

## Sustainability with Rieter Machines and Systems



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## Sustainable Spinning Processes Thanks to Rieter Technologies

Sustainability is nothing new for Rieter. A wide variety of factors which influence the long-term viability of Rieter products, systems and services have always been taken into account.

The limited resources of our planet are forcing us to rethink. Minimal environmental impact, maximum savings in electric power consumption, optimal utilization of resources – these are the sustainability factors that Rieter has already recognized over the last few decades and has systematically and consistently implemented in its system development. Anyone who masters the entire chain of the yarn production process is aware of how and where to implement a more sustainable approach. This is the focus of Rieter as system supplier.

When developing sustainable machines, systems and services, Rieter takes into account the entire life cycle of the machinery, thus creating added value for its customers. These machines have been designed to save energy, optimize resource utilization and produce efficiently and economically in order to increase competitiveness.



Rieter machines and services enable a sustainable yarn production.

# Protect Resources and Enable Sustainable

Improve personnel resources

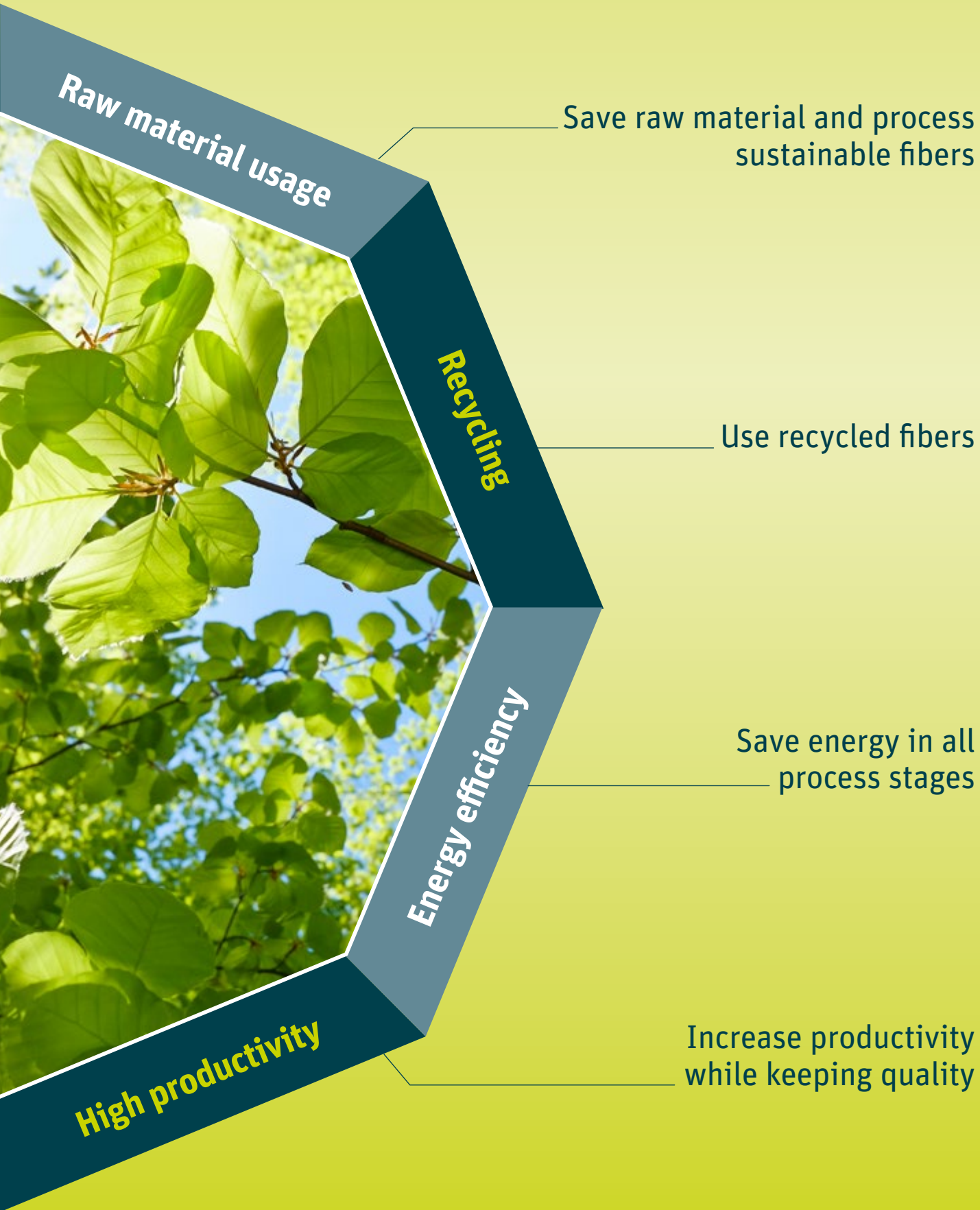
Optimize the mill with the all-in-one management system

Add value through long lifetime

Boost mill efficiency along the product life cycle



# Yarn Production



**Raw material usage**

Save raw material and process sustainable fibers

**Recycling**

Use recycled fibers

**Energy efficiency**

Save energy in all process stages

**High productivity**

Increase productivity while keeping quality

## Innovative Solutions for Sustainable Raw Material Usage

Rieter technologies involve spinning processes that make optimum use of raw materials and thus reduce fiber consumption. They facilitate the processing of sustainable and recycled fibers, which are playing an increasingly important role. Rieter is driving these innovative solutions for the sustainable use of raw materials and thus creating added value for its customers (Fig. 1).

