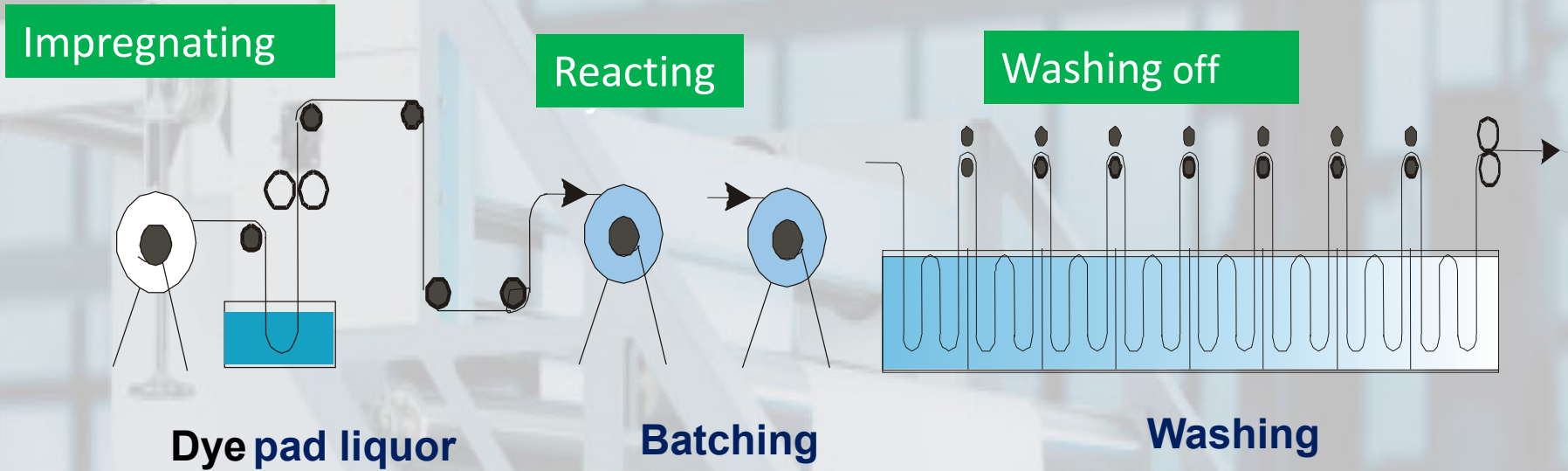


Cold Pad Batch (CPB) Dyeing



Widely used technique for semi-continuous dyeing of reactive dyes on cellulosic fabric

