with a closed loop silver recovery system for a film processor fixer with Super **Unilec Fixer**. The process involved is similar to that for the fixer from a separate bleach and fix paper process, but complicated by the amount of silver in film compared to paper, and by the amount of halide released during film fixing. Generally, at least 60% of a film fixer can be safely recycled. Possibly as much as 90% can be recycled, if there is a closed loop silver recovery installed and the fix bath time is sufficiently long.
For a full discussion of film fixer regeneration, please see the **FUJIFILM Europe** technical bulletin "Fixing Systems".

XI. pH AND DENSITY SPECIFICATIONS

1. Freshly prepared solutions

pH AND DENSITY SPECIFICATIONS FOR FRESHLY PREPARED SOLUTIONS						
Product	**Tank**			**Replenisher**		
	pH (25°C)	**Density (20°C) g/cm³**	**Density (25°C) g/cm³**	**pH (25°C)**	**Density (20°C) g/cm³**	**Density (25°C) g/cm³**
EnviroNeg Developer 60 AC	10.06 ± 0.05	1.034 ± 0.003	1.033 ± 0.003	10.13 ± 0.05	1.039 ± 0.003	1.038 ± 0.003
EnviroNeg Developer AC	10.07 ± 0.05	1.036 ± 0.003	1.035 ± 0.003	10.13 ± 0.05	1.039 ± 0.003	1.038 ± 0.003
EnviroNeg Developer LR AC	10.05 ± 0.05	1.036 ± 0.003	1.035 ± 0.003	10.17 ± 0.05	1.039 ± 0.003	1.038 ± 0.003
EnviroNeg Developer VLR AC	10.03 ± 0.05	1.038 ± 0.003	1.037 ± 0.003	10.17 ± 0.05	1.045 ± 0.003	1.044 ± 0.003
EnviroNeg Bio-Bleach AC	3.60 ± 0.10	1.067 ± 0.003	1.066 ± 0.003	3.40 ± 0.10	1.079 ± 0.003	1.078 ± 0.003
Negacolor Ultra Bleach 3	4.80 ± 0.10	1.082 ± 0.003	1.081 ± 0.003	4.70 ± 0.10	1.083 ± 0.003	1.082 ± 0.003
EnviroNeg RA Bleach 10 AC	3.80 ± 0.10	1.078 ± 0.003	1.077 ± 0.003	3.80 ± 0.10	1.116 ± 0.003	1.115 ± 0.003
EnviroNeg RA Bleach AC	3.80 ± 0.10	1.094 ± 0.003	1.093 ± 0.003	3.80 ± 0.10	1.145 ± 0.003	1.144 ± 0.003
Negacolor RA Bleach	4.38 ± 0.10	1.106 ± 0.003	1.105 ± 0.003	3.65 ± 0.10	1.150 ± 0.003	1.149± 0.003
Super Unilec Fixer 1 + 4	7.50 ± 0.20	1.087 ± 0.010	1.086 ± 0.010	7.50 ± 0.20	1.087 ± 0.010	1.086 ± 0.010
Super Unilec Fixer 1 + 3	-	-	-	7.50 ± 0.20	1.110 ± 0.010	1.109 ± 0.010
Negacolor RA Fixer	7.10 ± 0.20	1.076 ± 0.005	1.075 ± 0.005	7.10 ± 0.20	1.076 ± 0.005	1.075 ± 0.005

