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Editor in Chief: Ioannis Spiridopulos
e-mail: mail@suessen.com

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Bräcker
Bräcker AG, Obermattstrasse 65
8330 Pfäffikon-Zürich
Switzerland
www.bracker.ch

Novibra
Novibra Boskovice s.r.o., Na Kamenici 2188
68001 Boskovice
Czech Republic
www.novibra.com

Suessen
Spindelfabrik Suessen GmbH
Donzdorfer Strasse 4, D-73079 Süssen
Germany
www.suessen.com

Graf
Graf + Cie AG, Bildaustrasse 6
8640 Rapperswil
Switzerland
www.graf-companies.com

Front Cover:
Novibra Spindle NASA HPS 68
with CROCOdoff

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EDITORIAL

Ioannis Spiridopulos, Head Marketing & Sales
Editor in Chief SPINNOVATION

In this ITMA-free year the central event of the year is again in China with the local exhibition Shanghaitex held from June 10 to 13. You are kindly invited to visit the joint booth of the 4 companies Bräcker, Graf, Novibra and Suessen represented with interesting articles in this new issue of SPINNOVATION. Its new layout has been designed to outline the corporate identity of the four despite of all singularity.

Dear Reader,

You hold in your hand the new issue of SPINNOVATION. In this ITMA-free year the central event of the year is in China with the local exhibition Shanghaitex taking place from June 10 to 13.

The 4 companies Bräcker, Graf, Novibra and Suessen will show their new products on their joint booth D31 in Hall E1. You are kindly invited to visit us.

Novibra emphasizes the technology leadership in spindles for ring spinning machines with the new clamping device CROCOdoff for under-winding-free doffing. This is confirmed by the Chinese spinning mill Luthai Textile Company talking openly of their experience with the first installation.

An independent research on flange profiles, conducted by the well-respected German Institute iTV Denkendorf, attests Bräcker the superiority in the field of spinning rings. The flange profiles of the Bräcker TITAN rings achieved by far the best results in the tests.

Graf reflects on the outstanding performance of its Circular Combs and Top Combs and gives us an overview of all types of combs available, including the latest joint development with Rieter, which is the Ri-Q comb and now available on all E80 combing machine from Rieter. In another article Graf accentuates the importance of intensive Customer Support in the carding department.

Suessen shows its competence in modernizing your conventional ring spinning frames into an EliTe®Compact Spinning Machine. The article provides detailed information about the manifold aspects to be considered when planning a perfectly performing compact spinning machine. It makes very clear that every EliTe®CompactSet leaving the Suessen factory is a “tailor-made” solution for the specific machines of our customers.

In a very interesting mill report, the Indian spinning mill Nitin Spinners Ltd. describe their benefits from using the Suessen EliTe®CompactSet.

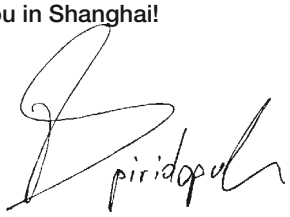
WST (Research & Development Centre of Suessen) gives you an insight on very sophisticated calculations in CFD (Computational Fluid Dynamics) applied in many aspects of product development in rotor spinning, air-jet spinning and compact ring spinning.

Further it is my pleasure to introduce to you the new Managing Director of Suessen and Wilhelm Stahlecker GmbH, Mr. Roland Eberhardt, effective March 1st, 2013.

Our aim is to keep the SPINNOVATION as a technical magazine with a lot of technical information for our customers. Our aim is not to use the SPINNOVATION as an advertisement brochure for the PTC products. I am pretty sure that the actual issue of our magazine, which has meanwhile become well-known in the textile world, fulfils this task quite well.

I very much hope you will enjoy not only the contents of this new SPINNOVATION, but also the new layout, and invite you to give us your comments and suggestions for further improvements.

See you in Shanghai!



Novibra

Vladimir Procházka, Product Manager

Welcome to the world of high-speed spindles

The history and the present day of the world's biggest exporter of spindles

Let me introduce Novibra with short note on its history. The company was founded in 1920 in Stuttgart, Germany, and in 1963 transferred to Owen, Germany. In 1976, Spindelfabrik Suessen took over a 60% share of the company.

Development of HPS 68 and NASA HPS 68

The years 1988 and 1989 were probably the most important for Novibra and for ring spinners worldwide. The new design of spindles HPS 68 was developed in 1988 and NASA HPS 68 in 1989. The revolutionary HPS design of spindles (introduced in 1988) changed classical ring spinning and opened new prospects for spinning at speeds of up to 25,000 rpm. Thanks to this design not only the spindle speed, but also the lifetime, particularly the lifetime at very high speed could be substantially increased. Till now the HPS design has maintained its unbeatable position and has become a synonym for high-speed spindle design.

The next milestone in Novibra's history was the year 1992 when the company was transferred to Boskovice, Czech Republic. The textile industry and textile machinery is very traditional in the Czech Republic. Located just 70 km from Boskovice is Usti nad Orlici, a place famous for being the birthplace of open-end spinning technology. The Usti based manufacturer of the first OE machines in the world (originally Elitex, nowadays Rieter CZ) became a member of Rieter Group in 1992.

When Novibra also became a member of the Rieter Group in 2001, cooperation between

both companies deepened. Traditionally Novibra also maintains very close cooperation with other companies of the Rieter/PTC Group, mainly WST Suessen, but also with Braecker, Graf and Spindelfabrik Suessen.

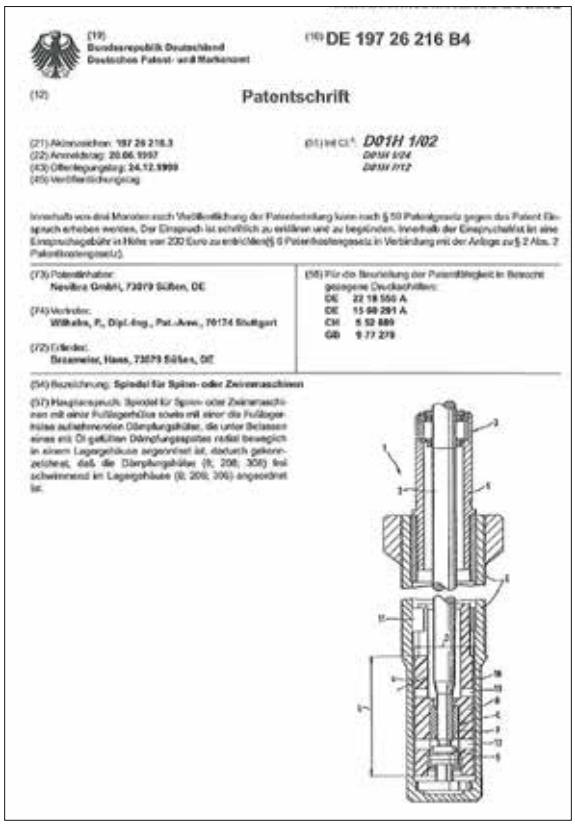
Since the introduction of the HPS design in 1988, Novibra has developed and produced a wide range of various types of high speed spindles, all equipped with an insert based on the HPS 68 design.

Beside complete spindles, Novibra also supplies individual inserts and thus other spindle brands are also equipped with Novibra technology.

Almost all renowned manufacturers of ring spinning machines specify NOVIBRA spindles for high performance.

Further development of HPS brought further improvement and diversification of our portfolio:

The double housing spindle NASA HPS 68 (NASA for short) reduces noise as well as vibration level. NASA is the most used spindle for premium spinning machines. The number of produced NASA spindles reached 7 million. NASA has become a standard for high-speed spindles particularly for speeds above 20,000 rpm.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(73) Patentinhaber:
Novibra GmbH, 73079 Süßen, DE

(74) Vertreter:
Wilhelm, F., Dipl.-Ing., Pat.-Anw., 70174 Stuttgart

(72) Erfinder:
Strasmeier, Hans, 73079 Süßen, DE

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(54) Bezeichnung: Spindel für Spinn- oder Zwirnmaschinen

(57) Hauptanspruch: Spindel für Spinn- oder Zwirnmaschinen mit einer Fußlagerhülse sowie mit einer die Fußlagerhülse aufnehmenden Dämpfungshülse, die unter Belassen eines mit Dämpfungsmittel gefüllten Dämpfungsspaltes radial beweglich in einem Lagergehäuse angeordnet ist, dadurch gekennzeichnet, daß die Dämpfungshülse (8; 208; 308) frei schwimmend im Lagergehäuse (9; 209; 309) angeordnet ist.

In contrast, L HPS 68 spindle is designed for spinning of coarse yarn counts. This spindle is suitable for bigger bobbins. In spite of its speed limit of 16,000 rpm max. this model is very popular among coarser yarn spinners. It is also worth pointing out that the L HPS 68 spindle is the only modern high-speed spindle with a neck bearing of 6.8 mm available in the market for very coarse counts.

Energy saving versions HPS/3 and NASA/3 significantly reduce energy consumption. In general Novibra has always focused on the reduction of spindle vibrations, higher speed, consistent yarn quality, low maintenance and longer lifetime.

Our objective it to provide a wide range of spindles to cover the economical and quality requirements of yarn producers and spinning machine manufacturers. The After-Sales Service is a key part of our company's philosophy. Our sales managers and technicians are travelling all around the world sharing know-how with our customers.

A spindle is not just a bearing. The development of yarn catching and cutting devices also has an interesting history – from the traditional Novibra steel catcher to more advanced yarn catchers, still used by machine manufacterers, and finally to modern SERVOGRIP catchers on RIETER machines. The recently introduced CROCOdoff cutting crown offers new opportunities to spinning mills equipped with autodoffers. Spindles with CROCOdoff cutting crowns help to improve the doffing process significantly and meet the growing requirements of modern spinning mills. CROCOdoff is not the last word. More new projects are on our road map.

Besides spindles, NOVIBRA also produces LUBRICO state of the art lubricating machines, top rollers equipped with the MICRO SEAL system, bottom rollers, various types of heavy-duty spindles and also individual spindle components – cutters, inserts, brakes etc…

NOVIBRA is the only 100% European manufacturer of high-speed spindles.

NOVIBRA is the leader in spindle technology and the only 100% in-house spindle maker, the biggest exporter of spindles worldwide.

Novibra

Hana Vávrová, Senior Sales Manager

CROCOdoff in Leading Chinese Spinning Mill Luthai

Luthai, trendsetter for whole China testing CROCOdoff

魯泰紡織股份有限公司
LUTHAI TEXTILE CO.,LTD.

Contact:
Luthai Textile Co Ltd
81 Songling East Road, Zizhuan District
Zibo City Shandong 255100
P.R. China

Whenever I am in Shandong province I never miss a chance to visit this company. I am not the only one. There is a reason why each and every company, striving to be trend setter in the textile market, seeks for opportunity to test their new products or take part in the Olympics in Luthai.

Luthai is the largest producer of high-grade yarn-dyed fabrics in the world. They excel in cotton planting, spinning, bleaching, dyeing, weaving, finishing and garment making to name a few. Almost the complete production is targeted for export to American, European as well as Asian markets.

Among many other honours Luthai was granted the base of the yarn dyed fabric research and development by China Textile Industry Association and its GREF shirts were repeatedly awarded grade AAA by Quality Association of China.

Today Luthai group can present the following figures:

Ring Spinning: 580,000 spindles out of which 80% are compacted, production of yarn about 95,000 kg/day.

Weaving: 3,000 sets of shuttleless loom, producing 477 km of yarn-dyed fabrics/day.

The count ranges from 30´s to 160´s in ring spinning. Using 100% combed cotton of local XinJiang production as well as cotton imported from the USA, Australia or Egypt.

