Spinning System
Bast Fiber Processing

RIETER

Spinning Bast Fibers

Modern Technology from the Raw Material to the Yarn

Cottonization of Bast Fibers
Such As Flax and Hemp

Bast Fibers

Highly versatile fibers

Textile consumption is increasing due to the growth in world population and improvements in living standards. This increase is mainly affecting clothing fabrics, which are made primarily from staple fiber yarns.

In parallel to this general growth, interest in natural fibers has recently increased again as environmental movements have gained great popularity, especially in industrialized countries. But the natural fiber renaissance is more than a short-term fashion trend. Both flax and hemp are very versatile plants that provide not only valuable fibers for textile and non-textile applications, but also raw materials for woodworking and the chemical industry. In addition to the more traditional practice of extracting long fibers from bast fibers, producing shorter, cottonized fibers is an important factor in ensuring that the raw material is used economically. However, it must be borne in mind that cottonized fibers only stand a chance as a textile raw material if they cost about the same as cotton.

Thanks to mechanical fiber preparation technology for creating cottonized fibers, it is now possible for the fibers to be in the same price range as cotton.

Flax

Hemp

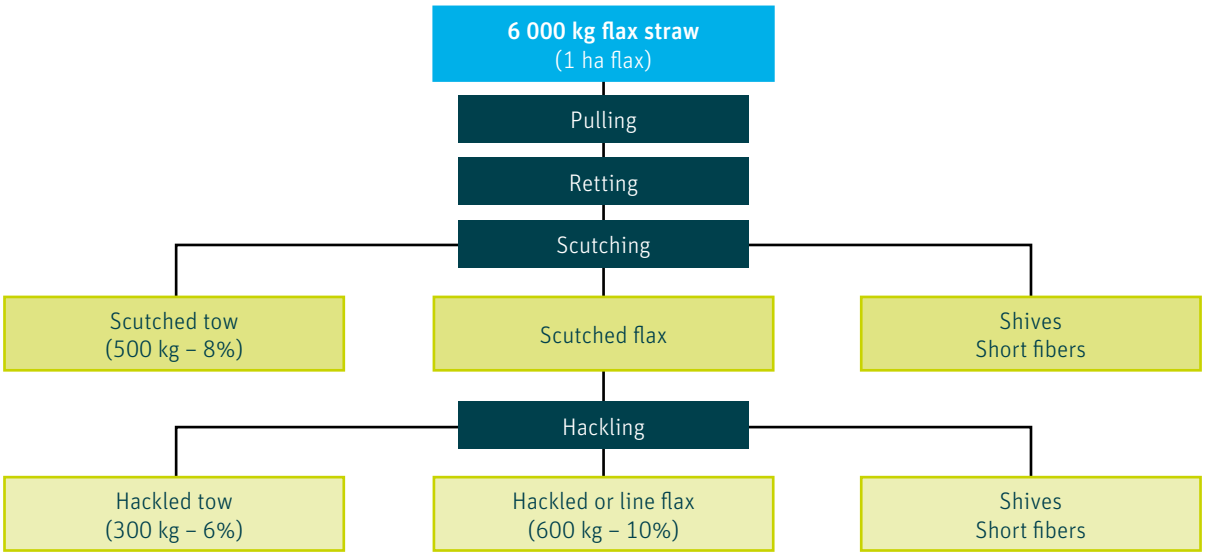
Processing Bast Using Flax Fibers as an Example

Raw-material utilization and raw-material quality

Flax is unique in that different types of fiber can be extracted from the same raw material. Some 6 000 kg of flax straw can be produced per hectare of land under cultivation.

500 kg of scutched tow, 300 kg of hackled tow and 600 kg of hackled or line flax can be extracted from this. Starting with 6 000 kg of flax straw, this corresponds to a total yield of 23%. Hackled or line flax is turned into linen yarn using the wet spinning process. The tow fibers (scutched tow and hackled tow) are spun into relatively coarse yarns using the traditional preparation and spinning process.