2. Seasoned replenished solutions

pH AND DENSITY SPECIFICATIONS FOR SEASONED REPLENISHED SOLUTIONS				
Product	**Tank**			
	pH (25°C)	**Density (20°C) g/cm³**	**Density (25°C) g/cm³**	**Density (38°C) g/cm³**
EnviroNeg Developer 60 AC	10.03 ± 0.05	1.043 ± 0.003	1.042 ± 0.003	1.039 ± 0.003
EnviroNeg Developer AC	10.03 ± 0.05	1.039 ± 0.003	1.038 ± 0.003	1.034 ± 0.003
EnviroNeg Developer LR AC	10.03 ± 0.05	1.040 ± 0.003	1.039 ± 0.003	1.035 ± 0.003
EnviroNeg Developer VLR AC	10.03 ± 0.05	1.042 ± 0.003	1.041 ± 0.003	1.037 ± 0.003
EnviroNeg Bio-Bleach AC	3.70 ± 0.10	1.080 ± 0.005	1.079 ± 0.005	1.075 ± 0.005
Negacolor Ultra Bleach 3	4.90 ± 0.10	1.084 ± 0.005	1.083 ± 0.005	1.079 ± 0.005
EnviroNeg RA Bleach 10 AC	4.40 ± 0.10	1.095 ± 0.015	1.096 ± 0.015	1.100 ± 0.015
EnviroNeg RA Bleach AC	4.50 ± 0.10	1.115 ± 0.015	1.116 ± 0.015	1.120 ± 0.015
Negacolor RA Bleach	4.38 ± 0.10	1.105 ± 0.005	1.104 ± 0.005	1.100 ± 0.005
Super Unilec Fixer	6.70 ± 0.50	1.090 ± 0.010	1.089 ± 0.010	1.085 ± 0.010
Negacolor RA Fixer	6.70 ± 0.20	1.084 ± 0.010	1.083 ± 0.010	1.079 ± 0.010

3. Seasoned recycled solutions

pH AND DENSITY SPECIFICATIONS FOR SEASONED RECYCLED SOLUTIONS				
Product	**TANK**			
	pH (25°C)	**Density (20°C) g/cm³**	**Density (25°C) g/cm³**	**Density (38°C) g/cm³**
EnviroNeg Developer Regenerator AC	10.05 ± 0.05	1.044 ± 0.003	1.043 ± 0.002	1.039 ± 0.002
Negagen Developer Regenerator LR AC	10.05 ± 0.05	1.044 ± 0.003	1.043 ± 0.002	1.039 ± 0.002
EnviroNeg Bio-Bleach AC	3.70 ± 0.10	1.090 ± 0.005	1.089 ± 0.005	1.085 ± 0.005
Negacolor Ultra Bleach 3	4.90 ± 0.10	1.090 ± 0.005	1.089 ± 0.005	1.085 ± 0.005
Super Unilec Fixer (*)	6.70 ± 0.50	1.090 ± 0.020	1.089 ± 0.020	1.085 ± 0.020

pH AND DENSITY SPECIFICATIONS FOR SEASONED RECYCLED SOLUTIONS			
Product	**REPLENISHER**		
	pH (25°C)	**Density (20°C) g/cm³**	**Density (25°C) g/cm³**
EnviroNeg Developer Regenerator AC	10.15 ± 0.03	1.043 ± 0.003	1.042 ± 0.002
Negagen Developer Regenerator LR AC	10.18 ± 0.03	1.043 ± 0.003	1.042 ± 0.002
EnviroNeg Bio-Bleach AC	3.40 ± 0.10	1.095 ± 0.005	1.094 ± 0.005
Negacolor Ultra Bleach 3	4.70 ± 0.10	1.095 ± 0.005	1.094 ± 0.005
Super Unilec Fixer (*)	6.70 ± 0.50	1.100 ± 0.020	1.099 ± 0.020

(*) See the **FUJIFILM Europe** technical bulletin "Fixing Systems" for more details.

XII. PROCESS MONITORING

It is recommended that the activity level of the chemical baths in each film processor should be monitored daily. Pre-exposed control strips should be run at least 2 or 3 times each day; the first strip prior to processing film, and then at evenly spaced intervals during production.
Whenever corrective action is taken, either to improve process control or adjust the processing machine, a control strip should be run to determine the effects of the change. It is wise to adjust the processor only after a trend has been established, which usually requires at least three control strips to have been run.
It is strongly urged that each photo-processing laboratory keep at least two code numbers of series of strips on hand as variation between different series can be quite large. Sharp variations with a new code number may not be caused by the processor, but rather may be the difference between the control strips themselves. It should be standard practice to process two strips with the new and old codes together to check that both strips record the same chemical activity. It is also recommended that the densitometer be re-calibrated and that reference strips be re-read in case any large deviations are experienced. This procedure will eliminate erroneous readings due to a problem with the densitometer or strips.
FUJIFILM Europe recommends the use of the OASIS Pro quality control system for local process monitoring. **FUJIFILM Europe** can also offer a highly professional monitoring service from our factory in Belgium. Please consult your **FUJIFILM** representative or look for OASIS Pro on the **FUJIFILM** Europe web site, which may be found at www.fujifilm.eu/feb.

