

Innovative concepts enable cost-aware production of towelling fabrics

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High quality towelling fabrics are characterised by the ability to soak up large amounts of water, are pleasant to the touch, offer good colour fastness and exceptional dimensional stability. From a technical point of view, the high water absorption capacity of towelling fabrics of up to 300% of their own weight means a considerable input of water in terms of finishing and preparation. In the modern production environment which is dominated by the issue of sustainability, it is therefore extremely important to be very careful in the way we use water as a raw material. With the aid of innovative concepts and continuous wet finishing plants like those manufactured by Benninger, water and energy can be saved - and therefore also production costs.

The majority of towelling fabrics in the world are pre-treated, dyed and finished on jet machines. On average, a liquor ratio of between 1:8 and 1:10 is used. In practice, the average amount of water required for reactive dyeing is 90 l/kg, but this figure can quickly reach 100 to 120 l/kg.

Continuous pre-treatment and dyeing of towelling fabrics

As towelling fabrics have a very low proportion of size, and water-soluble size is used in most cases, one plant concept for a pre-treatment system includes a pre-washing zone. If size is used which is not water-soluble, we recommend the inclusion of a short hot-desizing stage. The subsequent bleaching process operates with stationary dwell times in the bleach steamer of 20 to 30 minutes, followed by a washing stage and neutralisation of the fabric.

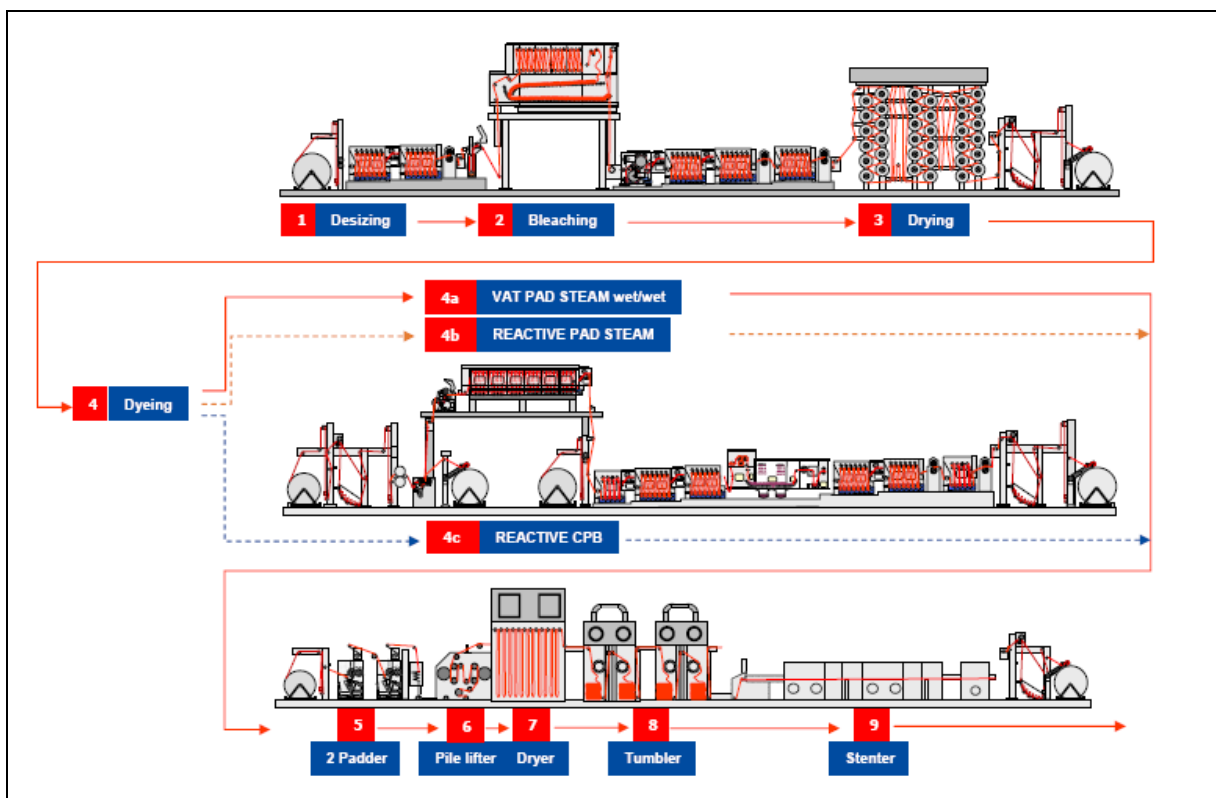
Towelling fabrics are mostly dyed with reactive dyes. For applications with high demands in terms of fastness, such as fabrics for use in hotels or hospitals, vat dyes are used. Suitable continuous dyeing methods include the CPB method, the pad-pad steam method and the pad-steam method.

