

# **USTER® NEWS BULLETIN**

Quality claims: How spinning mills  
can take control

Volume 1 – Yarn irregularity

52

## USTER® NEWS BULLETIN

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During the past decades, the world has experienced an unprecedented wave of changes. From the viewpoint of spinning mills, some of these changes have never seen before, such as:

- Massive migration of textile production to Asia
- Global GDP growth and rising world population, both leading to an increase in textile consumption
- Enhanced fiber properties and development of new raw materials
- Productivity increases between x10 and x50
- Processing of recycled fibers and textiles to achieve a circular economy
- Less availability of skilled personnel
- Vast introduction of automation and digitalization
- Globalized economy, with products made anywhere and offered everywhere
- A steep increase in use of personal electronics and communication devices
- Increases in the sense of social responsibility and ethical behaviors

Since its inception in 1961, Uster News Bulletin has aimed at sharing know-how with the textile industry. As mentioned, many things have changed in this period. However, a few have remained similar – and among those are the reasons for claims received by spinning mills.

The first time an Uster News Bulletin dealt with this topic was in 1974, in Uster News Bulletin 22.

On the one hand we have a fast-changing world and conditions. On the other hand, we have the transformation of textile mills, led by the evolution of technology, trends and globalization. This provides the opportunity to articulate the actual purpose of quality. As someone said, “testing must be at the point of production, with consequent savings in time, frustration and expense.” This is also the purpose of quality management in textiles – to add value.

In Uster News Bulletin 50 ‘Managing a spinning mill with quality in mind’, we illustrated the key factors affecting both the quality and the productivity of a spinning mill, looking at the spinning processes. Now, we try to dive deeper. Starting with the end in mind, we examine the potential issues in the yarn for its users, and how to deal with them proactively.

The aim of this paper is dual. The first is to analyze the reasons for claims that a spinning mill receives and understand the contributory factors to their development. Based on this, we will share best practices and our experience in handling them, as part of a purposeful and holistic quality management system, above and beyond quality control.

The second aim is to show our appreciation of spinners worldwide. Despite the increasing complexity and changes within their mills and the textile industry, they have managed quality over time with dedication and skill. Sometimes, we neglect to notice these efforts and the results, and we miss the opportunity for recognition.

We would like to invite spinners to think and act as you see fit, and as appropriate for your business, to find the right balance between quality, operating efficiency and profitability. Today, we have the technology, the experience and the know-how to reach a new level of consistency in yarn production. Targeting zero defects and consequently eliminating claims is a real option – as far as the balance of effort and financial impact permits.

This is an invitation to textile producers to ‘manage your mill with quality in mind’.

We hope you will enjoy it.

Oswald Baldischwieler  
Vice President – Product Solutions

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Head of Value-Added Services



# Contents

1	Introduction – 5
2	The research and analysis approach – 7
2.1	Reasons for claims – 7
2.2	The purpose of quality management – 8
2.3	Root cause analysis – 9
3	Managing yarn irregularity claims – 11
3.1	Fiber quality – 12
3.2	Material handling – 14
3.3	Machinery performance & settings – fiber to roving – 18
3.4	Drafting – 20
3.5	Spinning systems and components – 22
3.5.1	Ring spinning – 22
3.5.2	Rotor and air-jet spinning – 24
3.6	Ambient conditions – 26
3.7	Variation of yarn quality – 28
3.8	Quality testing and management – 30
4	Conclusion – 33
5	Bibliography – 34

# 1. Introduction

Despite the increases in productivity of textile machinery, spinners have managed to improve the quality of their yarns significantly. This is evident by looking at Uster Statistics, showing the development of quality over time.

## Yarn quality improvements

The graphs show quality parameters of two yarns at an Uster Statistics Percentile (USP) of 50% (Figure 1) from the first edition until the latest in 2023. For example, in

1957, the coefficient of mass variation (CVm) was 16.9% for 100% cotton ring yarns, combed, Ne 30 for weaving. Advances in ring spinning machinery led to a steady quality improvement in the years that followed. Since the late 1980s, the value has stabilized around 13% due to matured machinery, integrated quality control, improvement of the raw material and benchmarking against global competitors.