XIII. TROUBLESHOOTING FOR THE C41 PROCESS

Within the scope of this brochure, it is not possible to give a full description of all of the process variations that can occur with different manufacturers film control strips. You are advised to obtain a copy of the relevant process control manual for the filmstrips from the manufacturer of the filmstrips concerned.
Most process control problems are traced to variations in temperature, too short an immersion time, too high or too low a replenishment rate or inadequate circulation – or, increasingly as film volumes decline – problems with evaporation and/or oxidation (especially for the developer). Occasionally, chemicals are mixed improperly and sometimes the bleach is not being aerated.
Problems indicated by out of control blue and green values, are usually traceable to the developer step. Low red values, on the other hand, are most often caused by under active bleach. Contrast is greatly affected by the agitation rate in the developer.
As a general rule, where you have a choice of actions for solving or investigating a process control problem and you have no specific indication that one particular course of action is the answer, choose a simple physical change as the first test - usually temperature. It is easy to change a temperature up or down, and little time is lost. You should only make chemical changes when you have checked the basic physical parameters - once you have put chemicals (or water) into a processor tank, you cannot take them out! Do not forget to process a further strip if you have made a change to the process.

XIV. LOW THROUGHPUT

Most of today's problems with C41 chemistry – for minilabs, prolabs and finishers – can be traced to low throughput, or basically having a processor that is too big for your current film volumes. Give serious consideration to changing to a higher replenishment rate developer – LR to standard, or standard (or even LR!) to EnviroNeg Developer 60 AC. Do not also forget the secondary baths! Please see our website at www.fujifilm.eu/feb for full details.

XV. TROUBLESHOOTING - CORRECTIVE ACTIONS

Problem	Probable Cause(s)	Corrective Action(s)
High values in D-Min, LD & HD. Blue value is highest.	1. Developer temperature higher than process specification. 2. Over-replenishment of developer. 3. Excessive agitation in developer. 4. Excessive development time. 5. Over-concentration of developer caused by evaporation. 6. Over-concentration of developer replenisher due to mixing error. 7. Underactive bleach which is not immediately stopping developer action due to high pH of the bleach.	1. Adjust developer temperature to 37.8 °C. 2. Reduce developer replenishment rate to standard. 3. Reduce developer agitation. 4. Adjust developer immersion time to 3 min. 15 sec. 5. Add small quantity of water to developer solution. 6. Dump replenisher and mix fresh in accordance with instructions. 7. Check developer squeegees. Adjust the bleach pH to specification with acetic acid.
High values in D-Min, Green value is highest. Low or very low values in HD-LD and possibly LD, Blue value usually lowest	1. Underactive developer caused by low film throughput. 2. Oxidised developer and/or bleach caused by low film throughout and use of inappropriate chemistry. 3. Excessive processor operating hours for current film volumes. 4. Mixing too much developer at a time.	1. Change from LR to standard developer, or to EnviroNeg Developer 60 AC and EnviroNeg Bleach 10 AC, according to selection table on page 5. 2. Check that correct bleach procedures are in use – as above. 3. Consider running processor for less hours per day or less days per week. 4. Use smaller packs, or mix one pack at a time instead of multiple packs.
Low values in D-Min, LD & HD. Blue value is lowest.	5. Underactive developer caused by low temperature, low replenishment rate, low agitation, short time or over diluted replenisher.	5. Check process specifications and adjust to standard.
Low values in LD & HD. High values in D-Min.	1. Trace bleach contamination in the developer caused by excessive air agitation of the bleach.	1. Reduce airflow to the bleach.

