DDI

VAT DYES ON COTTON YARN

DDI

DOLPHIN BRAND

DOLPHIN

DYE STUFF INDUSTRIES

(Mfg & Exporter of Dyestuff & Chemicals)
MUMBAI (INDIA)

INTRODUCTION

GENERAL

Arlovat dyestuffs which belong to the 'Vat' group of dyes are employed wherever shades of highest fastness properties are required. Arlovat dyestuffs are particularly suitable for the dyeing of cellulosic fibres. But it can also be applied equally well for other textile such as, Viscose, Rayon, Jute, Linen and Natural silk with certain modification of the dyeing process.

COMMERCIAL FORMS

Arlovat dyestuffs are supplied in various forms & differ in tinctorial strength and fineness of dispersion. Such as -

Powder, Conc., Highly Conc. & Ultra Conc. Brands

These brands have poor fineness of dispersion and are recommended for leuco Vat dyeing only.

Microfine brands

These brands possess uniform particle fineness and are specially suitable for pigmentation dyeing methods. They are also suitable for leuco vat dyeing.

Ultra Dispersed brands

These brands represent a further improvement on the microfine brands. It is suitable for high speed continuous dyeing on a account of fast rate of reduction. They are also suitable for leuco vat dyeing.

PRINCIPLES OF DYEING

Arlovat dyestuffs are insoluble in water and must be converted into their soluble 'leuco compounds' form by reduction with sodium hydrosulphite in presence of caustic soda at certain temperature. The soluble leuco compound so formed possess high affinity for cellulosic fibres. The colour of leuco forms varies from dyestuff to dyestuff and is characteristic of the dyestuff from which it is produced.

METHODS OF DYEING

A. Preparation Of General Stock Vat Solution

Most of the Vat dyes should be vatted in a concentrated volume with required quantities of caustic soda and sodium hydrosuphite.

The powder, Conc., Highly Conc. and ultra conc. Brands are first pasted with a suitable wetting agent as Turkey Red Oil and little hot water. Microfine and ultra Dispersed brands are sprinkled in warm water under stirring. Add hot water and bring to the recommended vatting temperature. Add required quantity of caustic soda (Previously dissolved in water) under stirring. Sprinkle required quantity of sodium Hydrosulphite under stirring. The whole liquor is allowed to be reduced at the recommended vatting temperature of about 15 minutes with occasional stirring. This vatted liquor is called as stock vat solution.

The quantities of chemicals recommended for Vatting of Arlovat Dyestuffs is given as -

TABLE - 1

Stock Vat Method		I	II	III	IV
Arlovat Dyestuff	Gms.	100	100	100	100
Water	Litres	5	7.5	15	15
Turkey Red Oil	Gms.	10	10	10	100
Caustic Soda Solid	Gms.	150	200	300	300
Sodium Hydrosulphite	Gms.	100	150	200	200
Temperature	°C	50-55	60-70	60	80-90
Time	Mins.	15-20	15-20	15-20	15-20

NOTE
The following dyes should be vatted in full volume in the Dyebath containing the full quantities of caustic soda and sodium Hydrosulphite.

Arlovat Blue 3R (Blue RSN)
Arlovat Blue RSN Reddish Special
Arlovat Black BB
Arlovat Direct Black

B. Method Of Application
According to the Quantities of caustic soda, and sodium hydrosulphite and required vatting temperature of dyes, methods of application are classified as

A/Q1 method - The dyestuffs belonging to this method are most readily exhausted at 50-60°C and required large addition of caustic soda.

A/Q2 method - The dyestuffs belonging to this method are dyed at 45-50°C and require less caustic soda. For complete exhaustion in medium and deep shades addition of Glauber's salt or common salt is required.

A/Q3 method - The dyestuffs belonging to this method are dyed AT 20-25°C and require the least amount of caustic soda.

These dyestuffs required higher amount of Glauber's salt or common salt than A/Q2 method for sufficient exhaustion.