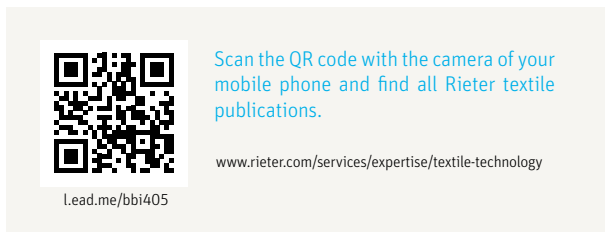


Fig. 1: A comprehensive textile publication is available on the Rieter website for each of the following topics.

### Processing post-consumer material into ring or rotor yarns

Today, only 1% of the world's clothing is recycled and 73% ends up in landfill, but the situation is changing. Technological advances and growing consumer expectations are leading to greener businesses and a reduced environmental degradation.

Rieter is offering solutions for the integration of post-consumer material into yarn production to help close the textile loop. Post-consumer material is made from waste created by a consumer and is not the same as pre-consumer recycled content which is made from manufacturer waste that never actually made it to the consumer.

Post-consumer waste consists of mainly old garments or other discarded textile products that are torn into what are known as tear fibers. These fibers – in most cases recycled cotton – are blended with virgin cotton. The results of our latest study have shown that it is possible to spin not only rotor, but also ring yarns of different quality with up to 75% post-consumer material on a Rieter system (Fig. 2).



Fig. 2: Rieter spinning systems offer solutions to spin ring and rotor yarns out of recycled fibers.

### Bast fibers for textile applications

Bast fibers like flax (linen) or hemp are versatile and valuable for textile and non-textile applications (Fig 3).



Fig. 3: Flax – a sustainable raw material

They are very sustainable because very few pesticides are used when cultivating bast and the water requirement is low. Rieter offers tailored, economical solutions for processing bast fibers in short staple fiber spinning.

In cooperation with the company Temafa, headquartered in Germany, Rieter offers different opening and cleaning states to refine the raw material. In a first step, bast fibers have to be shortened so they can be processed with cotton spinning technologies. This process is called cottonization and gives the fibers the same characteristics as cotton.

The cottonized material is then put through the fiber and spinning preparation process involving bale opener UNIfloc A 12, mixer UNImix B 72 and card C 75, followed by different draw frame passages – depending on the quality requirements. In the end, yarns made of flax blends or 100% flax are manufactured efficiently with the Rieter R 70 (fully automatic) or R 37 (semi-automated) rotor spinning machine.

Compared to traditional ring spinning, bast yarns produced on rotor spinning machines offer advantages in the end product. The rotor yarns have higher elongation, lower hairiness, a lower shive and dust content and significantly better downstream processing behavior. In addition, the conversion and equipment costs are low.

### New possibilities with spun-dyed viscose fibers

Another approach to meet the demand for an environmentally friendly production of textiles is to dye fibers during their manufacture, which involves adding the color pigments directly to the spinning solution. The conventional procedure for dyeing textile fabric, such as knits or wovens, is an expensive process with high water, energy and chemicals consumption.

In cooperation with Grasim Industries, located in India and one of the largest manufacturers of viscose fibers, a trial was conducted. Spun-dyed viscose fibers (Fig. 4) in different colors were processed with the air-jet spinning machine J 26.



Fig. 4: Spun-dyed viscose fibers reduce environmental impact.

The results showed that air-jet spinning responds well to these fibers as it exerts only minimal frictional forces between the fibers with the color pigments and the technology components of the machine. The fabrics produced with air-jet yarns demonstrated better optical evenness, a higher washing resistance and higher color intensity compared to ring yarn fabrics.

In addition to the reduced environmental impact, the yarn manufacturing costs were lower for air-jet spinning than ring spinning, and carrying out the dyeing process when manufacturing the fibers also lowered overall production costs.

### Spinning waste with high efficiency and quality

Efficient raw-material utilization is another important sustainability factor for Rieter. How can yarn be manufactured out of high amounts of waste and yet still meet quality requirements? Rieter has conducted a study on this topic.



**Fig. 5:** When spinning waste or material with high short-fiber content the direct rotor spinning process is the optimal solution.

The results show that the higher the short-fiber content, the more positive the effect of shortening the spinning process. Because a high short-fiber content in the raw material also runs the greater risk of uncontrolled drafts or fiber package-build up during spinning preparation. This can be counteracted with reduced drafting. The direct rotor spinning process, with only the autoleveled draw frame module RSB-Module 50 attached to the card and the carded sliver directly transported to the rotor spinning machine, has proven to be the best process for high short-fiber content – in terms of yarn and fabric quality, as well as conversion costs because fewer machines are used (Fig. 5).

### Improved yield with a Rieter system

Customers who opt for a complete Rieter system, for example to spin compact yarn, benefit from a perfectly synchronized spinning mill supplied from one source. A Rieter compact-spinning system achieves raw-material savings of 1% compared to a mixed spinning mill system from other manufacturers. In addition to the high yarn quality, waste reduction is a key factor in the compact-spinning of combed cotton and improves the economic impact on resources.

Low raw material loss is achieved in the blowroom line VARIOline thanks to the optimum combination of microtufts, VARIOset function and progressive cleaning. The high-performance cards C 80 with maximum technological cross section and the pre- and post-carding zones that can be equipped individually ensure excellent raw material utilization. High-quality technology components on the comb E 90 allow reducing noil extraction while retaining the same yarn quality (Fig. 6).