Schematic diagram for CPB



Step1 DIP

The substrate is immersed in the dye liquor through impregnation

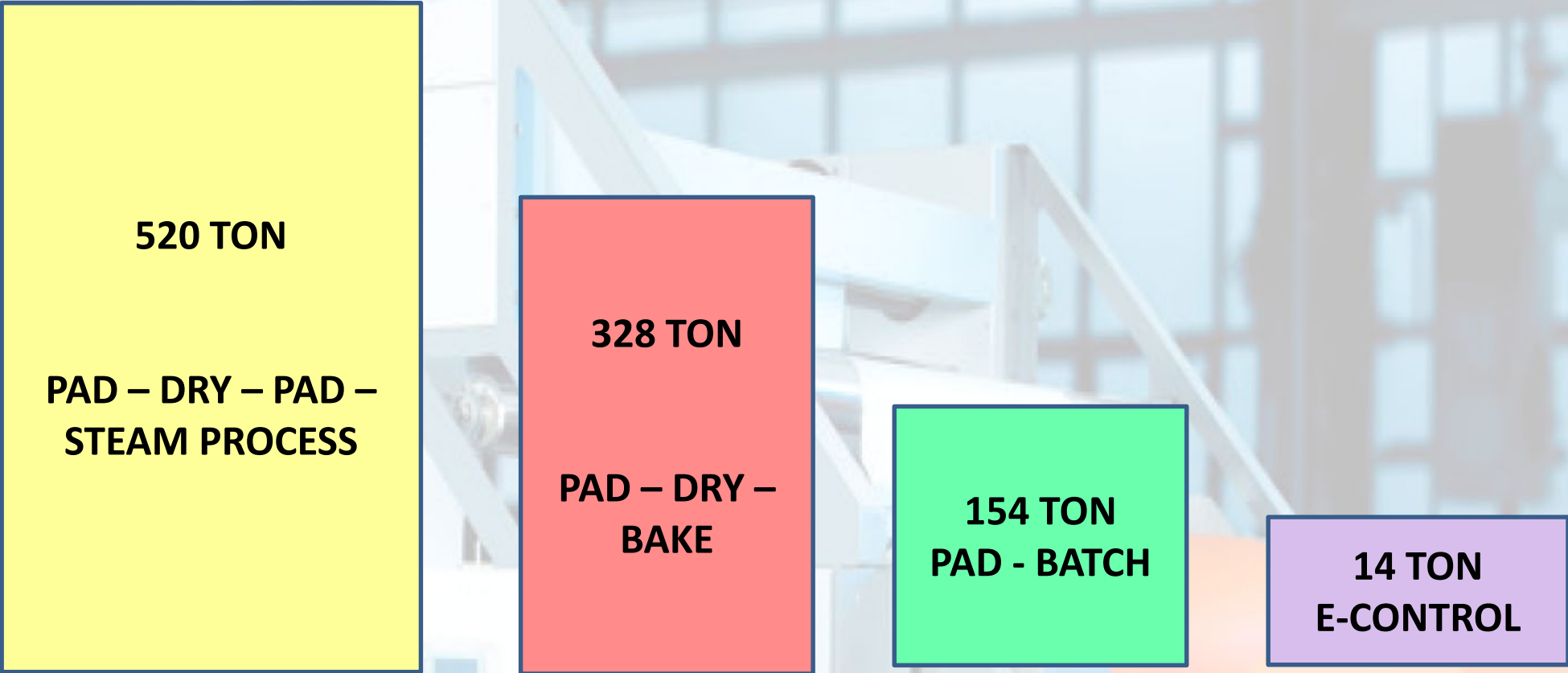
Step2 NIP

The treated substrate is passed between two/more rollers to squeeze out air and to force dye-liquor inside it and remove excess dye liquor

Cold Pad Batch dyeing Vs Exhaust dyeing

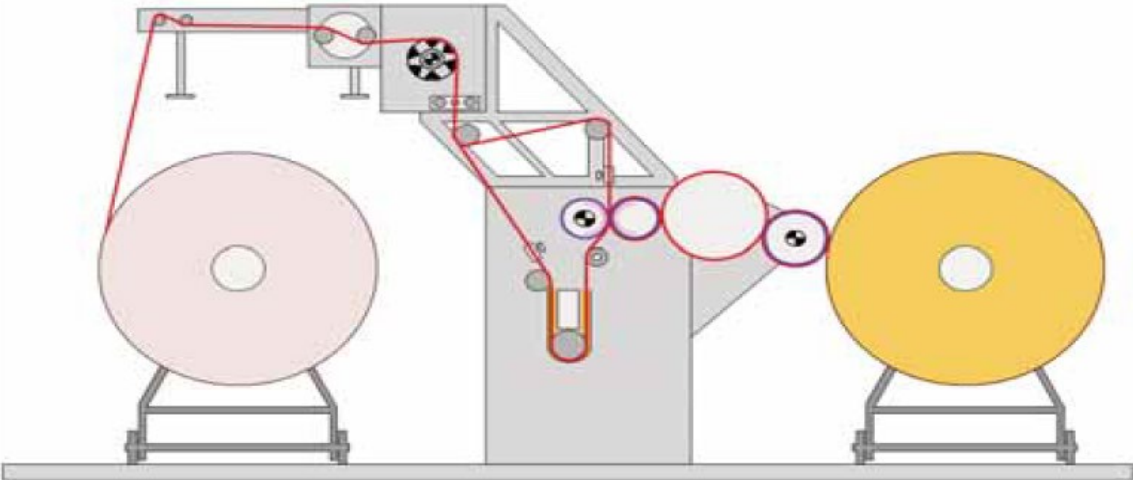
- **No Salt addition**
Totally eliminates salt and auxiliaries
- **Saves**
70% Water
60% Energy
40% Cost
40% Wages
- **Higher dye fixation: Improved wash fastness**
- **Better batch to batch reproducibility**