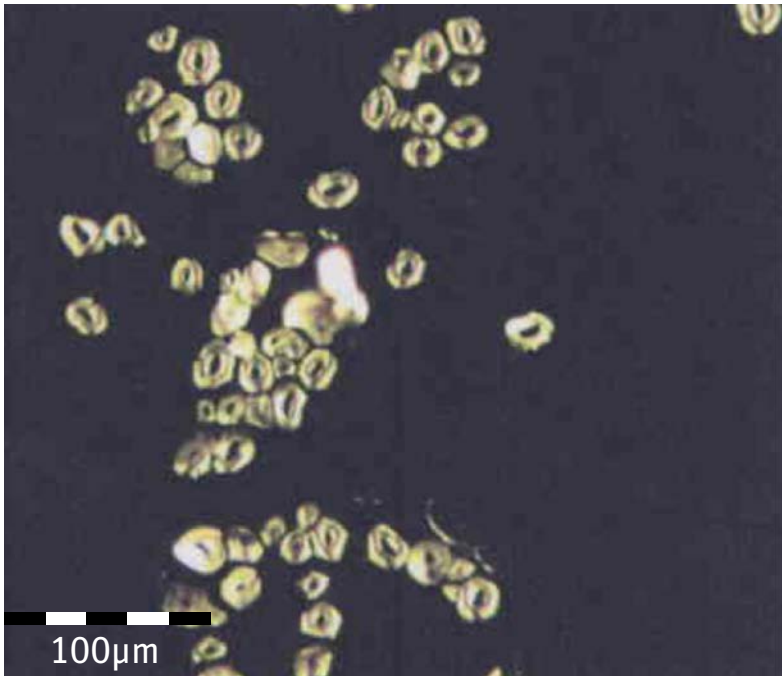
Flax harvest



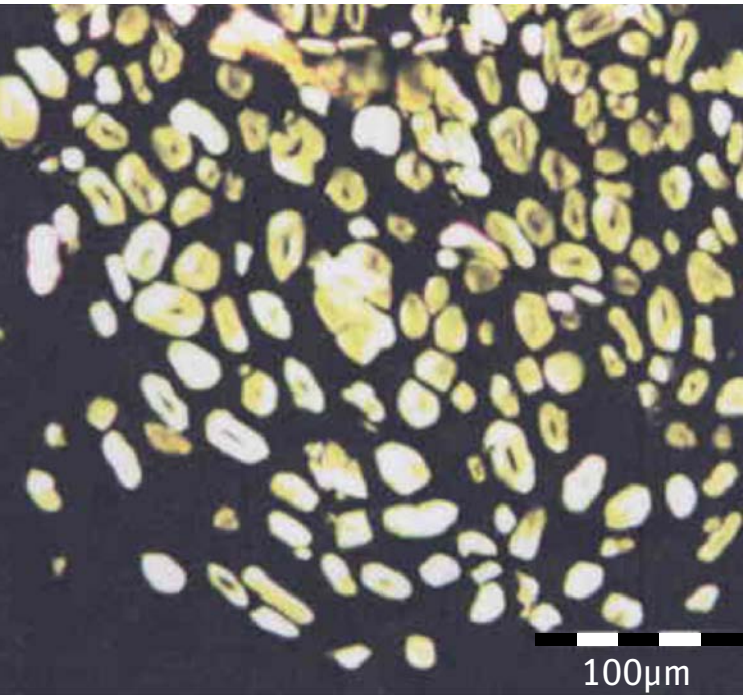
Flax processing levels

Increasing the potential of the tow fibers

From a price point of view, scutched tow and hackled tow are interesting raw materials for producing short fibers. Good fiber finishing is achieved using mechanical processing. The traditional wet spinning process for manufacturing bast yarns is very cost-intensive compared to the short-staple spinning technology used for cotton and man-made fibers. One possibility for utilizing this cost-effective short-staple spinning technology is to manufacture suitable short flax fibers of guaranteed purity, tenacity, fineness and length.



This cross-sectional image taken with a microscope shows the fiber distribution of flax tow and hackled tow in the fiber strand. The fibers in the fiber strand are not separated enough for economical processing using cotton spinning technology.



This cross-sectional image taken with a microscope shows the fiber distribution of broken-up short flax fibers in the fiber strand. The separation of the fibers is optimal for economical processing using cotton spinning technology. This separation is achieved using the Rieter-Temafa concept (see next page) in the fiber preparation.

Important parameters of raw-material quality

Extensive separation of fibers in the fiber strand is an important precondition for manufacturing yarns economically using cotton spinning technologies. The more easily the fiber strand can be separated into individual fibers during mechanical processing, the higher the fiber yield and the more homogeneous the fibers become as processing continues. The separability of the fibers is therefore also an important aspect for raw-material utilization.