**Fig. 6:** The comb E 90 secures gentle and controlled fiber treatment what results in best raw material utilization.



## Maximum Energy Efficiency in Yarn Production

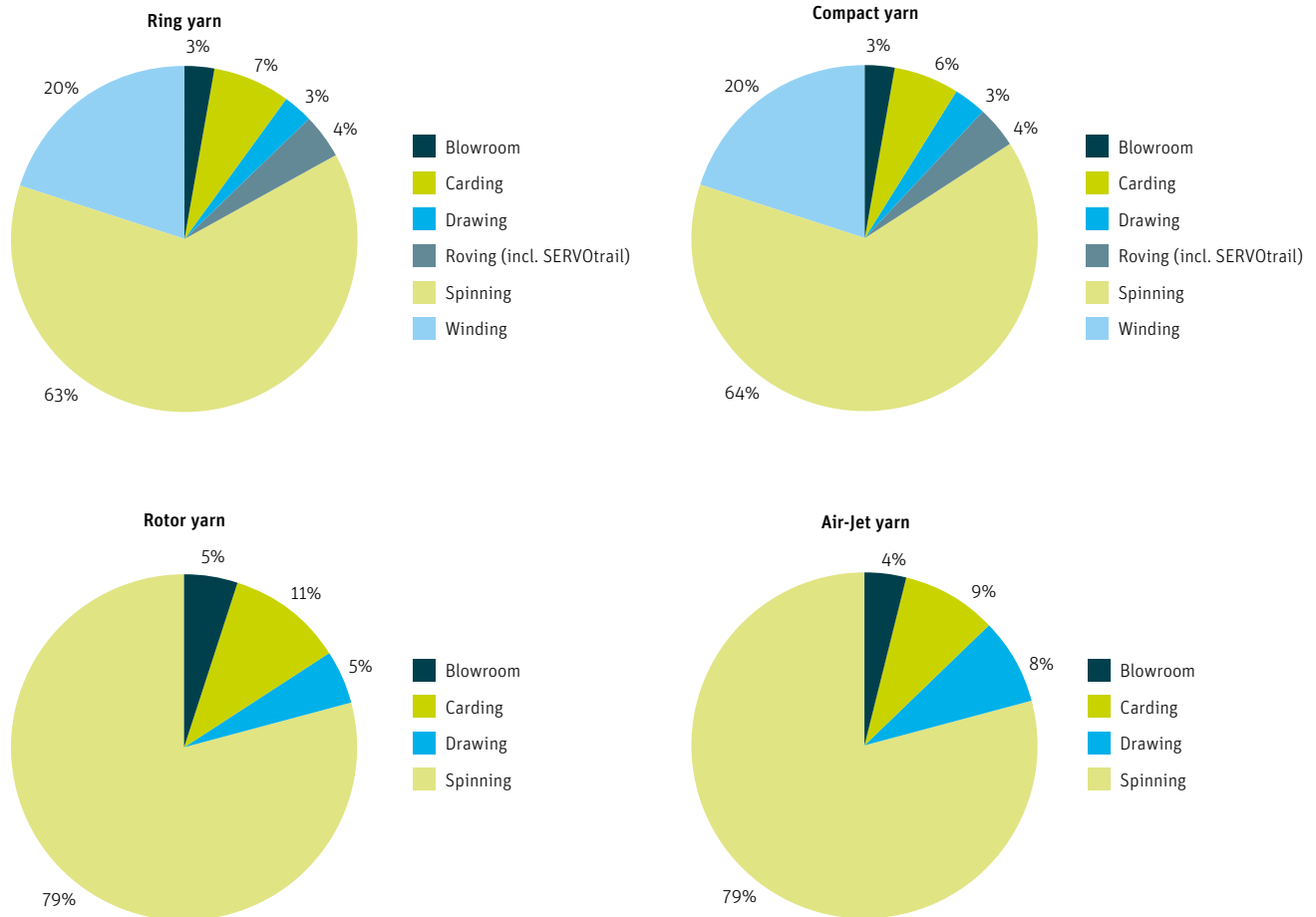
Rieter has a completely energy-efficient portfolio for all spinning systems established on the market. This applies to each individual machine, but even more so to a complete system that is precisely coordinated. Spinning mills can thus produce yarns with maximum energy efficiency, while at the same time protecting the environment.

Rieter, as a supplier of all four spinning systems, can meet the varying operating conditions of the customers and recommend the ideal system, while also taking power consumption into consideration. Whichever system Rieter customers decide on, all machines and systems make a contribution to

energy efficiency, one of the most important factors in the spinning process regarding sustainability.

Depending on the spinning system, energy consumption of the individual production steps differs greatly (Fig. 7). The largest share of energy consumption for each system is demonstrated by the end spinning machines. In addition, the share of energy costs for each of the end spinning machines differs greatly. Another fact is: the finer the yarn, the more dominant the share of energy consumption held by the end spinning machine and the higher the total energy consumption.

**Share of energy costs per production step**  
100% viscose, Ne 30; Turkey



**Fig. 7:** End spinning is the most energy-consuming stage in spinning, regardless of the chosen spinning technology.

### A system is only as good as its individual machines

For decades, the Rieter development teams have taken into account the energy principles for every spinning process and have incorporated them into the machine designs to reduce energy consumption per kilogram of product output (Fig. 8). Every single machine is maximally energy-efficient – as a complete system, unbeatable.

According to the share of energy per production step, the success of the energy reduction is to be weighted differently. First place goes to the end spinning machines, followed by the card. Therefore, the 11% reduced energy consumption from the former to the latest card generation is a significant step towards an environment-friendly production of yarns.

