The Textile Industry and Climate Change mitigation

The textile industry requires various productive processes. This is due to the wide variety of raw materials and treatment options available, which lead to a great variety of end products.

The industry has high energy requirements throughout all stages of the production process. The treatments vary. Some, such as melt spinning, require refrigeration; and others, such as dyeing, desizing and scouring need heat. Thus, energy consumption plays a central role in many key stages of the process.

The textile business is involved with climate change by virtue of its considerable energy consumption. To meet its energy demand, the sector resorts to two distinct types of energy sources: indirect emission sources (electricity) and direct emission sources (natural gas, cogeneration and diesel fuel).

Reduction in greenhouse gas emissions associated with energy consumption can be achieved by various means, the main ones being: energy efficiency, the rational use of energy consumption, and cogeneration.
This brochure proposes possible mitigation measures for the various productive processes of the textile industry.

Emissions reduction strategies

- Improve energy efficiency to reduce emissions.
  - Oriented towards both direct and indirect emissions
  - Special attention to the processes with the greatest energy consumption, such as heat generation, as they have a greater impact on climate change

Emissions mitigation alternatives in the textile industry

PREPARATION OF THE FIBRE

- Measures:
  - Fat recovery systems by means of decantation or hot water centrifuge equipment
  - Energy consumption minimisation systems , by means of sealing degreasing winches or vats and optimisation of mechanical water extraction.
- Advantages:
  - Reuse of wool fat as a by-product
  - Reduction in the level of dirt and facilitation of the subsequent rinsing tasks.
  - Water and energy savings

FABRIC PRODUCTION

- Measures:
  - Substitution of traditional lubricants in the manufacturing of knitted fabric with self-emulsifying oils
  - Substitution of adhesives with polyacrylates in the sizing process prior to the manufacture of woven fabric
- Advantages:
  - Elimination of oils and adhesives with water at low temperatures and without auxiliary agents
  - Use of smaller amounts of glue to obtain the same effectiveness
  - Reduction of the washing temperature with lower energy consumption
  - Subsequent bleaching and scouring in a single step
  - Reduced water and energy consumption

PRINTING

- Measures:
  - Printing with pigments
- Advantages:
  - Reduction of the process to 2 phases without additional consumption

PRETREATMENT

- Measures:
  - Application of the oxidative method for eliminating sizing agents
  - Enzymatic scouring by substituting chemical agents with enzymes
  - Recovery of sizing agents by ultrafiltration
  - Use of the Flash Steam and Pad Batch systems to perform desizing, scouring and bleaching in a single step.
- Advantages:
  - The oxidative method allows for efficient and uniform degradation of the desizing agents
  - The enzymes selectively attack the impurities that need to be removed, they reduce the working temperature, processing time, loss in the weight of fabric and consumption of the subsequent load.
  - The amount of energy consumed by the ultrafiltration phase is less than that required for the production of new desizing agents. The Flash Steam and Pad Batch systems allow for the simultaneous performance of distinct productive processes.
  - In general, energy consumption and economic costs are reduced.

FINISHES AND FINISHING AGENTS

- Measures:
  - Minimisation of energy consumption in the stenter by mechanical extraction of the water, air-water heat exchanger and thermal insulation.
- Advantages:
  - Energy savings of up to 70%
  - 20% reduction in heat losses

DYEING

- Measures:
  - Continuous dyeing of the polyester with vat colouring in a single step
  - Post-treatment to the polyester dye by means of a reducing agent to avoid baths after the dyeing bath.
  - Econtrol alternative process to traditional continuous and semi-continuous dyeing of cellulose fabrics
  - Use of liposomes as auxiliary agents in wool dyeing
  - Post-treatment with enzymes in the dye to achieve more efficient extraction of the colouring agents.
  - Optimisation of the equipment in the dyeing baths by sealing covers and doors
  - Optimisation of winch dyeing
  - Optimisation of jet dyeing by means of Soft-flow systems.
  - Use of the Jet-Overflow system
- Advantages:
  - Dye bath at low temperatures
  - Greater diffusion of the colouring agent
  - Reduction of temperature and steam losses
  - Usage of lower bath ratios
  - Reduction in processing time
  - Reduction in energy consumption

WASHING

- Measures:
  - Water and energy savings in the continuous washing and rinsing by means of automatic stop valves, counter-current flow and heat recovery systems.
- Advantages:
  - Improve the process efficiency and energy savings








Case study: El-Nasr (Egipt)

(Source: MedClean -27)

El-Nasr is one of the biggest public sector textiles factories in Egypt. Its main activities are as spinning, weaving and wet processing. With this production, volume their main environmental problem was the large amount of energy involved in all the processes. To try to resolve this situation, and in the context of a SEAM project, an environmental audit was carried out, the results of which identified problems related to poor energy management.

GENERAL MEASURES TO REDUCE EMISSIONS

- Improve insulation of the steam and hot water network.
- Install counter-current flow washes and rinses to improve efficiency.
- Install automatic shut-off valves in the laundering chains in order to control and optimize water flow.
- Thermal energy recovery and reuse of wash water from the rubbing of spinning and dyeing liquids.
- Optimization of chemical use through the substitution of some new products such as enzymes, new sizing agents, new lubricants, dyes, reagents, and so on.

RESULTS

All measures put in place proved to be easy to install and represented low or no cost to the company. A satisfactory energy conservation and fuel savings of 5% was attained. This contributed to the report, in a short period of time, to the return of the cost of the improvements and significant benefits for the company.

INVESTMENT COST AND AMORTIZATION

Factory Department	Action	(EUR) Capital and Operating costs	(EUR) Annual Savings	Period of return on investment (months)
All	Improved insulation of steam and water networks	14.083,2	39.646,0	<4
	Chemical use optimization	0	10269,0	Immediate
Tissues pretreatment	Installing countercurrent flows	12.909,6	65.064,4	<3
Additional measures to establish				
Tissues pretreatment	Installing automatic shut-off valves	10.709,1	13.159,0	<10
Yarns dyeing	Heat recovery from hot liquors	23.472,0	31.443,7	<9