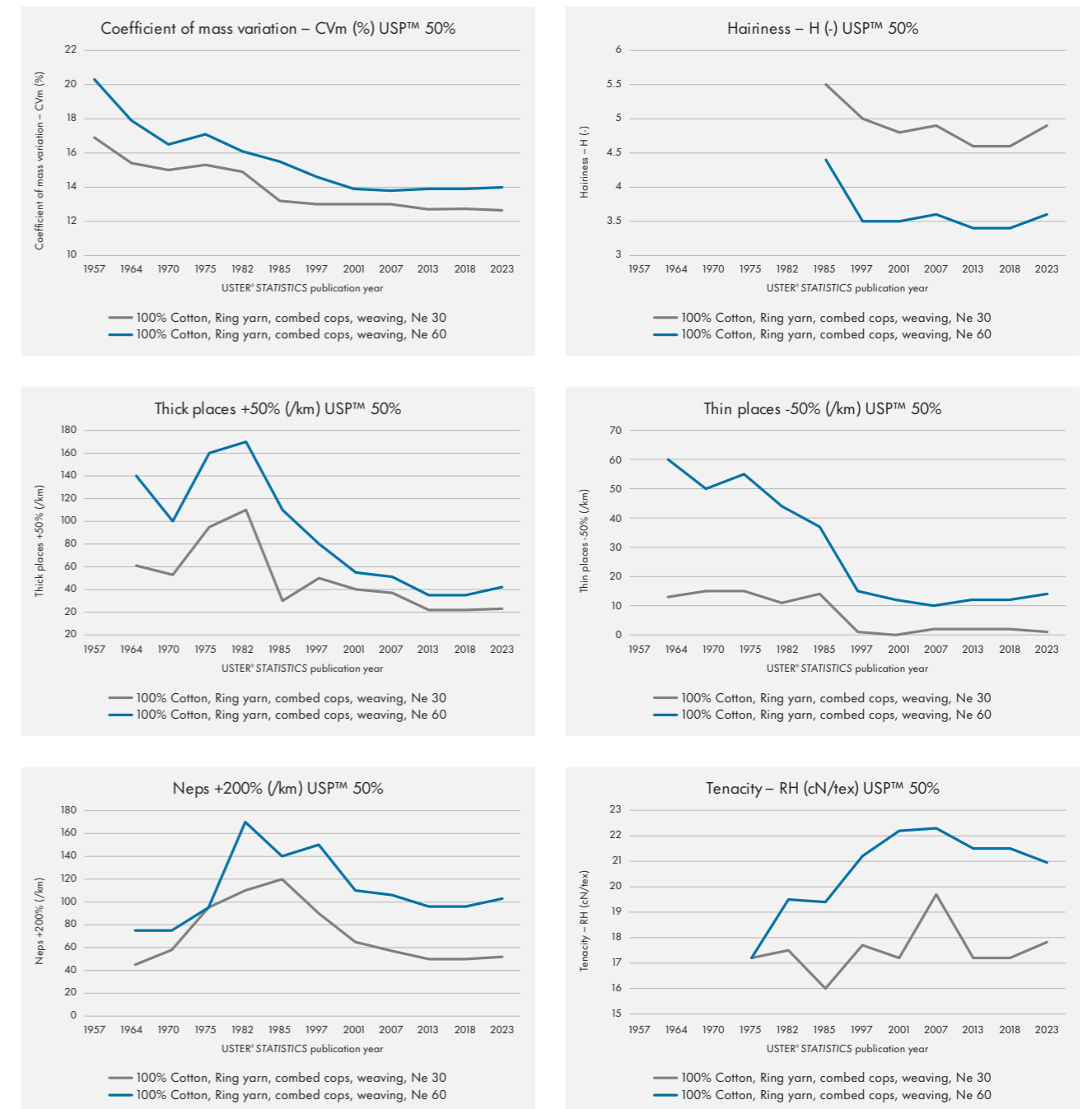


Figure 1 Development of quality – Uster Statistics

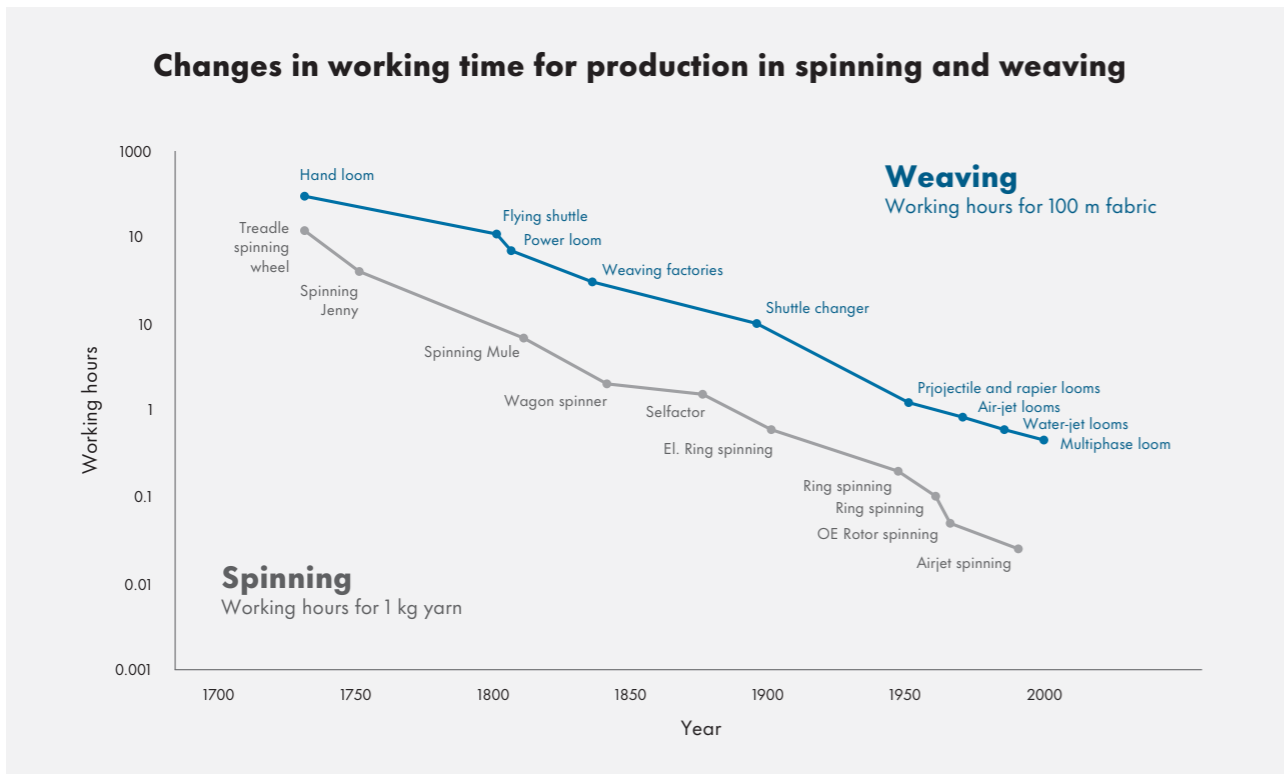


Figure 2 Development of yarn and fabric manufacturing speed (in working hours)

### Machinery development

At the same time, fabric manufacturers have also improved, as their quality requirements have increased too. Fabric formation machinery has become faster, so yarn quality must be better, and certainly more consistent quality, stressing the yarn to its limits. Looking back in history (Figure 2), the evolution of machinery and industrialization went hand in hand with producing in less time. And the trend continues today, as the industry is still striving for even higher efficiency often compensated for by increased speed.

Yarn spinning, like all manufacturing processes, is not free of problems and imperfections. Automation is increasing, in all textile processes, so any inconsistencies in quality affect the performance of the process and impact the quality of the final product. And this has a cost for everyone.

### Impact on quality claims

Has the number of claims reduced over time? We lack the data to be sure of this. But we might assume that claims would actually increase, because of the higher output of textile machinery and the greater demand for quality consistency from fabric producers. There is also the fact that smaller faults are now more prominently visible in textiles with more consistent quality. Machinery performance and controls have also improved, as has the degree of testing and comparability, with help of benchmarks like Uster Statistics. We should also consider economic fluctuations, which may be reflected in claims rising and falling. The total number and the importance of claims often depend on the market situation.

### Claims received by spinners

What we can say with greater certainty though, is that the reasons for claims received by spinners have remained quite similar, at least in the past 20 to 30 years.

Although the severity and distribution of the reasons may vary depending on the final use of the yarn, we can identify the most common factors that can be found in any spinning mill.

The point is, what can we do to limit or eliminate those claims, in an efficient and effective way? This Uster News Bulletin provides insights into this quest for operational excellence in spinning mills.

## 2. The research and analysis approach

To discuss claims, we first need to start defining them. Claims, by nature, are rarely linked to average quality. They are mainly outliers – seldom-occurring events that are very disturbing.

Often, claims occur because there is no agreement between the yarn producer and the knitter or weaver. Or the agreement is not specific about details, so variations and outliers may not be considered. This is a very important characteristic of claims, and many times it is overlooked.

USA. They covered a wide range of materials, though cotton and its blends were dominant in this research. Applications were both knitted and woven fabrics for traditional (non-technical) applications. We filtered out those claims that were commercial, such as delivery times or damage in transport. The focus was more on the pure quality claims arising from the yarn and its use.

Most of the spinning mills were following a quality control or management system, striving for improvements and consistency. Thus, the claims they received were for exceptions – and not their average quality levels.

### 2.1. Reasons for claims

#### Data collection

During the past five years, we collected the most frequent reasons for claims from more than 300 spinning mills all over the world. These claims were mainly coming back to the spinners from customers, after processing the yarn.

The spinning mills were in China, India, Bangladesh, Indonesia, Pakistan, Türkiye, Vietnam, Thailand, and the

#### Most frequent claims – in the past and today

We compared the collected claims to the findings in the Uster News Bulletin 22, from 1974. As the graph (Figure 3) shows, more than 80% of the claims were caused by similar reasons. None of the reasons for claims was new. Reasons linked to yarn irregularity have remained the most common cause, while contamination has increased significantly when comparing the distribution.