In addition to a padder trough with underliquor rollers, which ensure good penetration of the dyestuff into the fabric, key factors for achieving high quality dyeing results are temperature management of the fabric and the dyeing system. On account of their structure, towelling fabrics have a high capacity for retaining heat. Hot-rolled or set-down fabric needs a lot of time before it has evenly cooled to the temperature required for dyeing. Depending on the ambient temperature, this can take up to several days. Due to different dye affinities, unevenly cooled fabric leads to listing effects, i.e. the edges are dyed differently to the middle of the fabric. If the fabric is not properly cooled down, the dye liquor will also continuously heat up during the dyeing process. This leads to differences in colour between the start and end of a dyeing section. Benninger supports temperature management by providing systems which cool the dye liquor to the required dyeing temperature before supplying it to the trough. In addition it is also possible to cool the trough.

In order to reduce the so-called tailing effect which occurs in continuous dye application systems, i.e. the delay until an equilibrium is reached, a program is integrated in the software of the new Küsters DyePad which can be used to reduce tailing to a minimum.

One special feature of towelling fabrics is the structure of the border. For design reasons, different yarn materials like PES or viscose are often used. Special attention needs to be paid to this when dyeing according to the CPB method, as this has a different dye affinity compared to the cotton. Here we recommend continuous dyeing.

When dyeing with vat dyes according to the wet-wet dyeing method, it is important to make sure that there is a sufficiently long air passage between the pigmentation and the application of the chemicals. As well as freedom from air in the steamer, even and temperature-controlled fresh water supply in the water seal are very important. A short transition line from the steamer to the first washing compartment prevents over-oxidation particularly on fabric parts which do not contain any pile.