However, as Mr. Dong emphasizes, none of these would be possible without devoted employees. They are at the top of company´s priorities and naturally the ultimate value company treasures together with their know-how. There are more than 23,000 people working in Luthai.

I took the advantage of the opportunity and interview Mr. Guo Heng – Luthai Group Yarn Department Manager – and Mr. Dong Qiang – Luthai Textile Co., Ltd. 2nd Yarn Factory Director.

Mr. Guo Heng

While travelling in China I have learnt that Luthai is a trade mark of quality to any spinning mill. How have you managed to gain such reputation?

We have always focused on innovations, accepting the challenge and we have managed to keep avoiding big mistakes. We are also effective in acceptance of new technologies and last but not least our big advantage are our employees.

I believe many manufacturers are eager to cooperate with you.

Luckily we are still growing as a company and therefore have a chance to explore new technologies and seek the most convenient partners to our needs.

Could you tell us about the ongoing ring spinning frame Olympics? Which producers provided you with sample machine?

We were making trials with Rieter, Zinser, Toyota, LMW frames, but also with local machine producers as Jingwei, Tonghe or Mazuoli Dongtai. Generally said most of our machines and equipment are imported from Switzerland, Germany or Japan, however, we are always open to invest in new technologies which will bring us long service lifetime, energy savings and stable performance regardless the manufacturer country of origin.

Novibra is now launching new generation clamping device CROCOdoff (LongYa in Chinese) to the market. We appreciate to cooperate on this project also with Luthai. How did you actually learn about CROCOdoff?

The first time we have learnt about CROCOdoff was thanks to Novibra sales representative. Then we had a chance to see Best Machinery frame with CROCOdoff running in ITMA Shanghai. Therefore it was no surprise when TongHe addressed us and offered one machine with Novibra spindles with CROCOdoff for testing. On the top of it we have very good experience with Rieter Servo Grip system on K44 and a chance to get the same performance of cutting crown on other than Rieter machine is simply appealing.

What is your experience with CROCOdoff?

We are running TongHe frame with 1008 Novibra spindles and CROCOdoff for more than 6 months. We had to stop the frame for 1 month and move it to another place due to ongoing Olympics. However, as you could see the frame is running again. We moved it ourselves, no assistance from TongHe technicians was needed. They just helped us at the very beginning to set the machine for CROCOdoff needs.

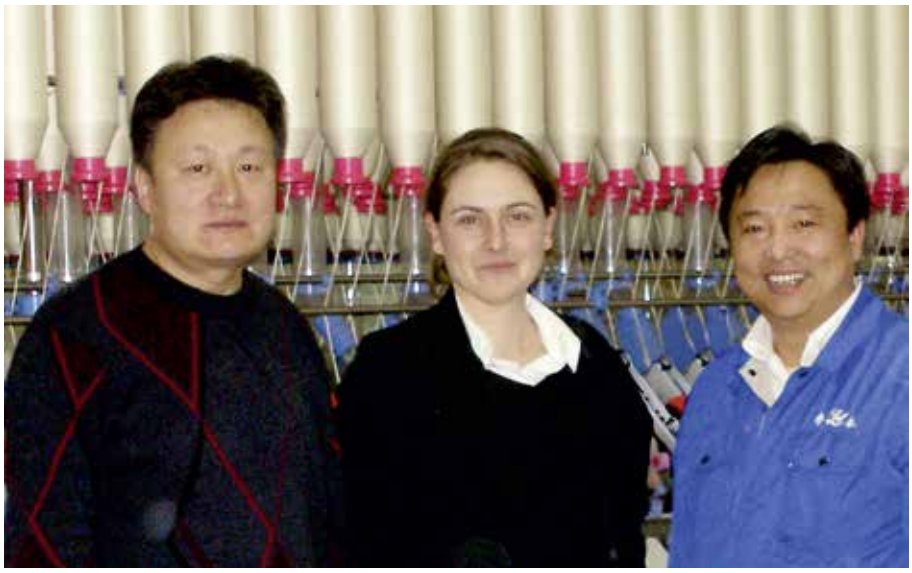
What do you mean by needs of CROCOdoff?

Frame software had to be adjusted by TongHe technicians to make sure the brake can stop in an instant and the spindle rail is in correct position in that moment. It is important in order to keep very short underwinding in CROCOdoff. I appreciate there was no delay in comparison to standard machine installation. The adjustment took just a few minutes. What is important to me the cooperation between frame and CROCOdoff is OK. The CROCOdoff itself is working well, we managed to reduce the ends-down at doffing by 50% in comparison to frame with yarn catcher.

And last but not least we have been successfully increasing the speed of the frame yet keeping the desired ends-down figures.

Thank you very much for your comments and we wish you a lot of success in your business.

Mr Shao Li Jie, Ms Hana Vávrová, Mr Dong Qiang

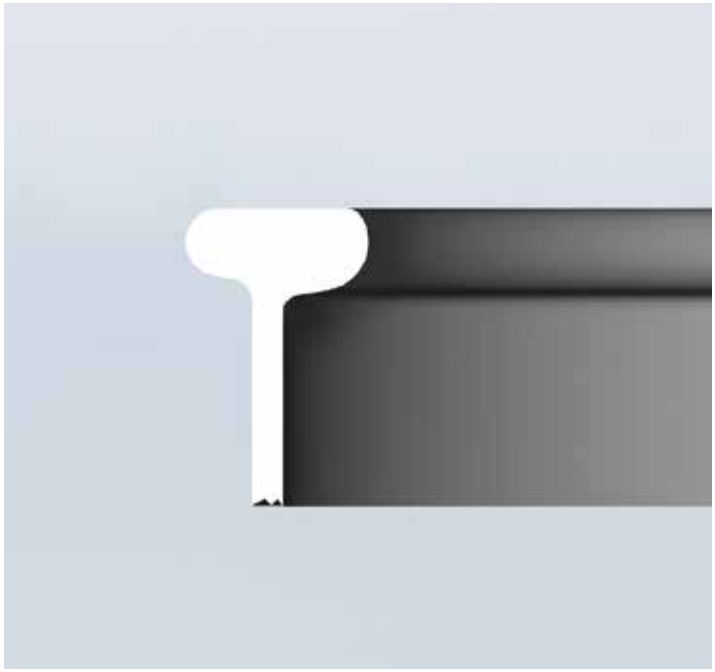


An independent Study of ITV (Institut für Textil- und Verfahrenstechnik, Denkendorf)

Comparison of Flange Profiles of Renowned Ring Manufacturers with Bräcker TITAN Ring, Profile N 98

The ring spinning process owes its dominance over other spinning methods established in the market to its simplicity and to the excellent quality of the yarns as a result of the real twist imparted by the ring/traveller system.

TITAN Ring, Profile N98, Flange 1



The element limiting productivity on a ring spinning frame is the ring/traveller system. Numerous trials have been undertaken in the past to replace the real twist by systems permitting a higher speed. The ingenious simplicity of the system as well as certain characteristics of the yarn spun could, however, not be reached until now.

It is essential to master the complex interplay of all parameters of the system to exploit the productivity of the ring spinning frames completely. It is almost an art to create a ring/traveller system which fulfils all the requirements for the process to the same extent, like productivity, yarn quality and low operating costs. As is generally known, the ring/traveller system has the primary functions to impart twist, build up yarn tension and wind the yarn. Major focus is initially put on yarn quality and productivity.

Traveller parameters must be adjusted to optimize yarn IPI values and yarn hairiness. On the other hand, a traveller type must be chosen which enables a steady lubrication film, as otherwise traveller wear, speed reduction and frequent traveller exchange are the consequence. The lubrication film also helps to reduce friction. This permits maximum speeds and minimum power consumption of the system.

Requirements for the ring/traveller system

Both the ring profile and the surfaces of ring and traveller must contribute to enable such a system to reach its entire productive efficiency. They help to improve not only the adhesion of the lubrication film, but also the emergency running properties in the mixed friction area. The travellers chosen in combination with certain rings and yarn types – with their different shapes and wire profiles, dimensions and coatings – must ensure the

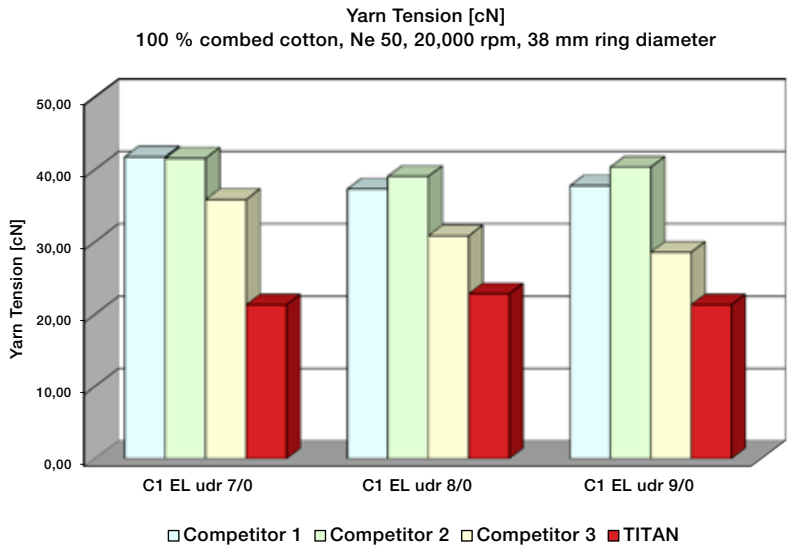
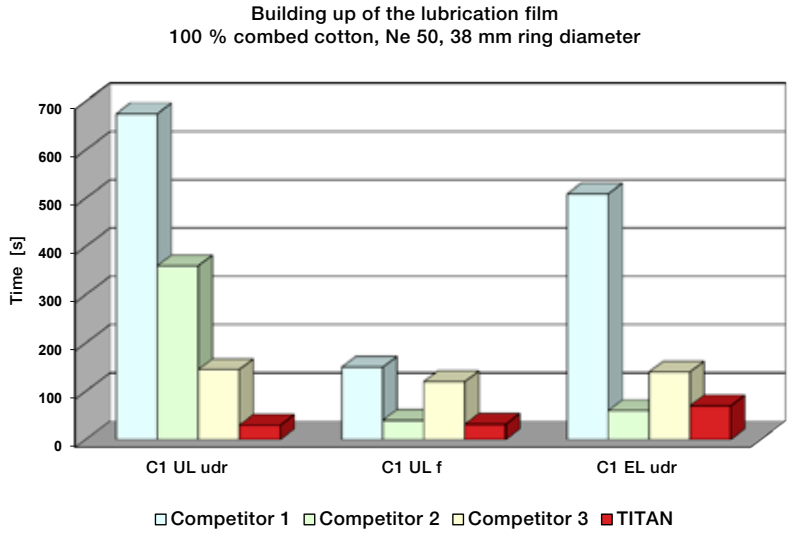


Fig. 1 - Average tensile strength of different systems with one traveller type, 3 weights each and 20,000 rpm; exemplary presentation

Fig. 2 - Time required for building up the lubrication film



build-up of the lubrication film and optimum yarn quality. In addition, the harmonization of these parameters is of utmost importance for the center of gravity and the running properties of the traveller. A smoothly running traveller is decisive for the ends-down rate of the machine.

The independent study by iTV (Institut für Textil- und Verfahrenstechnik Denkendorf) shows that not all ring/traveller systems of different suppliers reach the same results. This is aggravated by the fact that such systems must be manufactured with a highly consistent quality to provide invariable spinning conditions in the mills.