A/Q1 + method - The dyestuffs belonging to this method are dyed at 75-80°C and required very high addition of caustic soda. Blacks belong to this method.

Indigoid method - The dyestuffs belonging to this method are stock vatted in concentrated form at 75-80°C and require a protective colloid eg. Turkey Red oil to obtain a clear stock vat solution.

NOTE

The quantities of caustic soda and sodium hydrosulphite mentioned in table No. 2 are total quantities and the quantities used to prepare the stock vat should be deducted from it.

Quantities of chemicals recommended for dyeing are given in gms/litre.
Goods to liquor ratio is 1:20

Table - 2

Chemicals	AQ1+	AQ1	AQ2	AQ3
Caustic Soda	11-14	5-8	2 5-4	2-4
Sodium Hydrosulphite	7-9	3-5	2-5	2-5
Glauber's Salt or Common Salts	-	-	5-15	10-30
Dyeing Temp.	75-80°C	50-60°C	45-50°C	20-25°C

C. Exhaust Dyeing Of Cotton Yarn

The dyebath is set with the necessary amount of soft water at the correct temperature of dyeing and employed a liquor to goods ratio of 20:1. The recommended amount of caustic soda and sodium Hydrosulphite is added with stirring. This is followed by the addition of the vatted dyestuffs. The dyebath is stirred well and allowed to stand for about 5 minutes.

In case of those dyes which are to be vatted in the full volume of the dyebath, the procedure already mentioned should be adopted.

The well prepared cotton yarn is entered in the dye liquor and worked at the recommended temperature of 45-60 minutes depending upon the depth of shade. For method A/Q2 and A/Q3 the required amount of Glauber's salt dissolved in water should be added and worked about 15 minutes.

D. Oxidation

After completing the dyeing, squeeze the hanks and oxidize in air or employing suitable oxidizing agent such as. Hydrogen peroxide or sodium perborate.

A)	Sodium perborate	3 gms / litre
	Sodium bicarbonate	2 gms / litre
	Temp.	50°C
B)	Hydrogen Peroxide (130 Vols)	3-4 c.c. /litre
	Temp.	50°C

E. Soaping

This is the final stage of dyeing operation. The dyed oxidized material rinsed with cold water and treated in a bath containing.
2 gms / litre detergent
+
2 gms / litre soda Ash.

At the boil of 5-10 minutes followed by a hot and cold rinse.

GENERAL PRECAUTIONS

1. **Quality of Water**
   The water employed for pretreatment of material, to prepare stock vat and dyebath, should be soft. If only hard water is available, it must be treated with softening agents like sodium hexameta phosphate or sodium Ethylene diamine tetra acetate.

2. **Dye Vessels**
   The dyeing of vat dyes is best carried out in vessels made of stainless steel. Vessels made of copper or Alloys of copper must be avoided.

3. The material (cellulosic fibres) should be well scoured before dyeing.

4. It is essential to maintain the dye bath in a fully reduced stage throughout the whole dyeing period. Presence of caustic soda in dyebath can be checked with phenolphthalein test paper which turns red and presence of sodium Hydrosulphite can be checked with vat yellow paper which turn Blue.

5. The dyed material with following Arlovat dyestuffs are rinsed in water immediately after dyeing and prior to oxidation.

   Arlovat Blue 3 R (Blue RSN)
   Arlovat Blue RSN Reddish Special
   Arlovat Blue BC A/C
   Arlovat Blue 2B PDR

6. For true fast black shades of Arlovat Black BB powder, dyed material after oxidation should be treated in a cold liquor of sodium hypochlorite of about 30 minutes and rinsed well. Then it is soured with acetic acid, rinsed and soaped as for other vat dyes.

