

New Applications of Dyes in the Textile Industry



PATEL UTPAL R.

INTERNATIONAL CONFERENCE ON INDIAN DYESTUFF INDUSTRY
SEPTEMBER 22, 2006 Mumbai

Cotton hand-picking



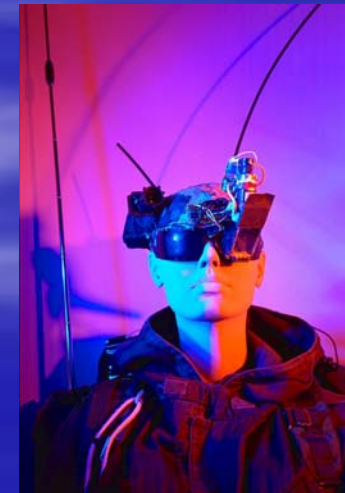
Hand spinning



Backstrap-weaving

They have come a long way!

Where would you like to go today?



AREA OF NEW APPLI....

- Application of new dye like thermochromic and photochromoc.
- Emergence of new fiber like bamboo fibre; spf Fibre.
- Redesigning the application method like application of cationic dye fixing agent; dyeing cum finishing process.
- Implementation of new technologies like E-CONTROL; PLASMA; ULTRASONIC.

New Paradigm

- Since the 19th Century, revolutionary changes have been occurring at an unprecedented rate in science and technology with a profound impact on our lives
- Inventions of ICs, computers, the Internet, discovery and complete mapping of the human genome, and many more have transformed the entire world
- We have also learnt a lot from nature!

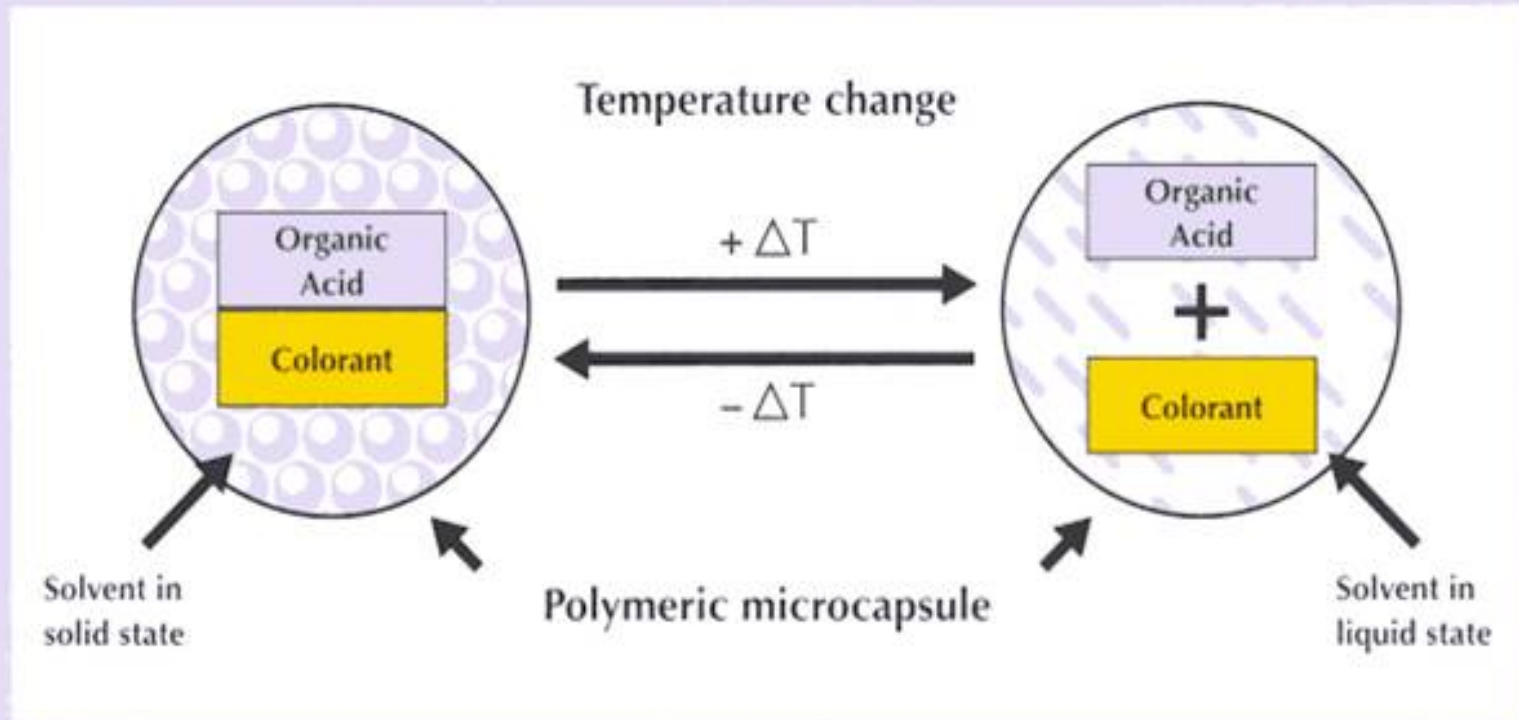
- Solid foundations of scientific understanding have been laid to guide the improved usage and processing technology of natural fibers and the manufacturing of synthetic fibers
- The technology has progressed so that manufactured fibers and their products surpass natural fibers in many aspects
- Textiles can now be designed for specialized applications
- Biological routes for synthesizing polymers or textile processing represent an environmentally friendly, sustainable way of utilizing natural resources

