Techniques for the reduction of energy consumption

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Outline

- General technical measures to increase energy efficiency
- Energy recovery
- Minimisation of energy consumption of stenter frames
- Process integrated techniques for reduction of energy consumption

General technical measures to increase energy efficiency

- Optimisation of production planning of finishing jobs to avoid down times of the stenter frame and related heating periods
- Optimisation of air condition systems (e.g. by sections or by direct conditioning of specific weaving machines for individual adaptation of volume and humidity)
- Optimisation of the cold and hot water system (installation of a pressure compensation tank, priority circuit for several pressure boosting pumps, shut off during shut down of the plant)
- Proper adjustment of drying/curing temperature and drying/curing time
- Optimisation of illumination
- Optimisation of boiler houses (re-use of condensed water, preheating of air supply, heat recovery in combustion gases)

General technical measures to increase energy efficiency
Control of energy consumption

- Monitoring and control of energy consumption is an essential precondition for energy efficiency increase in companies
- establishment of a register of energy consuming processes and of all single aggregates including air condition and lightning
- For monitoring consumption, indicators are defined for the entire company and for single processes e.g.
  - energy consumption (gas, oil, etc.) per ton of steam produced
  - electricity consumption of big aggregates per ton of product produced
  - consumption of steam and electricity per processed goods or group of goods
  - gas consumption for the stenter frame per group of goods

German textile plant: Cost savings of 175 000 €/a due to measures taken after monitoring/control of energy consumption.

General technical measures to increase energy efficiency

- heat-insulation of pipes, valves, tanks, machines,
- do not forget to insulate also condensate or waste water lines
- Replace damaged insulation

Increased insulation on the stenters alone from 120 mm to 150 mm saves 20 percent of energy

BREF Textile Industry Chapter 4.1.1

Damaged insulation
Source: Systain consulting

Proper heat-insulation of pipes

General technical measures to increase energy efficiency

Improvement of the compressed air system

- Compressed air production requires significant energy resources (often 10-20% of total electricity in a factory)
- A regular check of leackages should be part of good management as energy requirement is significantly increased even by small leackage
- Compressed air production should be stopped during long shut down times of machinery, and single areas should be able to be cut off from the system, in particular if they are associated with little use
- evaluation of the economic potential of installing a second compressed air system supplied with lower pressure.

Source: systain consulting

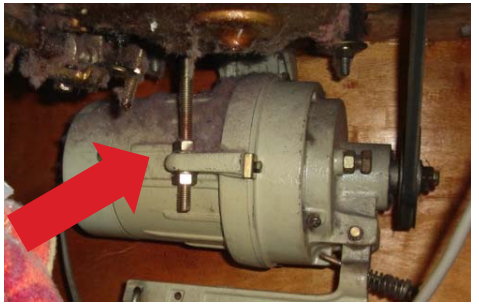
Ø of the leak	Losses of energy[1]
1 mm	1 900 kWh
3 mm	17 500 kWh
5 mm	48 000 kWh

[1] Assuming 4000 hours operating time

General technical measures to increase energy efficiency

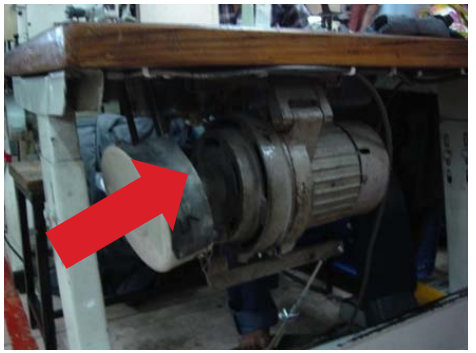
Installation of frequency-controlled electric motors

- Motors are usually major electricity consumers in a factory
- Often efficiency can be improved by 20-30% by cost effective measures.
- Especially motors with many running hours and / or varying speed offer considerable saving-potentials
- Not the investments price but electricity consumption is the major cost driver of motors
- Savings: **30-40% less electricity consumption per motor**
- Establish permanent maintenance of motors
- Proper maintenance saves **5-30% of electricity consumption per motor**



Motors covered with dust or damaged

Source: systain consulting



Proper maintained motor

Energy recovery

- Reuse of warm water by counterflow (e.g. washing of raw cotton, peroxide bleaching and alcalic boiling off, Dyeing, continuous washing and rinsing).
- Use of warmed-up cooling water (e.g. from soda lye recovery, batch dyeing, water-cooled compressors) directly for warm processes like dyeing or rinsing.
- Use of water/water heat exchanger for heating fresh water, e.g.:
  - Heat exchanger for waste water from reactive dyeing
  - Heat exchanger for waste water from washing and rinsing
- Use of air/water or air/air heat exchange, e.g.:
  - Heat exchanger for waste gas from stenters for pre-heating of air introduced into the stenter
  - Heat exchanger for cooling air of compressors for pre-heating of process water or heating water

Heat exchanger with filter

The heat exchange from waste water of a pad-steam dyeing to the water for the washing section saved yearly 1600 MWh natural gas.

The use of heat content of rinsing water from continous washing for heating of fresh water leads to energy savings of approx. 75% .

Minimisation of energy consumption of stenter frames

- Reduction of moisture content of the fabric with vacuum extraction systems, squeezing rollers etc. before it enters the stenter

  →Energy saving of up to 15%
- Regular maintenance of the burners
- Use of optimised nozzles and air guidance systems (e.g. nozzle systems that can be adjusted to the width of the fabric)
- Optimisation of air flow at the stenters (exhaust humidity between 0.1 and 0.15 kg water/kg dry air)

  →Energy saving of up to 57%
- installation of heat recovery systems

  → Energy saving of up to 70%
- insulation of thermal treatment units

  → Energy saving of up to 20%

BREF Textile Industry Chapter 4.8.1

Examples of process integrated techniques for reduction of energy consumption

- One-step desizing, scouring and bleaching of cotton fabric:

→ **Significant reductions** in water and **energy consumption**

- Use of Airflow jet dyeing machines:

→ **less energy needed** thanks to quicker heating/cooling and optimum heat recovery

- Use of high-fixation polyfunctional reactive dyestuffs:
  - Post-rinsing to obtain the required level of wet-fastness can be performed quickly and with reduced amounts of energy and water

→ **40 % reduction of energy consumption**

- Equipment optimisation applied to winch beck dyeing machines
  - Winch dyeing used when dyeing in piece voluminous textiles
  - significantly reduced liquor ratios
  - modern winches are designed to remove the carpet without dropping the bath and without cooling or diluting it with rinsing water
  - modern winches are fitted with hoods

→ **30 % reduction of electricity consumption**

Thank you for your attention!

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