Considering the energy consumption of an entire spinning system the effect is considerable (Fig. 9). The graph shows the most important steps in the development of the ring spinning system. To distinguish the systems only the most important machines are listed in following order: ring spinning machine, comber, card.

Former model	Current model	Reduction of energy consumption based on kWh/kg
C 70	C 80	11%
RSB-D 45	RSB-D 50	16%
G 36	G 38	7%
K 46	K 48	5%
R 60	R 70	22%
J 20	J 26	44%

Fig. 8: Each energy reduction per product increases the energy efficiency of the entire Rieter system.

### Energy consumption of a Rieter ring spinning system

100% cotton combed, Ne 30, 450 kg/h production

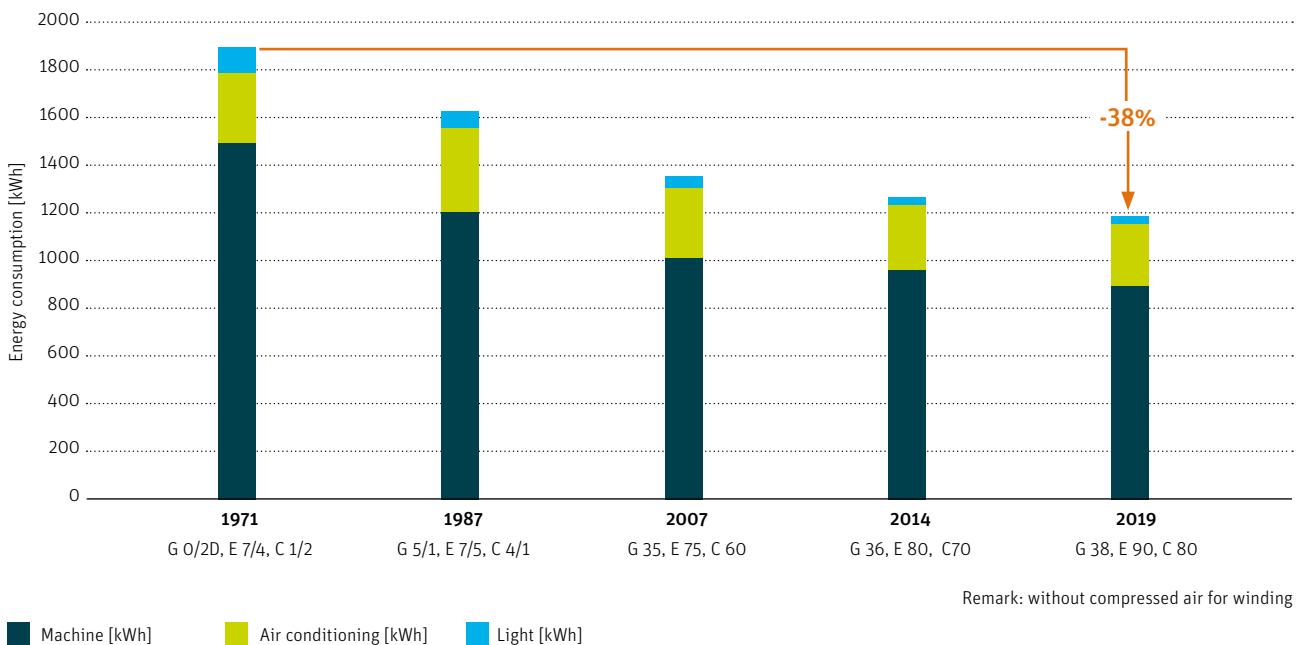
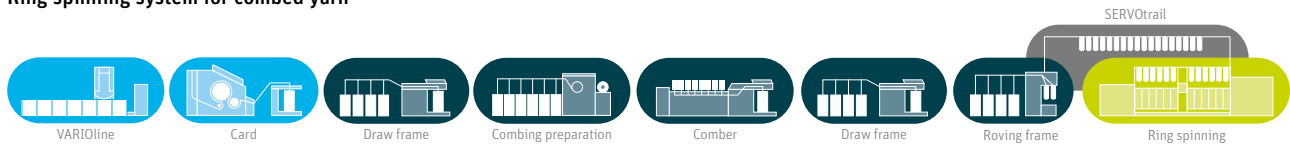


Fig. 9: During the last decades Rieter ring spinning systems for combed cotton could reduce the energy consumption by 38%.

**Ring spinning system for combed yarn**



**Fig. 10:** The Rieter ring spinning system saves 10% energy compared to others.

In a comparison with a mixed system with machines from different suppliers, a ring spinning system from Rieter (Fig. 10) demonstrated 10% energy savings. The comparison was based on a production of 2 078 kg/h cotton yarn Ne 14 for denim fabrics. The blowroom line VARIOline with the option ECOrized plays a significant part here. It reduces the energy consumption of the pneumatic fiber transport throughout the blowroom line by 30%. High production output,

energy-efficient drives, and innovative machine components on the card C 80 also lead to lower energy costs per kilogram of card sliver produced. The draw frames with the drive concept ECOrized are very energy-efficient too. The largest contribution to the low energy consumption of the Rieter system is made by the ring spinning machines G 38 with double-sided suction, energy-optimized elements and motors, as well as energy-saving spindles and spindle drives (Fig. 11).



**Fig. 11:** The ring spinning machine G 38 uses minimal energy thanks to double-sided suction and energy-efficient components.