Example of fully-continuous towelling fabric production

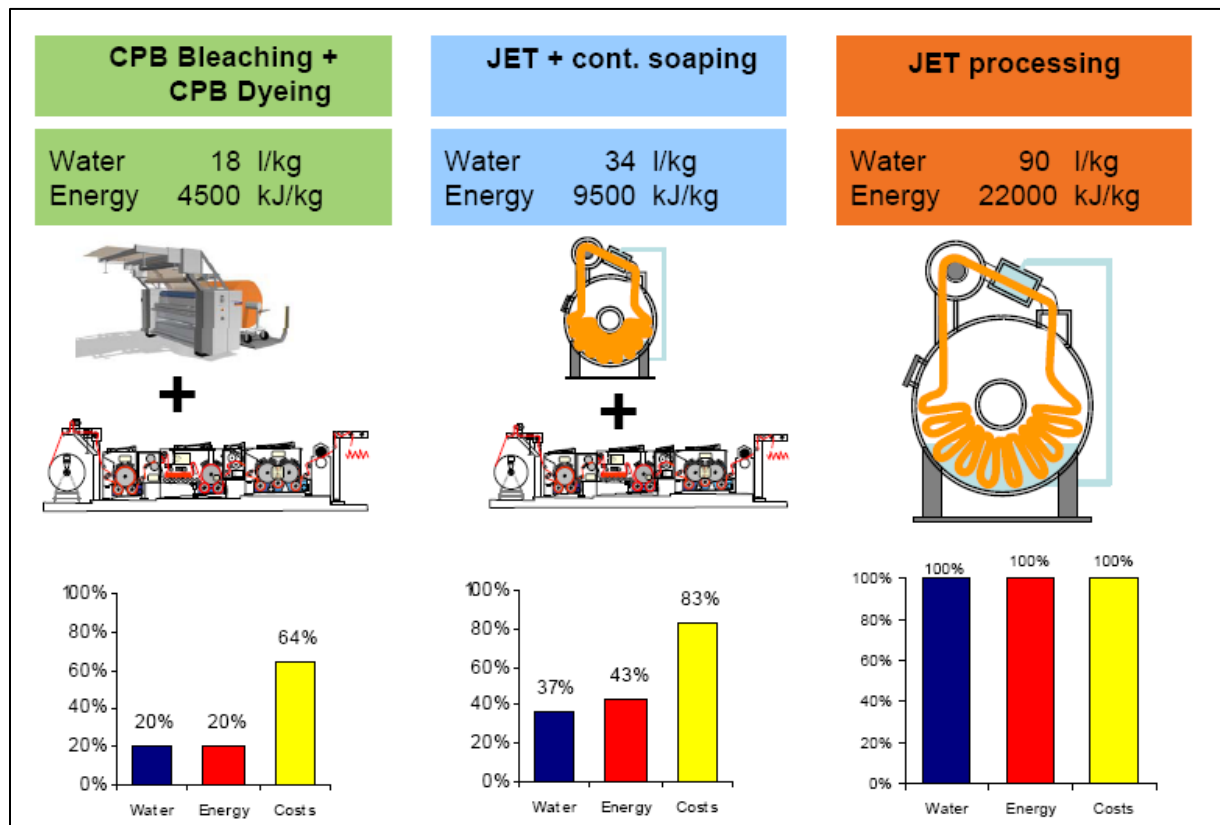
Concepts for saving water and energy

Combined process concepts, in which the process of dyeing with reactive dyes in the jet and then the washing and soaping process are performed continuously, already achieve water and energy savings in the region of 60%. In addition to these potential savings, they also increase the productivity of the jet machines.

If the system follows the CPB bleaching method, with continuous washing and CPB dyeing, the potential savings in terms of water and energy are around 80% in comparison to pure jet dyeing.

Further advantages of dyeing according to the CPB method include:

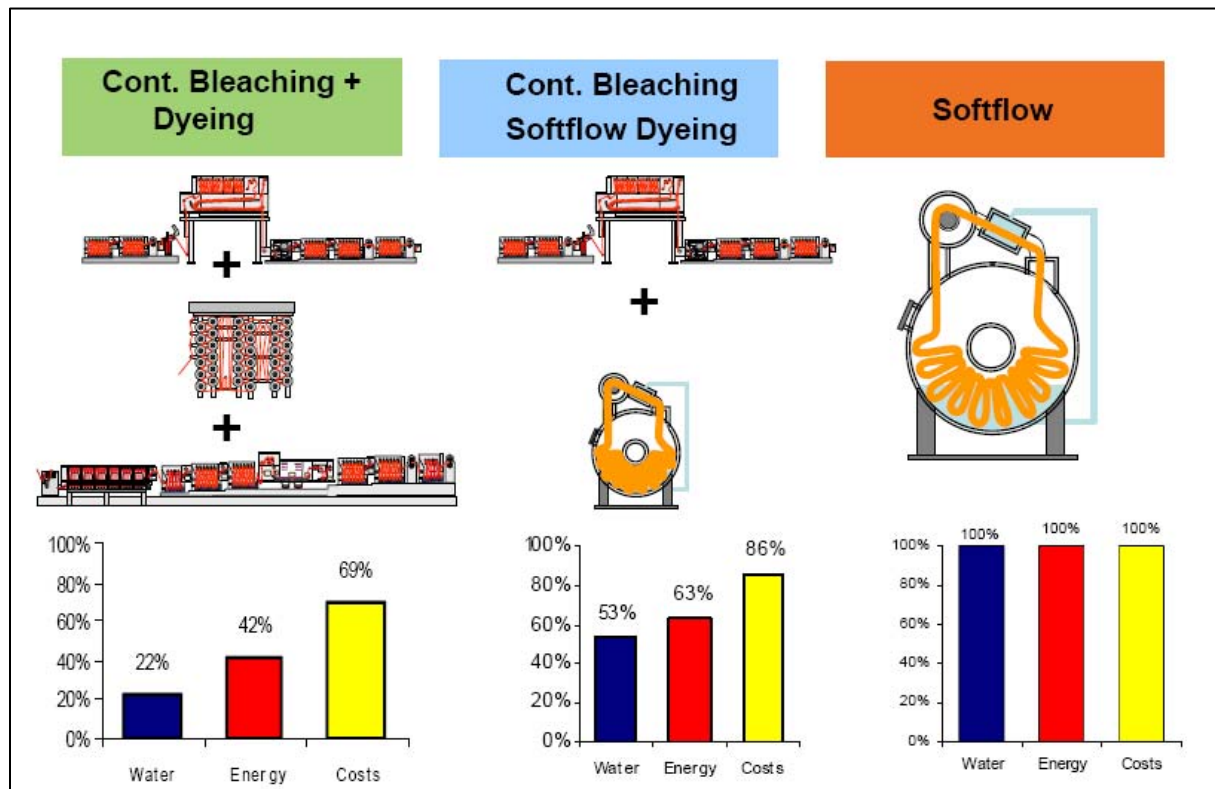
- No salt used
- Production quantities can be designed very flexibly
- Fast sampling possible
- Very good reproducibility