Study

Numerous new providers have entered the markets in the last years offering a confusing number of rings and travellers. Naturally, it is possible to use one of these systems which offers an acceptable performance, but as a result of the complexity of the system customers often find that other parameters are inadequate.

The study published here has focused on the following aspects:

1. Influence of different flange profiles on yarn tension
2. Build-up and destruction of the lubrication film
3. Traveller wear

This large-scale study compares Bräcker TITAN rings, profile N98, flange 1, 38 mm inner diameter, with various flange profiles of other renowned suppliers. After a thorough running-in of the rings and travellers, a Ne 50 cotton yarn was spun from 1 1/4” staple fibres. For each type of flange we used 12 rings.

1. Yarn Tension

To evaluate the productive efficiency of the systems at a number of speeds up to 20,000rpm, several types and weights of travellers were applied. The first parameter measured for each variant was the tensile

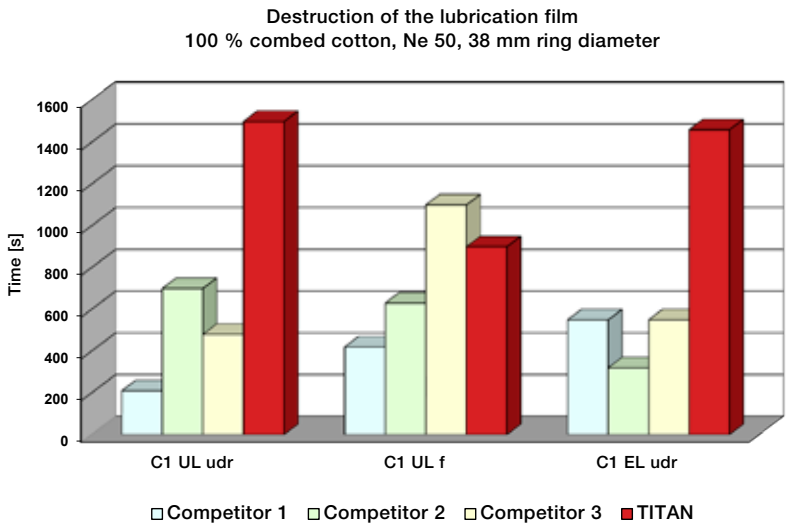
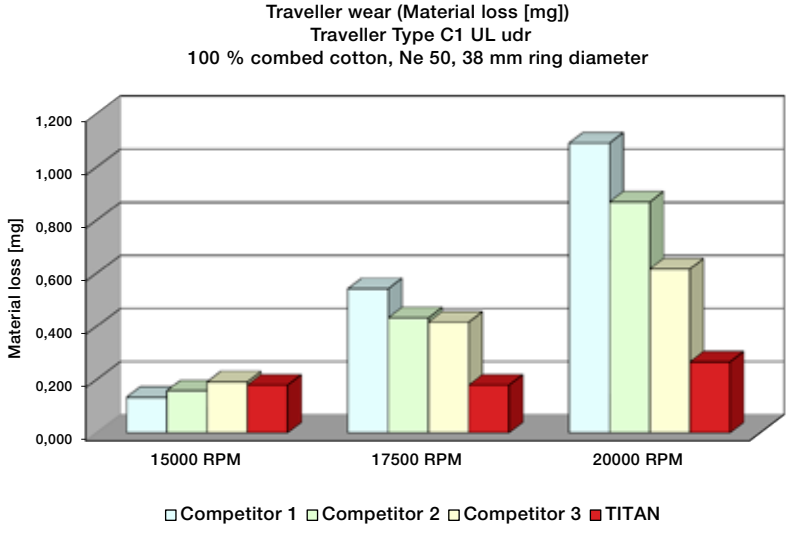


Fig. 3 - Time required for destruction of the lubrication film

Fig. 4 - Material loss of travellers



strength of the yarn above the yarn guide. These values provide direct information on the frictional forces of the ring/traveller system (Fig. 1). A low and constant yarn tension indicates an optimal coefficient of friction between ring and traveller.

2. Lubrication Film

The test set-up for the tensile strength was also used to measure the time required for build-up and destruction of the lubrication film (Figs. 2 and 3).

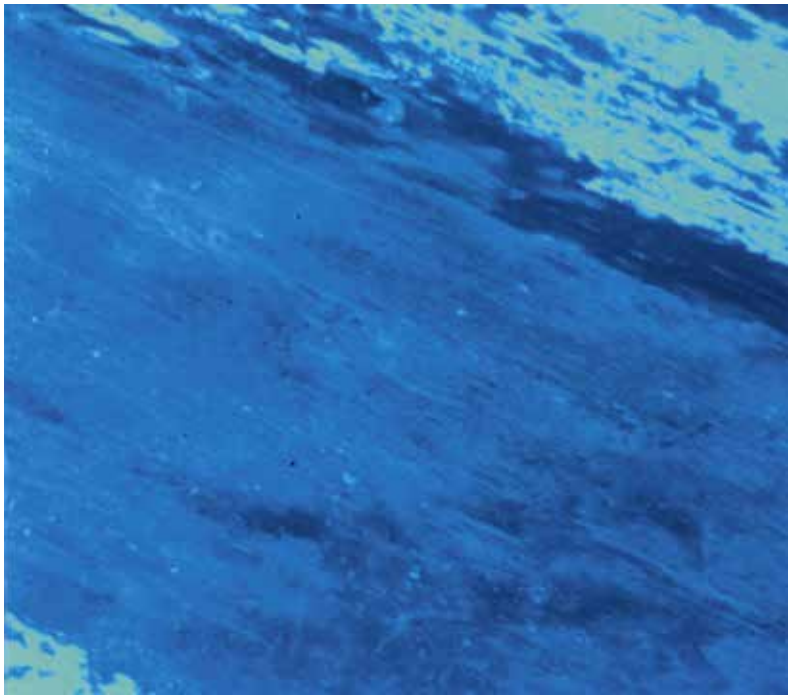
When the yarn is deflected in the traveller, marginal fibres spread off and some of them are drawn into the gap between ring and traveller and squeezed on the ring track. This creates a fibrous lubrication film which considerably influences the frictional conditions and the traveller wear.

Ring and traveller surfaces supporting the quick build-up of a lubrication film and stabilizing it by good adhesion, contribute substantially to reduced wear in the system. This is one of the most important prerequisites for high productivity and constant yarn quality at a minimum power consumption.

3. Traveller wear

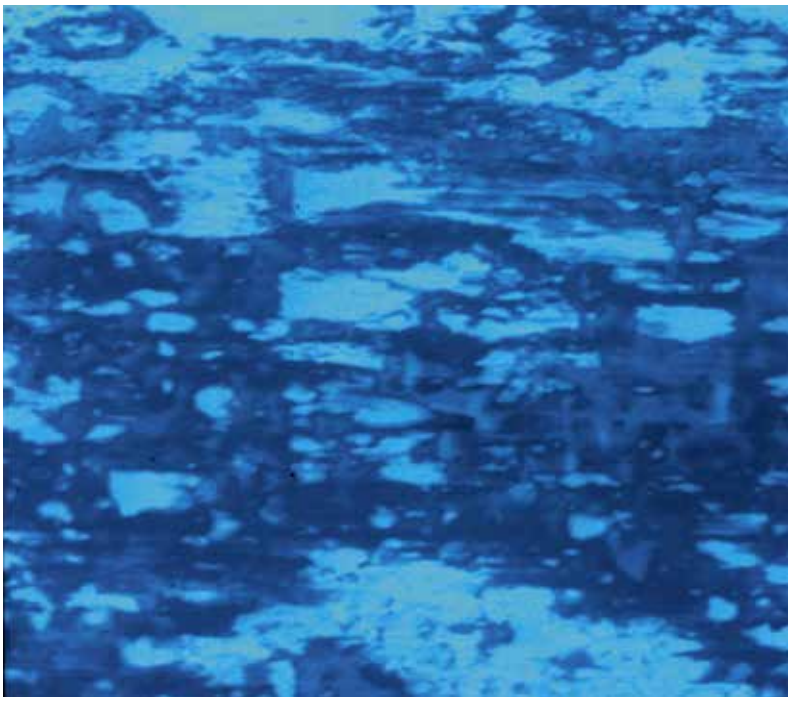
After a defined running time, the mass loss of the individual travellers was determined and thus the corresponding wear (Fig. 4).

The positional stability of the traveller during the cop running time also influences yarn quality, ends-down rate and traveller wear. This was measured indirectly by means of the peaks of the tensile strength. For control, “wind high-speed” videos were made under various working conditions. They enabled us to evaluate how the normal position of the traveller is changed, for example at the reversing points of the ring rail This is just another indication for one aspect of the ring/traveller system which takes influence on the whole quality of the end product, but it is not dealt with here with more details or diagrams.



Good lubrication film – even distribution

Bad lubrication film – spotty distribution



Summary

The results of the extensive tests are as follows:

- Measurements of the tensile strength proved that the Bräcker TITAN ring combined with the Bräcker traveller is able to build up the lubrication film more rapidly and to maintain it longer than any other product tested when lubrication “fails”.

- The lower friction of the Bräcker rings enables a very high spindle speed with low energy consumption. (On average 50% of the power consumption of a ring spinning machine is converted into heat due to the friction of the ring/traveller system.)

- Owing to the optimal build-up of the lubrication film with the Bräcker TITAN rings, the traveller wear could be substantially reduced. This has a positive influence on the traveller service life and thus directly on operating costs and productivity.

Conclusion

The sum of the results of the individual tests supports the statement that the combination of different flange profiles and travellers has a clear influence on the build-up and destruction of the extremely important lubrication film. It shows in addition that the flange profiles of the TITAN rings by the Bräcker AG achieved by far the best results in the tests.

Felix Hasler, Head Product Management

Circular Comb and Top Comb

Together with the top comb, the circular comb is the key technological component of the comber, influencing the characteristics of the yarn with respect to evenness, strength and cleanliness which in turn have a direct effect on the finished product as far as softness, visual effect and grip is concerned.

To improve the quality of the end product it is essential for the comber to extract short fibres, neps and other impurities and to produce an even sliver. The combing intensity, also referred to as comber noil percentage, depends on the cotton processed and its staple characteristics. It is the aim of the combing process to comb out as little as possible to achieve the optimal result for the intended application and the cotton processed.

To define ideal machine settings spinning tests are usually required, however the further processes also have to be taken into consideration.

The combing process is influenced by a number of parameters, e.g. raw material, material preparation, condition of the comber, machine settings as well as environmental influence. Only a perfect interaction between circular and top comb, which are designed to ideally harmonize, assures a proper combing performance.

The circular comb combs out the protruding part of the fibre fringe which is held by the nipper. In the process of transporting the fibre fringe to the detaching roller, the top comb combs out the part of the fibres previously clamped by the nipper.

The decisive factors for the selection of the correct circular- and top comb are: raw material parameters, staple length, fibre fineness, desired degree of combing, type of comber as well as production rate.

The various types of circular combs differ with respect to design, configuration and dimensions. In the past there used to be combers with circular combs with a larger outside diameter. Today's standard outside diameter, which is more or less established, is for 125.35 mm with an inside diameter of mostly 85 mm. Furthermore there are circular combs with combing surfaces of 90°, 111° and most recently up to 130°. A general rule applicable for circular and top combs is that the higher the number of points per cm2 or teeth per cm, the higher the comber noil percentage or waste.

In addition there are variations in working angle, number of segments and lengths of segments, depending on the type of comb. Graf has been producing circular and top combs for more than 25 years. Past and current developments of these products have been and are primarily in co-operation with Rieter. The product range of circular combs comprises the brand names PRIMACOMB, COMB-PRO and Ri-Q-Comb; for the top combs the brand names are Ri-Q-Top and FIXPRO.