## High Productivity Positively Impacts Ecological Balance

Maximizing Rieter machinery output by maintaining its high standard of quality contributes toward sustainable production. In addition, after-sales services offer many opportunities to boost productivity and efficiency, as well as ensure a longer lifetime for existing products through services involving performance optimization, preventive maintenance, customer training, upgrades and repairs.

### Reducing the ecological footprint with Rieter machines

With each new machine model, leaps in productivity have been achieved in all process stages, always taking into account that the quality standard of the respective sliver or yarn produced was maintained. The latest Rieter machines such as the card C 80, comber E 90 and rotor spinning machine R 70 are just three examples from the entire product portfolio which have reduced the ecological footprint.

Compared to all other cards on the market, the card C 80 produces at least 30% more card sliver at a consistently high sliver quality. As a result, the number of cards required for a spinning mill is significantly reduced. Depending on the raw material, this means that where four cards were previously used, only three are now required. The comber E 90 also has an unbeatable sliver production. With over 100 kilograms per hour, it is the most productive comber on the market. The productivity gain of 10% compared to the former model is achieved with the new intelligent drive concept,

together with the improved combing technology and newly integrated SB-D 50 draw frame technology. In rotor spinning, the improved spinning box of the R 70 creates advantages in terms of raw material utilization and productivity. Compared to other machines, it achieves greater spinning stability and higher yarn tenacity. This enables a productivity increase of up to 7% per spinning box.

A Rieter system is only as good as its individual machines. Each system, whether ring, compact, rotor or air-jet spinning system, enables spinning mills to achieve maximum productivity and thus competitiveness. The example below shows the advantage of a Rieter compact spinning system compared to a mixed system consisting of machines from different manufacturers (Fig. 12). Producing the same amount of yarn with less machines and even less waste supports the environmental footprint of the spinning mill.

### Mill Assessments boost efficiency

Performance Optimization Services boost mill efficiency and reduce yarn production costs to give customers a competitive advantage and contribute to the sustainability of a spinning mill. Customers benefit from improved settings and expert recommendations (Fig. 13, page 13). After assessment, Rieter provides a tailor-made report drawn from on-site data collection and analyses, as well as a customized solution concept.

Yarn production of 400 kg/h	Competition	Rieter	Savings/Improvements
<i>Main deviation in spinning</i>			
Number of compact-spinning machines	23	22	1 compact-spinning machine less
Production speed [rpm]	22 000	23 000	+4.5%
Number of spindles per machine	1 824	1 824	
<i>Main deviation in preparation</i>			
Number of cards	12	10	2 cards less
Number of draw frames	8	6	2 draw frames less
Number of combers	10	9	1 comber less
Comber noil [%]	18	17	1% less
Waste in blowroom and carding [%]	6.1	5.8	0.3% less

Fig. 12: Producing with less machines and less waste positively impacts the ecological balance.



**Fig. 13:** Rieter services offer Mill Assessments to boost efficiency, optimize costs and therefore enhance the sustainability of yarn production.

This concept includes process optimization and reorganization, wear and tear parts exchange, conversion recommendations and more.

An example with one of Rieter's customers shows that optimizing the spinning mill offers huge potential to improve production costs in the long term.

Buhler, the leading supplier of fine yarns, with headquarters in Jefferson, Georgia, USA has worked together with Rieter. Buhler has optimized its spinning mill. As a result, the productivity and quality of the spinning mill has been massively improved, while considerable raw material savings were achieved. Production costs have also been reduced and the production skills of employees have been strengthened.

The reduced production costs mean that investment in Mill Assessment, technology components and machine upgrades will be paid back in less than 18 months, giving Buhler more financial scope for further investments. Many aspects of Mill Assessment enhance the sustainability of yarn production.

### **Preventive Maintenance Packages minimize production stops**

Rieter machines are renowned for their outstanding performance. But even the best equipment needs replacement parts now and then. To use resources efficiently and to be competitive, yarn producers have to minimize production stops. One planned maintenance overhaul operation is less costly than several small urgent production stoppages. The Rieter Preventive Maintenance Packages help producers to use resources economically and to stay one step ahead of competition by maximizing uptime. They provide the original quality parts with considerably lower costs than if each part was purchased individually.

Over the years, Rieter specialists have analyzed the equipment from A to Z and identified several performance-critical parts that need to be replaced after a certain period of time. This enables customers to easily plan their preventive maintenance and order the parts in one package, right when they need them.

### Training maximizes mill performance

Tailored training for personnel ensures sustainable production through high machine performance. Apart from the fact that training improves skills, it also motivates the employees to contribute to a company's goals, like improving quality, optimizing productivity, increasing safety and much more to ensure a higher return of investment based on an efficient use of resources. Training can be provided in one of Rieter's training centers or directly at the customer's mill.

A sample calculation makes clear that everything a company management spends on personnel training is a profitable investment. To give an example, machine efficiency has been proven to increase by 1.2% after investing in machine maintenance skills. The manufacturing cost with a Turkish customer was consequently reduced by 0.054 CHF per kilogram produced yarn (calculated for a ring yarn production of 100% cotton combed, Ne 60, 520 kg/h).

### Efficiency thanks to Engineered Solutions

After several years of operation, machines no longer meet current requirements. Any little boost to recover their initial productivity contributes to the service life of the machine and therefore supports company sustainability. Rieter provides a wide range of solutions to restore spinning mill equipment to its best levels and beyond. The following two examples show how customers and the environment profit from this kind of modernization.