Using Flax as a Raw Material to Create Cottonized Fiber

The Rieter-Temafa concept

Temafa is headquartered in Germany and has been operating as a family-run business since 1874. The company is a global expert on blending and opening, recycling, air engineering and natural-fiber extraction. In spinning preparation Rieter and Temafa combine their experience in flax processing. The specific structure of the flax fibers calls for suitable preparation technology. The Rieter-Temafa concept is based on extensive experience in fiber processing and yarn manufacturing. It involves taking on the challenging task of preparing the flax tow for use in the spinning mill in such a way that high-quality yarns can be produced from it using the rotor spinning process.

Preparing the flax tow for the spinning mill

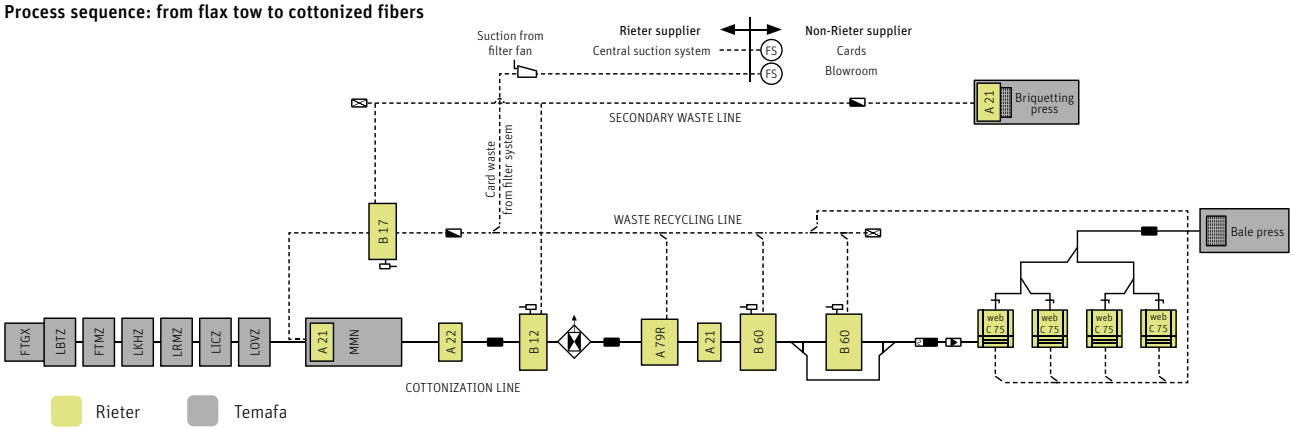
With the Rieter-Temafa concept, the flax tow is progressively relieved of shives and dust – without a cutting process. The raw material is refined in different opening and cleaning stages. The cottonized fiber material then passes into a baling press. The finished bales are then fed to spinning preparation.

Rieter blowroom machines – ideal preparation for the spinning process

Recycling unit

Rieter also supplies a recycling unit for optimal raw-material utilization. Recyclable waste from fiber preparation, the blowroom and carding is treated in such a way that it is comparable with cottonized fibers in terms of quality. The treated waste is processed using the fine cleaner UNIclean B 17 and fed back into the process via the blending and storage aggregate MMN from Temafa. Any remaining waste passes into the briquetting press.

Process sequence: from flax tow to cottonized fibers



B 60 OUTSTANDING ADVANTAGES

The UNIflex B 60 is responsible for giving the fiber material the same length, fineness, purity and spinning characteristics as cotton. The desired fiber length is set by adjusting the nipping point. This also reduces the short-fiber content.

The variable opening intensity opens the fiber bundles into individual fibers. Intensive cleaning is performed at the same time by precisely setting the cleaning intensity. The quantity of waste is controlled via the VARIOset function. Using VARIOset and the integrated dedusting unit reduces trash accumulation at the card.

Variable Opening Power

Opening intensity can be changed

Integrated Dedusting Unit

Higher machine efficiency in rotor spinning

Adjustable Fiber Length

The short-fiber content in the raw material is reduced by adjusting the nipping point