CONFUGARATION

- customer requirements
- Type of material
- Machinery aspect
- Designing aspect

APPLICATION OF SMART COLOR

Principle of Thermochromism



Coloured state

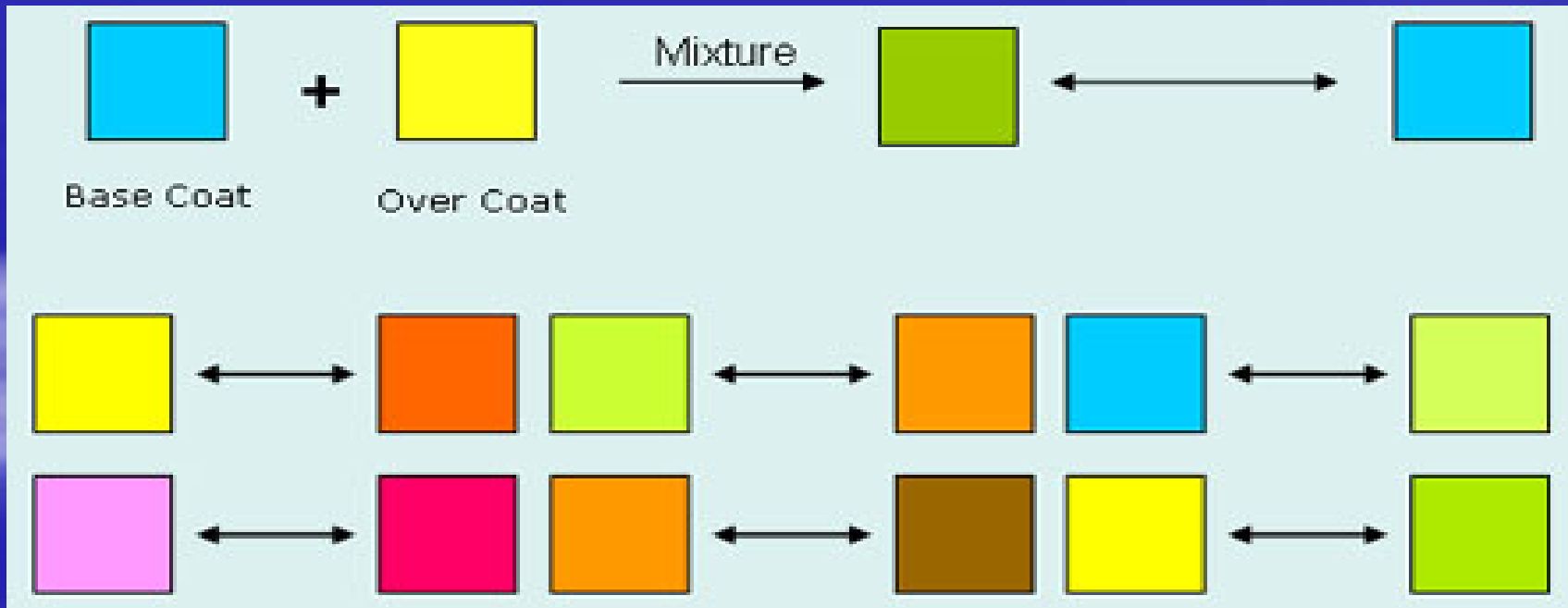
If the temperature is below the melting point of the solvent, the colour forming components are in contact. Due to electron interaction a visible colour occurs.