CPB process more sustainable



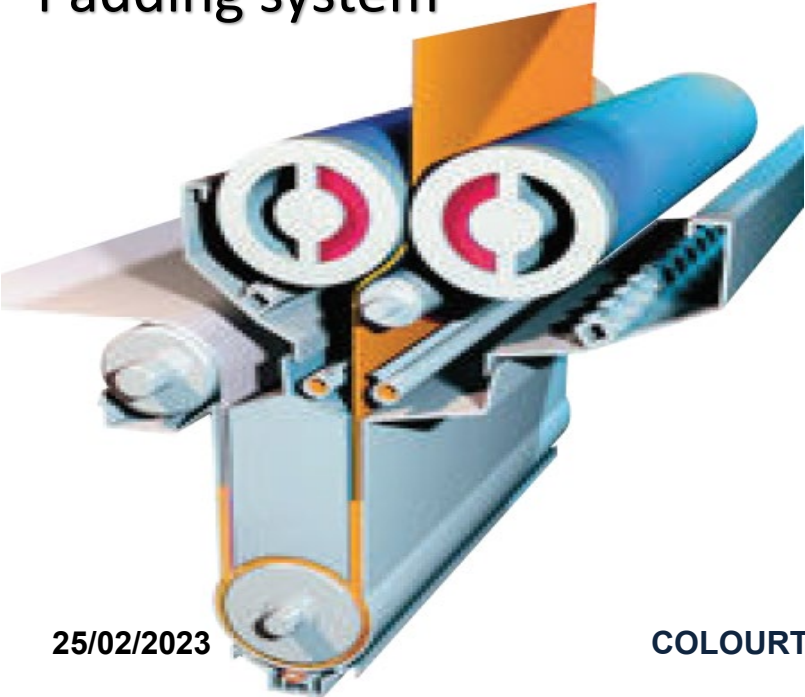
Comparative chemical consumption/same length of fabric