Combing products of Graf

PRIMACOMB 5025

PRIMACOMB

Years of research have resulted in the development of the PRIMACOMB high-performance circular comb. It allows an optimal combing process on all combers and as a result of the excellent performance Rieter applies it to initially equip their combers.

COMB-PRO

These circular combs have been developed for combers that run with maximum speed of 400 nips/min. This economically attractive circular comb reaches a slightly lower lifetime, but still meets the required quality parameters.

Ri-Q-Comb

The latest generation of circular combs has been developed in co-operation with Rieter for their most recent E80 comber. The highlight of this circular comb surely is the increased combing surface of 130° which allows an optimal combing action. The entire design of the circular combs has been changed; this model is for installation straight to the comb shaft without any additional components. This has got a very positive effect on the tolerances of the whole circular comb system. This generation of circular combs is for exclusive application on Rieter E80 combers.

Type	Combing surface	No. of sections	Application	Types of combers
Summary PRIMACOMB				
5014	90°	4	Short / medium staple	Rieter E7/5 – E60 and similar
5015	111°	5	Medium / long staple	
5025	90°	5	Medium / long staple	
5028	111°	5	Long staple	
8014	90°	4	Short /medium staple	Rieter E62 – E76 and similar, comb with conical draw-in area
9015	90°	5	Medium / long staple	
9030	90°	6	Long staple	
Summary COMB-PRO				
F14	90°	4	Short / medium staple	Rieter E7/5 – E60 and similar
F15	111°	5	Medium / long staple	
Summary Ri-Q-Comb				
i400	130°	5	Short / medium staple	Rieter E80 only
i500	130°	5	Medium / long staple	
i700	130°	6	Long staple	

Ri-Q-Comb product family

Ri-Q-Top

Today's generation of high performance combers puts increased demands on the two key components in the combing process, i.e. circular and top combs. It is only due to the special configuration, the precision and the special finish of these key elements that the increase in production rates as known today can be realized with the same or improved technological values. The top comb was developed with the goal of substantially extending the cleaning intervals – an aim that could be reached. This top comb ideally complements the circular combs PRIMACOMB and Ri-Q-Comb and assures highest values in the range of combed yarns.

FIXPRO

The FIXPRO top comb is constructed identically to the Ri-Q-Top and is designed to preferably complement the COMB-PRO circular comb.

Graf provides the entire scope of circular and top combs to cover all requirements and applications. Great efforts are undertaken to develop new circular and top combs to assure perfect components for the latest, but also for older types of combers.

Type	Teeth / cm	Application	Types of combers
Summary Ri-Q-Top			
2026	26	Short / medium staple	Rieter E7/5 – E80 and similar
2030	30	Medium / long staple	
Summary FIXPRO			
C26	26	Short / medium staple	Rieter E7/5 – E60 and similar
C30	30	Medium / long staple	

Michael Müller, Project Engineer

Customized EliTe®CompactSet

Facts:

The EliTe®Compact Spinning System is available

- for ring spinning machines of 15 different manufacturers
- for 88 different machine types
- with 521 different EliTubes
- with 223 EliTop variants
- in more than 3,000 different executions
- We have equipped 6,455 machines with over 6,000,000 spindles.

EliTe®CompactSet is the modernization package for short and long-staple ring spinning machines. It is designed to meet even the most challenging demands that high-end spinning mills make on a compact spinning system:

- Optimum and sustained yarn quality
- High consistency of all yarn parameters
- Minimal variation between spinning positions
- No restrictions in regard to raw material
- Easy handling
- Universal application
- Can be installed on almost all machine types

The Distinctive Characteristics of EliTe®CompactSet

- Variants for spinning short-staple and long-staple fibres (worsted spinning)
- Designed for all types of fibres and blends
- Works with spinning single yarns, two-ply yarns and core yarns
- Optimized and universally applicable spinning accessories and components
- Retrofit possible to most different types of top weighting arms of well-known suppliers
- Can be applied to new machines by the OEM or retrofitted to all types of ring spinning machines of renowned machine manufacturers

This article deals in particular with retrofitting various types of ring spinning machines. A modernization package mainly comprises the following four components:

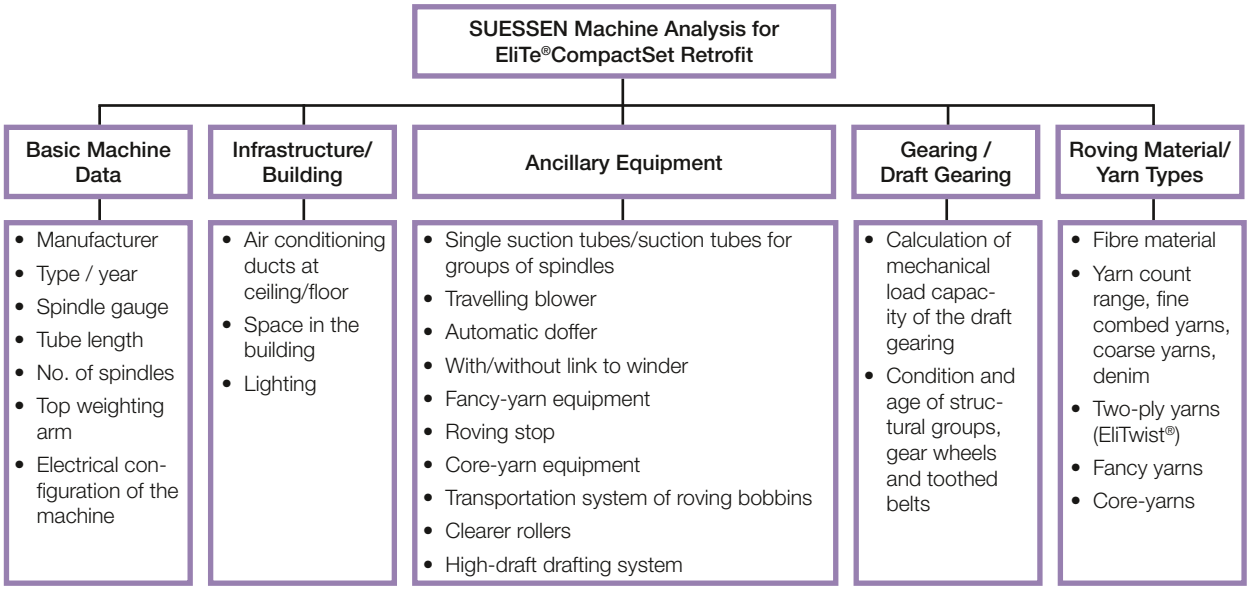
- EliTop with front top roller, EliTe®Roller and top weighting unit
- EliTube with lattice apron, insert, tensioning device and fixation to the roller stand
- EliVAC system for generating the vacuum
- and sometimes gear reinforcement

1. Prior to each modernization a number of different factors are inspected and analyzed.

Basic machine data

At first, important details of the basic machine are checked; the year of construction is often decisive. Some manufacturers have already changed details in the design of their frames without these changes being reflected in the machine type.

Other important criteria are the machine length, defined by spindle gauge and number of spindles, as well as the tube length applied.



Existing auxiliary devices

A customer's machine is also defined by its individual equipment which is very important for the retrofit solution:

- Bobbin creel
- Single suction tubes/suction tubes for groups of spindles
- High-draft drafting system
- Automatic doffer
- with/without link to the winder
- Travelling blower
- Fancy-yarn equipment
- Roving stop
- Core-yarn equipment
- Transportation system for roving bobbins
- Ducts for air-conditioning
- Clearer rollers

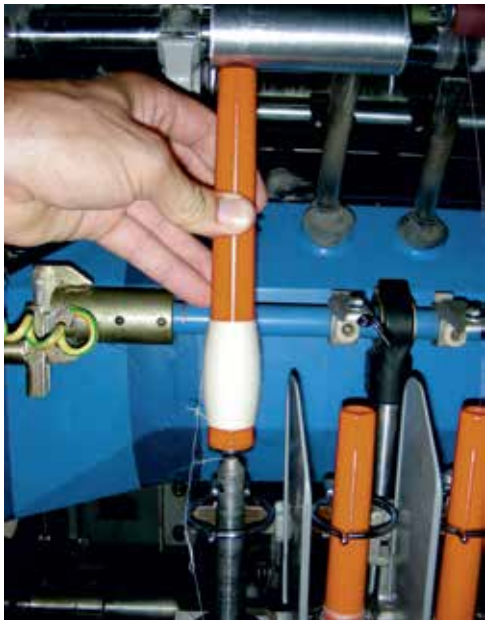
The draft gearing

The mechanical load capacity of the gearing is calculated: Which moments is the gearing able to take up? In addition, the calculation is influenced by the current condition of the machine and the age of its components.

Yarn specification

For which applications must the machine be designed? The important factors here are of course the fibre material, yarn count range, yarn twist range, single yarn or two-ply yarn, fancy yarn, core-yarn etc.

Fig. 1: Doffing not possible



Based on this data collection our engineers develop a survey of the forces performing on the machine, as well as of the space available in, at and around the machine. From this result the interventions required to modernize the machine.

The specific individual adjustments and interventions concerning the machine and its components are outlined in the following.

2. Adjustments on the drafting system

Offset in the drafting system

For certain machine types and in combination of tube length with automatic doffer it may be necessary to offset the entire drafting system in the spinning sections. This is required if a component of the swung-in doffer beam touches EliTube or EliTop when the full cops are removed (Fig. 1).

Depending on the machine type, various offset solutions are applied:

- Offset in the drafting plane (Fig. 2)
  Example: Zinser (short-staple machine)
- Offset in vertical direction (Figs. 3 and 5)
  Example: KTTM & Toyota
- Combined offset (Fig. 4)
  Example: Zinser (worsted)

As a result of this offset of the drafting system in the spinning sections it is necessary to also adjust the draft gearing. These solutions are available:

- Height offset of the draft gearing by installing spacer rails; this solution is applicable – among others – on the Toyota and KTTM ring spinning frames (Fig. 6).
- Installation of a parallel crank coupling (Fig. 7) – for example on Zinser and Cognetex ring spinning machines

Fig. 5 - Use of spacer rails

Fig. 6 - Height offset of the draft gearing

Fig. 7 - Parallel crank coupling

- Installation of an intermediate gearing box
  Example: Zinser 351

Reinforced Gearing

Depending on machine type and number of spindles it may be necessary to reinforce or replace the draft gearing of the ring spinning frame to be modernized. This is the case if the existing gearing cannot produce the required torque. Prior to a decision, SUESSEN analyzes and calculates the existing drives. On the

Fig. 2 - offset in the drafting plane

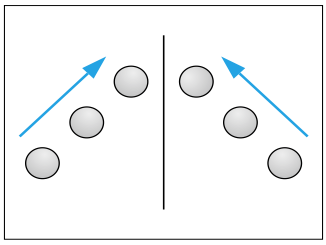


Fig. 3 - offset in vertical direction

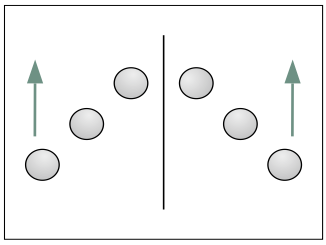


Fig. 4 - combined offset

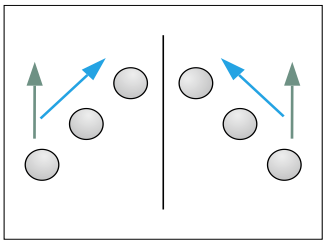


Fig. 8 - Installation of new motors

basis of this calculation the optimal solution is found. Some solutions are listed here:

- Mechanical reinforcement only
  Examples: Zinser 421 E, Lakshmi LR6
- Load relief of the existing drive:
  - reduced load on the existing drive
  - load assumed by new SUESSEN components
  Example: Rieter G33
- Installation of new motors and new mechanical components (e.g. gear wheels, belts, bearings and shafts)
  Example: Rieter G30
- Drive with servomotors complete by SUESSEN
  Example: Zinser 351

If the ring spinning machine has the additional feature of a fancy-yarn equipment, special attention must be paid to the design of the gear reinforcement:

- Multicount usually is no problem
- Multitwist only after consultation and approval of the Multitwist manufacturer

3. EliVAC production of vacuum

Dimensioning the filter box size and motor capacity of the EliVAC motor, but also the EliPipe diameters, directly depends on some parameters of the ring spinning machine and the intended application.

