ABRAPA

ASSOCIAÇÃO BRASILEIRA DOS PRODUTORES DE ALGODÃO

Spinning Brazilian Cotton

Challenges & Solutions

Best Practices, Key Learnings & Process Optimization

Contents

Preface

The Brazilian Cotton Growers Association (ABRAPA) has long been committed to strengthening the role of Brazilian cotton in the global textile value chain. Through advanced farming systems and sustainable practices, Brazil has established itself as one of the world's leading cotton producers and exporters. ABRAPA's mission is to ensure that Brazilian cotton not only reaches mills worldwide but also delivers optimal performance at every stage, from spinning to fabric.

In 2024, to better understand how spinners perceive Brazilian cotton, ABRAPA commissioned a perception mapping study in the top six importing countries. The findings revealed key strengths but also pinpointed specific challenges in the spinning process. In direct response, the Association launched a series of spinning and knit fabric processing trials to develop actionable solutions.

This report, **"Spinning Brazilian Cotton: Challenges and Solutions"** presents the outcomes of these trials, conducted in India, Indonesia, and Vietnam. It also incorporates proven best practices from Brazilian spinners with a long history of exclusively using domestic cotton. By offering these technical insights, the report aims to bridge the gap between Brazilian growers and the global spinning industry. It reflects ABRAPA's firm belief that transparency, collaboration, and continuous improvement are essential for maintaining Brazilian cotton as a preferred and trusted choice.

ABRAPA extends its sincere gratitude to the participating mills: Sudiva Spinners Pvt. Ltd. (India), PT Indorama Indonesia Tbk. (Indonesia), and Dong-il Vietnam Co. Ltd. (Vietnam). A special thanks also goes to the Brazilian spinning mills - Fiação Fio Puro, Têxtil União S.A. & Incofios Spinning Mill and testing center - Senai Blumenau/SC for their invaluable input. Their cooperation was instrumental in developing the practical recommendations set forward in this report.

As the industry evolves, ABRAPA remains dedicated to investing in initiatives that enhance quality, sustainability, and traceability. We are confident that the solutions presented here will empower mills to achieve superior results with Brazilian cotton, thereby reinforcing Brazil's position as a global leader in responsible and reliable cotton supply.

Gustavo Viganó Piccoli
President
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Executive Summary

Brazil is a global leader in cotton production and export, recognized for its large-scale mechanized farming, competitive pricing, and strong commitment to sustainability. It is the world's largest supplier of Better Cotton Initiative (BCI) certified cotton, with over 80% of its output meeting international sustainable standards. Concentrated in the Cerrado biome, Brazil's rain-fed cultivation achieves one of the highest yields globally without widespread irrigation.

A 2024 perception study commissioned by ABRAPA in key export markets - China, Vietnam, Bangladesh, Turkey, Indonesia, and Pakistan - found that while spinners value Brazilian cotton for its price and sustainability, concerns persist about fiber quality variations (e.g., SFI, UI, Color) and stickiness. These issues can affect spinning efficiency and yarn quality.

Subsequent technical mill trials in three countries, along with input from Brazilian spinners, confirmed these market perceptions. However, they also highlighted that the challenges are addressable. Spinners can mitigate them through targeted, low-cost operational adjustments and process optimization.

The following challenges were identified during the spinning trials, primarily associated with stickiness and variation in quality:

Figure 1: Department-wise Challenges in Spinning Brazilian Cotton[1]

Blow Room & Carding	Pre-Combing & Comber	Speed Frame & Ring Frame
·Higher accumulation of kitti and fly ·Fiber choking at coiler calendar rolls ·Trash and dust deposition in humidification plant filter room	·Higher fly accumulation in draw box of pre-combing lap former ·Higher fleece cuts at comber ·Sticky deposits on detaching rolls	·Frequent lapping on bottom rolls of speed frame ·Fly accumulation on top clearers of speed frame ·Sticky deposits on ring frame bottom roller & top cots

Key process and quality parameters were defined, monitored for deviations and further finetuned during the trials to optimize the spinning performance of Brazilian cotton. The results demonstrated that by adopting specific measures, the reported challenges can be effectively addressed.