Schematic diagram for padding

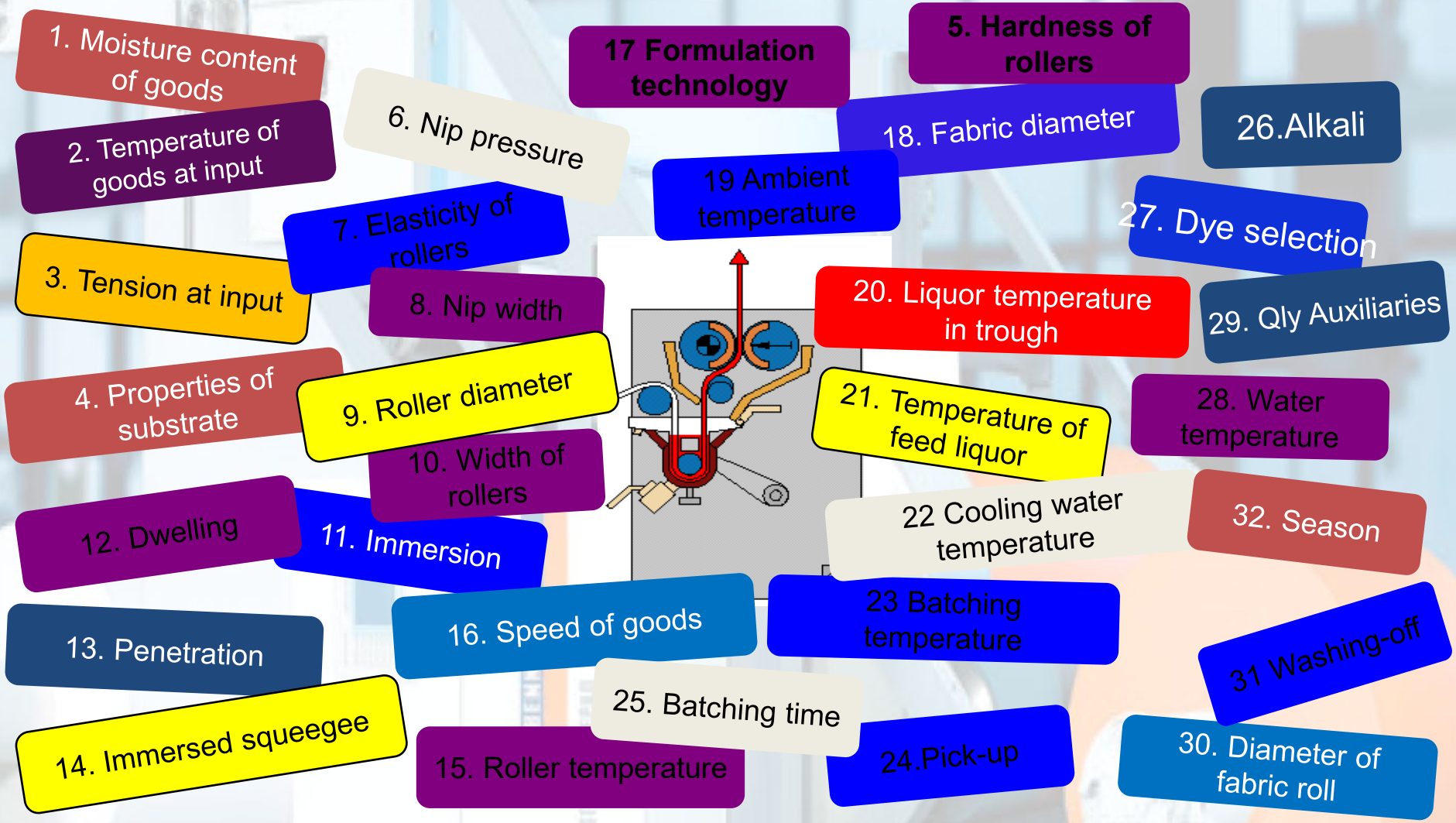


Padding system

Alkali dosing system



CPB- Variables in the process



Pre-treatment

Proper pretreatment of fabric vital for CPB dyeing
Uniform fabric structure / selvedge density

Ensure

- **Good absorbency 1-2 Sec**
- **Residual Peroxide –Nil**
- **Behave neutral core pH 6-6.8**
- **No presence of unwanted earth metals, salts, sizes and others**
- **Tewega > 6**

Woven / Knit fabric should be uniformly dried, cooled to room temp before entry in to pad liquor

Precautions before starting

Open width fabric under uniform tension with help of synchronized guidance system is a must

Improper settings could lead to

- **Piece to piece to shade variation**
- **Crease or twist in the fabric**
- **Listing - Side center side variation**
- **Production interruption**

Precautions during padding

Impregnation during padding is critical part of CPB dyeing Mechanical and Operational.

- **Uniform pad liquor distribution across the width**
- **Speed and Temperature control**
- **Side center side pressure control and uniform nip across the width**

Shore hardness

- **Woven fabric -70-80⁰**
- **Knits -50-60⁰**

Padding is best performed at ambient 20-25⁰C

Machine Parameters

Parameters		UOM
Fabric Movement speed	30 – 50	m/min
Padder Pressure (L-M-R)	20-30-20	Nm
	1.2-1.5-1.2	Bar
Trough volume	25 - 50	L
Fabric Immersion time	1.5 – 2.0	Sec
Pick up (Cotton, Viscose)	65-70, 85-90	%
Dye bath Temperature	20 - 25	°C

Immersion time should be 1 - 2 sec from the time the goods enter the bath until they are squeezed between the nip rolls.

Speed must remain constant during the batch

Attributes of dyes for Cold Pad Batch

- **Good alkali solubility**
- **Good Pad liquor stability**
- **High fixation & yield**
- **Medium Substantivity & Reactivity**
- **Lab-bulk & bulk Shade reproducibility**
- **Economical dye**
- **Good washing off properties**
- **Good suitability for wide range of blends**