7. Vatting & Dyeing temp. should be maintain strictly as per given in the chart.

FASTNESS DATA

The figures for light fastness are for day light fastness. ratings are expressed on a numercial scale of 1 to 8 as follows:

8. Maximum	4. Fairly good
7 Excellent	3. Moderate
6. Very Good	2. Poor
5. Good	1. Very Poor

All other fastness properties are expressed on a numerical scale 1 - 5 as follows :

5. No change in shade
4. Slight change in shade.
3. Moderate change in shade or dyeing weaker.
2. Very marked change in shade or dyeing much weaker.
1. Greatly changed in shades or dyeing very much weaker.

Staining :

5. No. Staining of adjacent white material.
4. Slight staining of adjacent white material.
3. Moderate staining of adjacent white material.
2. Fairly heavy staining of adjacent white material.
1. Heavy staining of adjacent white material.

The tendencies of the colour change are indicated by the following marks:

R Redder
B Bluer
G Greener
Y Yellower
D Duller
S Change in shade and depth of shade.
C Staining on adjacent white cotton material.

Key to Abbreviations :

\+ Denotes increase in depth.
* Requries an addition of 15-20% sodium nitrite and triethanolamine calculated on the weight of sodium hydrosulphite.

The dyeings illustrated in this pattern card have been carried out on bleached cotton yarn at 1:20 material to liquor ratio. "Arlovat" is the registered Trade Mark of Arlex Chemi (P) Ltd., Mumbai.

The information provided in this brochure and shade card is given in good faith but without warranty (Without guarantee)

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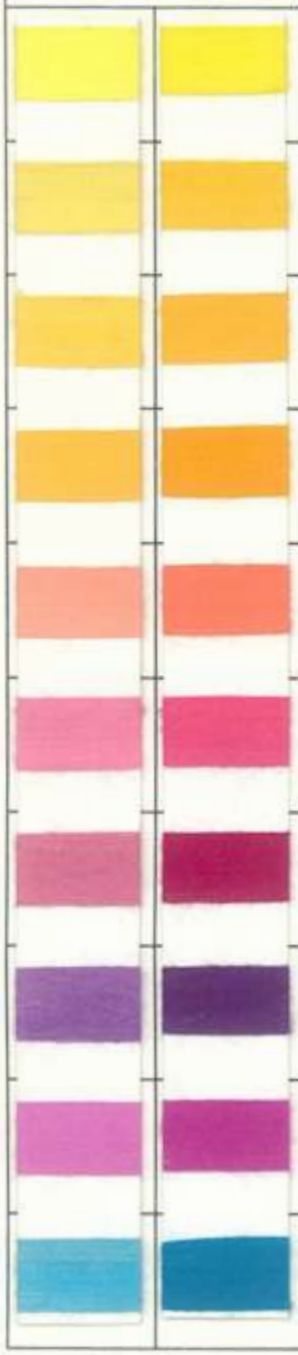
VAT DYES ON COTTON YARN



	General Properties		
	Stock Vat Method	Vatting Temperature	Colour of reduced vat
YELLOW 5G U/C. (C.I.VAT YELLOW 2)	II	60°c	violet
G. YELLOW GK Pdr. (C.I.VAT YELLOW 4)	I	50°c	Bord-eaux
G. YELLOW RK Pdr. (C.I.VAT ORANGE 1)	I	50°c	Bord-eaux
G. ORANGE 3G U/C. (-)	I	70°c	Bord-eaux
ORANGE RF Pdr. (CI VAT ORANGE 5)	II	70°c	Yellow
PINK R Pdr. (CI VAT RED 1)	IV	80°c	Yellow
RED 6B (CI VAT RED 13)	II	60°c	Bluish Green
PURPLE 2 R Pdr. (CI VAT VIOLET 1)	II	60°c	Bluish Green
MAGENTA B Pdr. (CI VAT VIOLET 3)	IV	85-90°c	Yellow
TURQ. BLUE G Pdr. (CI VAT Blue 29)	II	50-60°c	Olive Green