[1] Kitti means fragmented seed particles and fly means tiny loose fibres/dust particles that become air borne

Figure 2: Best Practices for Spinning Brazilian Cotton

Stickiness Testing
Develop a standardized methodology for stickiness testing. Test at least 10–20% of bales from each lot using stickiness tester or the oven tester to identify potential issues and enable timely troubleshooting.
Bale Management & Fiber Mixing
Use bale management software and leverage HVI data to ensure homogenous fibre mixing at the laydown. Mix cotton from multiple lots and/or merchants to dilute the impact of stickiness and quality variation.
Fiber Conditioning at Blow Room
Apply fiber conditioners at the blow room stage to reduce stickiness. Conditioning also improves fiber flow, reduces choking at coiler rolls, and lowers fly generation.
Optimizing Blow Room & Card Settings
Adopt settings setting such as lower beater speeds in the blow room and lower cylinder & licker-in speeds in carding. This reduces fiber rupture and improves overall yarn quality. Optimize waste extraction at blow room to extract maximum trash/seed-coats to control sticky deposition and fly accumulation in downstream processes.
Periodic Machine Cleaning
Increase cleaning frequency at all spinning stages to reduce sticky deposits and fly accumulation. This minimizes machine stoppages.
Maintaining Optimal Spinning Conditions
Maintain lower relative humidity (~45%) and higher temperatures (35-37°C). This helps to reduce fly and fiber choking. For colder external conditions, use of heating lamps in draw frame, comber and speed frame is effective.

By implementing these recommendations along with optimizing process parameters as per the yarn requirements, the mills where trials were conducted were able to significantly improve the spinning performance of Brazilian cotton. The cost of implementing these interventions is minimal and is justified by the improved efficiency and yarn quality achieved.

1. Introduction to Brazilian Cotton

1.1. Background

Cotton has been cultivated in Brazil for centuries, beginning with indigenous use and later becoming a key agricultural activity during the colonial period. The cultivation expanded rapidly in the 1980s, placing Brazil among the world's leading producers and exporters. A period of decline followed in the late 1980s and 1990s, driven by pest infestations and policy shifts. Recovery began in the late 1990s, resulting from investment in technology, improved seed varieties, and modern farming practices. Brazil re-established itself as one of the top global cotton producers by the early 2000s.

Production is concentrated in the Cerrado biome, where topography supports large-scale mechanized farming. Mato Grosso and Bahia account for most of the country's output, while other producing states include Mato Grosso do Sul, Maranhão, Goiás, Minas Gerais, Piauí, and Rondônia.

Figure 3: Major Cotton Producing Regions

Brazil's efficient production system is supported by large-scale mechanized farming practices. Mechanization of planting, cultivation, and harvesting using advanced equipment, including no-till seeders, precision sprayers, and modern pickers is enabled by flat terrain. Brazil achieves the highest global yields for non-irrigated cotton, with 92% of the crop cultivated in predominantly rain-fed, dryland areas.

The planting season starts from December to February, the harvest occurs from June to September, ginning operations and HVI classing take place from June to January. Crop rotation, commonly with soybeans, improves soil health, nutrient balance, and pest management while ensuring sustainable land use.

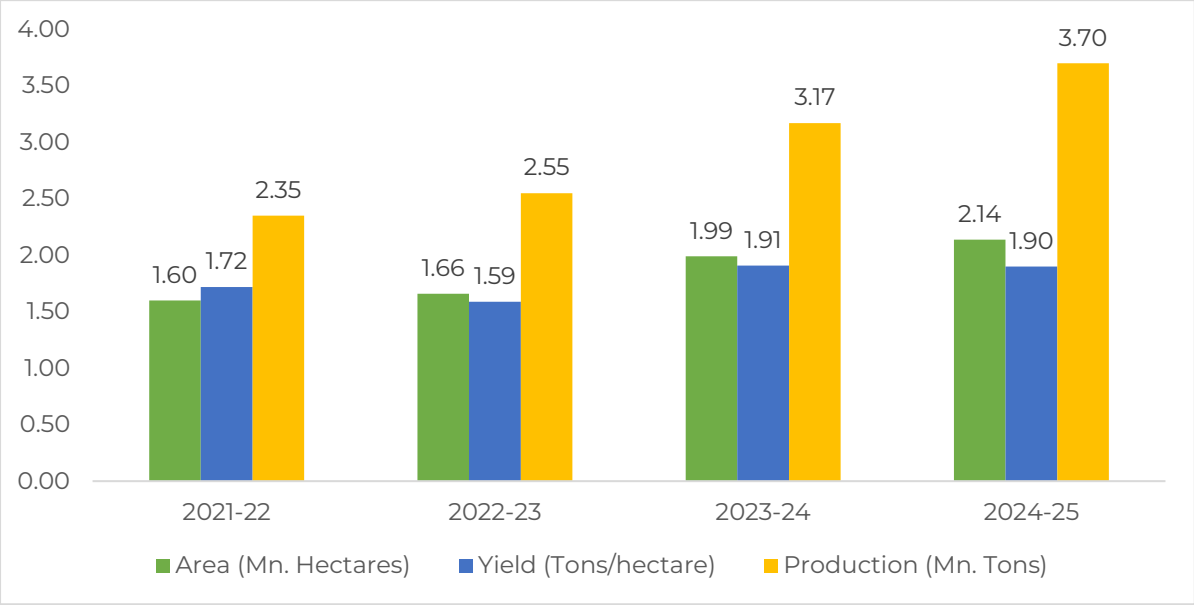
Brazil is also the world's largest producer of Better Cotton Initiative (BCI)-certified cotton, accounting for more than one-third of global BCI output. Since 2013, it is consistently ranked as the top producer of sustainable cotton, with over 80% of output certified under international standards. Traceability systems, such as satellite monitoring, QR code tagging, and integrated farm-to-port logistics, reinforce its position in responsible sourcing.

