Now a days Advance dying technology used worldwide:

The textile industry consumes a substantial amount of water in its manufacturing processes used mainly in the dyeing and finishing operations of the plants. The wastewater from textile plants is classified as the most polluting of all the industrial sectors, considering the volume generated as well as the effluent composition [[15](https://www.intechopen.com/books/eco-friendly-textile-dyeing-and-finishing/textile-dyes-dyeing-process-and-environmental-impact?fbclid=IwAR2kb05D9oQEP7fq-IF0BbCljkaYwhfV-OcGJTigp4avViZ_984bvR5V3tE#B15)-[17](https://www.intechopen.com/books/eco-friendly-textile-dyeing-and-finishing/textile-dyes-dyeing-process-and-environmental-impact?fbclid=IwAR2kb05D9oQEP7fq-IF0BbCljkaYwhfV-OcGJTigp4avViZ_984bvR5V3tE#B17)]. In addition, the increased demand for textile products and the proportional increase in their production, and the use of synthetic dyes have together contributed to dye wastewater becoming one of the substantial sources of severe pollution problems in current times [[6](https://www.intechopen.com/books/eco-friendly-textile-dyeing-and-finishing/textile-dyes-dyeing-process-and-environmental-impact?fbclid=IwAR2kb05D9oQEP7fq-IF0BbCljkaYwhfV-OcGJTigp4avViZ_984bvR5V3tE#B6),[9](https://www.intechopen.com/books/eco-friendly-textile-dyeing-and-finishing/textile-dyes-dyeing-process-and-environmental-impact?fbclid=IwAR2kb05D9oQEP7fq-IF0BbCljkaYwhfV-OcGJTigp4avViZ_984bvR5V3tE#B9)]. Water scarcity and increased environmental awareness compelled us to adopt water free dying technology.

Water free dying at a glance :

* The innovative water free dying technology consumes absolutely no water, uses less energy and free chemicals reduces emissions into the air.
* Another added bonus to this process is the non existent drying times which makes the process twice as first as water based dyes.
* This technique improves the sustainability efforts and in turn reducing the harmful effects to people animals and the environment that water based dye processes have had in the past.

To replace our traditional dying water free dying techniques are the only solution. Water free dying techniques are:

1. Dying with super critical Co2
2. Plazma Dying
3. Sublimation and transfer printing
4. Foam Dying

Dying with super critical Co2:

Top of Form

1. Using supercritical fluid carbon dioxide polyester and other synthetic can be dyed with modified disperse dyes.
2. When Carbon dioxide is heated to above 31°C and pressurized 74Bar it becomes super critical a state of matter that can be seen as an expanded liquid or a heavily compressed gas.
3. The supercritical fluid CO2 causes the polymer fiber to swell allowing the disperse dye to easily difiuse within the polymer, penetrating the pore and capillary structure of the fibers.
4. This deep penetration provides effective coloration of polymers which are characteristically hydrophobic.
5. Dyeing and removing excess dye are processes that are done in the same vessel.
6. Residue dye is minimal and may be extracted and recycled.

Key Advantages of super critical dying:

1. Elimination of water consumption
2. Elimination of wastewater discharges
3. Wastewater treatment process eliminated
4. Elimination of drying and dryer eXluent
5. Reduction in energy consumption
6. Approximately 95°/‹ of CO2 can be recycled
7. Dyeing time significantly reduced

Plazma Dying:

Plasma dyeing is a very surface sensitive method. It is a revolutionary way to carry dye to fabric and fabric surfaces. It is so advanced that it not only colors the yarn, but also thousands of filaments in each piece of yarn, yielding rich, brilliant colors. Penetration is complete. It produces superior results compared to sublimation printing and conventional dyeing, but that is just the beginning of its advantages.

Principle of plazma processing:

If a textile to be functionalized is placed in a reaction chamber with any gas and the plasma is then ignited, the generated particles interact with the surface of the textile. In this way the surface is specifically structured chemically functionalized or even coated with nm-thin film depending on the type of gas.

Advantages of plazma dying:

1. plasma drying Technology reduces detrimental impact on the environment
2. the result is more beautiful colours
3. substantially less water and Chemicals discharged
4. Producing luxuriously brilliant colour
5. maximum colour durability
6. Plasma treatment modifies the fibre surface rather than its interior.

Sublimation and transfer printing :

1. Sublimation and transfer printing described as a voter list coloration technology in that heat is applied via press heated roll or calendar to sublime the disperse dyes and drive colour into the interior of the fibre
2. it is done by way of explanation the design is printed onto a special sheet of release paper using sublimation ink which is then heat pressed onto the garment
3. at a very high temperature and pressure the ink forms a gas which then permanently dyes the polyester content of the fabric
4. sublimation technology is almost exclusively a polyester specific solution.
5. It is possible to transfer an image from a released paper and bonding chemistry surface of the Cotton through heat activated binder system or similar
6. Inkjet Technologies have been used to simulate the surface appearance of open fabrics including check words and yarn dyed Shirting given the issues outlined

Key Advantage of sublimation and transfer printing:

1. Primarily suited to t-shirt printing or for small areas of decoration;
2. Sublimation prints offer a soft hand and greater potential for printing larger fields of color;
3. Printing faster than dye sublimation, consumables (ribbon and paper) are less expensive.

Foam Dying:

A fabric is padded with a foam formed from an aqueous solution of a dyestuff, a foaming agent and the carrier for the dyestuff and padded, fabric is maintained at elevated temperature to fix the dye.

Materials-

white fabrics

-cotton, rayon, Silk or other natural fibre to dye on

-fibre reactive dyes

- soda Ash fixer

-synthrapol

-squeeze bottles to hold dyes

- flat Shallow plastic or Metal pan

-plastic mixing bowls

- wire whisk

Advantage

* Improved dye pre fixation
* improve Migration of the dye into the fibre
* higher colour yields in the fabric even after a relatively short dying times
* improved dimensional stability of the dyed fabrics

Reference:

* <https://www.intechopen.com/books/eco-friendly-textile-dyeing-and-finishing/textile-dyes-dyeing-process-and-environmental-impact?fbclid=IwAR2kb05D9oQEP7fq-IF0BbCljkaYwhfV-OcGJTigp4avViZ_984bvR5V3tE>
* <http://eco2dye.com/textile-dyeing.html>
* <https://www.fibre2fashion.com/industry-article/7659/foam-dyeing-and-finishing-a-step-towards-sustainable-processing-of-textiles>