Dyeing Method	Fastness Properties				
	Light Fastness Day Light 1/1	Washing Fastness ISO4 S	Soda Boil S	Chlorine Bleaching S	Hydrogen Peroxide Bleaching S
AQ1 at 60°C	4	4-5	3-4	5	5
AQ3 at 25°C	5-6	3-4	4-5	4*-5	5
AQ3 at 25°C	5-6	3-4	4-5	4*-5	5
AQ3 at 50°C	5-6	3-4	4-5	4*-5	5
AQ1 at 50°C	4-5	4	3-4	4	4
AQ1 at 50°C	5	4-5	4-5	4	4-5
AQ1 at 50°C	6	4-5	4-5	4-5	5
AQ1 at 60°C	6	4-5	4-5	4-5	5
AQ1 at 55°C	5	4-5	4	4-5	4-5
AQ1 at 55°C	5	4-5	4	4-5	4-5

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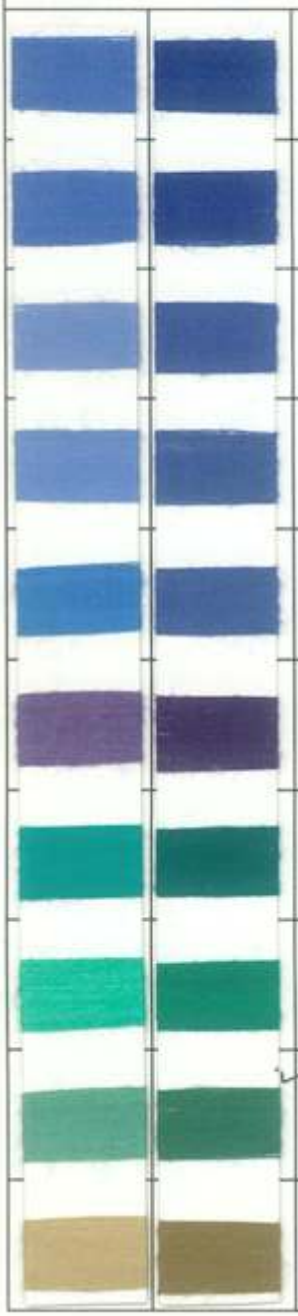

	General Properties		
	Stock Vat Method	Vatting Temperature	Colour of reduced vat
BLUE 3R (CI VAT Blue 4)	II	60°c	Blue
BLUE RSN (Ultra Reddish) (C.I.VAT BLUE 4)	III	60°c	Blue
BLUE 2B Pdr. (C.I.VAT BLUE 5)	II	65-70°c	Yellow
BLUE 4B (-)	II	60°c	Yellow
BLUE BC U/C. (C.I.VAT BLUE 6)	III	60°c	Blue
DARK BLUE BO (C.I.VAT BLUE 20)	II	60°c	Blue
GREEN FFB Pdr. (CI VAT GREEN 1)	II	60°c	Blue
GREEN 2G (CI VAT GREEN 2)	II	60°c	Blue
OLIVE GREEN B (CI VAT GREEN 3)	III	60°c	Blue Black
KHAKHI 2G (CI VAT GREEN 8)	II	60°c	Dull Yellow Brown

Dyeing Method	Fastness Properties				
	Light Fastness Day Light 1/1	Washing Fastness ISO4 S	Soda Boil S	Chlorine Bleaching S	Hydrogen Peroxide Bleaching S
AQ1 at 60°C	6	4-5	3R	4-5	4-5
AQ1 at 60°C	7	4-5	4R	2G	4-5
AQ1 at 60°C	7	4-5	4R	2G	4-5
AQ1 at 60°C	7	4-5	4R	2G	4-5
AQ1 at 50°C	7-8	4-5	3-4R	3G	4-5
AQ1 at 60°C	7-8	4-5	3R	4-5	4-5
AQ1 at 60°C	6-7	4-5	4	4-5	4-5
AQ1 at 60°C	6-7	4-5	4	4-5	4-5
AQ1 at 60°C	8	4-5	4	4-5	4-5
AQ2 at 50°C	6-7	4-5	3-4	4-5	4-5

