

Table 6: Typical Characteristics of Dyes Used in Textile Dyeing Operations

Dye Class	Description	Method	Fibers Typically Applied to	Typical Fixation (%)	Typical Pollutants Associated with Various Dyes
Acid	water-soluble anionic compounds	Exhaust/ Beck/ Continuous (carpet)	wool nylon	80-93	color; organic acids; unfixed dyes
Basic	water-soluble, applied in weakly acidic dyebaths; very bright dyes	Exhaust/ Beck	acrylic some polyesters	97-98	N/A
Direct	water-soluble, anionic compounds; can be applied directly to cellulose without mordants (or metals like chromium and copper)	Exhaust/ Beck/ Continuous	cotton rayon other cellulose	70-95	color; salt; unfixed dye; cationic fixing agents; surfactant; defoamer; leveling and retarding agents; finish; diluents
Disperse	not water-soluble	High temperature exhaust Continuous	polyester acetate other synthetics	80-92	color; organic acids; carriers; leveling agents; phosphates; defoamers; lubricants; dispersants; delustrants; diluents
Reactive	water-soluble, anionic compounds; largest dye class	Exhaust/ Beck Cold pad batch/ Continuous	cotton other cellulose wool	60-90	color; salt; alkali; unfixed dye; surfactants; defoamer; diluents; finish
Sulfur	organic compounds containing sulfur or sodium sulfide	Continuous	cotton other cellulose	60-70	color; alkali; oxidizing agent; reducing agent; unfixed dye
Vat	oldest dyes; more chemically complex; water-insoluble	Exhaust/ Package/ Continuous	cotton other cellulose	80-95	color; alkali; oxidizing agents; reducing agents

Source: *Best Management Practices for Pollution Prevention in the Textile Industry*, EPA, Office of Research and Development, 1995; Snowden-Swan, L.J. "Pollution Prevention in the Textile Industries," in *Industrial Pollution Prevention Handbook*, Freeman, H.M. (Ed.), McGraw-Hill, Inc., New York, 1995.