1.2. Global Positioning

Production

Brazilian cotton has shown consistent growth in both area and production over recent years. While yield has improved steadily, the acreage expanded from 1.60 Mn. Hectares to 2.14 Mn. Hectares, and production increased from 2.35 to 3.70 Mn. Tons, growing at a CAGR of 7.5% and 12%, respectively. Brazil achieved the highest average yield of 1,900 Kg/hectare in the world.

Figure 4: Brazil Cotton: Area, Yield and Production



Source: Conab, ABRAPA

This output represents 14% of global cotton production and positioned Brazil as the third largest cotton producer.

Table 1: Key Cotton Producing Nations (Production Volume in Mn. Tons)

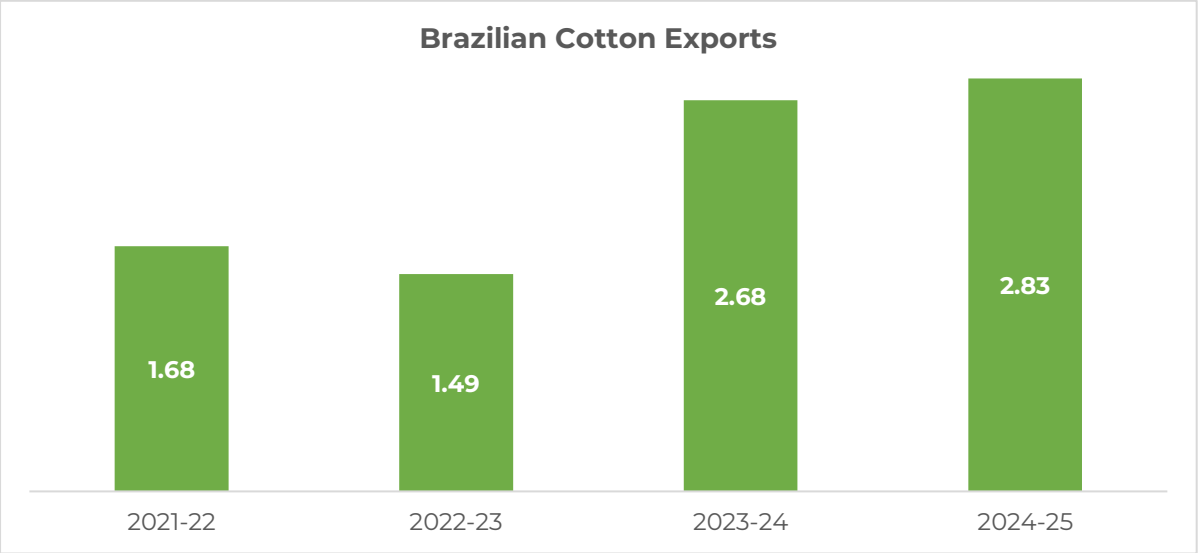
Country	2021-22	2022-23	2023-24	2024-25	Share 2024-25
China	5.81	6.69	5.95	6.97	27%
India	5.29	5.72	5.53	5.22	20%
Brazil	**2.35**	**2.55**	**3.17**	**3.70**	**14%**
USA	3.81	3.15	2.62	3.13	12%
Australia	1.27	1.26	1.10	1.22	5%
RoW	6.33	5.95	6.23	5.87	22%
World	24.86	25.32	24.6	26.11	

Source: USDA, Conab, ComexStat, and ABRAPA

Exports

From 2021/22 to 2024/25, Brazilian cotton exports increased from 1.68 to 2.83 Mn. tons annually. Brazil now exports to more than 70 countries, strengthening its role as a prominent supplier to the global textile industry. The trade is highly concentrated in three markets - Vietnam, Pakistan and China accounting for around 52% of exports.