Consumption data and costs for bleaching and dyeing towelling fabric

The continuous pre-treatment and subsequent dyeing on jet machines is another concept which has already proved to be very successful in practice. The advantages of this approach lie in a flexible production setup with very high reproducibility and water consumption of just 10 to 12 litres per kg of fabric. The potential savings with this concept are around 40% in terms of water and energy, with overall costs reduced by about 15% compared to pure jet dyeing.

Fully-continuous towelling fabric production, comprising a pre-treatment system and a pad-pad-steam dyeing installation, reduces the overall production costs by around 30%. With an optimum design, this means that water savings of around 78 % and energy savings of around 58% are possible. High process reliability, good reproducibility and a uniform colour shade within a dyeing section are further advantages of fully-continuous production.



Consumption data and costs for bleaching and dyeing towelling fabric

Fabric appearance

If the fabric is dyed in the jet after continuous pre-treatment then the resulting fabric appearance matches that of fabric produced entirely in the jet system. This is referred to here as a "milled" character. It means that the individual pile loops twist corkscrew-like and are distributed irregularly. The degree to which this effect arises depends on the height of the pile and the particular yarn used. The subject of fabric appearance is often picked up on by those who are sceptical about continuous production. It is true that with purely continuous production the pile loops are turned in less and the pile is distributed evenly. This results in a calm surface appearance. In addition, the fabric appears slightly flatter as a rule than fabric produced in a jet. With the aid of suitable pile lifter and tumbler systems which are available in the market, this appearance can be changed and - if required - a "milled" character can also be created. Continuous production thus widens the range of achievable appearances – ranging from calm, classy finishes to a pronounced "milled" character.

Benninger can cover every aspect of towelling fabric production - from pre-treatment right through to dyeing. The following elements are used:

- Washing compartments based on the world-renowned EXTRACTA principle
- TRIKOFLEX drum washing compartments for excellent surface washing
- REACTA steamers with roller bed design for optimum bleaching results and as a dyeing steamer, which guarantees freedom from air and good running characteristics or as a reaction unit for diffusion washing
- Küsters DyePad: dyeing padder as CPB bleaching station or for padding of the dyestuff
- Booster for application of chemicals by addition

The production of towelling fabrics with semi or fully continuous processes minimises the use of water and energy and reduces the waste water burden. This represents a valuable contribution to the sustainability of towelling fabric production.

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