Colourless state

If the temperature is above the melting point of the solvent, the colour forming components are separated. Therefore no electron interaction and no visible colour occur.

Way of producing effect

- Printing with thermochromic/ photo chromic colors
- **Coat Mixing of Created/Basic colors**
The color can be changed from one to another by mixing photochromic colorants and regular solvent dyestuffs.



Smart color for smart garment

Color with softener

- Dy-soft is a blend of color and softener.
- It is specially designed for garment industry to carry dyeing and softening process in one step.
- It imparts an unusually soft and supple hand to cotton, synthetic, and blended fabrics. It saves time, water and energy.

Enzyme with tint

- Provides ONE STEP stone-wash and tinting effect, abrasion, surface polishing, de-pilling, and body softness on Indigo denim garments.
- It does not require incorporation of additional dyes/dyeing step to obtain tinting effect.
- less processing time and cost and increase in plant output.
- Tinting effect can be obtained in various colors/shades/depth depending on requirements of color depth and abrasion.

Smart color for smart garment

Trifunctional color

- Dyeing of garment with trifunctional colors
- Tie the garment at different parts
- Discharging of trifunctional colors with reducing agent
- Neutralization of garment with oxidizing agent

INVISIBLE (UV light color)

- is a dispersion of invisible pigments.
- Blue Spray exhibits excellent running properties on all types of spray, brush, or knife-edge applications.
- A soft hand binder is incorporated in the product for excellent fastness and hand.
- Treated fabric or treated areas on fabric will exhibit bluish hue under black light/UV light.

New methodology

Dyeing cum finishing

- Specially formulated liquid dyes for p/c by PDC Process.
- RECIPE:-

TULACON C	XGPL
BINDER	40-50GPL
RESIN	60-80GPL
CATALYST	12-16GPL

BENIFITS

PROCESS

- One step, simple & economical
- Wash treatment not required
- Less water & energy consumption

PERFORMANCE

- High productivity due to short process
- No color in effluent
- Excellent reproducibility

PRODUCTS

- High compatibility & reproducibility
- Complete shade gamut
- High degree of fixation
- High light & chlorine fastness

Developments in sulfur dyes

Chemistry of the sulfur dyestuffs



Wash out effect

- Recommended dye :-sulphur (water soluble); pigment.
- Important parameter :- pretreatment with cationic dye fixing agent.
- Process route :- continuous as well as batch wise (for knits)