The following filter box types are specified:

Type 1:
- Height: 569 mm
- Motor capacity 5.5/7.5 kW
- With screen
- Exhaust air to the top only
- Supply air optionally from top/front
- Without pneumatic wiper

Type 2:
- Height: 701 mm
- Motor output: 9.7/11.5/15 kW
- Exhaust air to the top only
- Supply air optionally from top/front
- Optionally with/without pneumatic wiper
- Optionally with/without screen

Type 3:
- Height: 883 mm
- Motor output: 9.7/11.5/15 kW
- Exhaust air optional to the top/bottom
- Supply air optionally from top/front
- Optionally with/without pneumatic wiper
- Optionally with/without screen

The diameters of the large EliPipes vary from 160, 200 to 250 mm. The diameter depends on the air requirement resulting from machine length, number of spindles and single yarn/ EliTwist®.

4. EliTube – Adaptations at the roller stand

The EliTubes are fixed between two roller stands. Depending on the machine type, the roller stand design and possibly an offset of the drafting system, the measures to be taken are decided. As a rule, it is sufficient to remachine the existing roller stands (Fig.9), or to install an adapter at the existing roller stand (Fig. 10).

Occasionally, the roller stand must be replaced. SUESSEN will always strive to find the optimum technical and economic solution.

Fig. 9 - Remachining of existing roller stand

Fig. 10 - Adapter at the existing roller stand

5. EliTop adaptation at the top weighting arm

The following top weighting arm types are suitable for EliTe®CompactSet:

- SUESSEN: HP-A 310/320, HP-GX 3010, HP-A 510, HP-GX 5010
- Rieter: P3-1
- SKF/Texparts: PK225, 2025, 2130, 255/2055, 2155, 3000, PK 2630 SE, PK 2655 SE; 1601, 6000
- Toyota Alpha
- Chinese Texparts copies

Technological tests in spinning mills have proved that the best yarn parameters are achieved with the HP top weighting arms.

6. Space available in the drafting system

The space available in the area of the drafting system in the spinning sections can be restricted by different serial or special equipment:

- Bottom apron tensioning device
- Pneumafil suction tube for groups of spindles
- Core-yarn device
- Roving stop device (Fig. 11)

In such cases individual solutions for the suction tube connection at the EliTube, the options of leading the suction hoses etc. must be found.

7. Space available in the creel and immediate vicinity of the ring spinning machine

Around the creel of a ring spinning frame there is a multitude of optional equipment that implicates individual solutions for placing the

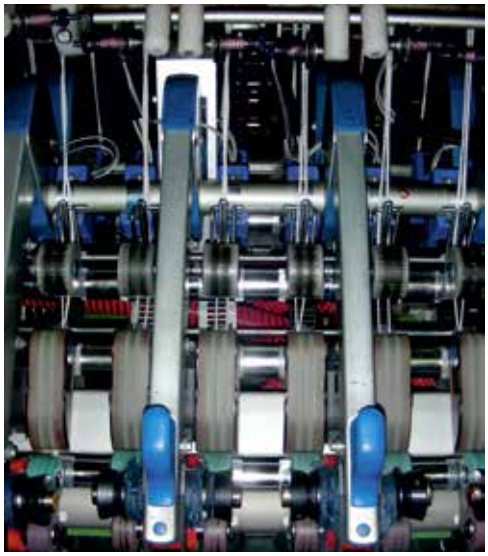


Fig. 11 - Roving stop device

EliPipes and the filter box. For example:

- How many rows of roving bobbins are there in the creel?
  The number of rows can be odd or even. In case of an odd number of roving bobbin rows, one row is exactly in the machine centre. Installing the EliPipes in the creel is then slightly more difficult.
- EliTwist®: The double number of roving bobbins must be placed in the creel, and the bobbin diameter has an influence on the space available.
- Roving guide rails
- Various types of transportation for roving bobbins:
  - Chain (meander through spinning mill)
  - Dead-end branch
  - Individual supply to each row of creel
  - With package doffer (e.g. HOWA)
- Blower travelling above the creel; there are various kinds of drives like driving belt with stationary motor, drive motor in the blower with trailing cables or power rail, sometimes reaching across several machines. Different methods of discharge of the travelling blowers occupy space above the machine (Fig. 12/13).
- Other special drives in the area of the creel of a ring spinning frame can belong to core-yarn or fancy-yarn equipment, or external electric devices like frequency inverters, which cannot be integrated in the machine (Fig.14).

Fig. 12 - Shift the position of the travelling blower

Fig. 13 - Discharge of the travelling blower

All these measures and special devices directly influence the position and installation of the pipes and filter boxes necessary for the EliVAC system.

In this context we have to mention again the filter box type (EliVAC generation of vacuum) already discussed in item 3. The filter box should ideally be placed in direct proximity to the ring spinning frame, for which it generates the vacuum. It can only be cleaned during the doffing operation.

As a rule, the EliVAC filter box is installed directly on the headstock or endstock of the machine or next to the machine on a separate standard rack. Some restrictions can make this difficult or even impossible.

- It can for instance be necessary to shift the position of the travelling blower and consequently to extend the creel (Fig.12).
- Or the EliPipes must make a detour around the bobbin transportation system (Fig.15).

Measures and special equipment on the ring spinning frame can make it impossible to place the filter box on or close to the machine. Here are some individual EliVAC solutions already realized:

- Rack at the machine with the possibility to park the tube containers close to the machine (Fig.16)
- Filter box on a rack above the link to the winder (Fig.17).

Fig. 14 - Other special drives in the area of the creel

Fig. 15 - Detour around the bobbin transportation system

- Filter box installed in the next room, if there is not enough space around the machine (Fig. 18).

In order to realize these individual solutions, a multitude of EliVAC filter boxes is available to meet all requirements.

8. Special solutions

As has been outlined above, the layout of a modernization with EliTe®CompactSet can be realized most flexibly with a lot of alternative solutions. Here are still some details of individual special types:

Machine sides driven separately

The customer spins two different colours; the machine has a separating foil in the centre. In addition, the left side of the machine is often driven independently from the right machine side. In case that just one side is driven, the filter box should of course create the vacuum for one side only. For this purpose, we developed a solution with damper (Fig.19). And the EliPipe on the creel must be connected separately to each machine side.

Filter box connected to central discharge

This special solution is highly recommendable, because over 10% of energy can be saved. The maintenance intervals are extended and a better yarn quality is produced.

Summary

On the basis of the local conditions our engineers develop the best solution for every customer. Alternatives and the diversity of solutions are almost immeasurable.

In principle, every machine can be upgraded with EliTe®CompactSet. Input and execution and consequently the costs vary from case to case.

Fig. 16 - Rack close to machine

Fig. 17 - Rack on top of winder

Fig. 18 - Installed in next room

Fig. 19 - Separate drive of machine sides

Felix Hasler, Head Product Management

Graf Customer Support

The card is known as the heart of the spinning mill; in this process step the quality of the resulting yarn is significantly defined and influenced.

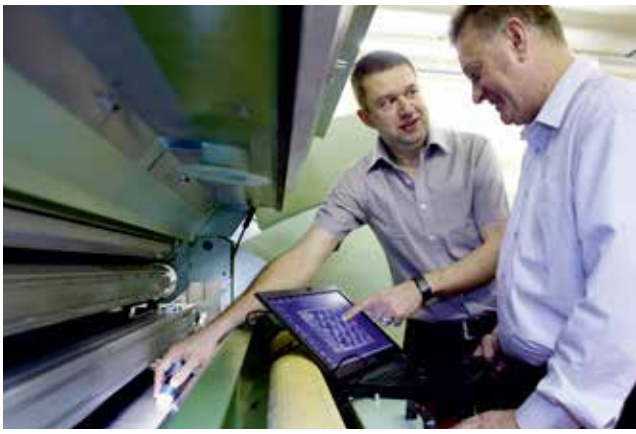
The two decisive parameters for the card are the quality requirements as well as productivity. While production rates of 5 kg/h were common in the sixties, today's rates can be in excess of 200 kg/h, depending on process and application.

As a result of the sturdy construction of textile machinery there are cards that have been in operation for up to 50 years and still fulfil their service. More than an estimated 140 different models of cards are in use worldwide. In order to equip these cards with correct and suitable clothings at the time of reclothing, it is imperative for a card clothing manufacturer such as Graf to know as many of these card models as possible.

Furthermore the dimensions of individual products such as revolving flats, stationary flats, mote knives as well as pre-opening segments have to correspond exactly with the requirements of the card model in question as otherwise the installation would not be possible. Collecting this detailed information can take years and the updating is an ongoing and important process.

Graf today keeps the data of more than 100 types of cards to assure that card-specific requirements are considered at the time of reclothing. Today the selection of correct specifications is made more difficult by the increasing number of second-hand machines that require special attention. These cards appear in certain markets as a result of the shifting of the textile industry from the West to the East.

To recommend the most suitable clothing combination for a card it is essential to know the application in terms of end product as well as the raw material to be processed. Such information is gathered by the technical sales team, either directly from the spinning mills or else through our agents. In-depth training, years of experience as well as well founded knowledge of all spinning processes from bale to yarn distinguish the entire team.



On the occasion of visits to customers the detailed requirements are established and taken into consideration for the resulting specification. Our experienced specialists will competently assist the customers in the correct setting of blow-room equipment and cards. If newly designed clothings are applied, the responsible technical sales will evaluate the conditions together with the customer and if necessary discuss and introduce the measures required. It is only as a result of such comprehensive know-how being available within our company that we can provide such service.

To achieve the maximum lifetime of the card clothings impeccable maintenance is inevitable; this is supported by a sound service schedule which can be established with the support of our specialists. Since each type of material reacts differently, the individual cycles need to be timed correctly. We usually hand out a recommendation for the card clothing management, based on average values which however need to be adjusted depending on the application.

It is a matter of great importance to us that our customers achieve the best possible results with our card clothings throughout their entire life time. More than with any other product in the spinning mill, the purchase of card clothings is a matter of trust and confidence in the entire package comprising technical advice, the product itself as well as correct service.

WST

Peter Blankenhorn, Head Technical Department

Design Optimization by means of CFD

In textile machinery as well as in the industry as a whole, the use of computational fluid dynamics (CFD) has an ever increasing relevance.

On the one hand, the development of computer technology provides processing power engineers could only have dreamed of a few years ago. On the other hand, this enables an immediate reaction to the rapidly changing requirements of the market. A design optimization by simulation is considerably faster than the traditional procedure by mechanical trials. Suessen therefore uses CFD for the design and the optimization of flow-related components. In the present article, the theory, procedure and evaluation of a CFD calculation will be explained by means of a yarn break suction tube of a ring spinning machine with EliTe®Compact Spinning System.