### ROBOspin increases machine availability

ROBOspin is the piecing robot for Rieter ring and compact-spinning machines and is offered for new machines and for the installed base (Fig. 14). It automates the piecing of ends down that occurs during spinning or after doffing and thus increases machine availability and productivity. Personnel can direct their attention elsewhere, thus improving overall efficiency.

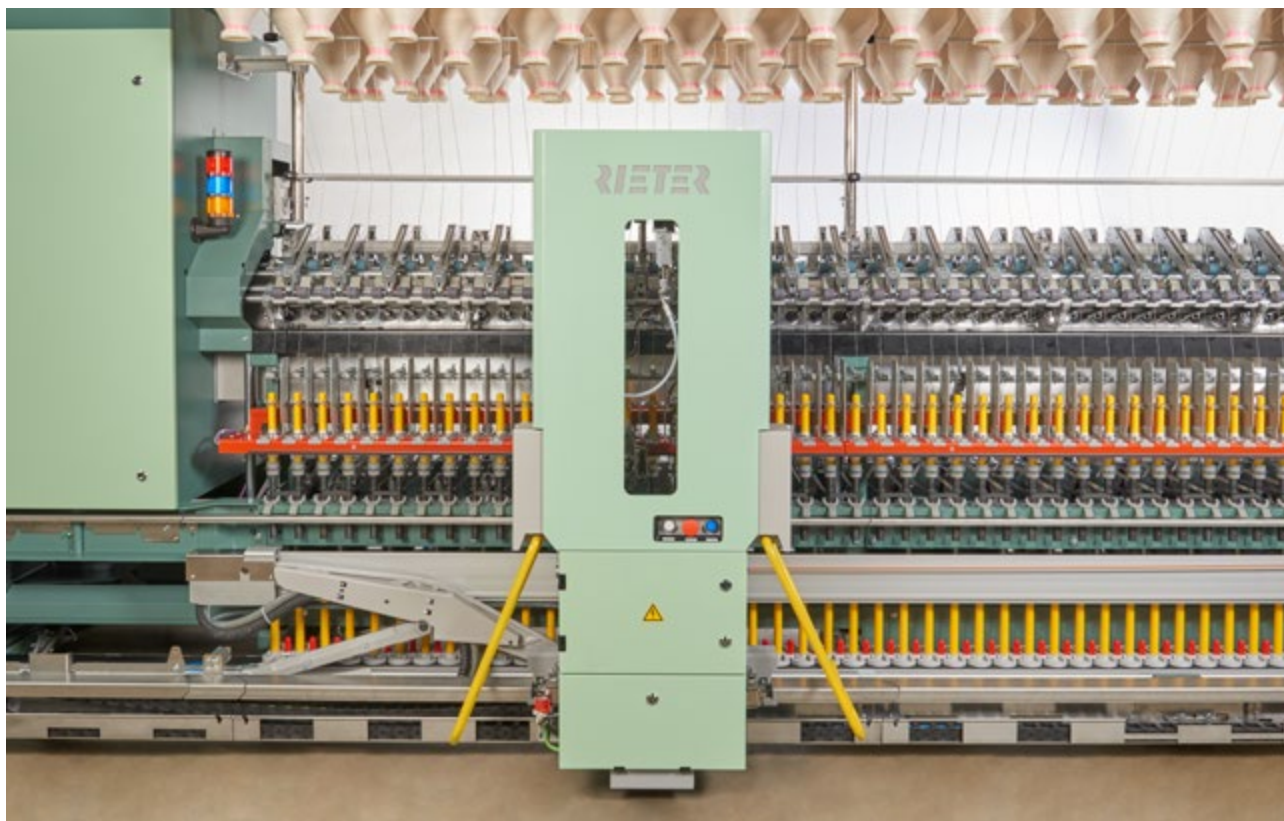


Fig. 14: ROBOspin increases machine availability and productivity.



Fig. 15: Efficient use of resources by upgrading an existing ring spinning machine with COMPACTdrum.

Regardless of the length of the machine, one robot is in operation per machine side. To detect the ends down ROBOspin uses a system that is now the standard at new Rieter machines – the integrated individual spindle monitoring ISM. The information is sent to ROBOspin via the machine control system, which then travels to the relevant spindle and repairs the ends down.

The huge advantage is that ROBOspin works 24/7 without any loss of efficiency and in addition delivers a consistent piecer quality.

### Modernization in compact spinning

The compacting device COMPACTdrum for Rieter ring spinning machines is an easy option for spinning compact yarns (Fig. 15). It is simple to install and remove and allows for high flexibility with easy switching between ring and compact yarn. With COMPACTdrum, customers can profit either from very low hairiness and high yarn strength, or can benefit from the full potential of lower grade raw material for a standard yarn quality. The high flexibility and low energy costs, along with very low production costs, maximize resource efficiency.

### Extended lifetime with repair services

To optimize the performance of the spinning mill, Rieter also offers repair and preventive services. Both contribute to sustainability by prolonging the life cycle of the products.

Repair services provide reliable, long-lasting and cost-efficient solutions – quickly and systematically – to lower the risk of a breakdown. With certified experts and 25 repair service centers across the globe, Rieter provides as-good-as-new repairs and thus extends the lifetime of textile machinery (Fig. 16).

Preventive services replace components before age-related faults occur. As a result, customers experience less downtime, reduced annual parts costs and, ultimately, optimize the performance of their machinery.



Fig. 16: Extend the lifetime of Rieter machines by using excellent repair services.



## Added Value Through Longer Lifetime

A long lifetime of a machine or its components means long service intervals, less downtime, higher efficiency and less costs. Two examples, such as the ring traveler from Bräcker or special alloy from Graf, underline the added value of contributing to sustainability.