Pad bath ingredients

- **Dyestuffs**

- **Alkalis**

If requires,

- **Urea**

- **Penetrating agent**

- **Sequestering agent**

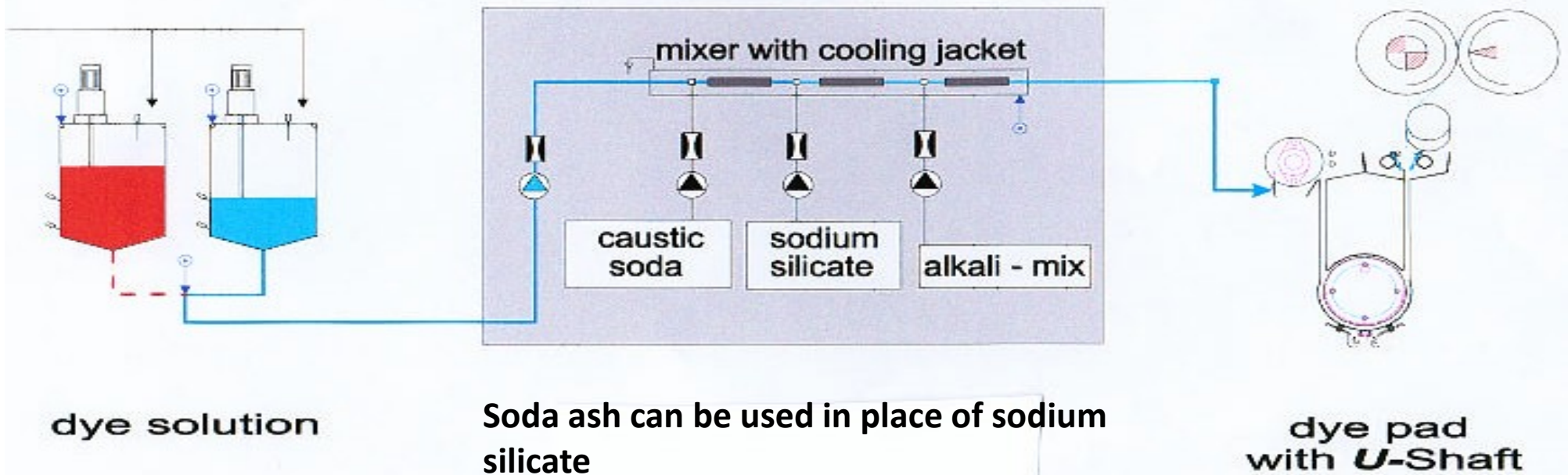
- **The Dyes are readily dissolve in cold or warm water.**

- **The dyestuffs are sprinkled into 5-10 times its weight of water at 20 – 40⁰C and dissolve using a high speed stirrer.**

- **The dyestuffs and alkali solution are mixed normally in a ration of 4:1**

Need of alkali ingenious proportionator

CPB dyeing



Typical scheme of an automated dispensing system for cold pad batch dyeing

To avoid hydrolysis of dyes or to obtain optimum yield Dyes and alkalis are introduced just before starting of padding with the help of a dosing system nearest to pad bath.

Dyestuff selection for CPB

**High light & wet fast for
Pastel to light shade**

- **Coralite Yellow FL-NP 01**
- **Coralite Yellow FL-G**
- **Coralite Red FL-2B**
- **Corazol Brill Red 3B**
- **Coralite Cyan FL-G**
- **Coralite Lt Blue FL-G**

Light To Medium shade for on-tone

- **Corazol Yellow X-RFT**
- **Corazol Red RFT**
- **Corazol Blue RFT**
- **Corazol Grey RFT**

Deep & Very deep shades

- **Corazol Yellow X-RFT**
- **Corazol Red X-RFT**
- **Corazol Cherry X-RFT**
- **Corazol Carmine X-RFT**
- **Corazol Navy X-RFT**

Dyestuff selection for CPB

**Economical dye selection For Deep and Extra Deep shades
Very high build up and fixation**

- **Corafix Yellow GD3R**
- **Corafix Orange GD3R**
- **Corafix Red GDN**
- **Corafix Rubine GDB**
- **Corafix Rubine GDN**
- **Corafix Navy GDB**
- **Corafix Navy GDG**

Suggested trichromie - pale to light shades



Product Name	1	2	3	4
Coralite Golden Yellow FL-NP 01 gran	●			
Coralite Yellow FL-G gran		●	●	●
Coralite Red FL-2B gran	●	●	●	
Corazol Brill Red 3B				●
Coralite Cyan FL-G	●	●		
Coralite Lt Blue FL-G			●	●

The above trichromie based on batching time variation and on-tone migration.

Suggested trichromie - medium to dark shades



Product name	1	2	3	4	5	6	7	8	9	10
Corazol Yellow X-RFT	•	•	•	•	•	•	•			•
Corafix Yellow GD3R									•	
Corafix Orange GD3R								•		
Corazol Carmine X-RFT	•	•				•				
Corazol Red X-RFT							•			•
Corazol Cherry X-RFT			•	•						
Corafix Rubine GDN					•			•	•	
Corazol Grey RFT*(<20 gpl in recipe)	•		•		•					
Corazol Navy RFT*(>20 gpl in recipe)		•		•						
Corafix Navy GDB* (>20 gpl in recipe)						•	•	•	•	
Corafix Dark Blue SGL										•

The above trichromie based on batching time variation and on-tone migration.