Theory

The fluid flow of Newtonian fluids can be described with the Navier-Stokes Equations that are named after the physicists Claude-Louis Navier and George Gabriel Stokes. Newtonian fluids show a linear correlation between the stress and the strain rate, which is given for air, water and most fluids in technical applications. Equation 1 expressed in words is: the change of the density ρ during the time t in a fluid element plus the change of the mass flow $\rho \cdot u$ in x-direction plus the change of the mass flow $\rho \cdot v$ in y-direction plus the change of the mass flow $\rho \cdot w$ in z-direction equals zero. The symbol ∂ represents the partial derivative. The following three Equations 2, 3 and 4 take into account the momentum conservation. The symbol τ denotes the shear stress, p the pressure and g the gravity. Equation 5 is called the energy conservation law. The symbol e denotes the specific inner energy, h the specific enthalpy, λ the thermal conductivity, T the temperature and $\dot{q}_S$ the heat flux. What looks quite complicated can be expressed in easy words: The rate of change of energy inside a fluid element minus the rate of work done on the element due to body and surface forces minus the net flux of heat into the element equals zero.

This set of equations is able to describe any fluid flow completely, e. g. the flow of water in a pipe, the flow around the wing of an airplane, or even the motion of clouds in the sky. Nevertheless, readers interested in mathematics will note that there are seventeen unknowns and only five equations. The set of partial differential equations cannot be solved. Twelve additional equations are needed. Three additional equations were gained from the state of the fluid and nine additional equa-

$$\frac{\partial}{\partial t}(\rho) + \frac{\partial}{\partial x}(\rho \cdot u) + \frac{\partial}{\partial y}(\rho \cdot v) + \frac{\partial}{\partial z}(\rho \cdot w) = 0 \tag{1}$$

$$\frac{\partial}{\partial t}(\rho \cdot u) + \frac{\partial}{\partial x}(\rho \cdot u^2 + p - \tau_{xx}) + \frac{\partial}{\partial y}(\rho \cdot u \cdot v - \tau_{yx}) + \frac{\partial}{\partial z}(\rho \cdot u \cdot w - \tau_{zx}) - \rho \cdot g_x = 0 \tag{2}$$

$$\frac{\partial}{\partial t}(\rho \cdot v) + \frac{\partial}{\partial x}(\rho \cdot v \cdot u - \tau_{xy}) + \frac{\partial}{\partial y}(\rho \cdot v^2 + p - \tau_{yy}) + \frac{\partial}{\partial z}(\rho \cdot v \cdot w - \tau_{zy}) - \rho \cdot g_y = 0 \tag{3}$$

$$\frac{\partial}{\partial t}(\rho \cdot w) + \frac{\partial}{\partial x}(\rho \cdot w \cdot u - \tau_{xz}) + \frac{\partial}{\partial y}(\rho \cdot w \cdot v - \tau_{yz}) + \frac{\partial}{\partial z}(\rho \cdot w^2 + p - \tau_{zz}) - \rho \cdot g_z = 0 \tag{4}$$

$$\begin{aligned}\frac{\partial}{\partial t}\left[\rho \cdot \left(e + \frac{1}{2} \cdot \vec{u}^2\right)\right] + \frac{\partial}{\partial x}\left[\rho \cdot u \cdot \left(h + \frac{1}{2} \cdot \vec{u}^2\right) - (u \cdot \tau_{xx} + v \cdot \tau_{xy} + w \cdot \tau_{xz}) - \lambda \cdot \frac{\partial T}{\partial x}\right] \\ + \frac{\partial}{\partial y}\left[\rho \cdot v \cdot \left(h + \frac{1}{2} \cdot \vec{u}^2\right) - (u \cdot \tau_{yx} + v \cdot \tau_{yy} + w \cdot \tau_{yz}) - \lambda \cdot \frac{\partial T}{\partial y}\right] \\ + \frac{\partial}{\partial z}\left[\rho \cdot w \cdot \left(h + \frac{1}{2} \cdot \vec{u}^2\right) - (u \cdot \tau_{zx} + v \cdot \tau_{zy} + w \cdot \tau_{zz}) - \lambda \cdot \frac{\partial T}{\partial z}\right] \\ - \rho \cdot (u \cdot g_x + v \cdot g_y + w \cdot g_z) - \rho \cdot \dot{q}_S = 0\end{aligned} \tag{5}$$

tions formulate the relation between the shear stresses and the velocity components *u*, *v* and *w*. A listing of all equations would exceed the limits of this article. The equations can be found in relevant literature.

Although the complete set of seventeen partial differential equations can be solved numerically, the computational effort is very high because they resolve even the smallest turbulence and the fluid elements have to be accordingly small. Therefore the most CFD programs are using so-called Reynolds-averaged Navier-Stokes equations that do not resolve small turbulence. The turbulence is modeled with the help of additional equations. A popular one is the *k* - *ε* turbulence model with two additional equations, Equation 6 for the turbulence kinetic energy *k* and Equation 7 for the turbulence dissipation rate *ε*. μ is the dynamic viscosity and $\mu_t = C_\mu \cdot \rho \cdot k^2 / \varepsilon$ the turbulence viscosity where C_μ is a constant. The closure coefficients $C_{\varepsilon 1}$, $C_{\varepsilon 2}$, σ_k and σ_ε are constants. P_{kb} and $P_{\varepsilon b}$ represent the influence of the buoyancy forces. P_k is the turbulence production due to viscous forces. These variables introduce further equations that are not covered here. Another frequently used model is the *k* - *ω* turbulence model with again two additional equations, Equation 8 for the turbulence kinetic energy *k* and Equation 9 for the turbulent frequency *ω*. This time, the relation $\mu_t = \rho \cdot k / \omega$ is used. The values of the closure coefficients *α*, *β*, *β'*, σ_k and σ_ω are chosen based on experience. $P_{\omega b}$ is the additional buoyancy term. As the *k* - *ω* turbulence model is better suited for the near-wall flow and the *k* - *ε* turbulence model for the inner region of the flow domain, Suessen is using the Shear Stress Transport (SST) model that combines the advantages of both turbulence models.

In a next step, the conservation equations have to be transformed to a form that can be solved by a computer program. The partial derivatives have to be converted to finite differences. The procedure is called discretization and consists of a spatial discretization, which replaces the differentials ∂/∂*x*, ∂/∂*y* and ∂/∂*z* by *Δ*/*Δx*, *Δ*/*Δy* and *Δ*/*Δz*, and a time discretization, which replaces the differentials ∂/∂*t* by *Δ*/*Δt*. *Δ* is the difference between finite values, e. g. the difference between the coordinates of two nodes. Details will follow in the next chapter. An inevitable drawback of the method is that an error term has to be introduced, taking into account the difference between the exact solution and the approximation. As only an iterative solution of the system of equations is possible, the error term grows from iteration to iteration and causes a numerical instability. Different mathematical solutions are available that will not be covered here, e. g. the Upwind discretization that uses differences determined by the direction of the flow instead of the central spatial discretization. The References [1], [2], [3] and [4] are recommended for a deeper insight into the theoretical background of the methods.

If not only the continuous fluid, such as air, is of interest but also particles that are transported by the air stream, then more equations are needed. The particle models are software-dependent. The following theory is applied by the CFD software ANSYS CFX [5], which is used by Suessen. The forces acting on a particle that affect the particle acceleration

$$\frac{\partial(\rho \cdot k)}{\partial t} + \frac{\partial}{\partial x_j} \cdot (\rho \cdot U_j \cdot k) = \frac{\partial}{\partial x_j} \left[\left(\mu + \frac{\mu_t}{\sigma_k} \right) \cdot \frac{\partial k}{\partial x_j} \right] + P_k - \rho \cdot \epsilon + P_{kb} \tag{6}$$

$$\frac{\partial(\rho \cdot \epsilon)}{\partial t} + \frac{\partial}{\partial x_j} \cdot (\rho \cdot U_j \cdot \epsilon) = \frac{\partial}{\partial x_j} \left[\left(\mu + \frac{\mu_t}{\sigma_\epsilon} \right) \cdot \frac{\partial \epsilon}{\partial x_j} \right] + \frac{\epsilon}{k} \left(C_{\epsilon 1} \cdot P_k - C_{\epsilon 2} \cdot \rho \cdot \epsilon + C_{\epsilon 1} \cdot P_{\epsilon b} \right) \tag{7}$$

$$\frac{\partial(\rho \cdot k)}{\partial t} + \frac{\partial}{\partial x_j} \cdot (\rho \cdot U_j \cdot k) = \frac{\partial}{\partial x_j} \left[\left(\mu + \frac{\mu_t}{\sigma_k} \right) \cdot \frac{\partial k}{\partial x_j} \right] + P_k - \beta' \cdot \rho \cdot k \cdot \omega + P_{kb} \tag{8}$$

$$\frac{\partial(\rho \cdot \omega)}{\partial t} + \frac{\partial}{\partial x_j} \cdot (\rho \cdot U_j \cdot \omega) = \frac{\partial}{\partial x_j} \left[\left(\mu + \frac{\mu_t}{\sigma_\omega} \right) \cdot \frac{\partial \omega}{\partial x_j} \right] + \alpha \cdot \frac{\omega}{k} \cdot P_k - \beta \cdot \rho \cdot \omega^2 + P_{\omega b} \tag{9}$$

are due to the difference in velocity between the particle and the fluid, as well as due to the displacement of the fluid by the particle. Equation 10 summarizes the components. m_P is the particle mass, U_P the particle velocity. The rotating force F_R, the virtual or added mass force F_{VM}, the pressure gradient force F_P and the history term F_{BA} can be neglected for air as continuous fluid, relatively heavy particles and a stationary frame of reference. The remaining drag force F_D is calculated with the help of Equation 11 and the buoyancy force F_B with Equation 12. In the case of particles transported by air, the designation buoyancy force might be confusing because the density of the particles is higher than the density of air and the designation gravity force might be more appropriate. Nevertheless, the general designation was kept due to historical reasons. C_D is the drag coefficient, ρ_F the density of the fluid, ρ_P the density of the particles, m_F and m_P the corresponding mass, A_F the effective particle cross section, d_P the particle diameter, U_S the slip velocity, U_F the fluid velocity and U_P the particle velocity. In the present example, a one-way coupling is sufficient. The air flow is calculated first and the solution of the continuous fluid is used to integrate the three-dimensional trajectories of the particles based on the forces acting on them from the surrounding fluid and other sources. A one-way coupling is feasible if an influence of the particles on the air flow can be excluded – which would be the case if only a few particles are transported.

All calculations dealt with are carried out within the CFD software and the user has no direct contact with the mathematics. Nevertheless, the engineer must be aware of the theoretical background. The right solver settings have to be selected and, in the case of any error, the engineer has to be able to interpret the error message and to take the right response measures.