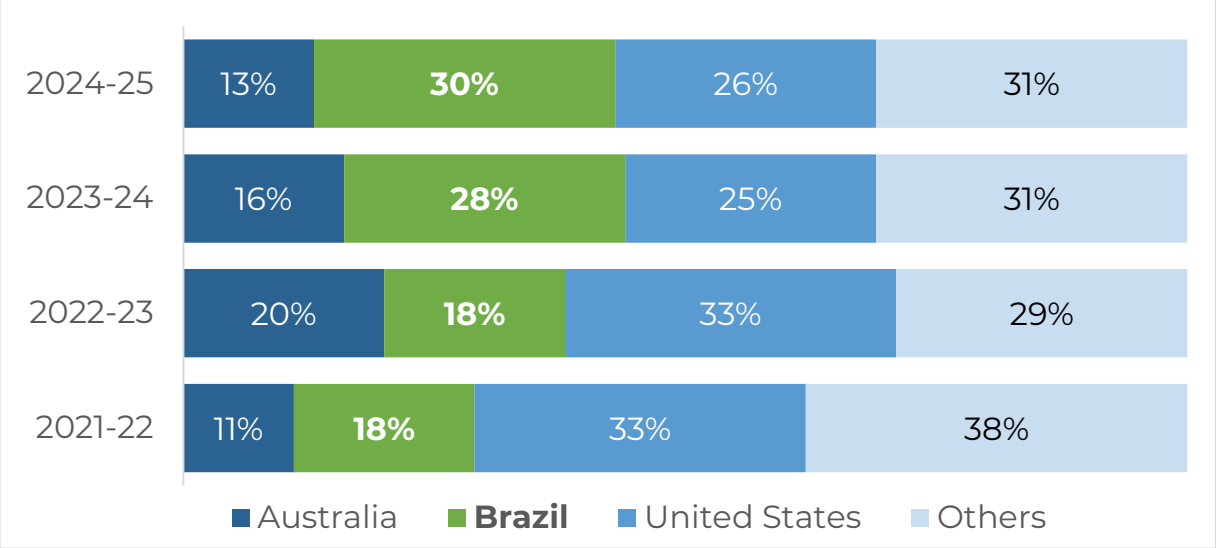
Figure 5: Brazilian Cotton Exports (Mn. Tons)



Source: Conab, ABRAPA

Brazil became the top global exporter in 2023/24 and reached a record 30% share of world cotton exports in 2024/25.

Figure 6: Market Share of Global Cotton Exports



Source: USDA, Conab, ComexStat, and ABRAPA

1.3. Fiber Properties

Below table summarizes the key fibre parameters of Brazilian cotton such as length, strength, micronaire, maturity, uniformity, etc.

Table 2: Key Fiber Quality Parameters of Brazilian Cotton (Uster HVI and AFIS results)

Parameters	Range
Uster HVI	
SCI	125-145
Length (mm)	28-31
Fineness (mic)	3.8-5.0
Strength (g/tex)	28-32
Uniformity Index (UI)	82.0-83.5
Short Fiber (%)	7.5-10.5
Elongation (%)	4.5-6.5
Maturity	0.85-0.90
Reflectance (Rd)	74-80
Yellowness (+b)	7.5-11.5
Uster AFIS	
Neps/gram	200-280
L(n)	20.0-21.5
Short Fiber Content (n)	19.5-25.0
Immature Fiber Content (IFC%)	4.75-6.25
Maturity Ratio	0.85-0.92

This result places Brazilian cotton in the medium-to-long staple range (28–31 mm), with strength, micronaire, and maturity levels that allow efficient processing in both ring and rotor spinning.

In addition to the above, three other important parameters are:

a. Stickiness

Brazilian cotton exhibits inherent stickiness tendency, with its severity ranging from moderate to high across crop years. The issue is linked to whitefly infestations, aphids, and genetic factors.

b. Trash Content

Brazilian cotton shows higher levels of trash (plant debris) compared to other origins. This is mainly attributed to harvesting methods and pre-ginning farm practices. Gravimetric analysis indicates that trash ranges from 1.75–3.0%, with occasional peaks reaching >4.0%.

c. Contamination

Brazilian cotton has low contamination levels due to mechanical harvesting. While occasional traces of fragmented plastic from module coverings have been detected at blow room contamination sorters, these are not considered a significant risk and occur sporadically across all major origins.

2. Challenges Faced by Spinners

Several spinning related challenges were highlighted during both the perception mapping study and subsequent spinning trials. These are largely driven by the inherent stickiness and variation in quality parameters such as Short Fiber Index (SFI), color grade, and maturity. They directly impact the yarn consistency, production efficiency, and overall spinning performance.

