Introduction

Jagson disperse dyes can be used for dyeing and printing of polyester fibers and polyester fiber blends. In exhaust dyeing the most important method of application is high temperature process.

Besides high temperature process Jagson disperse dye can also be used for carrier process and in contiuous dyeing by the thermosol process. In printing fixation can be achieved depending on the sublimation properties either by HT steaming, hot air or by pressure steaming. We have covered almost all the properties of disperse dyes in this shadecard. A lot of technical efforts have been taken to ease the implementation process of Jagson disperse dyes for the customers.

Dyestuff

Disperse dyes can be mainly divided in 3 basic structure:

1) Azo
2) Antrhaquinone
3) Special dyes

As per the dyeing properties the dyes can be classified as follows:

EType

Features

- Good leveling property.
- Suitable for pale- medium shade.
- Suitable for carrier dyeing as well as high temperature dyeing.

SE Type

Features

- Good exhaustion type at medium dyeing temperature.
- Good leveling property
- Good sublimation fastness.
- uitable for pale-deep shade by high temperature, carrier, thermosol dyeing and printing.

S Type

Features

- Good for exhaustion at high dyeing temperature.
- Excellent sublimation and high stability for various finishing process.
- Suitable for medium-deep shade by high temperature, thermosol dyeing and printing.

Dyeing of polyester fibers

Polyester fibers have excellent properties in terms of :

- Strength
- Wear Resistance
- Resistance to chemicals
- Wash and wear properties
- Bulkiness
- Stretch properties

Following are the dyeing methods for polyester fiber:

- High Temperature
- Carrier
- Thermosol dyeing
- Thermosol printing

Practical dyeing methods, may vary according to kind of blended fibers, various fastness and handling to be required.

PRETREATMENT

The pretreatment and dyeing methods vary based on the form in which this substrate is being processed:

- Polyester loose material
- Tops, knit goods or woven fabric
- Spun polyester
- Filament, textured polyester filament
- 100% polyester fiber or blends

Pretreatment serves for

- Removing sizes, preparations and soil from the surface of the fiber
- n case of knit and woven goods serves for relaxation and bulkiness

In case of polyester/ cellulose blends desizing and mercerizing must be carried out prior to scouring.

SCOURING

Desizing and scouring must be carried out prior to dyeing because:

- Textile material is generally endowed with the oiling or sizing agent in order to carry out the
  spinning, weaving and knitting process.
- Various stains and machine oil attach on the material during the textile manufacturing process.
- All together it hinders the dye solution from penetrating during the dyeing process.

- In case the softening agents or winding oils are not removed properly they can be deposited in dyeing bath and can cause spots on the goods.
- All together without scouring it results into unleveling dyeing, ring dyeing and decrease of
  fastness and brilliance of textile material.

Generally water soluble paste is used as sizing agent for polyester fibers.

The desizing process is as follows:

Non ionic or anionic scouring agent	1-3gm/liter
Alkali [soda ash etc]	0.5-2 gm/liter

After treatment for 20-60min at 70*-90*C, washed out with warm water and cold water sufficiently. A starch type size is applied sometime to polyester/cotton blended material, so in this case enzyme type desizing agent may be used. Washing and relaxation of knit and woven goods made of the textured and micro filament should be carried out at temperature as close as possible to 95*C on a tensionless open with washer.

BLEACHING

Bleaching is an optional step. If a higher degree of white is desired, optical bleaching agents must be used. The conditions for bleaching polyesters/cellulose fiber blends depend on the cellulose portion in the blend.

HEAT SETTING

Heat setting is required to stabilize polyester fabric. Ensuring the piece goods retain its shape during all the stages. Although it can also be omitted or can be carried out after dyeing. When its omitted stabilizing is carried out after dyeing. Generally it depends on the nature and structure of the fabric. But following can be considered in majority of the cases:

Woven and Knit goods	170*-195*C
Polyester filament fabric	185*-220*C
Blends of polyester and cellulose fibers	190*-210*C

pH VALUE of Dyes
pH needs to be maintained after all auxiliaries and dyes are added. Buffer system is used to maintain constant pH throughout the dyeing process.