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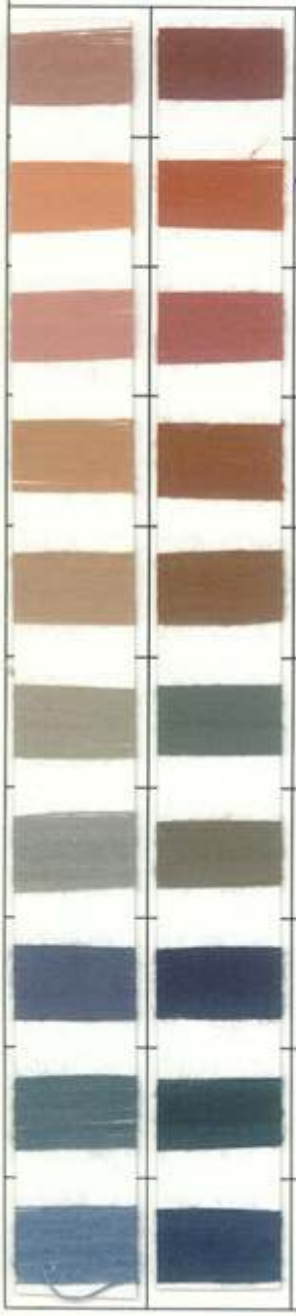

	General Properties		
	Stock Vat Method	Vatting Temperature	Colour of reduced vat
BROWN BR U/C. (CI VAT BROWN 1)	I	60°c	Yellow Brown
BROWN R U/C. (CI VAT BROWN 3)	I	60°c	Redish Yellow
BROWN RRD Pdr. (CI VAT BROWN 5)	IV	85°c	Redish Yellow
BROWN 2G U/C. (-)	II	60°c	Dull Yellow Brown
BROWN G A/C (-)	II	60°c	Dull Yellow Brown
OLIVE R U/C. (C.I.VAT BLACK 27)	III	60°c	Dull Redish Brown
OLIVE T (C.I VAT BLACK 25)	II	60°c	Grey
GREY 3B U/C. (CI VAT BLACK 16)	II	60°c	Violet
BLACK BB (CI VAT GREEN 9)	II	60°c	Dull Blue
BLACK CH (-)	III	60°c	Dull Blue

Dyeing Method	Fastness Properties				
	Light Fastness Day Light 1/1	Washing Fastness ISO4 S	Soda Boil S	Chlorine Bleaching S	Hydrogen Peroxide Bleaching S
AQ2 at 50°C	7-8	5	4-5	4-5	4-5
AQ2 at 50°C	7	5	4-5	4-5	4-5
AQ2 at 50°C	7	5	4-5	4-5	4-5
AQ2 at 50°C	7-8	5	4-5	4-5	4-5
AQ5 at 50°C	7-8	5	4-5	4-5	4-5
AQ2 at 60°C	7	4-5	4-5	4-5	4-5
AQ2 at 60°C	7-8	4-5	4Y	4-5	4-5
AQ1 at 60°C	6-7	4	3	4	4
AQ1 at 50°C	8	4-5	3-4	4-5	4-5
AQ1+ at 70°C	7-8	4-5	3R	5	5

UNITS OF LENGTH MEASUREMENT

Metric System

1 Millimeter	mm	=		=	0.03937 Inches
1 Centitmeter	cm	=	10 mm	=	0.3937 Inches
1 Metre	m	=	100 cm	=	1.0936 Yards
1 Kilometer	km	=	1000 m	=	0.6214 Miles

British System

1 Inch	=	2.54 cm	=	25.4 mm
1 Foot	=	12 Inches	=	0.3048 m
1 Yard	=	3 Feet	=	0.9144 m
1 Mile	=	1760 yards	=	1.6093 km

UNITS OF WEIGHT MEASUREMENT

Metric System

1 Milligram	(mg)			=	0.0154 grain
1 Gram	(g)	=	1000 mg	=	0.0353 ounce (oz)
1 Kilogram	(kg)	=	1000 g	=	2.2046 pounds (lbs)
1 Tonne	(t)	=	1000 kg	=	2.2046 lbs