Suggested trichromie: Green, Turquoise, Royal blue

Yellowish Green shades:

Corazol Brill Yellow GL**
Corazol Turq Blue G 266%**

- Batching time should be 24-36 hr based on shade depth.
- Lab trial recommended before bulk

Bluish green shades:

Corazol Yellow GR
Corafix Blue FG

Bright Royal:

Corafix Brill. Sky Blue G

Dyestuff selection for Blacks

- **Corafix Black GDNN (Neutral black)**
- **Corafix Black GDRE (Redder black)**
- **Corafix Jet Black GDG 110%/GDGN 110% (Greener black)**

Lab to bulk recipe optimization is recommended

Choice of alkali for fixation:

In consideration of deposits of scales on machine, substrates and large quantity of water required in washing

1st Preference:

- 1. soda Ash only**
- 2. mixture of soda ash and caustic soda**

2nd Preference

- 3. sodium silicate and caustic Soda**

Method 1: Soda Ash only for pale-light shades

Dyes Conc (g/l)	1	5	10	20	30
Soda Ash (g/l)	15	15	20	20	20

Dosing pump required

Dye : Alkali = 4:1

Padding bath temp: 20 – 22°C

Fixation temp: 25 – 30°C

Pickup (CO) 60 – 65 %

Viscose 80-90%

Other auxiliaries if requires,

Levocol 2010 (Sequestering agent)

Levocol NF (Anionic wetting agent)

Method 2: Soda Ash + Caustic Soda

Dyes Conc (g/l)	<20	20-40	40-60	60-80	80-100
Soda Ash (g/l)	20	20	20	20	20
Caustic Soda (50%) (ml/l)	3	5	7	9	11

Dosing pump required

Dye : Alkali = 4:1

Padding bath temp: 20 – 22°C

Fixation temperature 25 – 30°C

Pickup (CO) 60 – 65 %

Viscose 80-90%

When dyeing terry towel or corduroy fabrics by method 2, the amount of caustic soda should be increased by 50%

Other auxiliaries if requires,

Urea (in dye solution)

Levocol 2010 (Sequestering agent)

Levocol NF (Anionic wetting agent)

Method 3: Sodium Silicate / Caustic Soda

Dyes Conc (g/l)	<20	20-40	40-60	60-80	80-100
Sodium Silicate (g/l)					
37 – 40^oBe / 70 – 72^oTw	130	130	130	130	130
58 – 60^oBe / 133 – 140^oTw	85	85	85	85	85
Caustic Soda (50%) (ml/l)	4	6	8	10	12

Dosing pump required

Dye : Alkali = 4:1

Padding bath temp: 20 – 22^oC

Fixation temperature 25 – 30^oC

Pickup (CO) 60 – 65 %

Viscose 80-90%

Other auxiliaries if requires,

Urea (in dye solution)

Levocol 2010 (Sequestering agent)

Levocol NF (Anionic wetting agent)

Alkali concentration conversion

- **Caustic soda concentration :-**

Baumé °Bé	NaOH % W/W	NaOH % W/V	Density g/ml
41	36.25	50.5	1.393
50	49.02	74.7	1.525

Solution density measured at 15.56°C = 60°F

Specific gravity is also called relative density which is measured by Mass/Volume

- **Sodium silicate concentration :-**

$$\text{Degree Baume } ^\circ\text{Be} = 145 \left(1 - \frac{1}{\text{specific gravity}} \right)$$

A Twaddle °Tw is a simplified hydrometer scale used only for liquids with higher densities than water.

$$^\circ\text{Tw} = 200 (\text{specific gravity}-1)$$

Check points

- The made up colour should be tested for complete dissolution by drop test on the filter paper.
- The Silicate should be from reliable sources without contamination of heavy metals
- The Silicate should be suitably diluted to obtain a 40° Tw solution
- The recommended quantity of Caustic Soda for the different depths of shades should be added and filtered through a strainer. This would form the stock solution

Batching:

To ensure optimum fixation of dyes

- The fabric roll must be packed in air tight polythene film which prevents CO₂ from air partially neutralizing alkali and may cause a shift of shade.
- The recommended temp is 25°C
- The batched up roll is then rotated with 5 – 14 RPM.
- The dyes are fixed at a given temperature and time average 16 hr (4-24 h)
- Dwelling area should be air conditioned.