2.1. Market Perceptions: What Spinners Reported

The perception study was aimed to map the technical characteristics, end-use suitability, technical & commercial challenges of Brazilian cotton and benchmarking against other cotton origins. It covered Brazil's six key export destinations - China, Vietnam, Bangladesh, Turkey, Indonesia, and Pakistan. These countries together accounted for 95% of total exports in 2023.

Figure 7: Perception Mapping Study Coverage

Spinning mills in all the key markets reported multiple factors such as pricing, low contamination, sustainability, traceability, and credibility of suppliers as the key strengths of Brazilian cotton.

Spinning mills reported challenges including high quality variation, high short fiber index, stickiness, low spinning performance, occasional contamination and traceability related issues.

Figure 8: Challenges Reported during Perception Study

High Short Fiber Index (SFI)

Almost all the spinners reported higher Short Fiber Index (SFI) in Brazilian cotton compared to other origins. This increases fiber wastage during yarn production and negatively impacts productivity and quality consistency.

High Quality Variation

50% of the spinners reported significant variations in fiber quality parameters such as strength, colour grade, spinning consistency index, and maturity. This impacts quality consistency and efficiency.

Stickiness

More than 60% of the spinners reported stickiness issue as a challenge. This causes fly accumulation on machine and frequent stoppages.

Low Spinning Performance

Almost all spinners reported that Brazilian cotton has 2–3% higher wastage levels and 6–8% lower productivity as compared to US and Australian cotton under ideal conditions. This translates into higher production costs and limits the fiber's competitiveness.

Contamination - Coloured Plastics

Most of the spinners reported that Brazilian cotton is mechanically harvested and contamination free, though there are occasional cases of coloured plastics. This increases the risk of visible defects in light shade fabrics.

Contamination - Plant Debris

70% of the spinners reported high levels of plant debris and trash content. This directly affects spinning efficiency and yarn recovery.

Traceability

Majority of spinners found Brazil cotton's traceability system effective, though 20-25% reported mismatches in HVI reports and incomplete barcode linkages. Data inconsistencies can reduce confidence in quality assurance.

Mills reported using Brazilian cotton for 15–45% of their total cotton consumption on average. Several of the spinners mix Brazilian cotton with US and Australian cotton to optimize costs, while mixing with West African cotton enhances strength, and productivity.

The study indicates that the procurement of Brazilian cotton is expected to grow further. Its advantages in pricing, sustainability, and low contamination levels make it an attractive choice for global spinners. However, operational challenges related to fiber quality variation and stickiness remain key areas requiring interventions.

2.2. Technical Challenges in Spinning

During the technical trials at different spinning mills (ring spinning), issues were observed at different stages because of stickiness such as trash depositions, fly accumulation, fleece cuts, fiber choking, and random lapping.

Blowroom & Carding

Figure 9: Higher Kitti & Fly [2]Deposition on Carding Web Plate

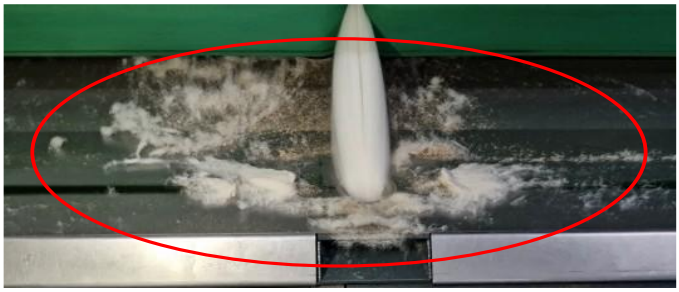
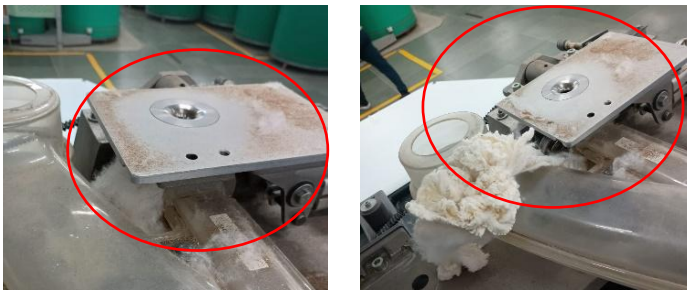