VARIOset

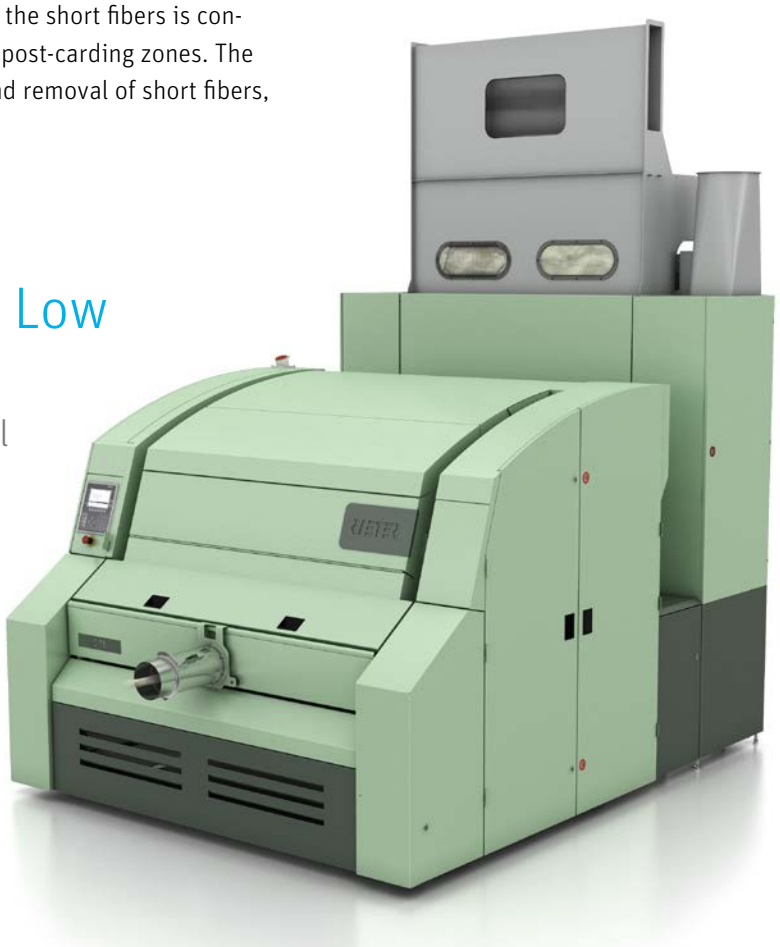
Precise setting of the cleaning intensity and quantity of waste with VARIOset

C 75

The web card C 75 sets new benchmarks in quality and productivity for cottonizing bast fibers. Compared to conventional cards, the card technology with a 1.5-meter working width achieves a reduction in process-related waste. This results in better raw-material utilization.

The card is adapted to suit the raw material using appropriate carding elements. The focus here is on the fiber's refinement, length and purity. The 1-roller licker-in module is used to open the fibers gently. The mote knife on the licker-in module ensures that any remaining shives, unopened bast bundles and dust are removed efficiently.

The efficient removal of these components and the short fibers is continued by the carding elements in the pre- and post-carding zones. The main carding zone facilitates the separation and removal of short fibers, contamination and fiber neps.



High Production with Low Energy Consumption

With its high productivity and small machine footprint, the web card C 75 offers the highest production volume per unit of surface area

Clothing Grinding System IGS

Maximum card clothing service life with consistent web quality

Adaptation to the Raw Material

The setup of the card is adapted precisely to the raw material, e.g. focusing on fiber opening of cottonized bast fibers

Better Raw-Material Utilization

Compared to conventional cards, the card technology with a 1.5-meter working width achieves a relative reduction in process-related waste

100% Flax Yarns

Fiber and Spinning Preparation

Opening with the UNIfloc A 12 produces ideal tufts

Optimal fiber preparation

Fiber preparation is a joint undertaking by Temafa and Rieter. The fibers are now in a condition that enables modern Rieter blowroom machines to be used. Optimal opening, cleaning and dust extraction are just as important as homogeneous blending. This ensures economical yarn production on the rotor spinning machine.

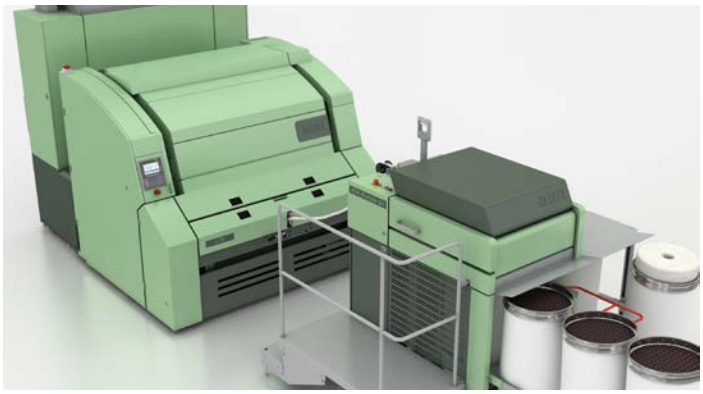
Bale opening

The flax tow used to manufacture cottonized fibers is heterogeneous in its properties. These variations have to be eliminated by optimal bale opening. The automatic bale opener UNIfloc A 12 carries out this task. It opens material uniformly from the bale and prepares the optimum tuft size for the subsequent machines.