Suggested washing off process

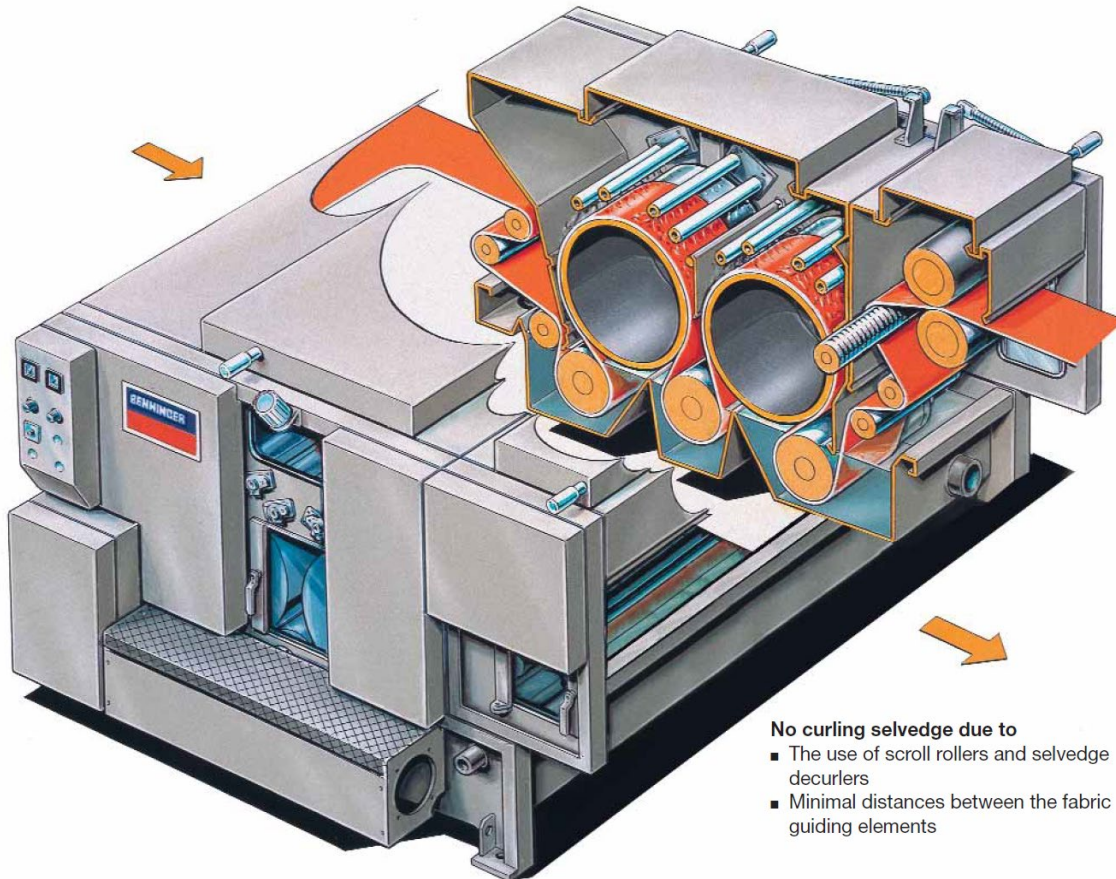
In the first 2 - 3 tank, excess amount water is used, to remove silicate, alkali and drop the pH to 8 - 8,5.

Temperature in these tanks should not be above, 50 °C. If pH does not drop or washing machine is short, it is wiser to wash rest of the chambers at 50 °C and in the second pass at boiling temperature.