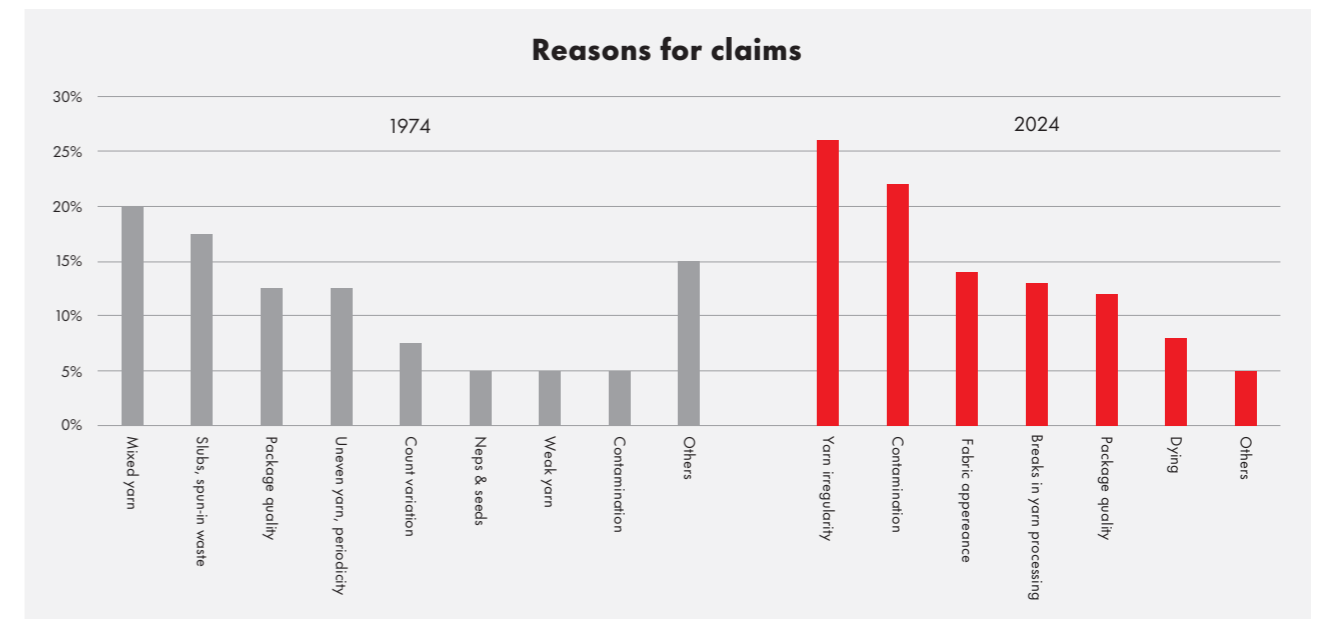


Figure 3 The most frequent claims for the spinning mills in 1974 and in 2024

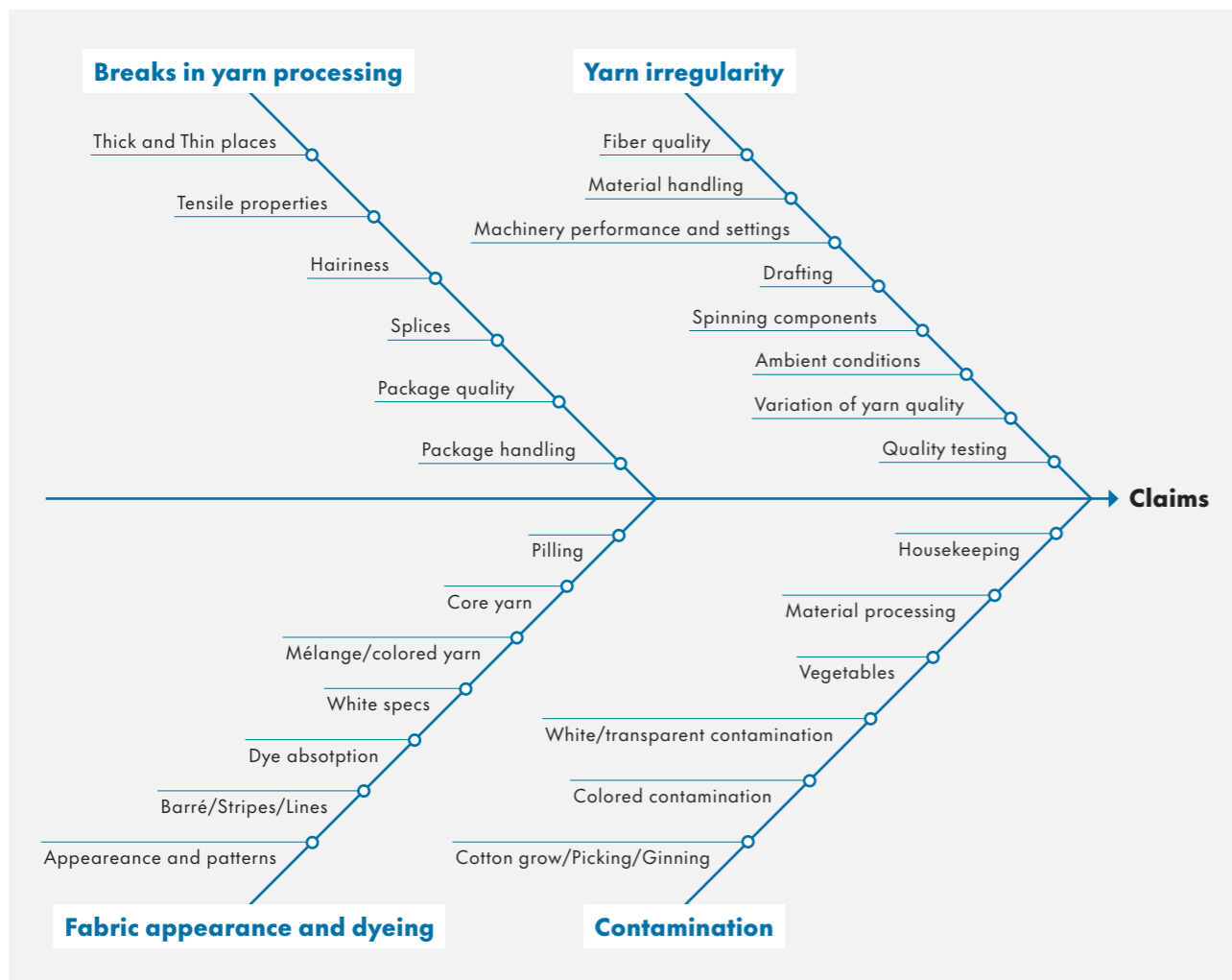


Figure 4 The attributes of the reasons for claims – overview

### Claim categories

During our research, we realized that it is necessary to group the reasons for claims in four categories that are mainly used by most spinners

- Yarn irregularity, Breaks in processing (incl. Package quality), Fabric appearance and dyeing, and Contamination

This helps to reach conclusions and ultimately design better approaches to dealing with the root causes of the issues.

In our attempt to understand and find the origins of the most frequent reasons for claims, we will use the root cause analysis method.

Our first diagram (Figure 4) is another way to show the results of our research, adding the most typical and frequent attributes of the reasons for claims.

### 2.2. The purpose of quality management

Trying to understand what leads to claims requires time to reflect on quality and its purpose. This is like a journey back to basics, which it is important to remember.

#### Why do we need quality control?

Starting with the basics, we need to ask, “why do we need quality control”?

To make it very simple and practical, spinners need quality control because they must meet their customer requirements, at an economical cost, to enable their mills to operate profitably. This means they must do the following:

- Maintain the highest possible operating efficiency
- Reduce any kind of waste everywhere
- Use the least expensive raw material for their purpose

To achieve all this, and at the same time to produce the required quality level, spinners need to have a quality control program in place.

### How is quality management different from quality control?

So, given that we understand quality control, why should we use or need quality management? And how is quality management different from quality control? Most spinners, consciously or not, have a quality management system in place. This enables them to influence quality and maintain it at the required level, achieving their operating targets. Quality is influenced by:

- Machinery set-up for available raw material quality
- Yarn engineering according to the specifications and the end-use of the yarn
- Identifying and removing exceptions from the spinning process
- Environment, people

Having a sustainable competitive advantage is simply: consistency. Quality management is a live process, a balancing act between constantly changing inputs and certain anticipated results, with the goal to achieve a consistent and homogeneous quality that would lead to limited claims or none at all.

### 2.3. Root cause analysis

Spinners can maintain constant quality in their operations with an effective claim management. The root cause analysis can be a practical help. By breaking down specific claim categories, spinners can delve deeper into the underlying issues and address them systematically.

### Analyze the reasons for claims

Consider the following steps:

1. Identify the main claim categories
2. Determine the attributes of these claims
3. Pinpoint the contributors to these attributes
4. Establish best practices to handle these issues

Root cause analysis can be visualized using a fishbone diagram, also known as an Ishikawa diagram. It was invented by Kaoru Ishikawa (1915–1989), as a quality management method to analyze and identify the source of issues and its effect.

For instance, the claim 'yarn irregularity' can include machinery set-up, raw material quality, environmental factors, testing and more, as primary branches. From there, the reasons for claims can be broken down further to a tangible root cause. And spinners can define measures to mitigate them.

### Add own issues and causes

The method has the benefit of visualizing the root causes better, as each single cause is often linked with others. At the same time, it is an opportunity for spinners to use it as a template and map their own experiences and findings over time. This ensures that the cumulative know-how of a mill will be used and enriched, instead of being lost.

This series of Uster News Bulletin describes the reasons for claims – and approaches to manage them. It covers the most frequent ones that have been a common concern for all spinners during our study. To provide a comprehensive analysis, we have structured the content in four volumes, each addressing a specific claim category, starting with 'Yarn irregularity'.

### 3. Managing yarn irregularity claims

#### Main contributors

Typically, yarn irregularity claims address the inconsistency in imperfection values, the higher mass variation, periodic defects and the density variation. This can cause stripiness, streakiness or cloudiness to the wavelength of the variation involved. What we have experienced over the years is the strong relation of the longer cut lengths (1 m, 3 m and 10 m) to the fabric appearance. Especially with quality-sensitive fabrics and yarns, the impact of medium- and longer-term mass variation is becoming much stronger.