Figure 10: Excessive Trash & Dust Deposition in Humidification Plant Filter Room

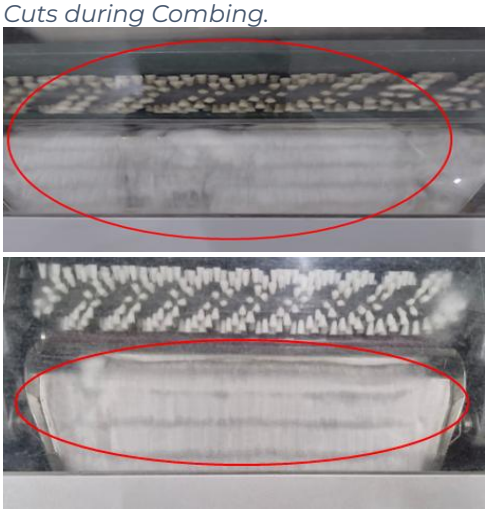
Figure 11: Fiber Choking at the Coiler Calendar Roll with Kitti Accumulation



Lap Former & Comber

Figure 12: Heavy Fly Accumulation in Draw Box at Lap Former

Figure 13: Increased Incidence of Fleece Cuts during Combing.



[2] Kitti means fragmented seed particles and fly means tiny loose fibres/dust particles that become air borne

Speed frame

Figure 14: Higher fly Accumulation on Top Clearer

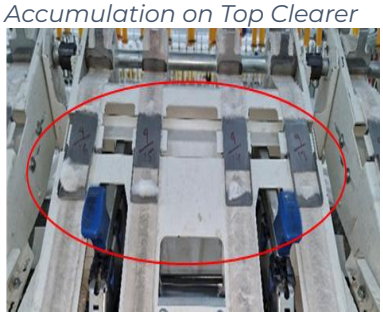
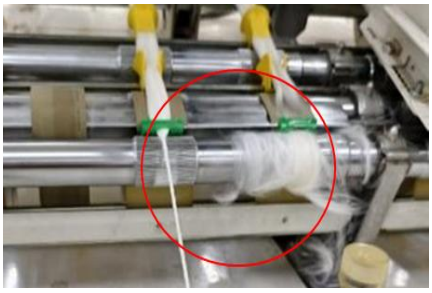
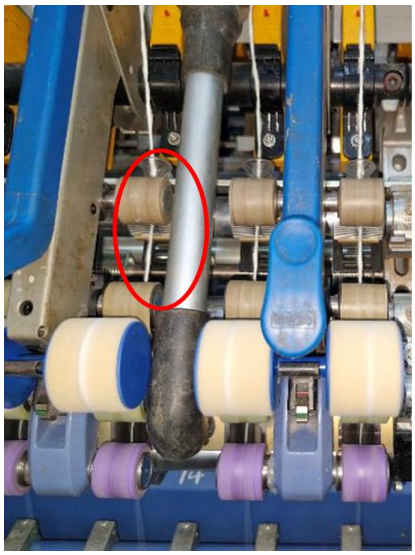


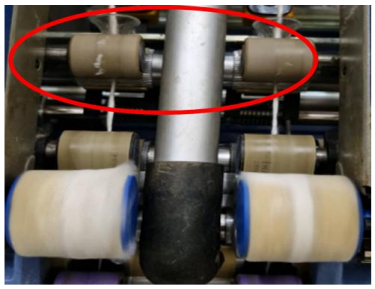
Figure 15: Random Lapping on the Bottom Rolls

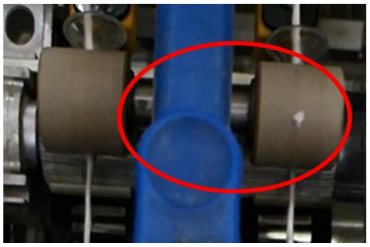


Ring frame

Figure 16: Fly & Sticky Deposition on the Top Rolls and Clearers



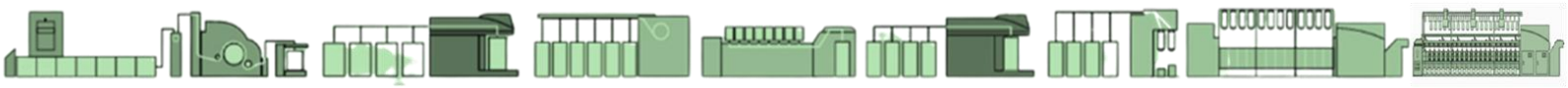




These challenges directly impact the efficiency, quality and yarn realization**.**

In summary, following impacts of stickiness were observed in spinning Brazilian Cotton:

Figure 17: Summary of Challenges Observed in Spinning Brazilian Cotton due to Stickiness



Mixing & Blow room	Card	Breaker Draw frame	Lap Former	Comber	Finisher Drawframe	Speed Frame	Ring frame	Winding
• Trash & dust deposition in humidification plant filter room	• Higher kitti & fly deposition on web plate at carding • Fiber choking at coiler calendar roll and kitti deposition		• Fly accumulation in draw box	• Higher fleece cut in combing • Sticky deposits on detaching rolls		• Frequent lapping on bottom rolls • Fly accumulation on top clearers	• Fly & sticky deposition on the top rolls	• Higher cuts due to periodic faults

3. Best Practices for Spinning Brazilian Cotton

The trials were aimed at identifying key interventions that improve the performance of Brazilian cotton that arise due to stickiness and other fibre related challenges. This section outlines those proven practices that enabled spinning mills to achieve consistent quality and operational efficiency.