Procedure

The method of procedure will be explained by means of the example of a yarn break suction tube, which is located below the EliTe® Compact Spinning System. In the beginning a sufficiently large volume is created around the geometry to be investigated. As the airflow has to be simulated, the geometry of the suction tube and of the rollers of a drafting system is excluded from the flow domain. A symmetry boundary condition is applied and only half the model is used. The procedure enables a reduction of the elements by a factor of two without any loss of accuracy. The spatial discretization of the Navier-Stokes equations is realized with the help of a mesh that decomposes the flow region into elements. Most CFD software includes a meshing module for the generation of tetrahedral meshes or simple hexahedral meshes. In the present case the special software ICEM CFD for the generation of complex hexahedral meshes was used. In general, with the same number of elements, hexahedral meshes achieve a better quality of the calculation than tetrahedral meshes. The velocity of a fluid at the surface of a body is always zero. Inside the suction tube, the velocity increases to approximately 40 metres per second within a distance of 0.28 mm from the wall. The wall friction cannot be ignored. Considering the high velocity gradients at the surface of the suction tube, multiple thin layers of elements are created at the walls of the geometry. Figure 1 shows the mesh of the flow domain for the calculation of a Suessen suction tube. The cavities on the upper side of the flow domain represent the EliTube and the EliTe®Roller. A discretization vertex called node is located at every corner of each element. The mesh of Figure 1 consists of 490 thousand elements and 516 thousand nodes. The system of equations, introduced in the previous chapter, has to be solved for every

$$m_P \cdot \frac{dU_P}{dt} = F_D + F_B + F_R + F_{VM} + F_P + F_{BA} \tag{10}$$

$$F_D = \frac{1}{2} \cdot C_D \cdot \rho_F \cdot A_F \cdot \mid U_S \mid \cdot U_S = \frac{1}{2} \cdot C_D \cdot \rho_F \cdot A_F \cdot \mid U_F - U_P \mid \cdot (U_F - U_P) \tag{11}$$

$$F_B = (m_P - m_F) \cdot g = m_p \cdot \left(1 - \frac{\rho_F}{\rho_P}\right) \cdot g = \frac{\pi}{6} \cdot d_P^3 \cdot (\rho_P - \rho_F) \cdot g \tag{12}$$

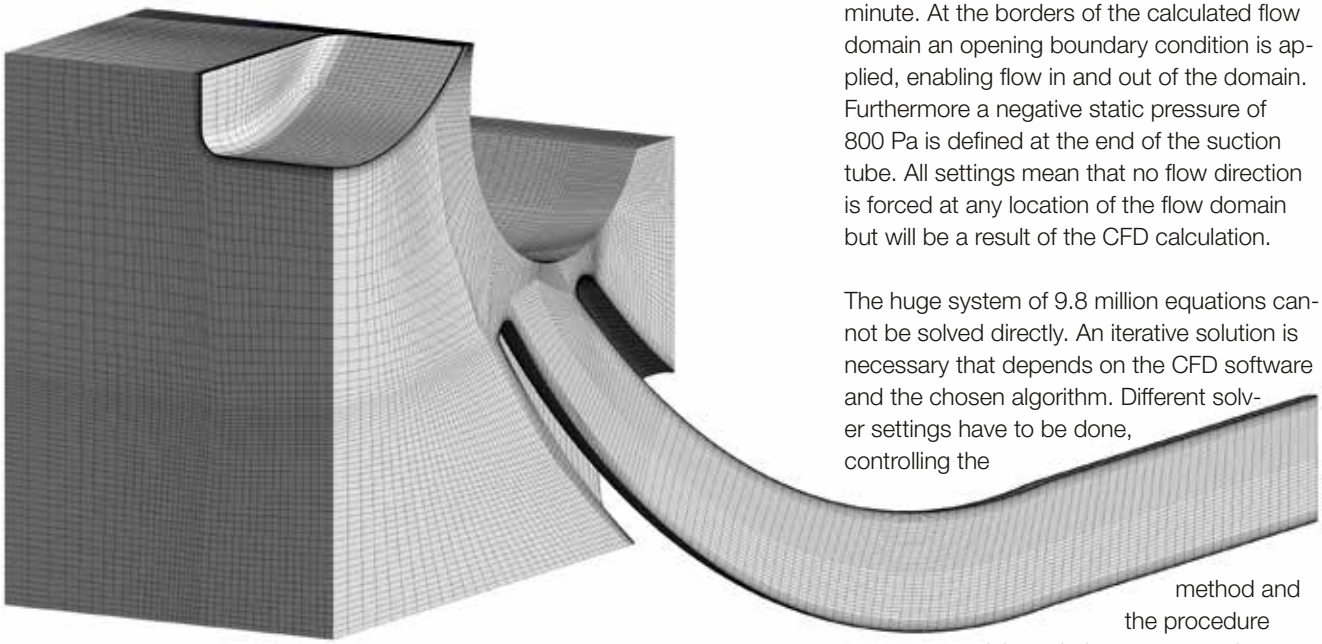


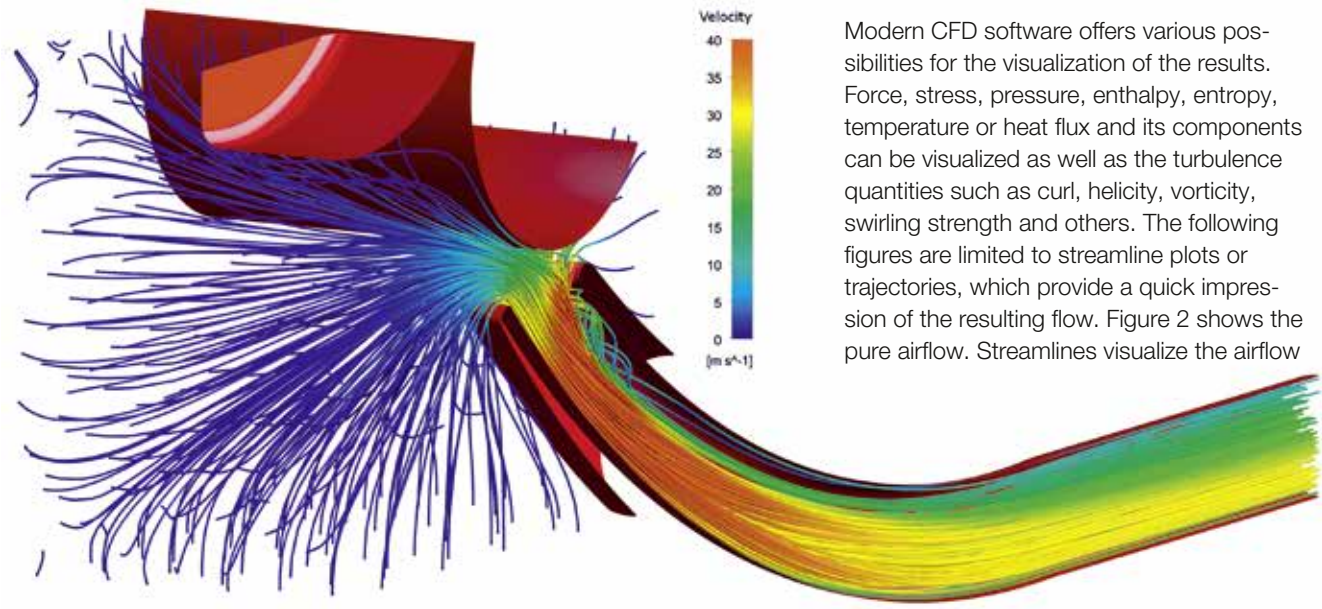
Fig. 1:
The spatial discretization of the flow domain: the mesh

node. 17 equations for the 17 unknowns of the Navier-Stokes equations plus 2 equations for the turbulence model multiplied with 516 thousand nodes result in a huge system of 9.8 million equations.

In a next step the boundary conditions have to be set. A zero velocity is defined at the surface of the suction tube and a velocity of 0.3 metres per second at the surface of the EliTube and the EliTe®Roller, which corresponds to an average delivery speed of 18 metres per minute. At the borders of the calculated flow domain an opening boundary condition is applied, enabling flow in and out of the domain. Furthermore a negative static pressure of 800 Pa is defined at the end of the suction tube. All settings mean that no flow direction is forced at any location of the flow domain but will be a result of the CFD calculation.

The huge system of 9.8 million equations cannot be solved directly. An iterative solution is necessary that depends on the CFD software and the chosen algorithm. Different solver settings have to be done, controlling the method and the procedure of the solution process, whose explanation would go beyond the scope of the present article. The calculation time of the relatively small model of Figure 1 is two and a half hours with single processor support. Of course, modern computers have several processors. The computational domain can be divided into several partitions and calculated in parallel using multiple processors. The calculation time is hereby significantly reduced, e. g. to 52 minutes with four processor support.

Fig. 2:
Streamline plot of the air velocity



Results

Modern CFD software offers various possibilities for the visualization of the results. Force, stress, pressure, enthalpy, entropy, temperature or heat flux and its components can be visualized as well as the turbulence quantities such as curl, helicity, vorticity, swirling strength and others. The following figures are limited to streamline plots or trajectories, which provide a quick impression of the resulting flow. Figure 2 shows the pure airflow. Streamlines visualize the airflow

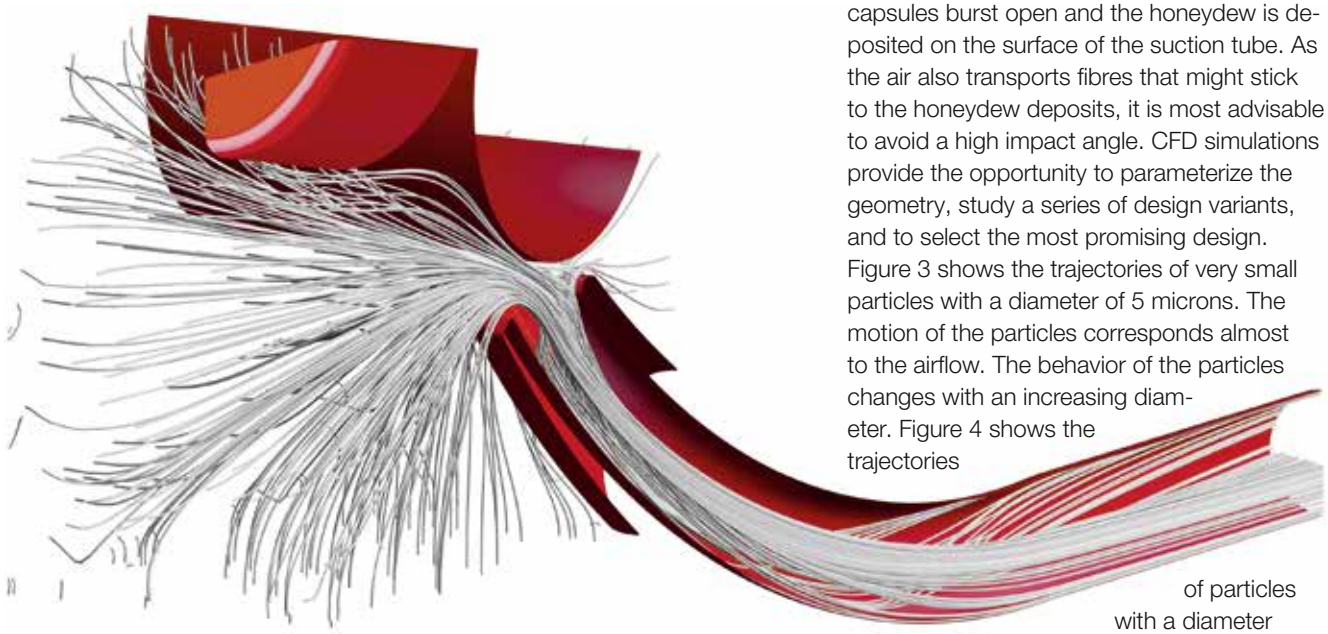


Fig. 3: Trajectories of particles with 5 microns

starting from selected seed points. The colour indicates the velocity of the air. The magnitude of the velocity is displayed in the legend. The air velocity is almost zero at the borders of the calculated flow domain and reaches about 40 metres per second inside the suction tube. In the case of the yarn break suction, not only the air but also the behaviors of particles that are transported by the air are of great interest. On the one hand, the particles should not be distributed throughout the machine and are therefore withdrawn by suction; on the other hand the contact of sticky particles with the suction tube has to be controlled. If the impact angle of e. g. encapsulated honeydew particles is too high, the capsules burst open and the honeydew is deposited on the surface of the suction tube. As the air also transports fibres that might stick to the honeydew deposits, it is most advisable to avoid a high impact angle. CFD simulations provide the opportunity to parameterize the geometry, study a series of design variants, and to select the most promising design. Figure 3 shows the trajectories of very small particles with a diameter of 5 microns. The motion of the particles corresponds almost to the airflow. The behavior of the particles changes with an increasing diameter. Figure 4 shows the trajectories of particles with a diameter of 25 microns. Although there is a contact between the particles and the suction tube, the impact angle can be considered as non-critical.