10-20gpl cationic dye fixing

w1

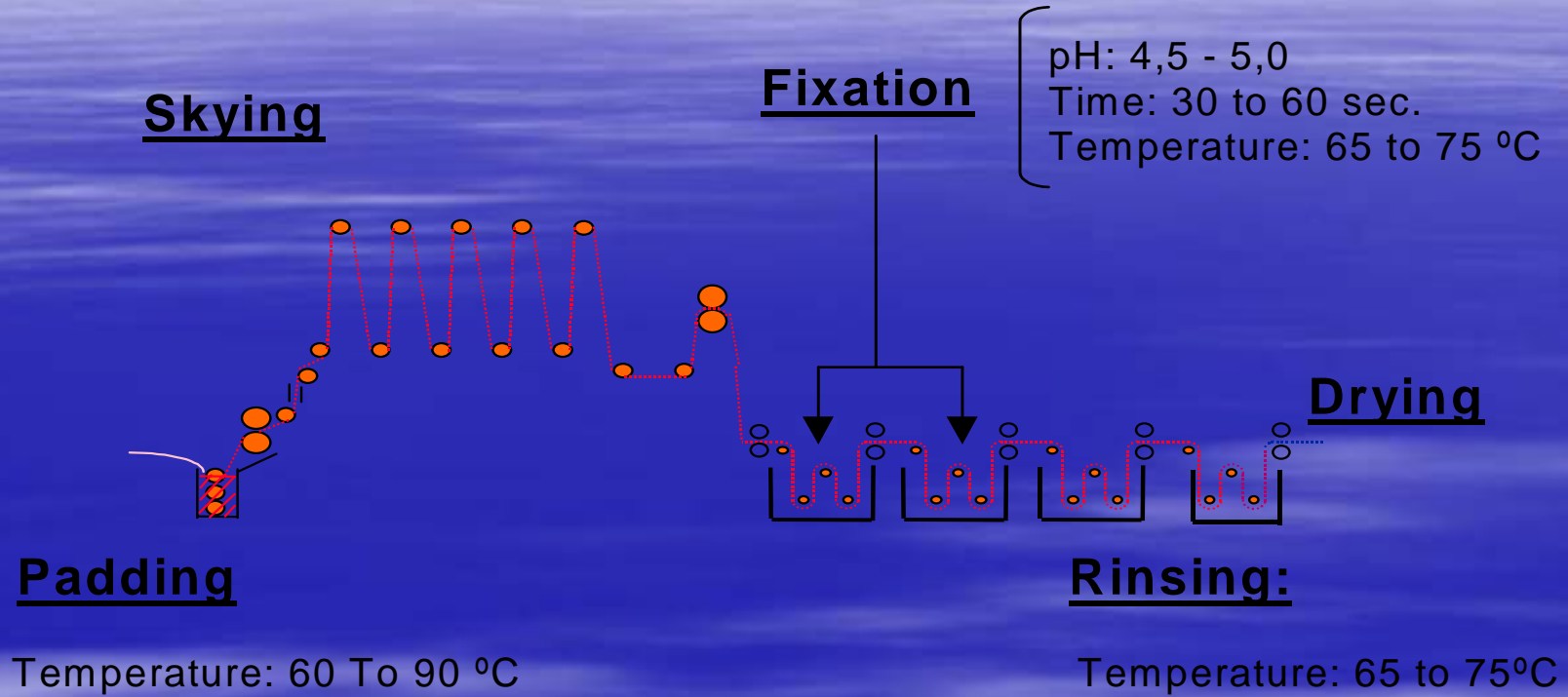
Sul. Dye 50-150

washing

Wash out effect

- One step dyeing process saves time, water, energy.
- Excellent fastness ratings.
- Excellent levelness.
- Hardly any contamination / staining of the dyeing equipment, which can be cleaned up easily.
- As in case of sulphur dye we are going to use water soluble dye there is no need to use reducing agent
- Less effluent.

PAD OX



PAD OX

ADVANTAGES OF PAD-OX:

To sum up, the advantages of the Pad-Ox process are very clear:

Technical Advantages

The enormous flexibility and simplicity of the process

100% fixing of the colour

Clean process

Short time/ high productivity

Easy colour change from batch to batch

Good level of fastness

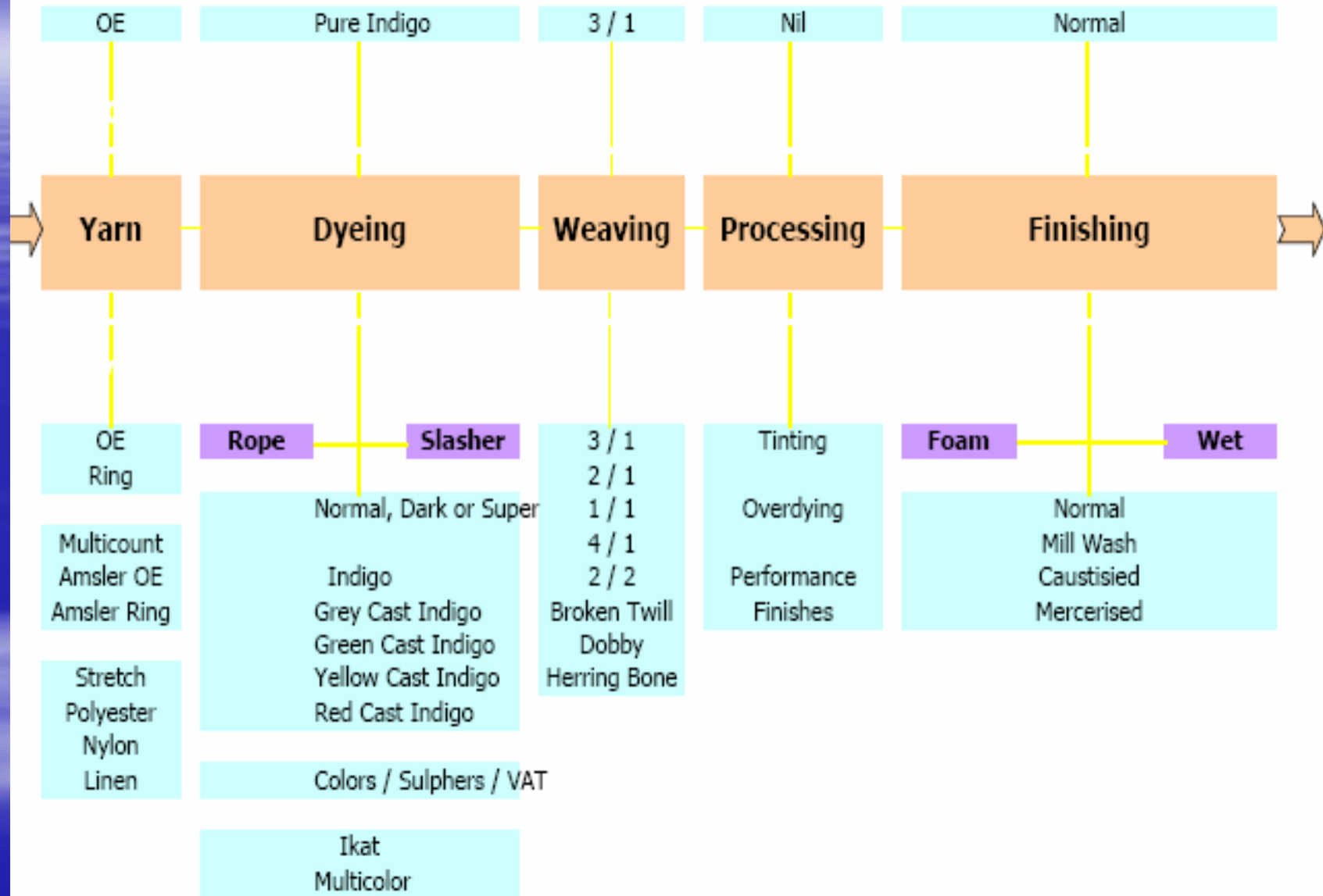
Economic and Ecological Advantages

Low consumption of reducing agent

Minimal coloration of backwaters

Practically no water consumption

Denim - Yesterday and Today



E- CONTROL

- With increase in demand for shorter lot sizes / shade | continuous dyeing the simple efficient, ecological, and energy saving process of e control for dyeing with reactive dye has become all the more relevant.
- **CONCEPT :- PAD- HUMIDITY FIX.** (efficient fixation w/o salt & urea)

E-CONTROL

Benefits

- Ideal choice for short or long lot dyeing
- Full color range
- Excellent reproducibility of colors
- No risk of browning of cellulose fibers thanks to low fixation temperature - bright colors possible
- No urea - no fumes - no machine contamination
- No salt (easy wash-off of unfixed dyestuff)
- Instant color viewing
- Accurate, easy and rapid laboratory check method
- No unproductive batching sequences, no moiré effects
- Migration minimized by rapid fixation and humidity control
- No crushing of pile fabrics (e.g. corduroy)
- Improved penetration of difficult fabrics due to presence of humidity during fixation
- Energy-efficient thanks to optimum humidity control
- Ideal process for fast change technology