British System

1 Ounce	(oz)	=	437.5 grains	=	28.35 gms
1 Pound	(lb)	=	16 ounces	=	0.4536 kg
1 Stone		=	14 lbs	=	6.3503 kgs
1 Hundred Weight	(cwt)	=	112 lbs	=	50.802 kgs.
1 Ton		=	20 cwts	=	1016 kg.

CAPACITY

Metric Measurement

1 Litre	=	1000 ml	=	0.22 gallons

British Measurement

1 Pint	=	5683 cc	=	0.5683 litres
1 Gallon	=	8 pints	=	4.5461 litres

Capacity of Cylindrical Vessel

$$V = \frac{D^2 \times H \times 0.785}{1000}$$

V = Volume in litres D = Diameter in Centimetres
H = Depth in centimetres

$$V = D^2 \times H \times 0.785 \times 6.25$$

V = Volume in gallons D = Diametres in feet
H = Depth in feet

Capacity of rectangular vessel

$$V = \frac{L \times B \times H}{1000}$$

V = Volume in litres L = Length in centimeters
B = Breadth in centimeters H = Depth in centimeters

V = L x B x H x 6.25

V = Volume in gallons L = Length in feet
B = Breadth in feet H = Depth in feet

Concentration

1 gm / litre = 1 lb/100 gallons
1 oz / gallon = 6.23 gms / litres

Speed

Mile per hour = 1.61 km. per hour
Yard per minutes = 0.9144 metre per minute

Temperature

Temperature Centigrade and Fahrenheit
°C to °F = (C x 9 / 5) + 32 or 5 F = 9 C + 160
°F to °C = (F -32) x 5/9 or 9 C = 5 F - 160

Pressure

1 atmosphere = 1.033 kg. per sq. cm. = 14.7 lbs. per sq. ft.
1 kg per sq. cm. = 14.27 lbs . per sq. inch

Common Numerals

1 Score = 20
1 Gross = 12 Dozens
1 Lakh = (10) 5
1 Million = (10) 6
1 Crore = (10) 7

Twadell to Specific Gravity

$$S = 1 + \frac{(°Tw \times 5)}{1000}$$

Specific Gravity to Twadell

Degrees Twadell = (Sp. gr. - 1) x 200

Specific Gravity to Baume

$$\text{Degrees Baume} = \frac{144.38\ (\text{Sp. gr.} - 1)}{\text{Sp. gr.}}$$

1 Horse power = 0.7351 KW

1 Kilowatt = 1000 Watts = 1.36 h. p.

1 Litres Hydrochloric acid 32°Tw contains 1.16 kg. by weight.

1 Litres Sulphuric acid 168°Tw contains 1.84 kg. by weight.

1 Part Glauber's salt calcined = 2.25 parts crystals

1 Part Sodium Sulphide conc. (flake, Rock, fused) = 2 parts crystals

1 Part Soda ash anhydrous = 2.7 parts crystals

°Be	°Tw	Approximate Caustic Soda Solid content	
		W/v In gms / litre solution	W/v In gms / kg solution
20	32.2	166.7	143.5
21	34.2	177.4	151.5
22	36	188.8	160
23	38	201.2	169.1
24	39.9	213.7	178.1
25	42	226.4	187.1
26	44.2	239.7	196.5
27	46.2	253.6	206
28	48.4	267.4	215.5
29	50.4	281.7	225
30	52.6	296.8	235
31	54.8	311.9	244.8
32	57	327.7	255
33	59.4	344.7	265.8
34	61.6	361.7	276.5
35	64	380.6	288.3
36	66.4	399.6	300
37	69	419.6	312
38	71.4	441	325
39	74	462.1	337.5
40	76.6	484.1	350

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