### Lifespan three times longer thanks to hi-tech ceramic coating

The Bräcker ring traveler ZIRKON is the one with the longest lifetime compared to all other travelers on the market (Fig. 17). A lifetime of over 1 000 hours can be achieved at maximum speeds, which is the equivalent to a lifetime three times longer than regular ring travelers. A high-tech ceramic coating, applied with state-of-the-art technology, is what sets it apart. The ring traveler thus contributes to the efficiency of production processes by reducing machine downtimes. Especially for new installations of compact-spinning machines, the ring traveler ZIRKON is a highly profitable choice.

Traveler lifetime depending on yarn count

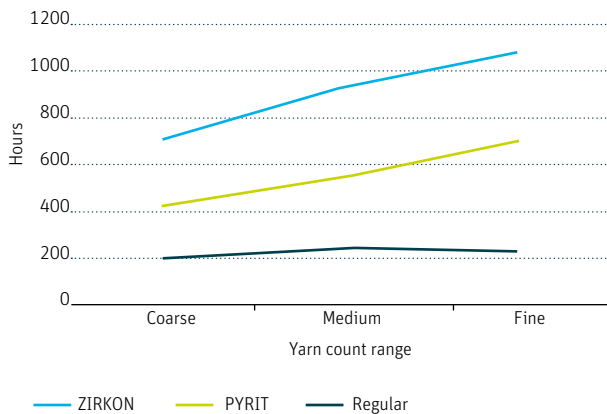


Fig. 17: The ring traveler ZIRKON offers a service life that is three times longer compared to regular ring travelers.

### Lifetime for card clothings increased by 50%

The MULTISHARP alloy from Graf increases the lifetime for card clothings by 50% and lowers maintenance costs significantly (Fig. 18).

Alloys on card clothings for different customer requirements

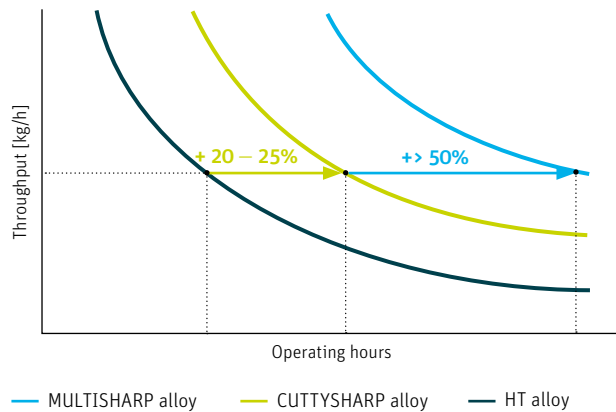


Fig. 18: MULTISHARP alloy for card clothings offers 50% longer lifetime.

The unique, wear-resistant alloy for all card clothings guarantees consistent carding results and ensures a reproducible yarn quality over the entire lifetime. This extends service intervals and reduces service interactions, which lowers maintenance costs. Longevity is a decisive factor in using resources to their maximum efficiency.

## Digitization Supports a Sustainable Yarn Production

Digitization is playing an increasingly important role around the globe; it will make an enormous contribution to promoting sustainability. The Rieter Digital Spinning Suite permanently monitors the entire process chain and quickly highlights inefficiencies. Rapid response increases the efficiency of the spinning mill in terms of energy consumption, raw material usage and other aspects, and supports the spinning mill in sustainable yarn production.

Commitment to a sustainable policy is a growing concern among brands and consumers. This has increased the significance of an ability to report on business and processes with even greater transparency. Digital technologies have a strategic role to play in this context.

ESSENTIAL – Rieter Digital Spinning Suite is an all-in-one mill management system helping spinners to overcome these

challenges. It connects the entire spinning mill machinery, including auxiliaries from other suppliers and monitors all data, such as energy consumption (Fig. 19).

Four modules feature a series of solutions to cover all customer needs, from organizing daily tasks to monitoring the current spinning mill status via non-stop data recording. With inefficiency eliminated, resources are optimally used.

The system provides organized data from the entire spinning process, collecting relevant information, identifying weaknesses, managing personnel in the most economical way. The specific recording of production, energy and quality data facilitates fast response times and increases the efficiency of the spinning mills, while also reducing costs. Tracking the sustainability footprint of a spinning mill is also supported.