#### Testing and prevention

Claims are also reported as a result of test outcomes or improper testing. Measurements, whether conducted in-house as part of quality control routines, or by customer testing after delivery, can identify problems. Addressing them requires clear communication and documentation to prevent similar claims in the future. The active involvement of quality management ensures that corrective actions are implemented, and continuous improvement initiatives are applied throughout the organization.

#### Effects on the yarn quality characteristics

There are various opportunities to resolve the issues at their origin before they evolve into larger claims, which may become more costly as the process continues.

Every stage of the spinning process (**Figure 5**) can be influenced by multiple factors, such as raw materials, environmental conditions, machinery, and the skill level of personnel. These affect yarn quality.

In the following, each subchapter addresses one specific cause for yarn irregularity claims identified in this study, covering its contributing factors and providing recommendations for resolving them within a spinning mill.

Process stages	Evenness C <sub>Vm</sub>	Thick places	Thin places	Neps	Hairiness	Count	Strength	Elongation
Bale lay-down	●	●	●	●	●		●	●
Blowroom	●	●	●	●			●	●
Card	●	●	●	●	●	●	●	●
Draw frame	●	●	●	●		●	●	●
Comber	●	●	●	●	●		●	●
Roving frame	●	●	●		●	●	●	●
Spinning machine	●	●	●	●	●	●	●	●
Winding machine	●	●	●	●	●		●	●

● Direct relationship    ● Indirect relationship

**Figure 5** Influence of process stages in spinning mills on the quality of yarns

### 3.1. Fiber quality

For cotton, since it has inherent natural variation, the fiber fineness (micronaire) is perhaps the most important parameter to be kept within given limits. It influences the spinnability of cotton fibers, as well as the quality of the resulting yarn.

#### Laydown consistency

The objective during bale mixing is a consistently narrow micronaire range. Minimizing variation in micronaire values, both across and within laydowns, is critical. The shift of micronaire values often lead to barré or inconsistencies in yarn strength. To mitigate the risk of such claims, spinners use the data of Uster HVI for their laydown management (Figure 6). Building on this emphasis, many mills have integrated automated solutions such as Uster FiberQ with algorithms that control not only micronaire but also multiple fiber characteristics. This reduces manual work, but more importantly it improves long-term quality from fiber to yarn by refining the raw material selection.



Figure 6 Bale mixing – laydown

#### Fiber process control

Further on, reducing neps is one of the three most frequent challenges for spinning mills – according to our experience. Instead of trying to reduce the neps in spinning, it is an advantage to avoid creating them at the start of the process. So, many spinners are taking measures in the blowroom and in carding, at the beginning of the process.

Managing the levels of trash reduction, short fiber content increase, and nep increase in the blowroom is an important aspect. During cotton processing, the material is opened into tufts and undergoes several stages of opening and cleaning that aim to remove impurities. A side effect of this cleaning process though is an increase in neps and short fiber content, due to the mechanical stress. Some spinning mills adjust card settings or try to remove broken fibers during combing, but a more effective and economical recommendation is thorough testing and blowroom optimization.

To control blowroom and carding performance, measurements on Uster AFIS are part of the routine test plan and additionally after machine maintenance or changes in cotton laydown recipes. These tests ensure optimal opening and cleaning at an appropriate waste amount. A close monitoring of potential fiber damage is essential.

#### Processing statistics



Figure 7 Fiber processing Uster Statistics – Total nep count (/g)

The processing charts in Uster Statistics track the fiber quality characteristics. Key parameters around neps, short fibers, and impurity are plotted through each processing stage. Figure 7 shows the typical increase in neps in the blowroom from bale to card mat, followed by a decrease after carding as neps are removed. Spinning mills can compare their level against the global standard. This allows a quick assessment of the situation, such as identifying areas of overperformance or potential improvements.

#### Various raw materials

Process control is also important, and even more so when processing mechanically recycled cotton. Depending on the source of the recycled material and its opening method, the short fiber content can already be on a higher level 'by nature' when entering the blowroom.

Likewise, fiber damage can apply to man-made fibers with initially uniform cut lengths. Uster AFIS 6 is able to measure cotton as well as synthetic materials. With thorough quality management, spinners can reveal fiber deterioration at source before it unfolds in yarn irregularity.

## Causes, effects and solutions – Fiber quality

### Reasons for claims

**Natural variation in cotton**  
– Impact on spinning and fabric appearance

**Shift in micronaire (fiber fineness)**  
– Impact on spinnability and resulting yarn quality  
– Impact on barré  
– Impact on tenacity variation

**Fiber neps creation**  
– Imbalance of trash, short fibers and neps

**Fiber damage**  
– Impact on processing and final yarn quality



### Solutions for spinning mills

**Laydown recommendations:**  
– Measure cotton fiber properties with Uster HVI  
– Mix bales with narrow fiber fineness range (micronaire)  
– Keep low variation between and within laydowns  
– Consider multiple fiber characteristics

#### Measure blowroom and carding performance with Uster AFIS process control

– Regularly  
– After machine maintenance  
– After recipe change  
– Different raw materials

#### Avoid neps and fiber damage, instead of fixing issues later

– Fine-tune settings  
– Balance waste, opening and cleaning

#### Compare to Uster Statistics

– Identify potential

### 3.2. Material handling

Material handling issues are perhaps the most common reasons for yarn irregularity claims. They are related to what we call 'mix-ups' in the spinning production.

It is vital here to make sure that the overall quality remains consistent over time, as mentioned in Uster News Bulletin 50. This is particularly important to avoid the so called 'waves' of material with higher-than-normal levels of neps, for example. These 'waves' may follow the yarn to the end, polluting the entire lot.

#### Mixing and identification

Mixing of material is a skill in itself, and starts from the beginning of the spinning process. The first stage is the laydown, followed by homogenous blending of fibers at the mixer, to keep long-term quality constant.

Many spinners are very careful when mixing cans from different cards in the breaker draw frames, as not all cards have the same performance. For blending, they ensure that the cans have the right identification (color mark, number, etc.) to distinguish between the different materials (Figure 8).



Figure 8 Good identification and mixing of cans from different cards (different color ribbons)

#### Handle with care



Figure 9 Avoid issues of one's own doing

Material should be handled with care throughout all process stages. Common issues seen in many spinning mills are overloaded cans, stacked roving bobbins and material friction points (Figure 9). All of them lead to irregularities due to pressure marks and removed or added fibers.

#### Preventing material mix-ups

Problems with roving, bobbins, packages, lots or blends are typical kinds of 'mix-ups'. Many spinners take particular care to avoid such 'mix-ups'. In roving production, they use the FIFO (First-In-First-Out) operating principle to avoid having roving bobbins of older production dates.



Figure 10 Avoid improper bobbin and package handling

In ring spinning and winding, many spinners clean the machines at each article change, to make sure that there are no spinning bobbins lying underneath (Figure 10). If any are found, the yarn is sent to waste.

At the winding process, there are several possibilities for spinning bobbin mix-ups:

- During the storage of cops at standalone winders
- Using the same tube color for different yarn qualities or counts
- Having more than one different article running on the same winding machine
- Even on linked machines, cops can fall and later, with another article running, could be put back on the winder.

#### Yarn clearing, quality and yarn fault alarms

Finally, when inputting yarn clearing limits, spinners take care that the settings can detect any unacceptable deviations in yarn count that are relevant to their production.