Mixing, carding, drafting

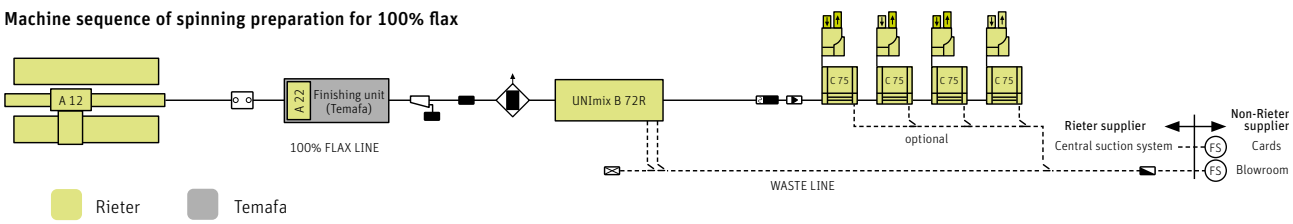
With its 3-point mixing principle, the UNImix B 72R is the ideal mixing machine. The large storage capacity of the UNImix B 72R provides an appropriate dwell time for the material and thus ensures a trouble-free production flow.

On the basis of the yarn counts to be spun, an integrated draw frame module with autoleveling after carding is sufficient.



Cards with the RSB-Module 50 deliver the ideal feed sliver for the rotor spinning machine.

Machine sequence of spinning preparation for 100% flax



100% Flax Yarns

The yarn manufacturing process

Processing on rotor spinning machines

Highly efficient end spinning of standard and fancy yarns made from flax is possible on semi-automated and fully automatic rotor spinning machines. Optimal raw-material utilization and perfect coordination of the installation as a whole result in an extremely economical yarn manufacturing process.

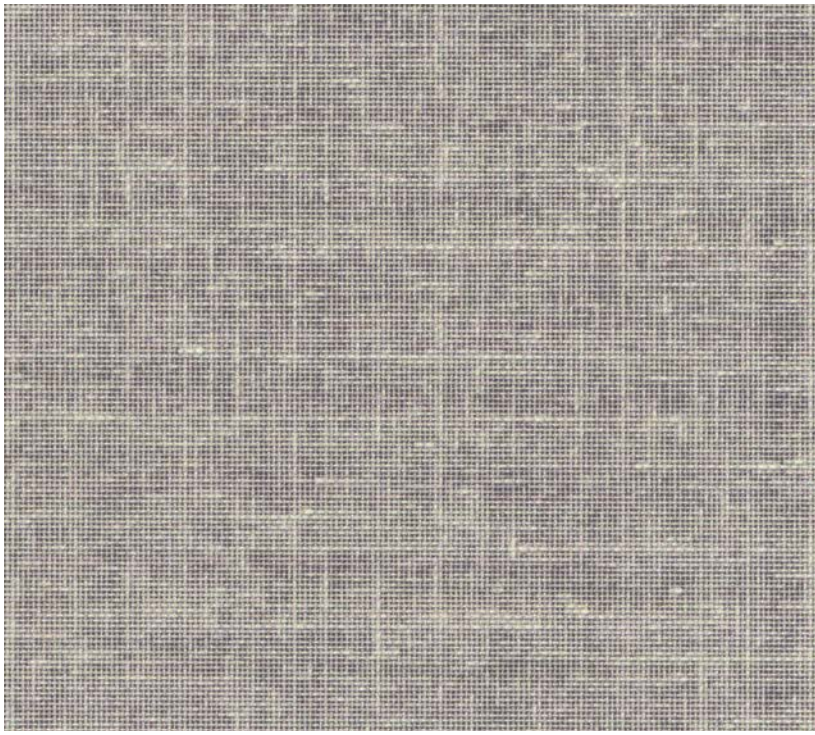
Standard and fancy yarns can be produced economically on a rotor spinning machine.

Yarn counts

Depending on raw-material quality, yarn counts of 200 tex (Nm 5) to 83 tex (Nm 12) can be spun from 100% flax.

Properties of the yarns and woven fabrics

In comparison to traditional ring spinning processes, flax yarns produced on rotor spinning machines offer advantages in the end product. The yarns have a higher elongation, lower hairiness, a lower shive and dust content and significantly better downstream processing behavior, plus the production costs are low. The equipment costs are lower, the woven fabrics and end products offer better abrasion resistance and higher dye retention, and the finished textiles are more comfortable to wear and are less likely to crease.



