



**Eco-Friendly, Atmospheric, Equilibrium Dyeing Process
For Fibers, Fabric, Tow and Carpet
(Composition, Apparatus and Method)**

Equipment Provided By:



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Introduction

A dye composition of 99.7% pure synthetic glycerin and dispersed press cake dyes allows an increase in dye-uptake and dyeing rate acceleration while reducing energy costs by 75% and water consumption by 95% when compared to conventional dyeing procedures. Performance of dye leveling, color homogeneity and light fastness are obtained by conductive heating of fibers, fabric, tow and carpet.

Problem Statement

Saving of time and energy is of immediate global interest to the textile industry while practically eliminating negative environmental effects as encountered in conventional dyeing procedures: e.g., wastewater and volatile organic chemicals. The introduction of this new dyeing technique allows less energy and water to the user: both highly important areas of activity to consider.

Previous Options

Many solvent and aqueous compositions and procedures for dyeing yarns, fabrics and other textile structures composed of polyesters, polyamides, polyacrylics and the like encompass limitations. Some are slow and inefficient; some require special pressure vessel equipment; some require volatile and flammable solvents. All cause air and liquid pollution.

The *TateCraft Process* addresses each of these issues with improved dyeing consistency, uniformity and reduced expenses. The virtual non-toxicity and overall safety of the *Tatecraft Process* is also considered.

Process Solution

The textile industry has investigated many sources of energy for heating, drying, dye fixation, printing and curing, resin-formed fibers and fabrics. The *TateCraft Process* uses conductive heating in non-pressurized scouring and dye concentration immersion baths. The dyeing process is open to the atmosphere and is based on equilibrium dyeing technology. Press cake dyes are mixed with synthetic glycerin and heated to 190C.

Synthesized glycerin is selected because it is highly stable under typical storage conditions, compatible with many other chemical materials, virtually non-toxic and non-irritating in this application, and has no known negative environmental effects.

Glycerin is also selected as an excellent dispersing medium because it is a water clear, odorless, viscous liquid. It does not change color after repeated heating and cooling cycles.

Excess dye composition and purified water used in the scouring processes are re-circulated, adjusted and re-used.

Process Benefits

- Eliminates Volatile Organic Chemicals
- Reduces Energy Consumption by ~75% per pound dyed

- Reduces water consumption by ~95%
- Offers lowest dye cost process in the industry
- Operates above the melting point of dyes but below sublimation points
- Compatible for use with dyes having multiple melting points
- Dye concentrations between 0.1 gram and 4.0 gram per liter of glycerin
- Dye composition can be stored or recycled
- Scouring water can be recycled
- Uses undiluted conventional pure dye powders (press cakes)
- Volatization rate of the dispersant is the same as the consumption rate of the dye
- Concentration rates always remain constant
- Excellent light fastness is realized by eliminating the use of carriers, wetting agents, strike control agents, etc.
- Removal or separation of the dye from the glycerin dispersing medium is accomplished without difficulty
- Elimination of any crocking tendency is straight forward and efficient
- Uniformly dyes polymeric textile structures repeatedly over extended periods of time

Process Machinery

- Unwind Stand
- Pre-Scour Cleaning
- First Dewatering
- First Godet Heating
- Dyeing Vessel, Heating and Cooling
- Second Dewatering
- Dye Scour Vessel
- Third Dewatering
- Post Scour Vessel
- Fourth Dewatering
- Second Godet Heating
- Oiling
- Re-Winding

Support Equipment

- Water Purifier (16 Mega ohm Purity)
- Water - Glycerin/Dye Ultra or Hyper Filter
- High Efficiency Filter for Scouring Water Post Treatment
- Pure Water Storage Tank
- Ultrasonic Agitators

- Dye Composition Mixing Tank
- Pumps, Heaters, Testing Equipment, Controls, etc.

Summary

The *TateCraft Dyeing Process* is an in-line, environmentally friendly, atmospheric pressure; equilibrium balanced dyeing system primarily for use with polyester and nylon. Product supply can be from a Yarn Creel, Warp Let-Off, Tow Box or Cloth Roll Let Off. A fully dyed finished good is subsequently wound in a low cost one-step process requiring no chemicals other than a scouring agent, dye press cake, synthetic glycerin and purified water. All effluent is recyclable.

The three key process considerations that have been optimized are:

1. Dye Concentration
2. Product Temperature
3. Dye exposure time

The system is extremely versatile.

It has virtually eliminated any negative environmental effects currently encountered with conventional dyeing processes.

Operation, energy and other utility supply costs are low. The savings potential are quite large!

The process as described is protected by U.S. Patent 6,117,192 issued September 12, 2000 and U.S. Patent 6,582,479 issued June 24, 2003



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