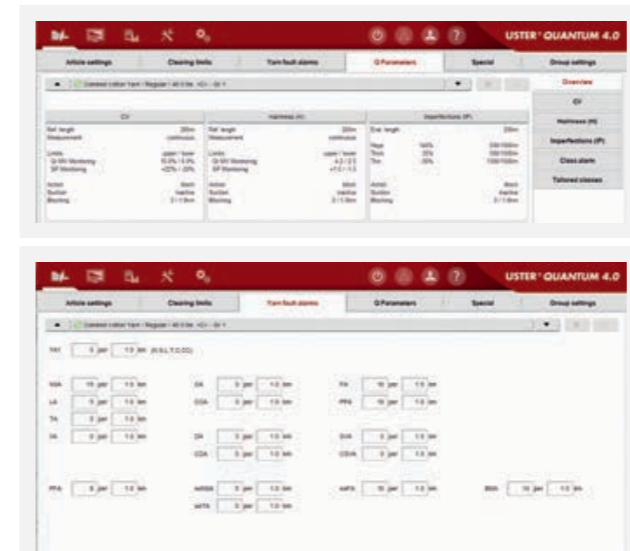


Figure 11 Define yarn-specific quality and textile alarms at Uster Quantum 4.0

There are methods, and multiple settings, which can help to identify and separate cop mix-ups. With Uster Quantum clearers, spinners are using quality data alarms (Figure 11) for mass variation (CvM), imperfections (IP) and Hairiness (H). The clearing channels such as count (C, CC), shade variation (SV, CSV) and blend mix-up (BM) can assist in detecting and alarming quality mix-ups. Especially in cases of a mix-up of different fiber material types, fiber glow or blend ratios, these detections have proved to be a great help.

#### Separation of bobbins and packages at winding

As a process, it is always recommended to separate alarm cops from the winding process. In some cases, operators are distracted and will take an alarmed cop and put it back in the magazine or just return it to the circulation of the machine. A calculation shows that a single cop with the wrong yarn count, containing 3,000 meters of yarn, will initiate 300 individual clearer cuts in the count channel if not separated from the winding process through appropriate textile alarm limits.

The number of alarmed cops can be taken as a key performance indicator to control the effectiveness of the different shift operators or over the production time. Experience indicates that mills with a percentage of alarm cops lower than 0.2% with correct alarm limits for all available channels have better control in the spinning process.

### Trace to the origin of the defect

Today, there are solutions that can detect and isolate exceptions but also guide to their source and eliminate problems at their origin. When such systems are used by spinners, they result not only in improving the yarn quality level – in terms of both consistency and average values – but also in significantly reducing the cost of quality. Experience has shown that such closed-loop control systems save many thousands of dollars, because they could indicate and detect the source of the problem in real time and stop its further production.



Figure 12 Uster RSO 3D – Quality per ring spindle

Such a solution is the Uster RSO 3D which combines linked ring spinning and winding machines via the spindle monitoring system and the yarn clearer. Through bidirectional communication, the single spindle identification allows users to trace the ring spindle causing the trouble (Figure 12). Defective bobbins such as off-quality or slip spindles can be removed before the winding process.

Results have shown that the performance of the system is rewarding, even within the first few weeks. Users have recorded significant reductions of waste, on-time detection of off-limit quality at its source and increased overall efficiency.

### Package distinction

With the packages in the winding room, spinners do the same checks when they are changing the article. All final yarn packages – ring, rotor, air-jet – need proper identification.

In packaging and warehousing, they make sure boxes or pallets are identified correctly and use 'DO NOT MIX' labels if necessary.

## Causes, effects and solutions – Material handling

### Reasons for claims

**Improper mixing/blending**  
– Impact on yarn irregularity due to 'waves'

**Mix-ups (lots, roving, bobbins, etc.)**  
– Impact on fabric appearance  
– Impact on dyeability

**Poor material treatment**  
– Impact on yarn quality

**No full utilization of yarn clearer settings**  
– Impact on package quality

**Exceptions**  
– Impact on quality consistency

**Missing traceability and issues not fixed at source**  
– Impact on recurring faults

**Lack of operator training**  
– Impact on self-inflicted issues



### Solutions for spinning mills

**Homogeneous mixing/blending**  
– Follow concious procedures at fiber and sliver stage

**Avoid mix-up of roving bobbins**  
– Follow FIFO principles

**Avoid mix-up of bobbins**  
– Remove remaining material at article change from machine or below  
– Properly store and identify yarns  
– Separate by tube color  
– Clear split and instruction when there's more than one article at the winder

**Detect bobbin mix-up at winding with yarn clearer settings and alarms (last control point)**

– Set appropriate clearing limits  
– Take actions for quality alarms  
– Use yarn fault alarms

**Identify and trace exceptions**

– Offline/in-line testing  
– Closed-loop system, e.g. Uster RSO 3D

**Proper handling of alarmed bobbins**

– Separate alarmed bobbins  
– Instruct and train operators

**Avoid mix-up of packages**

– Remove old packages at article change  
– Proper labeling

**Handle every material with care**

– No material friction  
– Train operators



### 3.4. Drafting

Drafting affects the irregularity of the yarn, which impacts on fabric appearance. From the beginning, it is important to avoid long term mass variations from preparation, since some cannot be avoided by doubling but will remain in the yarn.

#### Roller distances

Generally, when drafting fibers, it is important to consider the fiber length and its distribution when setting up the drafting distances. The drafting roller settings should never lead to broken fibers. So, the short fiber content of output material should not exceed the short fiber content of the incoming material. Roller distances at the pre-drafting zone and the main drafting zone are set according to the fiber length of the long fibers, especially 5% L(n) measured by Uster AFIS (Figure 14).

#### Fibers in the cross-section

The other very important characteristic is fiber fineness and its variation, as it determines the number of fibers in the cross-section and thus, the degree of irregularity for a given draft. Especially on draw frames, for slivers with very fine fibers (fine micronaire), some spinning mills increase the break draft and enlarge the roller distances for the break draft to achieve better quality results.

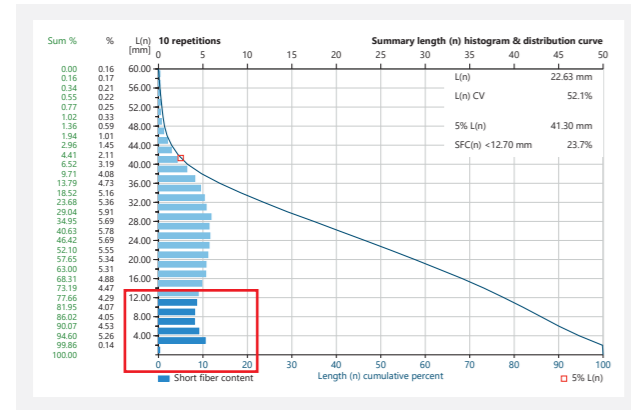


Figure 14 Fiber length distribution Uster AFIS 6

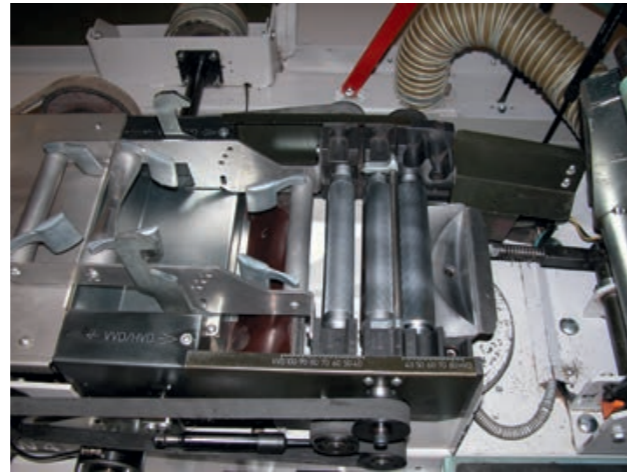


Figure 15 Drafting zone

Both, 'swimming fibers' as well as broken fibers – too wide or too narrow distance – can lead to sliver variation. After setting the drafting zones (Figure 15), a cross-check of the mass diagram and the mass spectrogram with Uster Tester 6 is recommended (Figure 16), to be sure that the roller settings are correct, and the draft ratios are set properly.

#### Impact of roving draft

Roving and spinning are perhaps the major contributors to yarn irregularity when it comes to drafting. When setting the drafting on the roving machine, it is important to consider the roving count, taking into account the final draft for the yarn being produced. It is also important to determine the correct twist level for rovings, because this influences the drafting behavior of the roving in ring spinning. If the twist is too low, it will lead to false drafts with long thin places. If the twist is too high, thin and thick places will occur, due to uneven and 'hard' draft.