INK-JET PRINTING

<u>Components</u>	<u>Function</u>	<u>Concentration (%)</u>
Demineralised water	Aqueous carrier medium	60-90
Water soluble solvent	Hygroscopic viscosity ctrl	5-30
Dyestuff or pigment	Dye carrier	1-10
Surfactant	Wetting penetration	0.1-10
Biocide	Prevents fungi and bacterial growth	0.05-1
Buffer solution	Ph control	0.1-0.5
Other additives	Completing agent Deforming agent Dissolving agent	>1

INK-JET PRINTING

Reactive inks:

- Inks based on reactive dyes can be used to print cotton or viscose and, to some extent, wool and silk. As the name suggests, the dye reacts with the cellulose to form covalent bonds. It is this bond that gives reactive dyes their high levels of fastness to washing.

PIGMENTS:

- Pigment resin systems are another attractive system, which can also be used for ink-jet printing of textile. It requires a polymerisable resin to be applied to the fabric (due to limitations of viscosity of ink-jets) and then curing the resin on the substrate by UV radiations or thermal means.

Disperse dyes:

- Disperse dyes are the main printing system for polyester. Ciba has developed a series of disperse dyes suitable for DOD Bubble jet printing system. Terasil DI disperse inks are utilized for polyester automotive fabrics and apparels whereas Terasil TI disperse inks are developed for special polyester applications.

COATING WITH PLASMA

Liquid
Precursor

+

Plasma

+



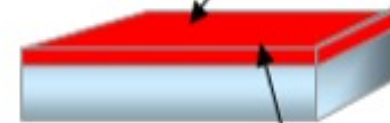
Precursor polymerization



Surface activation/grafting



Super-functional
coating



Nm to μm

Functionality
Preservation

COATING WITH PLASMA

Competitive advantages

Technology leadership

New product development and commercialization

Process enhancements

Solutions to manufacturing problems

Increased throughput

Improved productivity

Financial benefits

Cost savings

Greater operational profitability

High added value through new and improved products and processes

COATING WITH PLASMA

Eliminate chemicals

No need to handle and store bulk chemicals

No chemical mixing or bath formulation

No need for solvents, surfactants, or acids

Reduce consumption

Very low raw materials consumption

Very low energy consumption

No water consumption

Simplify operations

Single-step process

Small equipment footprint

No need for drying ovens or operations

Negligible need for waste disposal/recycling

New generation fiber...

New generation fiber...

- Soybean Protein Fiber is an advanced textile fiber. It is made from the Soybean cake after oiling by new bioengineering technology.

Wearing Values

- **Cashmere-like handle:** soft and smooth, soft and natural luster, good draping property
- **Dry and comfort:** excellent moisture absorption and air perviousness
- **Good color fastness:** good acid, alkali and ultraviolet resistance, color is natural and soft
- **Natural bacteria resistance:** bacteria resistant elements are integrated in fiber's molecule chain, which makes the fabrics keep the property of resisting coli bacillus, staphylococcus aureus and candida albicans permanently.
- **Nursing the skin:** Compared plant protein could be absorbed by human body more easily without side effect.

New generation fiber...

Soybean protein fiber (SPF) has different physical and chemical construction from natural protein fiber.

Process:

A. gray goods ----pretreatment, alkaline Proteolytic enzyme , removing sericin ---- scouring and bleaching----- whitening----pressing water ----- dyeing- --softening .

B. gray goods----- alkaline and Hydrogen peroxide bleaching , removing sericin---washing----reduction bleaching---whitening--pressing water ---- dyeing---finishing

MOST SUITABLE DYES ARE ACID AND REACTIVE

New generation fiber...

1. Characteristics of bamboo fiber

Strength:

Natural anti-bacteria

Green & Biodegradable

Breathable and Cool

Soft hand feeling

Luxurious shiny appearance

Weakness:

Low tensile strength (wet tensile strength is lower: 60% of dry tensile strength)