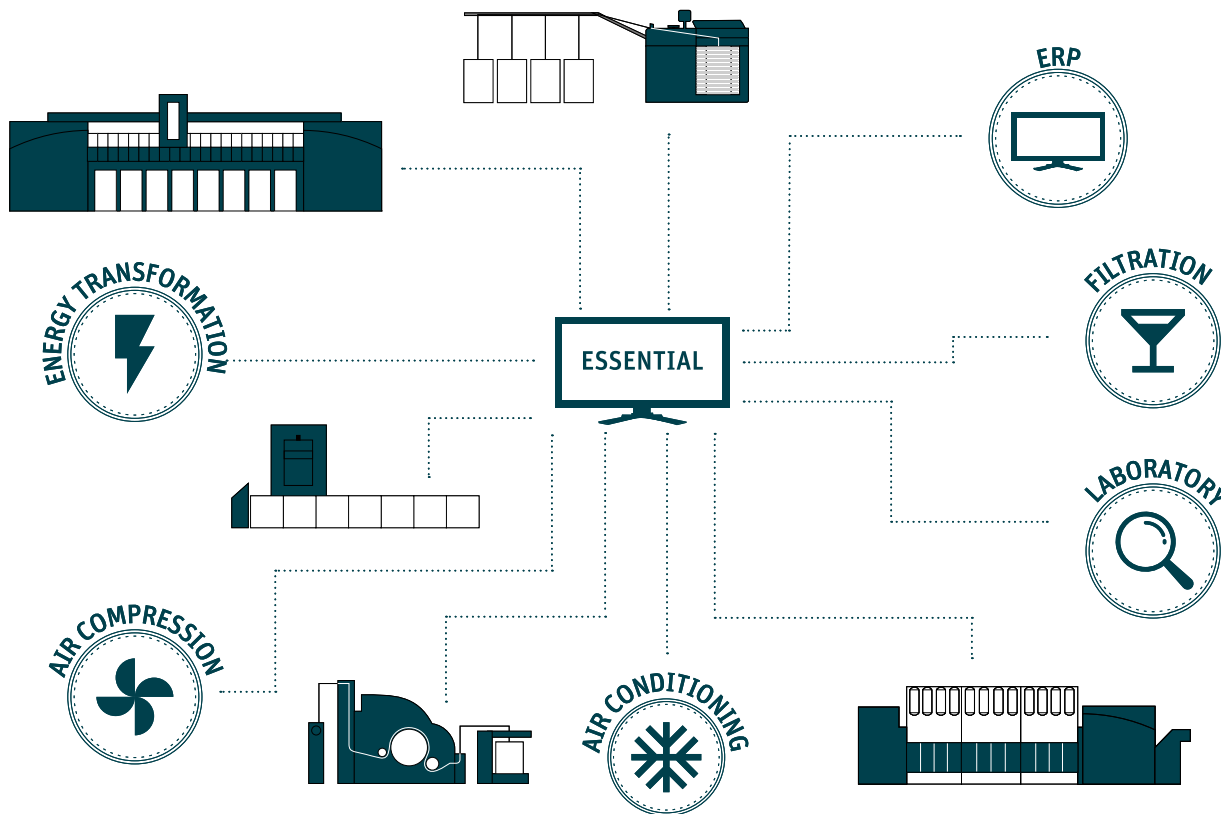


Fig. 19: ESSENTIAL enables tracking the sustainability footprint of a spinning mill.

## Automation Improves Handling of Resources

Sustainability in the automation solutions of a production process involves using resources more efficiently and relieving people from exhausting work. Furthermore, automated machines and tailored automation solutions solve the challenges of the spinning mills, like growing labor shortages and a lack of industry-specific expertise.

With its products and systems and by collaborating with companies such as Electro-Jet, Rieter offers automated, customer-specific solutions for the entire spinning process from a single source.

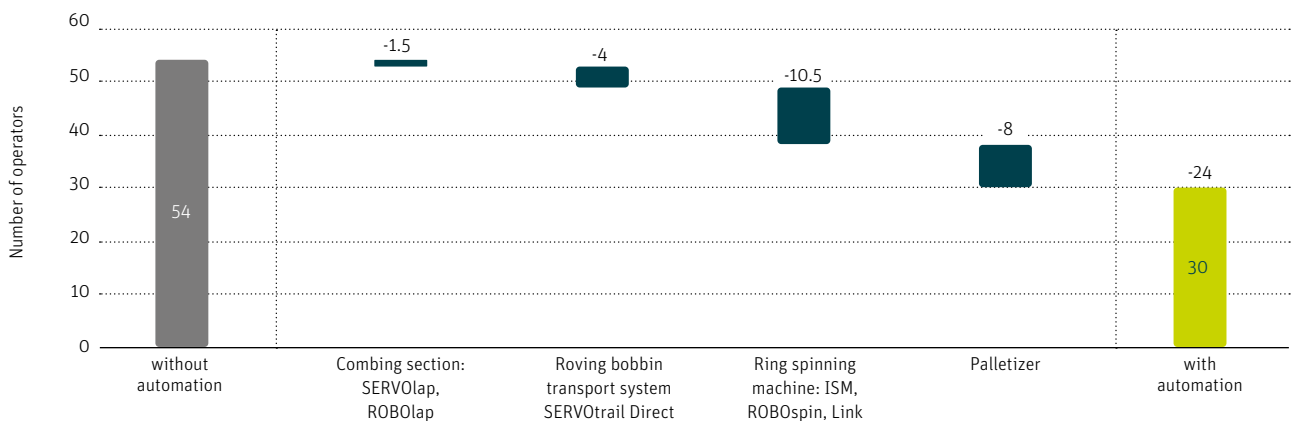
### Automated spinning mill makes 44% savings on personnel

As part of a comparative study, a spinning mill with just under 53 000 spindles for producing combed compact yarn was used and the effect of the various available automation solutions evaluated. From the blowroom to the packed yarn package, Rieter automation solutions reduce the required number of personnel by 44% – from 54 to 30 operators (Fig. 20).

At each process stage, it is possible to save on personnel and deploy them more efficiently at a different location. Taking the entire spinning process into consideration, the greatest potential for savings is in the operation of ring spinning machines. The piecing robot ROBOspin, the individual spindle monitoring system (ISM) and the interface to the winder Link make the ring spinning process far more attractive and allow for far greater efficiency when it comes to personnel resources.

Rieter products ensure the sustainable long-term success of a spinning mill!

Advantages of automation



Basis: spinning mill for combed compact yarn with 53 000 spindles

Fig. 20: With different automation solutions on and between the machines, the number of operators can be reduced significantly.

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