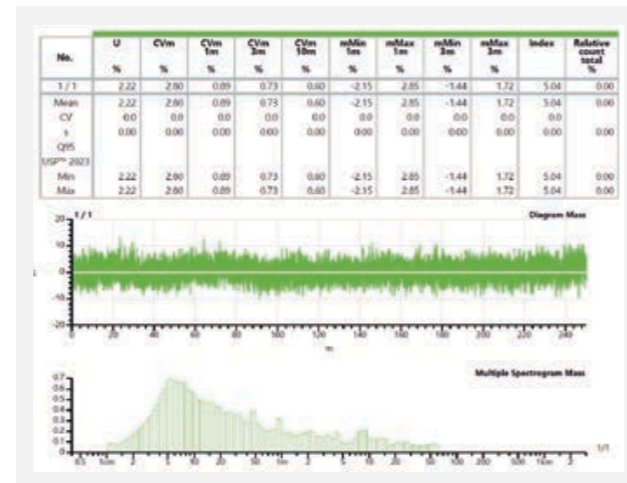


Figure 16 Sliver variation Uster Tester 6

## Causes, effects and solutions – Drafting

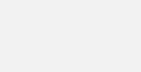
### Reasons for claims

#### Mass variation

- Impact on yarn irregularity and fabric appearance

#### Roving draft and spinning machine dependencies

- Impact on ring spinning
- Impact on yarn irregularity



### Solutions for spinning mills

#### Check Uster AFIS results for process control

- Fiber length and distribution to set correct drafting distances
- Short fiber content (SFC) input output control to check roller settings and avoid broken fibers
- Fiber length to set pre-drafting and main drafting zones accordingly
- Fiber fineness and variation to determine fibers in cross section (yarn irregularity)

#### Cross-check roller settings and draft ratio with Uster Tester

- Avoid long-term mass variation in preparation
- Monitor mass diagram
- Monitor mass spectrogram

#### Define proper roving setting

- Consider roving count vs. final yarn draft
- Consider roving twist – influence drafting behavior on ring spinning machine (too low – false drafts/too high – uneven or 'hard' draft)

### 3.5. Spinning systems and components

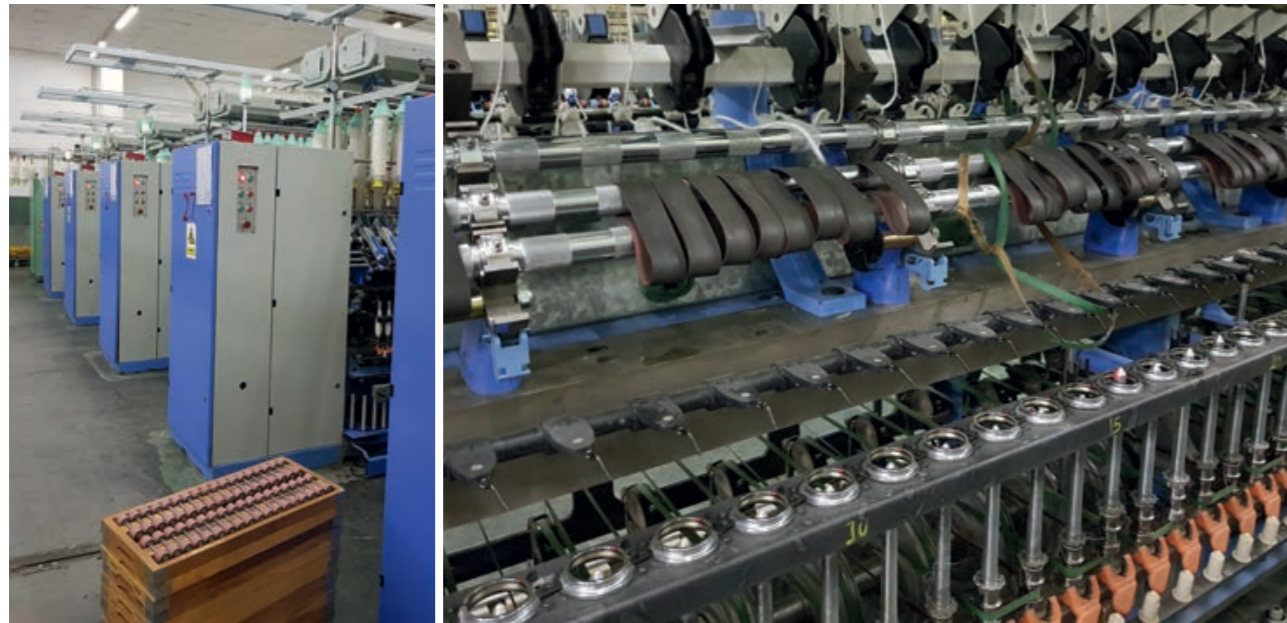


Figure 17 Maintenance and exchange cycles at ring spinning – rollers, aprons

#### 3.5.1 Ring spinning

##### Ring and traveler

Using the correct traveler and ring types, as well as the right materials and dimensions, has a major impact on yarn quality and productivity. This helps to achieve proper spindle speed levels, with good quality. When processing polyester fibers also the melting point is a determining factor. Spinning room conditions, fiber quality and production parameters are all important considerations when selecting the correct traveler and ring types and sizes.

##### Apron and top roller

The aprons and surfaces of the top rollers need attention in two different directions – type selection and maintenance. The right material, the dimensions and hardness degree (shore value) of these elements will impact the running behavior. Regular maintenance, with an exchange and/or grinding schedule, will help to control and reduce quality deviations (Figure 17). The goal of each mill is to find the right combination and maintain the conditions in an efficient and reliable way.

##### Ring diameter

Another important aspect for many spinning mills is the selection of the correct ring diameter. It is always a target to achieve the highest possible spindle speed, which is facilitated by smaller ring diameters. But when processing coarser counts, this has the opposite effect: the number of splices in winding caused by more bobbin changes will at least partially negate the advantage of the higher spindle speeds, in addition to the yarn quality deterioration inherent from the extra splices.

##### Smooth function and surface

In spinning, the attention to detail is important. For example, the free movement of the roving bobbin handlers (casablancas) is important to avoid false drafts. So is the smooth surface of the pigtails and anti-balloon rings, to avoid scratching the yarn and thus increasing the hairiness and the imperfections. And the roving traverse mechanism must be set at the right place and with the right traverse distance, to avoid running at the edges of the rollers or at a very narrow zone, creating grooves.

	Ring diameter	RSM speed	Yarn length bobbin	Bobbin changes & splices
<b>Fine count</b>	Small	High	More	Acceptable
<b>Coarse count</b>	Small	High	Less	More
	Large	Slow	More	Acceptable

## Causes, effects and solutions – Ring spinning

### Reasons for claims

#### Wrong ring and ring traveler type, material, size

- Impact on quality and productivity

#### Not suitable ring diameter

- Impact on number of splices at winding

#### Roller and apron type and maintenance

- Impact on yarn quality (deviations)

#### Pigtails and anti-balloon rings

- Impact on yarn quality (esp. hairiness and imperfections)

#### Roving traverse

- Impact on yarn irregularity

#### Roving bobbin movement (casablanca):

- Impact on drafting



### Solutions for spinning mills

#### Choose ring and ring traveler considering

- fiber material
- ambient conditions
- production parameter

#### Choose best ring diameter for yarn count (range)

- Balance dependencies

#### Influence running behavior with roller and apron type

- material
- dimensions
- hardness (shore value)

#### Maintain quality consistency with regular and reliable maintenance cycles

- scheduled grinding
- scheduled exchange

#### Maintain a smooth surface of the guiding elements to avoid scratching the yarn.

to avoid scratching the yarn.

#### Set right position and distance to avoid grooves.

to avoid grooves.

#### Ensure smooth movement of roving bobbins to avoid false drafts.

to avoid false drafts.

### 3.5.2 Rotor and air-jet spinning

#### Opening rollers

The selection of the right type of opening rollers and their speed have a massive influence on the quality of rotor spun yarn. The mechanical treatment of the fibers has an influence on the separation of the fibers, but also on fiber shortening and neps. It is also important to monitor the service life of the opening roller, in order to maximize its potential, but also to ensure that the right time for replacement is not missed.