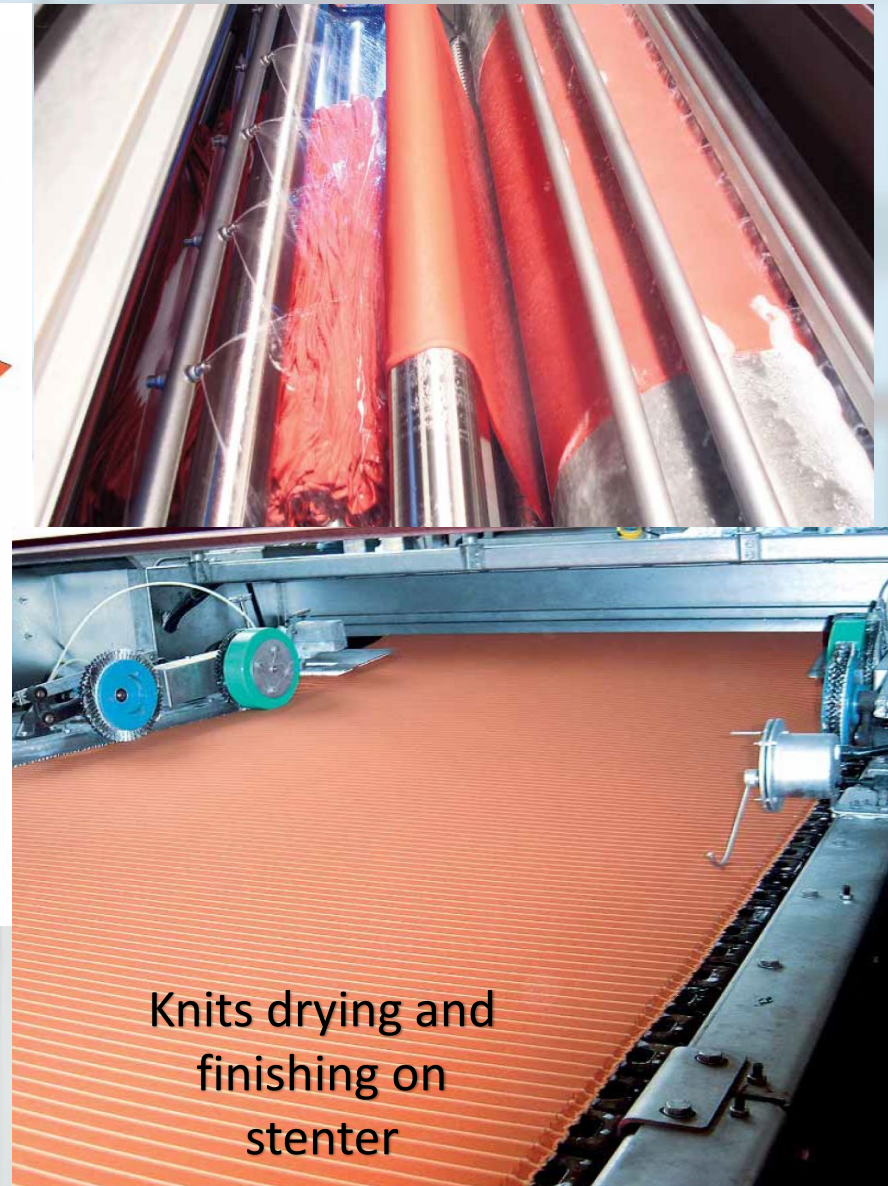
1. Chamber 50 °C
2. Chamber 50 °C
3. Chamber 50 °C pH 8 - 8,5
4. Chamber 98 °C Levocol 2010
5. Chamber 95 °C Levocol 2010 (if require)
6. Chamber 98 °C
7. Chamber 70 °C
8. Chamber 40 °C pH 6.0 – 6.5



washing off process for knits in open width



- No curling selvedge due to
- The use of scroll rollers and selvedge decurlers
 - Minimal distances between the fabric guiding elements



Knits drying and finishing on stenter

Laboratory Confirmation

Quick sampling is necessary for CPB dyeing

- To enhance shade matching in lab
- Fast checking of made-up pad liquors

Using Dry heat for quick fixation

- Just after padding, keep the fabric sample in a polythene bag.
- The bag is sealed to prevent evaporation after primary removal of air.
- Then keep in a drying chamber preheated to 50°C for 90 min or 60°C for 60 min

Laboratory Confirmation

- **Rapid fixation with Microwave oven**
- **Variable temperature control commercial micro oven**

The setting selected on the microwave is to ensure 1 liter water in a plastic container or glass beaker that reached the temperature as

- **Starting temperature : 20⁰C**
- **After 5 min : 30⁰C**
- **After 10 min : 45⁰C**
- **After 20 min : 65⁰C**
- **After 30 min : 85⁰C**

Batching for 15 – 30 min at room temperature before fixation in a microwave may improve results. Fixation can be done quickly (3-5 min) in a microwave oven.

Thanks...

For any inquiry/support contact...

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