Retained silver in film - verified by infrared viewer.	Underactive bleach caused by: 1. Excessive developer carry-over into bleach. 2. Short immersion time in bleach. 3. Under-replenished time in bleach. 4. High Fe(II) concentration in bleach due to under-aeration. 5. Error in mixing of replenisher or regeneration of bleach replenisher.	1. Adjust developer squeegees. For regenerated bleach adjust bleach tank solution & replenisher densities. 2. Increase immersion time up to 6 min 30 sec. 3. Increase bleach replenishment rate. 4. Increase aeration. 5. Dump replenisher and make fresh mix, or adjust working tank bleach and replenisher bath.
Low red values in HD and HD-LD.	Underactive bleach caused by : 1. Excessive developer carry-over, short time in bleach, underreplenishment of bleach, high Fe(II) concentration or error in bleach mix ratio. 2. Over-replenishment of bleach. 3. Out of balance recirculated fixer from electrolytic recovery unit. 4. Over-concentration of bleach due to evaporation. 5. Low pH and/or high bleach contamination in the fixer.	1. See corrections 1 to 5 in "Retained silver in film" section for corrective action. 2. Raise pH of bleach to specification. Adjust bleach replenishment rate to specification. 3. Dump all fixer and mix fresh solution. 4. Add small amount of water to processor bleach tank to adjust density to specification. 5. Adjust pH of fixer tank to between 6.2 and 7.2. Check flow rate of wash between the bleach and the fixer.
Spots or streaks on film.	1. Low wash flow rate between fixer and stabilizer. 2. Under-replenished or dirty stabilizer. 3. Dirt in dryer or high dryer temperature.	1. Dump and refill wash tank. Adjust flow rate to specification. 2. Dump and refill process stabilizer tank. 3. Clean dryer. Reduce dryer temperature.
Black residue in developer replenisher tank.	Excessive mixing of developer replenisher.	Mix developer according to instructions. Reduce mixing propeller size and/or propeller speed or mixing rate.
Sharp increase in D-Min, LD & HD. Blue value is the highest.	Contamination of processor tank developer, usually with fixer.	Dump processor tank developer, clean tank, change filters and refill with starter, water and replenisher. Check mixing tank for contamination.

XVI. CARE AND STORAGE OF SOLUTIONS

All **FUJIFILM Europe** chemicals for use with the C41 process are supplied as all-liquid concentrates. They dissolve readily in water and no excessive mixing time is required. A maximum of 30 seconds mixing is needed to ensure complete dissolution after the addition of each concentrate to the solution being prepared.

None of the chemicals when used under normal conditions is subject to undue oxidation. However, the volume of developer replenisher prepared should not be for more than one week's normal consumption. Longer storage times will increase the degree of oxidation and lead to lower process activity.

The use of floating lids where replenishers are stored in vats will assist in reducing oxidation, especially in processors subject to low film throughput. If use of **EnviroNeg Developer 60 AC** is indicated, use of a floating lid or anti-oxidation balls or pellets in the developer replenisher tank is essential.

In processors with abnormally low turnover, oxidation of the developer will become a problem. In this case it is better to change to a developer with a higher replenishment rate (e.g. from **EnviroNeg Developer LR AC** to **EnviroNeg Developer AC**). **EnviroNeg Developer 60 AC** and **EnviroNeg RA Bleach 10 AC** are new products specially designed to greatly reduce the effects of low or very low film throughput increasingly found as film volumes continue to decrease and the film processors used become far too large for the number of films processed.

NEVER mix or store developer in containers that have contained bleach, fixer or bleach-fix, due to the risk of severe developer contamination. It is good practice to check the calibration of mixing vats once per year to ensure that changes in the shape of the vat have not occurred, thus giving rise to incorrect volumes.

All photographic processing solutions can exert harmful effects when brought into contact with human tissue to a greater or lesser extent, depending on the nature of the solution and its concentration. All users of such solutions should exercise the greatest care to avoid the chemicals contacting the skin, eyes or other parts of the body. Always wear solution resistant gloves and effective eye protection.

In case of accidental contact with processing solutions, wash the affected part with plenty of clean cold running water. Wash with an acidic soap and rinse thoroughly with water. Consult a medical doctor. Some photographic solutions produce irritating vapours, therefore thorough ventilation is essential. Do not inhale air above processing solutions.
Always read the hazard information on the packs of solution concentrate before attempting to handle the solution.