#### Rotor

The rotor is the next important element in the spinning process. Firstly the diameter and speed, and then the associated circumferential speed, are important criteria to consider. The circumference of the rotor depends on the fiber length of the raw material used and therefore also on the maximum achievable speed. The type of rotor and the rotor groove are further important criteria. In terms of quality, the rotor must always be checked for deposits, which can lead to moiré in particular. When processing man-made fibers, particular attention must be paid to deposits of spin finish in the rotor.

#### Torque stop

During yarn formation, the nozzle and the torque stop must be observed, first and foremost ensuring that the same type is used at all spinning positions, to avoid a simple mistake that happens far too often. Wear and deposits are further points.

#### Nozzle

The nozzle is the central technological element in the air-jet spinning process and its type and diameter have a significant influence on the yarn characteristics. Damage or deposits (dirt, lubricant, fibers etc.) can massively disrupt yarn formation and lead to the well-known phenomenon of 'weak yarn'. Due to the technology of the air-jet spinning process, this yarn can be wound without twisting and strength over a longer period of time without yarn breakage. In the worst case, the blockage at the nozzle is released and the spinning process starts again, with the result that an undefined yarn length without strength and twist is present on a package, which in any case leads to a malfunction during further processing.

#### Sliver quality

Due to the high speed and the high overall draft, the fiber guidance in the drafting system is of particular importance. A trouble-free spinning process can only be guaranteed if the fibers are fed absolutely parallel, which also shows the importance of the pre-process (sliver preparation), especially for this spinning method.

#### Top roller diameter and condition

The correct hardness of the top rollers depending on the material to be processed is a further point. It is recommended that all top rollers, especially the delivery cylinder, have the same diameter. It goes without saying that these must not be damaged, as it could lead to yarn breakage and/or regularly recurring defects.

#### Guiding elements

The choice of the correct fiber guiding elements and spacers relative to the yarn count is just as important as the type and condition of the aprons. The desired quality can be achieved only if optimum fiber guidance is guaranteed.

## Causes, effects and solutions – Rotor and air-jet

### Reasons for claims

#### Poor maintenance of rotor machine parts and setup

- Impact on performance
- Impact on yarn quality

#### Processing and control at rotor machine

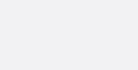
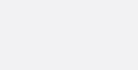
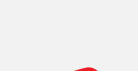
- Impact on irregularity
- Impact on periodic faults

#### Inadequate spinning preparation

- Impact on spinability

#### Unmatched or defective air-jet components

- Impact on yarn irregularity
- Impact on weak yarn



### Solutions for spinning mills

#### Choose suitable parts and maintain them

- Opening roller type
- Rotor groove, diameter depending on fiber length

#### Make sure all positions run with the same parts, e.g. avoid mix of nozzle or torque stop

#### Apply appropriate settings

- Speed (opening roller, rotor)
- Winding tension → strength/elongation
- Waxing

#### Ensure housekeeping

- Avoid deposits in the rotor (moiré)

#### Ensure sliver quality

- alignment of fibers

#### Select suitable fiber guidance elements

- match sliver guiding parts to count
- use correct spacers at rollers

#### Check aprons and rollers

- type and condition of aprons
- top rollers hardness and diameter
- avoid damaged top rollers

#### Nozzle type and condition

- suitable diameter
- avoid deposits

### 3.6. Ambient conditions

#### Clean surrounding conditions

A key to quality in spinning is cleanliness. The fact that the yarn is simply running is no guarantee of good quality. A high level of fluff accumulation or inability to keep the machines clean (Figure 18), especially from fiber deposits in the region of the drafting zones, correlates to a high irregularity of mass. A blocked roving trumpet can cause count deviations without initiating a yarn break. A draw frame drafting zone with a lot of fly around can create thick places which will be very long thick places in the yarn.



Figure 18 Avoid fiber and dirt accumulation as reason for yarn irregularities

#### Training empowers operators

Operators have an important role in this. With proper training, the right tools and instructions, many spinners manage to avoid problems and keep their mills very clean (Figure 19), all the time. A good practice to follow in general is to avoid using compressed air to clean by blowing, simply because the fly will come back in the machine. Instead, spinners are increasingly using vacuum cleaners, with much more sustainable results. Trained operators also can spot when suction is insufficient and ask the engineers to fix the problems.



Figure 19 Clean surrounding conditions in ring spinning

#### Climatic conditions

Nowadays, high productivity in spinning can be only ensured if the climatic conditions are properly controlled. The target is achieved not only by 20 to 40 air changes to reduce fiber fly and fluff generation, it also depends on the suction channels below the machines and proper air conditioning.

In older buildings, this is often challenging, and the air conditioning might not fulfill all requirements in the best way. For new installations, as well as extensions in new buildings, these requirements are easier to control and optimize from the beginning.

For air conditioning during spinning, an absolute water content in a range of 10–14 grams of water per kg of dry air is common for the ring spinning department, depending on the fiber type to be used. A drier environment will help in processing sticky cotton but will generate more fiber fly. In contrast, more humidity will increase the risk of lapping.

Generally, there are some guidelines regarding the ambient conditions and the targeted performance of the air-conditioning for the entire spinning mill. These are:

	Relative humidity %	Temperature °C	gr H <sub>2</sub> O / m <sup>3</sup> air
<b>Blowroom</b>	55	26	~12–14
<b>Carding and drawing</b>	55	26	~12–14
<b>Spinning</b>	42	25	~12–14
<b>Winding</b>	50	28	~14–16

## Causes, effects and solutions – Ambient conditions

### Reasons for claims

**Housekeeping and fiber fly**  
– Impact on self-inflicted irregularities, especially thick places

**Wrong or unstable climate conditions**  
– Impact on spinability

**Missing or improper air change**  
– Impact on fiber accumulation



### Solutions for spinning mills

#### Ensure proper cleaning and maintenance of air

- Avoid blocked suction
- Operator instruction and tools
- Regular cleaning cycle (plan)
- Vacuum cleaner vs. compressed air

#### Control relative humidity, temperature and water content



### 3.8. Quality testing and management

#### Constant laboratory conditions

Many spinners share yarn quality data along with a yarn delivery. In most cases, the yarn quality data is derived from the packages after conditioning under standard conditions and testing in a well-equipped laboratory. Disputes can arise if the yarn has been tested under non-standard conditions or under different standard conditions by either the spinner or the yarn buyer, or if the test equipment has not been well maintained. Typically, such disputes are resolved commercially or by testing in a neutral laboratory.

#### Quality management for spinning mills

Best practices for spinning mills are well described in Uster News Bulletin 50. To ensure the highest standards, the following factors play a crucial role:

- Investing in continuous training and development ensures that employees are knowledgeable about the latest quality standards and practices (Figure 22).
- Consistent and accurate testing under standard conditions, with reliable test instruments and with defined limits (Yarn profile) is essential to maintain yarn quality and prevent disputes.
- Implementing real-time monitoring helps detect variations immediately and ensures adherence to specifications throughout the production process.
- Using Uster Statistics allows spinners to set measurable targets and compare their quality levels with others in the industry, thus enhancing competitive positioning.
- Regularly analyzed quality data helps in identifying trends, making informed decisions, and supporting continuous improvement processes.
- Yarn specifications serve as an understandable tool for agreements and communication with yarn buyers

#### Reliable testing

How the samples are collected and presented to the instrument can also have an impact on the test result and measured irregularity (Figure 23). Testing procedures should always be the same especially when measuring roving and sliver (Figure 24). Undwinding devices help to ensure uniform material movement. Inaccurate testing can lead to wrong evaluation and inadequate yarn quality in the end.