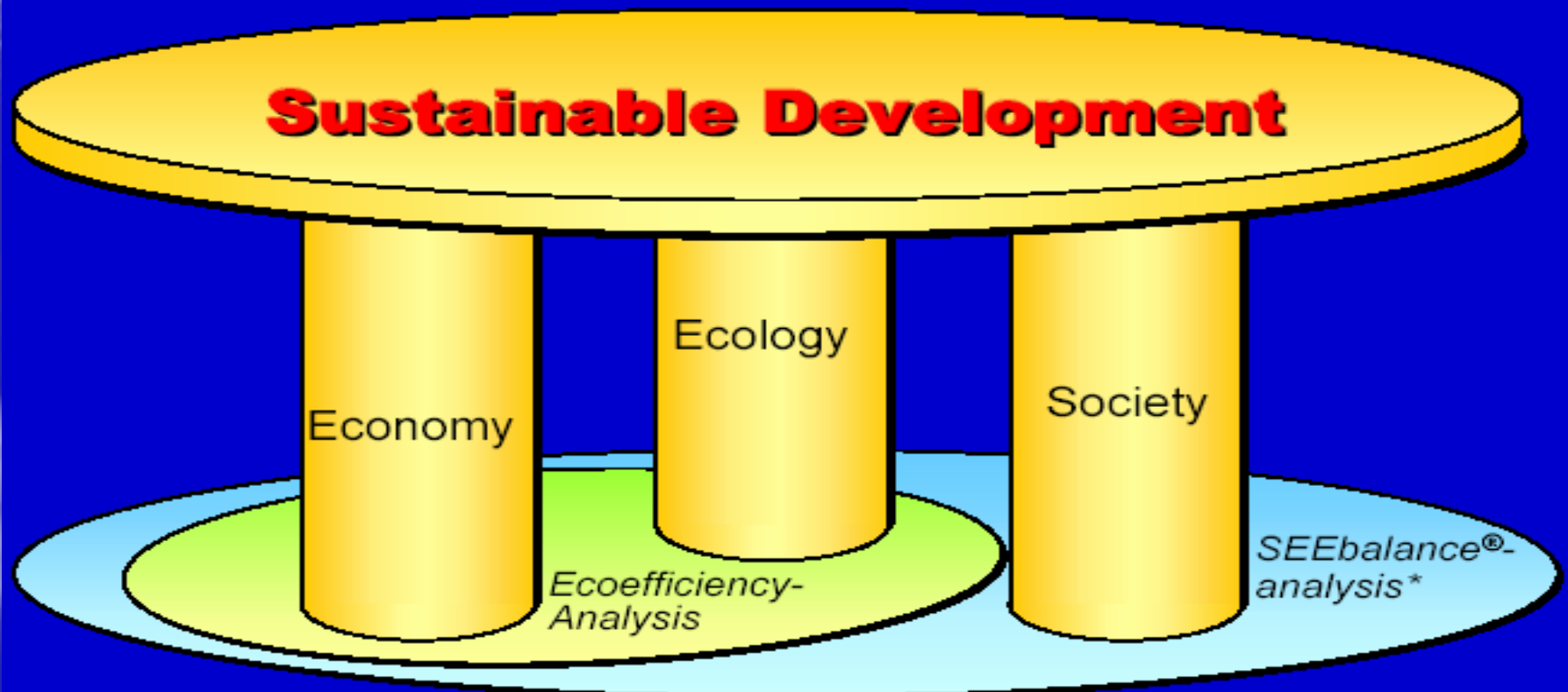
Weak cohesion in spinning

New generation fiber...

- Dyeing
- Bamboo fiber's wet tensile strength is low. It swells acutely in water. Bamboo textiles are suitable to be dyed on jigger or winch loose rope dyeing machine.
- Note : In dyeing, the volume of soda can not exceed 25g/L. The
- temperature can not exceed 100° C.
- In drying you should keep low temperatures and maintain low tensions.
- Suitable dyes VAT; REACTIVE; SULPHUR ETC....
- Low color yield than cotton

CONCLUSION

Sustainable Development is based on three Pillars



CONCLUSION

- IT IS THE HIGH TIME THAT WE NEED TO DISCOVER OUR HIDDEN POTENTIAL TO INNOVATE, CREATE, COLLOBRATE, AND COORDINATE SO WE CAN GO AHEADON THE PATH OF PROGRESS AND PROSPERITY THROUGH MAXIMIZATION OF PRODUCTIVITY AND QUALITYAND STREAMLINED DELIVERY SCHEDULELS.