Figure 18: Best Practices to Optimize Brazilian Cotton Spinning

Stickiness Testing

Bale Management and Fiber Mixing

Fiber Conditioning at Blow Room

Optimizing Blow Room and Card Settings

Periodic Machine Cleaning

Maintaining Optimal Spinning Conditions

3.1.Stickiness Testing

Stickiness testing provides necessary data for troubleshooting at early stages.

- **Measure stickiness** in at least 10-20% of bales from every lot using stickiness testing equipment.
- **Set an acceptable stickiness threshold** aligned with the mill's processing for the determined stickiness level.

Stickiness testing in cotton can be carried out using two ways, high-speed stickiness tester or oven testing methods. There are two commercially available high-speed stickiness testers: Contest-S, Mesdan, Italy and Sticky Cotton Detector H2SD, Cirad, France.

The oven testing method measures the +b value before and after caramelizing the cotton samples at 150°C for 25 minutes. The difference in +b values indicate the degree of stickiness. In Brazil, several spinners prefer oven testing method over H2SD testing.

3.2. Bale Management & Fiber Mixing

- **Use bale management software** along with **HVI data** tagged with every bale ID.
- **Mix cotton from multiple lots, merchants, or regions** to achieve better consistency.
- **Adjust the mixing ratio of sticky cotton with non-sticky cotton lots** based on stickiness test results.

These above steps ensure homogeneity in the blow room feed, which reduces the risk of barreness and enhances long-term quality consistency. It also dilutes issues resulting from stickiness, which often varies from lot to lot and merchant to merchant.

3.3. Fiber Conditioning at Blow Room

- Use **fiber conditioners** for smooth processing at all spinning stages, irrespective of conventional, compact, open-end, or air-jet spinning.
- **Install a spraying system** at the blow room stage (mixing, bale openers and bale pluckers) to apply the conditioner automatically during operation.

The conditioner forms a coating on the fibers, which reduces stickiness and minimizes fly and dust. It also enhances fiber movement across machine surfaces and through transportation ducts. Two fiber conditioners are available in the market: Gintex from Cotton Corporation USA and Miracle-869 from Shiba Corporation, Japan which have been proven to deliver successful results. Gintex is widely adopted by the spinning industry in Brazil.

Automated measuring and on-line spraying equipment for these conditioners are available for easy application at the blow room stage (mixing, bale openers or bale pluckers). These are also equipped with a semi-automatic feeding and control system for the conditioner spray. These systems are compatible with all types of blow rooms and are easy to maintain.

Figure 19: Conditioner Spraying Equipment

The application of such conditioners will cost ~1.50 US Cents/kg of yarn, which is justified by the significant cost benefits it provides.

3.4. Optimizing Blow Room and Card Settings

Brazilian cotton contains a higher amount of thick and sticky trash components. To improve trash extraction and reduce downstream challenges, it is essential to optimize opening and cleaning action.

- **Keep gentle opening** in blow room to reduce the impact of variation in Short Fiber Content (SFC) and fiber strength.
- **Operate lower beater speeds in the blow room and cylinder & licker-in speeds in carding** to reduce fiber rupture.
- **Extract maximum trash at the blow room stage, followed by carding.**
- **Monitor** key parameters such as **neps/g and SFC(n)** at intermediate stages **– specifically at the blow room input/output and carding input/output** to achieve an optimum balance of trash levels, waste, and neps.

Optimizing opening and cleaning actions results in improved quality outcomes and prevents fiber rupture. Extracting maximum waste at blow room significantly reduces the kitti deposition and fly accumulation in carding as well as fly accumulation in draw box of lap former.