DYEING

Disperse colors are usually high temperature dyes. In majority of the cases it is used in powder/ granule form. The 2nd option available is paste form which is 50%-80% content concentration of the powder product. Generally luke warm water [40*-50*C] is added with stirring to complete the dispersion.

- **HIGH TEMPERATURE DYEING**

  The dye batch must be controlled to pH 4.5-5 using weak acid such as acetic acid or with buffer using sodium acetate to promote the reproducibility of dyeing or to maintain the brilliance of shade.

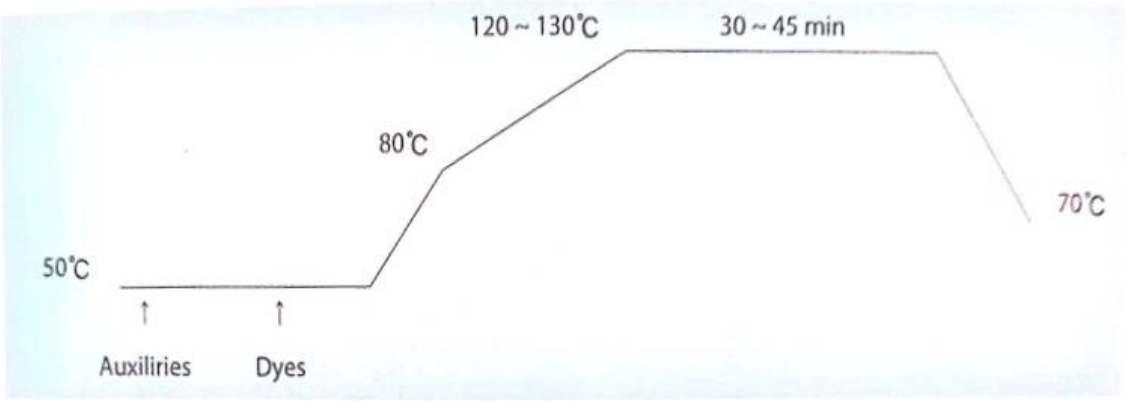
  Standard Recipe:

Jagson Dyes	X%
Dispersing agent	1g/liter
Acetic acid to adjust pH to 4.5-5	
Leveling agent	

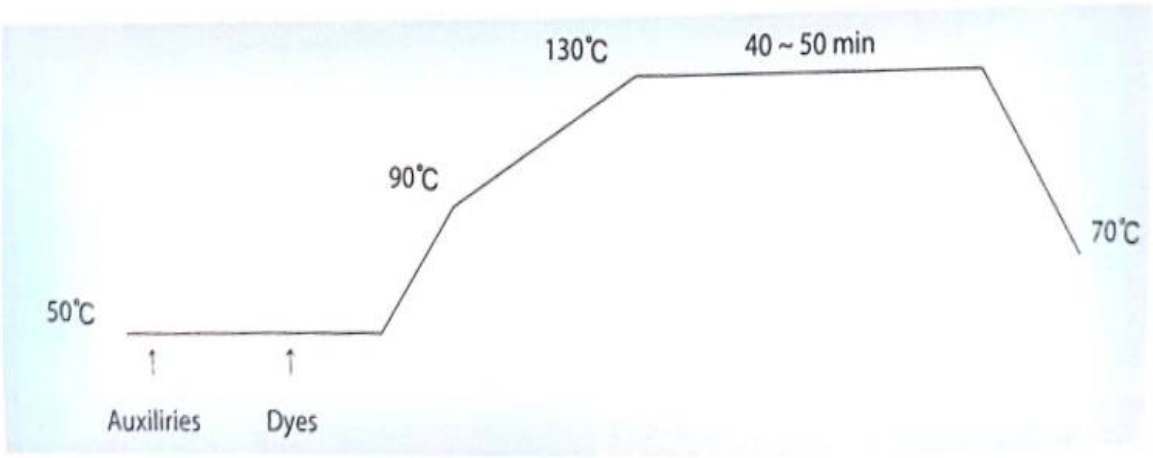
For dyeing fabric which is densely woven on HT beam dyeing machines, long rope circulation times in jet dyeing machines or poor liquor penetration in dyeing of wound packages 1.5g/liter of disperse leveling agent is required. Leveling agents aids rapid dyeing processes as well. Dyeing takes place at 50*C- 60*C. After introducing the goods to be dyed the temperature is raised at the rate of 0.5 to 2*C/minute to a dyeing temperature of 130*C. The rate of rising temperature depends on density of packages/weight /length of ropes respectively. Dyeing is continued for 20-45 minutes depending on the depth of shade at 120*C-135*C For level dyeing, [for problematic dyeing machine in packages and beam dyeing with light weight materials i.e. long ropes in jet dyeing] it may be necessary to reduce the rate of rising.