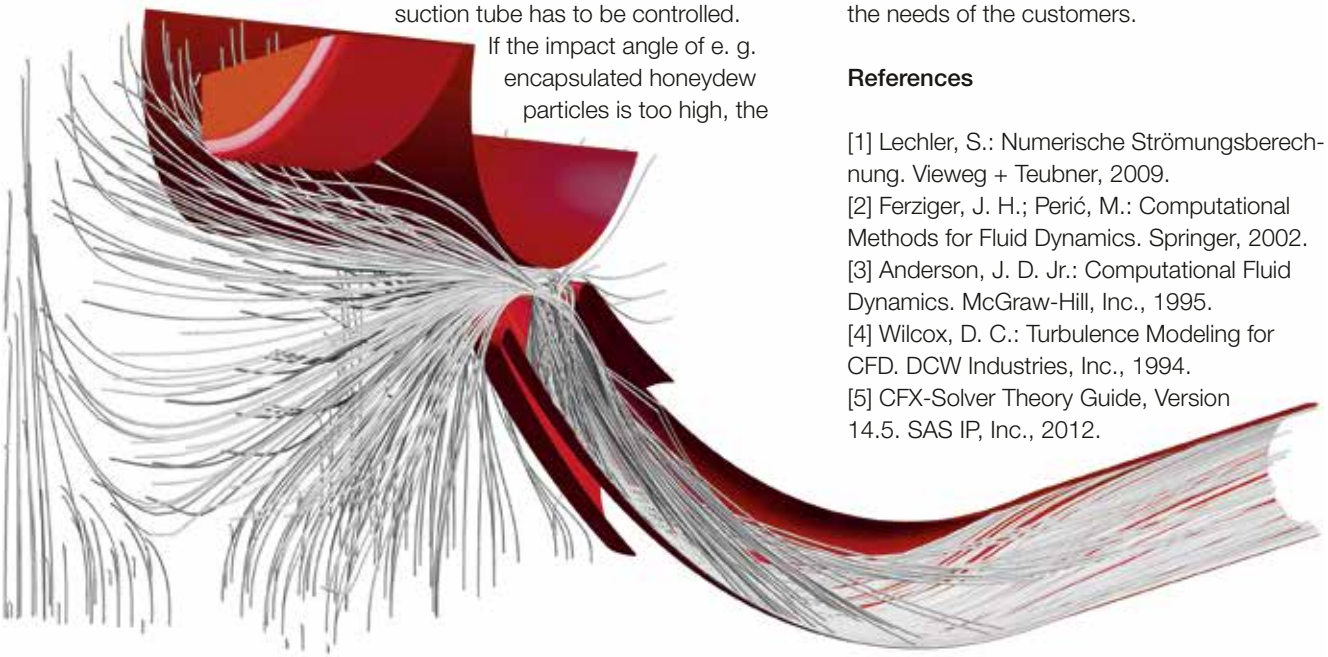


Fig. 4: Trajectories of particles with 25 microns

With the help of CFD simulations the behavior of different alternative designs can be studied as an integral part of the design process and a systematic optimization of flow-related parts is enabled well before a first prototype is manufactured. The simulation therefore provides Suessen with the ability to respond quickly to the demands of the market and helps to meet the needs of the customers.

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K.C.Oberoi, Venus Textile Systems, India

Nitin Spinners Ltd.

"World Class Spinning Solutions" – Manufacturers of 100% Cotton Yarns and 100% Cotton Fabrics in Bhilwara, Rajasthan. ISO 9001-2008 Certified Company

Contact data:
Phone + 91-1482-286110-113
Fax + 91-1482-286114
e-mail: nsl@nitinspinners.com
website: www.nitinspinners.com

Mr. Dinesh Nolkha,
Managing Director

Established in 1993, Nitin Spinners Ltd has earned a prominent place in cotton yarn industry in India. The company is engaged in producing high quality cotton yarn and knitted fabrics. Starting with a modest production of 700 MT per annum, the company today produces 22,000 MT of yarn and 4,000 MT of grey fabrics.

The stringent commitment to global standards of quality has seen the company growing over the last decade. The company has kept up pace with changing global customer demands for textiles and has focused its attention on select core products. Such a focus has enabled the company to play a dominant role in the global textile arena.

For the production capacities of the company please refer to table 1.

Table 1

Department	Installed Capacity	Production Capacity (TP A)	Products
Ring Spinning	77616 Spindles	13500	100% Combed Cotton Yarn (Single & Multifold, Compact and Slub) up to 50 Ne
Open End Spinning	2936 Rotors	8500	100% Cotton Yarn up to 30 Ne
Knitting	31 Circular Knitting Machines	4000	Knitted fabrics - single jersey, rib, interlock, fleece etc.

The company has installed latest and best available technology with plant & machinery imported from Switzerland, Germany and Italy, but also ring spinning machine equipment from LMW and KTTM.

The company also has Coal Based Captive Power Plant of 10.50 MW with 100% Backup Furnace Oil Based Power Plants and dedicated 132 kV line from state grid. Nitin Spinners has invested 70.7 million $ in gross fixed assets as on 31st March 2012.

In the quest to improve quality and competitiveness, the company has installed Suessen EliTe®Compact Spinning System on 12,000 spindles in first half of 2012.

Nitin selected Suessen EliTe®Compact Spinning System which has worldwide accept-

System	EliTe®	Conv.	EliTe®	Conv.	EliTe®	Conv.	EliTe®	Conv.
Yarn count in Ne	40/1		40/1		30/1		30/1	
Material code	CWC	CWE	CHCX	CHX	CHCX	CHX	CWC	CW
Average Count	40.20	40.20	39.98	39.99	29.98	29.98	30.40	30.30
Count CV%	1.0	1.0	0.95	0.96	0.90	0.93	0.90	0.95
TPI	25.95	26.80	22.16	23.45	19.10	19.65	22.16	22.50
TM	4.09	4.23	3.50	3.71	3.49	3.59	4.02	4.09
CSP	3300	2720	3018	2520	3050	2568	3320	2750
RKM	21.74	19.30	20.59	17.90	20.70	18.00	22.50	19.50
RKM CV%	7.50	8.50	8.50	8.90	8.20	8.80	7.50	8.20
Elongation %	4.50	3.80	4.20	3.90	4.80	4.40	5.50	4.60
Elongation CV%	8.50	9.50	7.20	8.40	7.50	8.80	8.00	8.60
U%	9.10	10.18	9.0	10.17	8.6	9.52	8.9	9.4
Thin (-50%)	0	1	0	1	0	0	0	0
Thick (+50%)	12	29	12	26	10	14	10	12
Neps (+200 /+280%)	53	75	50	67	25	42	30	53
Total IPI	65	105	62	94	35	56	40	65
H.I.	4.00	5.85	4.20	6.00	4.60	6.60	4.40	6.40
Classimat								
Short Faults(A1toD4)	58.0	72.0	52.0	68.5	40.0	55.5	50.0	55.0
Long Faults (EFG)	0	0	0	0	0	0	0	0
Thin Faults (HI)	0	0	0	0	0	0	0	0
Objectionable (Top-6)	0	0	0	0	0	0	0	0
Total Faults	58.0	72.0	52.0	68.5	40.0	55.5	50.0	55.0
Gms/Spl/Shift	130.0	125.0	143	135	224	205	200	191

Table 2

ance. Conversion of KTTM machines with tube length of 210 mm was a challenge which Suessen, with vast experience, overcame by lifting the drafting zone. The compact system not only improved the quality, but also helped in increasing the productivity. The comparative quality parameters are given in table 2.

This improvement in the quality was possible with State-of-Art Suessen components backed by good after-sales service and technological support given by Suessen.

The yarns produced by the Company are suitable for multiple applications such as knitted & woven apparels, terry towels, denims, home furnishing, medical and industrial fabrics. The knitted fabrics produced by the company are used by renowned brands in Apparel and Garment Industry.

Nitin Spinners Ltd has achieved turnover of 80.75 million $ during the year 2011-12 out of which exports is about 56.60 million $.

Due to its impeccable quality standards, about 70 % of its produce is exported to more than 50 countries across the globe including the European Union, USA, Latin America, Middle East Asia, Far East Asian countries, African countries etc.

The company is a Star Export House. The company is also having ISO 9001 Quality Certificate and is also certified for OEKO Tex Standard & GOTS/OE Sustainable Textiles and for Producing Organic Yarn.

The company has also been awarded TEXPROCIL Silver Trophy for Second Highest Exports in the category of Grey Fabrics for the year 2006-07 and 2007-08 and bronze trophy for the year 2010-11. The company has also been conferred State Award for “Excellence in Exports” for the year 2007-08 and 2010-11 by the Government of Rajasthan.

Mr. Dinesh Nolkha informed that because of good quality they get a premium of approximately Rs. 5.00 per kilogram even on normal yarn and with compact they get further additional Rs. 8.00. Further a significant increase in production is achieved.

Mr. Sandeep Garg, Vice President

Mr. Roland Eberhardt
New Managing Director

Spindelfabrik Suessen GmbH and Wilhelm Stahlecker GmbH with new Managing Director

Mr. Roland Eberhardt was appointed Joint Managing Director by the Board of Directors of Spindelfabrik Suessen GmbH and Wilhelm Stahlecker GmbH, Germany, effective March 1st, 2013.

With Mr. Roland Eberhardt the companies were able to engage a very experienced expert in the field of textile machinery.

Mr. Roland Eberhardt completed his studies of mechanical engineering and textile machinery at the Technical University (TU) in Munich and Technical University (TH) Stuttgart graduating Dipl.-Ing.

At the beginning of his career he was employed as head of production and development in companies like SKF TMC (Stuttgart) and Brückner (Leonberg) in Germany.

Until recently, Mr. Roland Eberhardt was Managing Director of a company developing and manufacturing high-precision stamping and injection moulding parts as well as components and tools for system-relevant products among others for the automotive sector. In the last 10 years he regrouped and restructured this company in a highly competitive market.

New Graf Service Workshop in Vietnam

Together with the local agent, Timtex, Graf has established a new Service Workshop in Ho Chi Minh City/Vietnam. It is equipped to carry out all the service work required by the local customers for flat cards of 40" to 60" working width.

The service provided comprises flat mounting and equalizing; mounting of standard, interlinked and groove-wound metallic card clothings on to lickerins, feed rollers, take-off rollers as well as rollers of blow room equipment.

In addition the service centre has got all equipment available to carry out mounting and maintenance work on site at customers' mills such as mounting and resharpening of cylinder and doffer wires and resharpening of flat clothings.

Exhibitions in 2013

Shanghaitex, June 10-13, P.R.China

Bräcker, Graf, Novibra and Suessen will participate in the Shanghaitex 2013, sharing the booth D31 in Hall E1.

The "4" place the exhibition under the joint slogan: **"Good - Better - Premium - Experience the difference"** demonstrating the combined accumulated competence in handling and processing natural and man-made fibres along the whole yarn production line.

Recent successful participations:

- INDO inter TEX, April 18-21, Indonesia, together with the agent PT. AGANSA Primatama
- Tecnotextil, April 15-18, Brazil
- Saigontex, April 11-14, Vietnam

Bräcker

Novibra

Suessen

Graf