Fabric structure with typical linen characteristics

Flax Blends

Fiber and Spinning Preparation

Flexible bale opening

In the case of blend spinning preparation, the linen component is laid down as bales and opened using the automatic bale opener UNIfloc A 12. The second component – cotton or man-made fibers – can also be opened using the UNIfloc A 12. Depending on the batch size, manual laydown on the mixing bale opener is beneficial. It is also possible to process a blend with three components – of course with the appropriate machinery.

Cleaning, blending, sliver formation

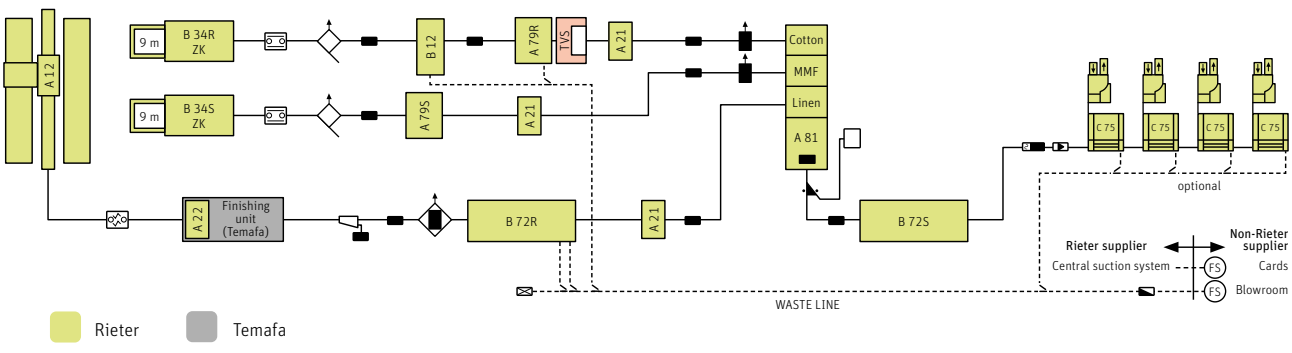
All components to be mixed are fed to the precision blender UNIblend A 81. The cotton runs through the cleaning process via the cleaning unit of the mixing bale opener B 34R, the pre-cleaner UNIclean B 12 and the fine cleaner UNIstore A 79R. The cottonized linen fibers enter the UNIblend A 81 via the mixing machine UNImix B 72R. The man-made fibers are fed from the mixing bale opener B 34S via the UNIstore A 79S to the UNIblend A 81.

Blends can be processed straight from the card with the RSB module or after additional draw frame passages. Connecting the card directly to the new autoleveler draw frame module RSB-Module 50 reduces the number of draw frame passages and improves the efficiency of the spinning mill. Depending on quality requirements, carding is followed by one or two draw frame passages, with the final passage on an autoleveler draw frame.

The autoleveler draw frame module RSB-Module 50 reduces the number of draw frame passages.

The draw frames RSB-D 50 and SB-D 50 offer solutions for all quality requirements.

Machine sequence of spinning preparation for blends



Flax Blends

The yarn manufacturing process

Rotor spinning

End spinning of 100% flax and blends with flax fibers is still largely carried out on ring spinning machines as per tradition. Rotor spinning machines, however, offer decisive advantages. The incoming draw frame sliver is opened in the spinning box, whereby the fiber material undergoes further cleaning and trash particles are removed. The blend is also improved with reversed doubling. Standard yarns and fancy yarns made of flax blends are manufactured highly efficiently on Rieter rotor spinning machines (semi-automated/fully automatic).

Blend variations and yarn counts

End spinning of the following blends and yarn counts, for example, is possible using flax short fibers:

70% flax/30% other fibers*, Nm 5 – Nm 18 yarns
50% flax/50% other fibers*, Nm 5 – Nm 24 yarns
30% flax/70% other fibers*, Nm 5 – Nm 34 yarns
* cotton, viscose, modal, polyester or polypropylene

Ideal feed sliver for the rotor spinning machine

Properties of the yarns and woven fabrics

Blended yarns are suitable for producing easy-care garments. The blends offer a wide scope for designing fashion items and thus a considerable expansion of the product range.

Coating fabric
warp: Nm 28/2 cotton yarn, ring-spun
weft: Nm 12 flax yarn, rotor-spun

Furnishing fabric
warp: 78 dtex polyester filament
weft: Nm 9.6 flax yarn, rotor-spun

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2261-v2 en 2011