S type Dyeing temprature

HT dyeing of Rifalon E/SE Type Dyestuffs <For pale to medium shade>



HT dyeing of Rifalon S Type Dyestuffs <For medium to Heavy Shade>



REDUCTION CLEARING

To remove the unfixed dye on the fiber surface reduction clearing/soaping is carried out. In case an additional carrier has been used it is advisable for the goods go be given an intermediate rinse at 80*C.

It can be omitted for jet dyeing. In case of deep shades, the reduction clearing can be carried out in the dyebath itself to improve economy. It can be omitted for loose stock and yarn in pale to medium shades, if carried out it can ease the further processing.

Reduction clearing

For 100% polyester or polyester/cotton blended material dyed with disperse dyes are treated in liquor containing:

Sodium hydroxide [Flake]	1-2g/liter
Sodium hydroxide [Flake] for loose stock and silver	2-3g/liter
Hydrosulfite conc.	1-2g/liter
Scouring agent [non ionic surfactant]	1-2g/liter

Temperature: 70*-80*
Duration: 10-20min
For Polyester/Wool blended material dyed with disperse dyes are treated with liquor containing:

Ammonia aqueous solution	1-2cc/liter
Hydrosulfite conc.	1-2g/liter
Scouring agent [nonionic surfactant]	1-2g/liter

Temperature: 60*-70*C
Duration: 10-20min
SOAPING
For Polyester/Cotton blended material dyed with disperse dyes and reactive dyes, reduction clearing cannot be carried out in one bath. Soaping is carried out as follows:

Nonionic surfactant	1-3g/liter
Soda ash	0-2g/liter
Temp x time	80*-100* x 10-20min

- CARRIER DYEING

  Only selected dyes can be used in carrier dyeing because the exhaustion and build up property are rather poor. Compared to temperature dyeing covering property is also poor.

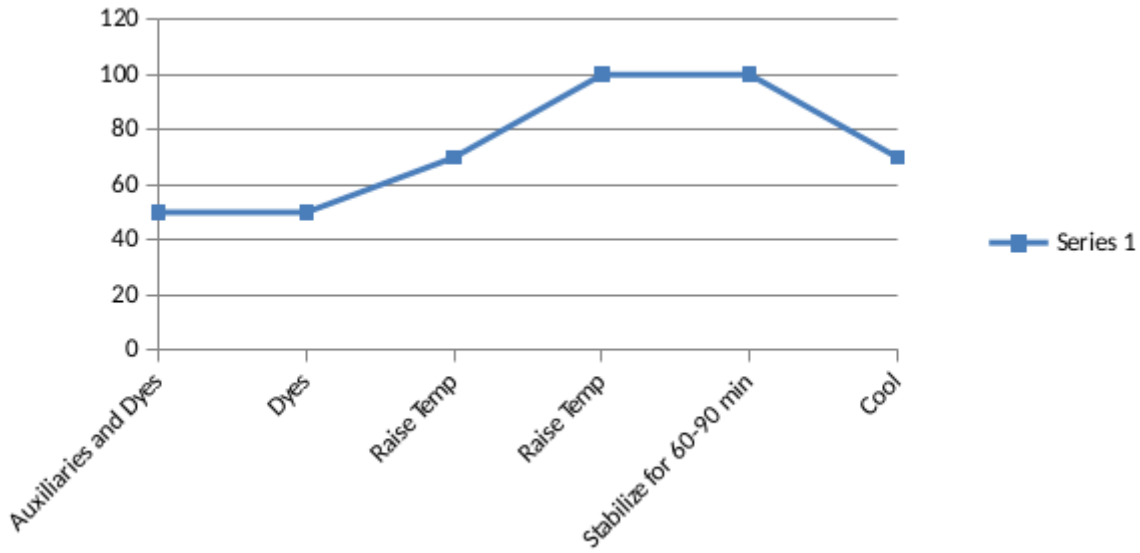
  Standard Recipe:

Carrier	Xg/liter
Jagson Dyes	Y%
Acetic acid to adjust pH to 4.5-5 bring it to boil within 30-40 min	
Dye for 60-90 minutes according to depth of shade	

REDUCTION CLEARING
However following after treatment is sufficient

Polyester Wool Blend	
Emulsogen EL	2g/liter
Acetic acid	0.5ml/liter
Duration	20 min
Temperature	80*C
Polyester Cellulose Blends	
Dispersing agent	2g/liter
Duration	20 min
Temperature	80*C

Carrier Dyeing

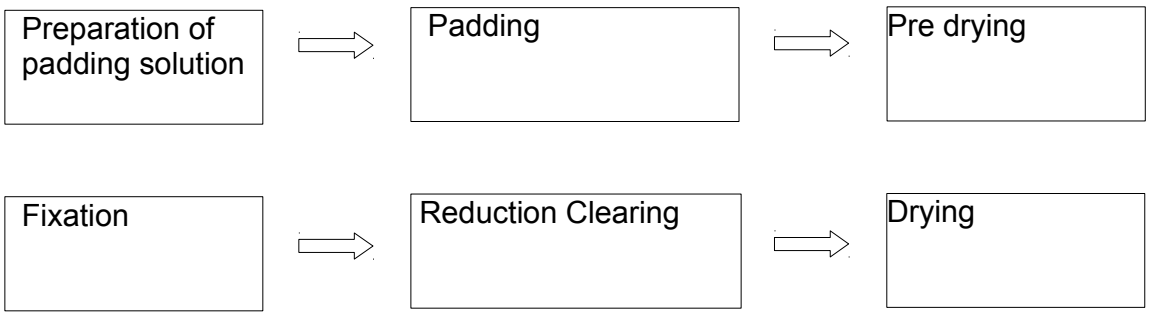


- **THERMOSOL DYEING**

  Thermosol dyeing is employed as a continuous dyeing mainly for polyester/cotton blends, because of very high fixing temperature around 200*C. Dyes with high sublimation fastness are recommended for thermosol dyeing.

  Liquid grade dyes are recommended for thermosol dyeing. It becomes easy to handle when pad liquor is being prepared.

For 100% polyester following process is followed:



RECIPE

Dyes	Xg/liter
Sodium Alginate [Migration Inhibitor]	10-15g/liter
Wetting Agent	1-2g/liter
Acetic acid to adjust pH to 5-6	
Pad liquor temperature	20*-30*
Pick up	60-65%
Pre drying	To 25-30% residual moisture
Drying Temperature	110*-120*
Thermosol Temperature	190*-210*
Thermosol Duration	20-90 seconds

Above recipe can be varied depending on the equipment, depth of shade and fabric weight.

REDUCTION CLEARING
Treat the fabric at 80*C for 15-20 minutes as follows:

Sodium hydroxide[flake]	1-2g/liter
Hydrosulfite conc.	1-2g/liter
Scouring agent [nonionic surfactant]	Xg/liter

THERMOSOL PRINTING

DISPERSING of Dyes
Generally dyes are scattered into 10 -20 times of their quantity of soft water at a maximum temperature of 40*C – 50*C while this is being stirred. The dyes are dispersed using high temperature stirrer running at 1000rpm.
For pad liquors, using large quantity of dyes, generally paste is formed with 10 times it quantity of soft water [40*C – 50*C] then disperse with the aid of a high speed stirrer [1000rpm] and dilute further if necessary.

