



## Glycol Ethers for Textile Printing and Dyeing

### Textile Industry Background

The textile industry uses two basic methods for coloring fabric – vat dyeing and textile printing. Vat-dyed fabric or yarn is imparted with a single color, while textile printing uses a printing process – usually gravure – to give fabric a particular design.

Two dyeing methods are jet dyeing and continuous dyeing. In jet dyeing a continuous loop of fabric is dyed at once. The dye liquor is sprayed through a powerful venturi jet carrying the fabric with it. After passing through the jet, the fabric enters a cloth guide tube. Dye liquor and fabric together circle through the equipment until the proper shade has been achieved. In continuous dyeing, fabrics are run through a dyebath. The dyestuff is fixed to the fiber by high temperature (420°F) or by steaming. High heat thermosol processing is employed when the woven fabric to be dyed contains polyester fibers or polyester blends.

### Technology of Textile Printing and Dyeing

DOW glycol ethers are used as dyebath additives within the textile dyebath market to obtain properties such as proper shade, level dyeing, colorfastness, reduced dyeing temperatures and reduced dyeing cycle times. DOW glycol ethers help the dyes penetrate and saturate the fabric, accelerating the dyeing process. They also serve as couplers for other components of the dye formulation and can act as compatibilizing agents for fabric blends such as nylon/acrylics.

DOW glycol ethers most frequently used in dye formulations are DOWANOL\* DPM, TPM, PPh, EPh, Methyl CARBITOL™, and Butyl CARBITOL. The choice of glycol ether depends on the type of dye and fabric. Rich, even colors are the result of the good flow and leveling properties of these glycol ethers.

In the disperse dyeing of synthetics, DOWANOL EPh and PPh are commonly used as dye carriers. Dye carriers are chemical substances added to the dyebath to accelerate the rate of the dyeing process of hydrophobic synthetic fibers, such as polyesters and triacetates. Polyester and triacetate fibers have high glass transition temperatures (T<sub>g</sub>), typically 130° and 125°C, respectively. To obtain good diffusion of the dye into the fiber, fiber T<sub>g</sub> must be below the drying temperature. The use of good plasticizing agents, such as DOWANOL EPh and PPh, decrease fiber T<sub>g</sub> by increasing the segmental mobility of the fiber's macromolecular chains, thereby increasing the diffusion rate of the dye into the fiber. This can significantly reduce the time and temperature required for the dyeing process.

Textile  
Applications of  
DOWANOL  
Products

In the vat process, DOW glycol ethers help dyes penetrate and saturate the fabric. They also serve as couplers for other components of the dye formulation, including blends of dyes used in the formulation to produce various shades.

In polyester dye formulations, DOWANOL Eph glycol ether is frequently used as the sole carrier or in combination with other carriers. When used with chlorinated hydrocarbons, it provides rapid solvent dyeing of these fibers. Rich, even colors are the result of the good flow and leveling properties of this glycol ether.

As a result of their penetrating ability, glycol ethers are important components of pastes used in the printing of cellulose acetate and polyester fabrics. By lowering surface tension and reducing paste viscosity, DOWANOL PPh, Butyl CARBITOL, and Methyl CARBITOL glycol ethers promote deep penetration into the fabric and good flow and leveling.

In addition to enhancing the performance of the dye, these glycol ethers have evaporation rates slow enough to prevent pastes from drying on the printing plates and cylinders.

