Sustainability that pays off.

World Champion Technology:
Higher Energy Efficiency – Higher Profits

Production of woven architectural fabric: Energy consumption reduced by 27 per cent in 10 years

About 0.8 billion square meters of woven canvas are manufactured worldwide: Products of tarpaulin, which are used for trucks or as big-size architectural material. If German technology of latest generation was used exclusively for the production of these fabrics, enormous energy savings would be possible for each individual process step. They sum up to 27 per cent! From filament production to the coated woven fabric – German manufacturers of textile machinery, components and accessories make energy costs shrink.

Light-weight, solid and extremely weather-resistant – these are the qualities required for woven tarpaulin. The products can be used for many purposes. As for the truck tarpaulins, it is the worldwide number, as for the architectural material it is their enormous size – imagine for example the roof of the Millennium Dome in London – which make it meaningful to consider sustainability issues. Also other applications such as sun awnings for a courtyard at a school in Abu Dhabi enter into the worldwide manufacturing volume of 0.8 billion square meters.

The result of the sustainability analysis conducted by German engineers shows the possibilities to reduce cost: Using today's technology of the German textile machinery industry compared to the machinery offered ten years ago, more than one quarter of the energy (27 per cent) can be saved for the production of woven architectural fabrics.

This is equivalent to 74 billion watt hours per year (74 GWh/year). The quantity would be sufficient to operate 630 million notebooks for one working day.

Back to the world annual production: With 0.8 billion square meters (956,792 square yards) the four biggest upper Italian lakes – Lake Garda, Lake Maggiore, Lake Como, Lake Isseo – could be covered with the tarpaulin of woven polyester filaments.

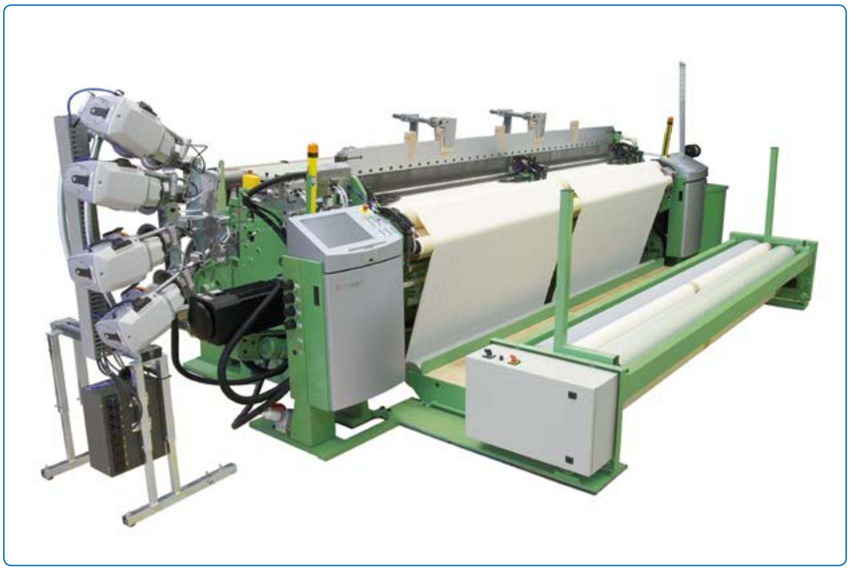
Production – efficient, hard-wearing and cost-efficient

Such comparative figures attract attention and at the same time offer the opportunity to think of sustainability aspects and of cost-saving possibilities regarding the production process of these coated textile fabrics: Therefore the energy- and resource-saving production is in the focus of research and development in terms of competition for cost-efficient and high-quality woven tarpaulin.

The textile products used in architecture have to stand meteorological stress factors, such as wind, heat and rain. In Dubai they have to endure sandy windstorms, in Beijing humid heat during summer. Therefore high tensile strength and low shrinkage are the most important quality factors to be met. The continuously booming market demands for high-quality supporting material, which can be produced effectively and cost-efficiently. Under these circumstances the Asian, European and American manufacturers make use of air-jet weaving machines with high productivity and a fabric width from 2,800 to 5,000 mm without additional processing steps.

Basis for the calculation of sustainability

Which process steps do these woven tarpaulins undergo, that are typically woven from polyester yarns? In the process step spinning, polyester yarn is manufactured – here, a low-shrinkage polyester yarn with a count of dtex 1100 f 192 serves as comparator basis. As a rule, this material is used as warp thread in longitudinal direction and as weft thread in transverse direction. In the next step of warp preparation, the warp threads are warped on sectional beams of 1000 mm outside diameter. For the production of the textile fabrics, a weaving machine of 4000 mm working width and 16 threads per cm each in longitudinal and transverse direction (Panama weave) has been taken as a basis.



The mass per unit area of the reference product for the architectural field described is about 360 g/sqm. Coating or laminating of the raw material available on rolls varies substantially according to the regions. This process step provides the performance of the woven fabrics in outdoor areas. Including coating, the woven fabrics for architectural applications reach and exceed a mass per unit area of 600 – 1500 g/sqm. The example chosen takes as a basis a finished product of 1000 g/sqm. Coating here is applied as paste. The specific energy requirement of the coating depends substantially of the type of coating. In this case, an application by air knife has been chosen.

The process steps filament production, warping, weaving and coating have been taken into consideration for the balance envelope. Beside consumption of electrical energy (for filament production, warping and weaving) also the energy required for compressed air and air conditioning for filament production have been used for the calculation.

Energy reserves – More than one quarter of savings

German technology is worldwide leading in quality; beside high productivity and energy efficiency it guarantees at the same time a high technical availability of the equipment.

