

Sustainable fashion: Dyes

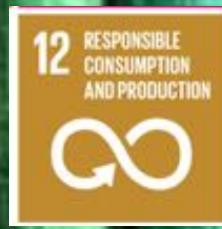
Sustainability issues and development goals



Slave Labour
Work unsafe Conditions



Non minimum wage



Fast-fashion and
promotion of excess
consumption



Excessive carbon
emissions



Fresh water use and
contamination of water



Pollution &
land use for natural
crops

Today's Picture

Process

- Recognised as one of the most environmental destructive processes
- Fabrics normally bleached before the dyeing process
- Chemical aids are needed throughout the dyeing process
- Chemical additives are used for colour fastness and resistance to degradation as final step
- Substantial amounts of water use throughout
- High temperatures and pressure needed (high energy use)
- Inefficient dying process- 10-50% of the dye used will be lost and become mixed with waste water and released into the environment

Dye

- Nearly all dyes used today are synthetic and of those, Azo dyes make up 60-70%
- Some azo dyes are extremely toxic and form carcinogenic and mutagenic compounds
- Harmful to both humans and the environment
- Highly stable compounds that are designed to resist biodegradation
- Causes both physical (colour) and chemical (high organic load+ toxic chemical) effects on aquatic environments
- Ineffective waste water treatment

Technologies available to reduce effects

- **Natural dyes** Colour from plant and animal sources. Sun bleaching. Naturally coloured cotton. Issues with availability, crops and pesticide use, use of chemicals to fix the dye to the fabric and the large amounts of water needed
- **Liposomes** Biological cells (phospholipids) that act as surfactants (emulsifiers, detergents, wetting agents, dispersants) that reduce the amount of chemicals needed and for the need of high temperatures therefore saving energy. Same price as conventional surfactants and improve the quality of the final product and also save money on energy
- **Ultrasound-assisted textile dying** Disperses dyes, degasses the fibre capillaries, enhances dye diffusion rate. Accelerates physical and chemical reactions under less extreme conditions-less chemical and lower temperatures. Increased dye uptake and enhanced dying rate. Reduces energy and water consumption
- **Improved waste water treatment** The use of microorganisms and artificial radiation to breakdown the stable dyes and compounds advanced oxidation process
- **Closed loop systems** Waste is purified and reused so no waste is released to the environment

Conclusions

Need for optimisation across the whole process- eco friendly methods that improve fixation of dyes, the use of less toxic dyes, the use of less water, better waste water treatment.

Ideally a combination on the technologies available to achieve the least environmental damage possible.