The liquid grades are diluted by being stirred into cold water [3-5 times their quantity]

The printing is carried out depending on the sublimation properties by HT steam, hot air or by pressure steaming. Below are the typical printing recipes:

A) HIGH PRESSURE STEAMING METHOD:
RECIPE of color paste

Jagson Dyes	X
Water	Y
Thickening paste	500-700
Tartaric acid / Citric acid [pH 5-6]	2-3
Sodium Chlorate	5
Leveling agent	10-20
Total	1000

After printing and drying, steamed for 20-30 min at 130*C, then washed with cold and warm water, and reduction clearing.

B) HIGH TEMPERATURE STEAMING [HT Steaming]/ DRY HEAT FIXATION
RECIPE for Colorpaste

Jagson Dyes	X
Water	Y
Thickening paste	500-700
Fixing accelerant	50-80
Tartaric acid / Citric acid [pH 5-6]	2-3
Sodium Chlorate	5
Leveling agent	10-20
Total	1000

After printing and drying, steamed with super heat steam for 5-10min at 170*-180*C, then washed with cold and warm water, and reduction clearing.

C) DISCHARGE PRINTING
The dischargeable disperse dyes dyed by carrier or high temperature dyeing [at about 120*C]
The material discharged by following methods

	White Discharge	Colored Discharge
VAT dyes	-	X

Wetting agent	0-30	0-30
Carrier	0-30	0-30
Decrolin soluble conc	200-350	200-350
Water	X	Y
Thickening paste	550-450	550-450
Total	1000	1000

DISCHARGING AGENT STANNOUS CHLORIDE

	White Discharge	Colored Discharge
Undischargeable dyes	-	X
Dischargeable dyes	0-30	0-30
Leveling agent	0-30	0-30
Stannous Chloride	60-100	50-100
Water	X	Y
Thickening paste	600-550	600-550
Total	1000	1000

After printing and drying, steamed for 20-30 min at 120*-130*C, then washed with cold and warm water, and reduction clearing.

D) RESIST PRINTING

Recipe of resist paste

	White Discharge	Colored Discharge
Undischargeable dyes	X	-
Dischargeable dyes	-	X
Wetting agent	0-20	0-20
Stannous Chloride	50-100	-
Tartaric acid	3-5	3-5
Sodium Chlorate	-	2
Water	Y	Y
Thickening past	500-600	500-600
Total	1000	1000