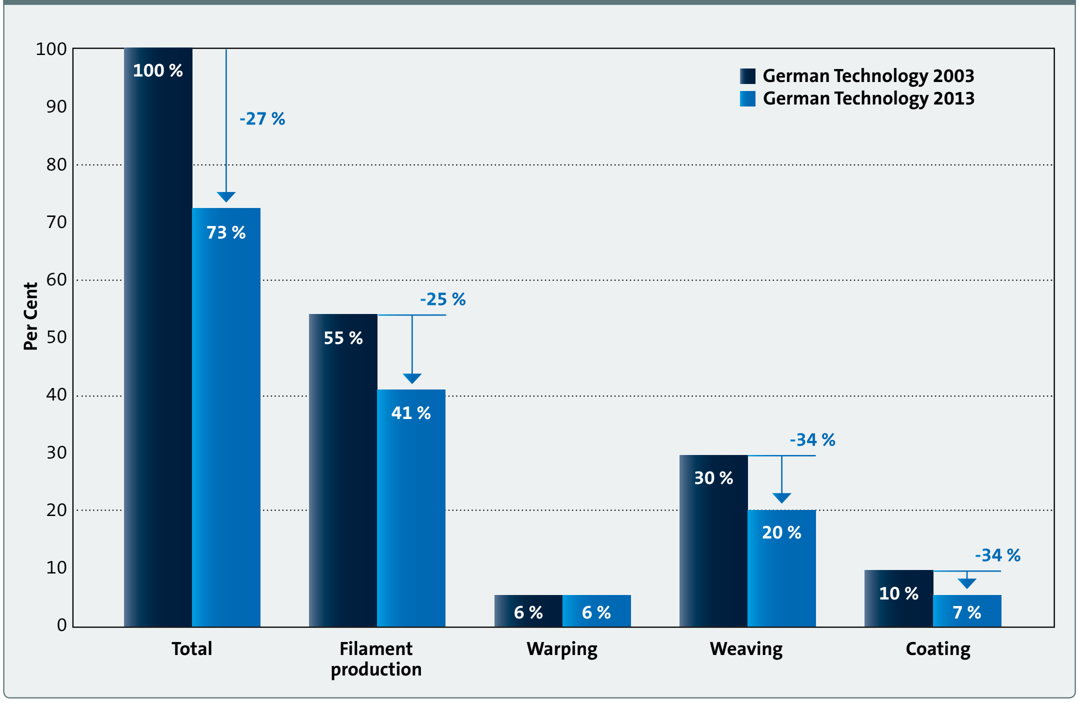
German engineers succeeded in reducing energy consumption significantly by developing new machinery. Latest state-of-the-art textile technology generates considerable savings in the process steps yarn manufacturing, weaving and coating, as shows the comparison between the level of German technology in 2003 and 2013.

In the overall balance of the energy used in the four process steps examined, a total saving of 27 per cent could be obtained. The most important progress has been made in the most energy-intensive step of yarn manufacturing.

Production of filaments – energy-optimised components make the difference

Using a 16-thread (formerly 8-thread) spinning system for the spinning process, a significant reduction of energy consumption could be reached at simultaneously increased productivity. As energy and environmental costs in the production of filaments sum up to half of the converting costs in the spinning process, today energy-optimised components are installed in the major parts of the spinning plants. Round spinning beams make save more than 40 per cent of the energy, and high-frequency induction heating technology of the godets more than 20 per cent compared to conventional systems.

Woven Architechtural Fabric – Energy Consumption 2003 – 2013 in %



Warp preparation – high performance and better quality
Modern sectional warping machines as they are produced for warp preparation by German textile machinery manufacturers are characterised by high performance and a significantly improved warping quality. The energy consumption for warping, however, is relatively low compared to the overall process.

Weaving – Energy requirement reduced by 34 per cent
As mentioned before, weaving machines of 4 m width have been taken as a basis. When comparing the machinery designs of 2003 and 2013, the result is a reduction of up to 29 per cent for the electric power – in particular due to the higher performance (production) of the weaving machine itself – and of 28 per cent for the pro-rata power consumption of the compressed air treatment process. Further energy-saving effects are generated by direct drives and the weft insertion procedure by compressed air.

Change to wider weaving machines does not only result in lower electricity bills. The exchange of a weaving machine of 3 m working width by a weaving machine of 4 m leads to a major reduction of the weft waste of up to 29 per cent. Conserving these resources means an additional ace for sustainability. Thus, it is not surprising that the number of weaving machines with larger working width in particular, has substantially increased in the last ten years.

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Coating – Energy requirement reduced by 34 per cent

Referring to the overall process chain for the manufacture of architectural fabrics, the energy requirement for coating is below 10 per cent. The energy required here is necessary for heating the process air.

Nevertheless there are saving potentials. During coating, an intelligent air management can reduce the air flow required for the thermal treatment process and as a consquence lower the energy consumption. Additonal savings are possible by the use of modern sensor and measuring technology, generating an improved application quality with less energy.

An essential effect has the proper operation of the equipment by limiting the air flow to the necessary minimum. Depending on the type of polymer coated, an exhaust air treatment may become necessary. There are different types of cleaning procedures which differ in their energy consumption.

Top rating for German technology

Roland Berger Strategy Consultants, one of the world's leading consultancies had awarded best ratings to the German textile technology for increase of energy efficiency. According to Roland Berger, further development of German textile technology should result in an about 15 per cent higher efficiency until 2020. This product-specific comparison along the overall process chain even proves that German technology already today reaches more.

Sources and companies participating

www.machines-for-textiles.com/blue-competence/stories

Facts & Figures:

- 27 % energy savings for the overall process (2013/2003 year-on-year)
- 29 % reduced weft waste
- increased productivity – the most efficient way to save energy
- high-quality product – higher profits

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