Figure 22 Clear instruction for operators



Figure 23 Improper collection and presentation of test samples

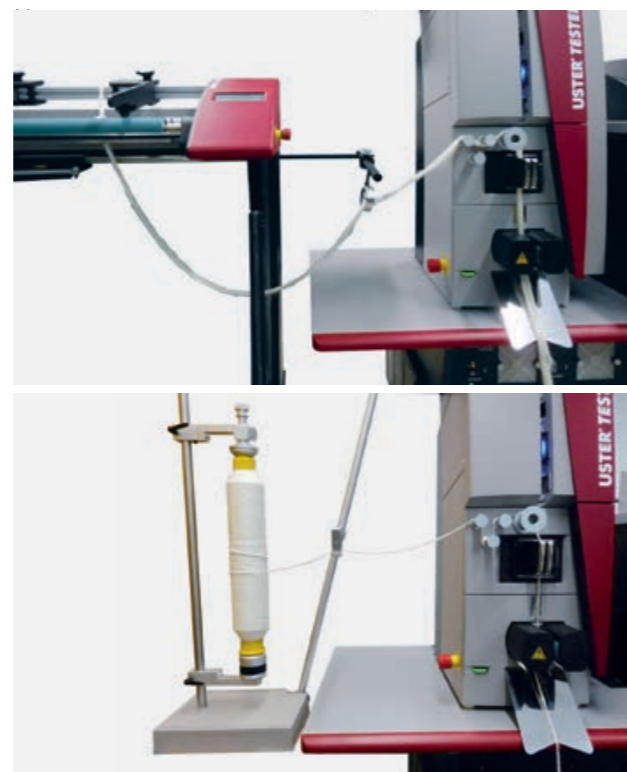


Figure 24 Reliable testing of sliver and roving

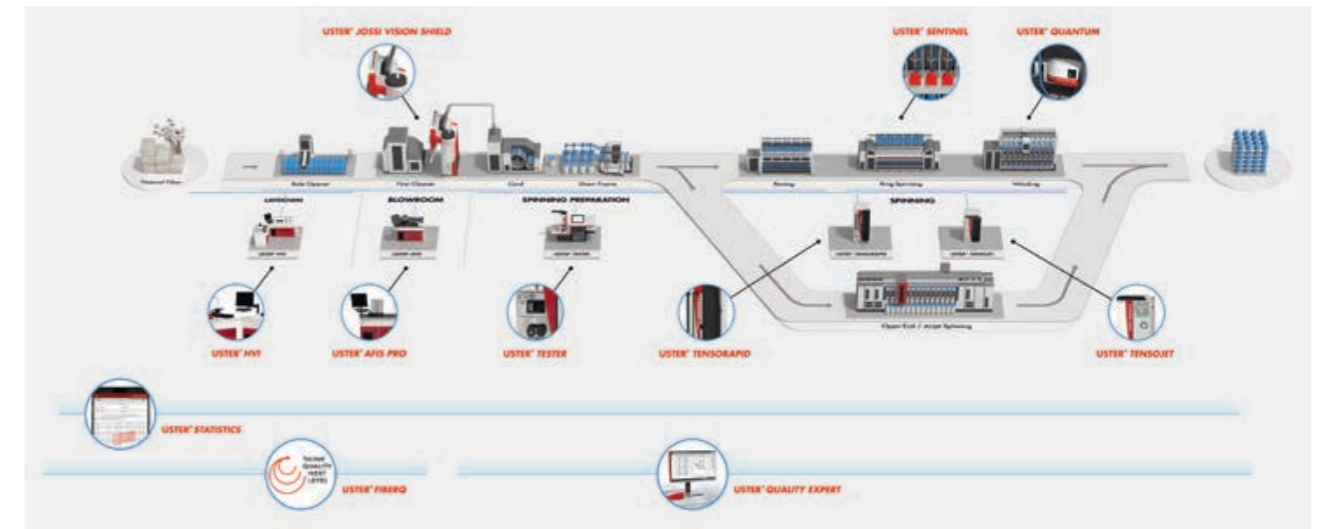


Figure 25 Uster solutions along the spinning process

#### Routine test plans and actions plans

For timely detection of yarn irregularities, mills have set up dedicated test routines throughout the spinning processes (Figure 25). In developing such plans, the Pareto principle should be considered: major complaints are often due to single exceptions. Such anomalies may go undetected, if sample size, number of repetitions, testing frequency or in-line monitoring are insufficient for the mill's operations.

When handling claims, spinning mills usually close the loop with a practical action plan. Among other methods, the root cause analysis, described at the start of this document, is very helpful in building a customized knowledge base, capturing issues and deriving specific measures. Consequently, the number of claims can be reduced long-term. Specifications are achieved reliably and agreements with yarn users are kept.

## Causes, effects and solutions – Quality testing and management

### Reasons for claims

#### Improper sampling and testing

- Impact on test result and interpretation

#### Employee know-how

- Impact on quality
- Impact on analysis

#### Quality management and test plan not in place

- Impact on uncontrolled deviations

#### Benchmarks too low/too high

- Impact on quality achievement

#### Inappropriate yarn specifications with yarn buyers or no agreements at all

- Impact on quality expectations



### Solutions for spinning mills

#### People

- Live a quality mind-set
- Train personnel

#### Laboratory and instrument service

- Test on reliable and well-maintained instruments
- Participate in round trials
- Keep constant lab conditions
- Follow material conditioning

#### Define and follow suitable routine test plans

- Laboratory testing
- In-line process control
- Useful and consistent test procedures
- Handling of exceptions with action plan
- Testing frequency

#### Data-based analysis and decision making

- Control meaningful quality parameters
- Understand and interpret the results
- Identify root causes

#### Benchmark and yarn profiles

- Set specific yarn specification
- Benchmark with Uster Statistics

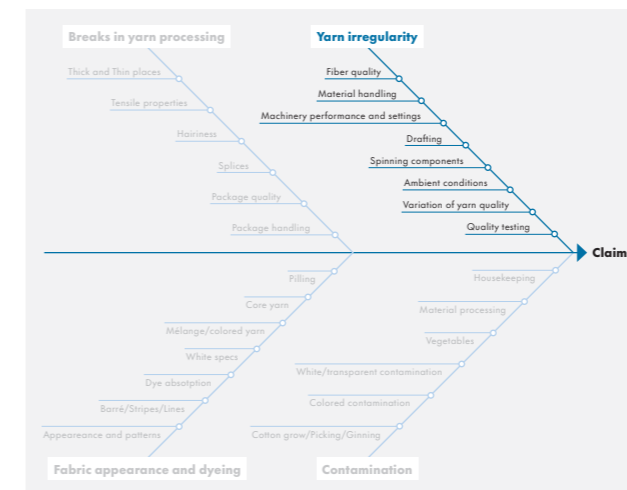
## 4. Conclusion

Yarn irregularity remains one of the most frequent reasons for customer claims in the textile industry. To mitigate these issues, it is crucial to manage material, spinning components, settings and ambient conditions thoroughly.

Quality management is an integral part of maintaining high standards. Agreements are essential to ensure that the yarn produced meets the specific requirements of the end-user. Many quality problems and customer complaints arise from inadequate quality agreements. Reliable laboratory testing, in-line monitoring and reporting routines remain necessary, even though the evolving artificial intelligence gradually facilitates the interpretation of results.

Ongoing training encourages continuous improvement and a quality mindset that is 'lived' by everyone in the spinning mill. Over time, the knowledge base will grow as new challenges may arise due to the increasing diversity and sustainability needs of the market.

Uster Technologies provides valuable support with expert guidance and reliable solutions, enabling spinning mills to maintain consistent yarn quality and minimize defects. This concludes Uster News Bulletin 52, the first volume of the series, in which we share the most common reasons for yarn irregularity complaints – and how to overcome them. Looking ahead, the next volumes will investigate further the other main branches that cause claims.



# 5. Bibliography

**Uster Statistics 1957 – 2023**

→ Uster 360Q Platform/web app

**Uster News Bulletin No. 22 –  
THE USTER AUTOMATIC Electronic  
Yarn Clearing Installation, July 1974**

**Uster News Bulletin No. 47 – Origin of fabric  
defects – and way to reduce them, July 2010**

→ Uster 360Q Platform/insights

**Uster News Bulletin No. 50 – Managing  
a spinning mill with quality in mind,  
December 2014**

→ Uster 360Q Platform/insights

**Geiger, Walter, Qualitätslehre, Einführung –  
Systematik – Terminologie. Deutschland, 1986**

**Ishikawa, Kaoru, What is Total Quality Control?  
The Japanese Way, 1985**

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