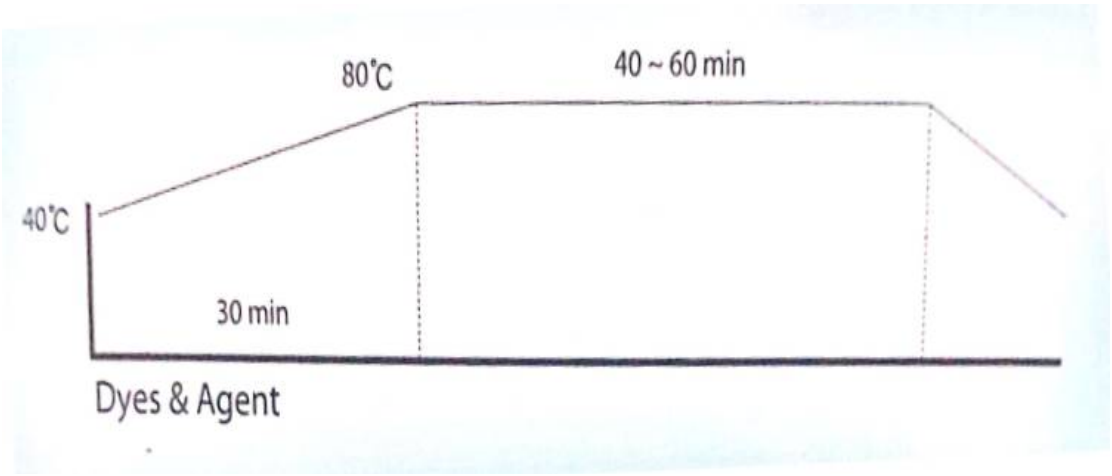
EXHAUST DYEING

On Acetate

Jagson dyes	X%
Dyebath pH	4.5-5

Acetic acid	0.25g/liter
Sodium acetate	1g/liter

Exhaust dyeing on Acetate



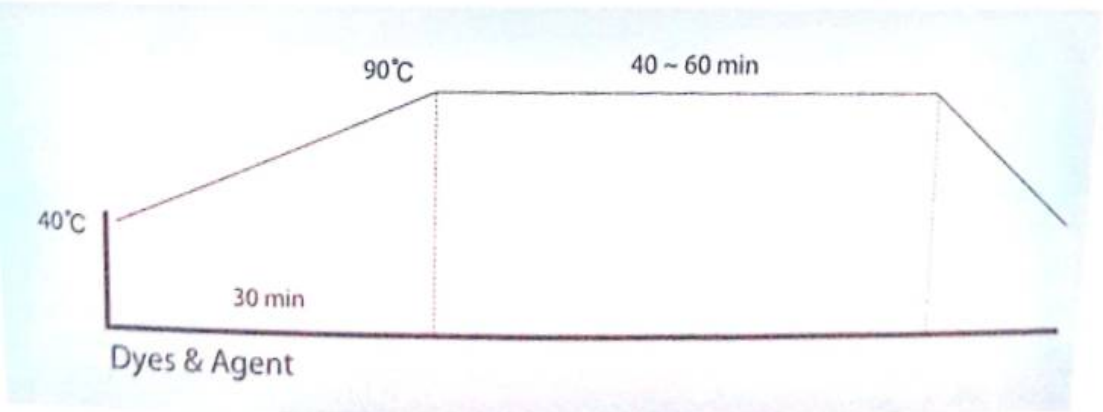
Dyes and Agent [for 30min]Raise Temp to 90*Stabilise Temp for 40-60min Lower Temp

EXHAUST DYEING

On Nylon

Jagson dyes	X%
Dyebath pH	4.5-5
Acetic acid	0.25g/liter
Sodium acetate	1g/liter

Exhaust dyeing on Nylon



Dyes and Agent [for 30min]Raise Temp to 90*Stabilise Temp for 40-60min Lower Temp

LEVELING AND STRIPPING OF FAULTY DYEING ON POLYESTER

The best effects are obtained by working with the longest liquor ratio. Treatment should be repeated with fresh liquor if required.

Leveling under HT conditions

After the liquor has been heated to 50*-70* and adjusted to pH 4.5-5 an addition is made of liquor ratio 1:20 to 1:30

Carrier for leveling: 0.5g/liter

The liquor is then heated slowly to 120*C and the goods are treated for 30-50 min at this temperature. It is then gradually cooled back, after which the goods are rinsed in warn and then cold water. When dyeing are being leveled out, it is advisable to add to the leveling bath about 10% of the dye quantities employed in the dyeing process in order to obtain the corresponding hue and depth of shade.

Stripping under HT conditions

At a temperature of 50-70*C an addition is made to the liquor of liquor ratio 1:20 to 1:30

Carrier for leveling	3g/liter
Caustic soda solution 32.5% [38* Be]	5ml/liter
Hydrosulfite conc. [also a small quantity of defoamer is required]	3g/liter

The liquor is heated slowly to 115*-120*C, then the goods are treated for 45-60 minutes at this temperature, after which the liquor is cooled back to 60*-70*C subsequently the goods are rinsed in hot and then cold water and dried as usual.

Oxidative radical stripping or partial stripping

At a temperature of 50*-70*C an addition is made to the liquor of Liquor ratio 1:20 to 1:30

Carrier for leveling	3g/liter
Sodium Chlorite	3gl/liter
Bleaching Agent	1g/liter

The liquor is adjusted to pH 4 with formic acid 85%

The reading shown in shade card were carried on dyeing that were reduction cleared materials. Depth of shade [Standard depth 1/1 SD]