The waste level and quality results for the trials conducted in two mills with wider settings are summarized below:

Table 3: Cotton Quality

Parameters	Mill-1	Mill-2	Mill-3
Mixing	100% Brazilian Cotton	100% Brazilian Cotton	Brazilian Cotton: 60% and US Cotton: 40%
Trash in cotton	2.75-3.00%	1.75-2.00%	-
Neps/g	250-300	250-300	225-275
L(n)	19.8	21.0	20.5
SFC(n)	24.5-25.0	20.5	23.0-23.5
IFC (%)	6.00	5.60	5.25
Maturity Ratio	0.88	0.90	0.90

Table 4: Waste Levels in Blow Room and Carding

Parameters	Mill-1	Mill-2	Mill-3
Blow room waste	1.50%	1.30%	1.50%
Card waste	5.50%	5.00%	8.0%

Table 5: Quality Levels of Cotton, Blow Room and Carding

Parameters	Mill-1	Mill-2	Mill-3
Input quality levels			
Cotton Neps/g	250-300	250-300	225-275
Cotton SFC(n)	24.0-24.5	21.0	23.0-23.5
Output quality levels at blow room			
Neps/g	350-375	280-300	360
SFC(n)	25.0-25.5	21.0-22.0	24.5
Output quality levels at carding			
Neps/g	80-100	60-65	85-90
SFC(n)	23.5-24.0	19.0-19.5	24.5
Card production (kg/hr)	75	75	75
Output quality levels at comber			
Neps/g	30-35	20-21	26-28
SFC(n)	15.0-16.0	9.0-10.0	15.0-15.5

These practices minimized the impact of sticky trash in subsequent process stages, ensuring better working and improved yarn realization. Waste extraction was maximized to below mentioned levels during the trial in the mills and desired carding and comber output quality were achieved. Mill 1 and Mill 2 achieved yarn realization of 76.25% and 73.85%, respectively, using 100% Brazilian cotton, while Mill 3 recorded a 76.4% yarn realization with a 60:40 blend of Brazilian and US cotton. All three mills were able to attain the desired quality parameters.

Table 6: Overall Yarn Realization

Particular	Mill-1	Mill-2	Mill-3
Waste extraction at blow room			
Blow room droppings (cleaner-1)	1.00%	0.60%	1.50%
Blow room droppings (fine cleaner)	0.55%	0.70%	
Waste extraction at carding			
Card droppings	3.75%	3.55%	8.0%
Card flat	1.50%	1.45%	
Micro-dust	0.85%	0.75%	0.75%
Sweeping waste	0.50%	0.55%	0.50%
Fan waste	0.25%	-	-
Hard waste	0.35%	0.30%	0.35%
Noil	**14.75%**	**18.55%**	**12.50%**
Total waste	**23.75%**	**26.15%**	**23.60%**
Yarn realization achieved	**76.50%**	**73.50%**	**76.40%**

Note: The waste level and the quality parameters were also largely dependent on the final product quality, productivity and recovery targets of each mill.

- Mill-1 maintains good yarn quality at a consistent level for Ne 30 Combed Compact 100% cotton yarn. During the trial, the ring frame end breakage rate of 3.50 breaks/100 spindle-hours was achieved with a high productivity, and a total clearer cut of 90 cuts/100 kilometres (including FD and PP faults) at winding.
- Mill-2 maintains stringent yarn quality levels for Ne 30 Combed Compact 100% cotton yarn. During the trial, the ring frame end breakage rate of ≤2.00 breaks/100 spindle-hours was achieved with good productivity, and a lower total clearer cut of 75-80 cuts/100 kilometres (including both FD and PP faults) at winding. It uses strict raw material procurement and closely monitors cotton quality during contract and purchase stages.
- Mill-3 maintains optimal yarn quality performance. During the trial, ring frame end breakages were reduced by 22%, and clearer cuts at winding decreased by 15% through optimization of process parameters and control of room conditions (RH & temperature). To further enhance performance, the use of conditioning oil at the mixing stage was recommended, as it effectively minimizes stickiness and dust/fly levels.

These results along with reasons and interventions proposed during the trials are detailed in Annexure.

3.5. Periodic Machine Cleaning

Following cleaning measures beyond routine practices are effective for Brazilian cotton spinning:

Blow Room & Carding:

- **Clean** rotary flat cleaning brush in carding periodically to avoid clogging.
- Maintain adequate **suction pressure** in **dust extraction piping**
  - Trützschler carding lines: ~800 to 850 pascals
  - Rieter carding lines: ~1,000 to 1,100 pascals
- Clean the **carding web-plate, trough, and coiler area every 8 hours with a dry cloth. Use water to clean**, if stickiness is observed.
- Ensure **enhanced cleaning of LDF filter rooms** for both blow room and carding, as these often accumulate excessive trash and dust.

Spinning Preparatory (Draw Frame, Lap Former, Comber, Speed Frame):

- **Clean draw frame top rollers** every **2-hours** to maintain sliver quality.
- **Clean the lap former draw-box drafting zone** thoroughly **at every creel change.**
- **Clean comber detaching rolls/draw box top rolls every 8 hours with water or a dry cloth.**

Ring Frame:

- **Clean ring frame drafting top rolls** (front and back) **daily** on running machines **with a dry cloth** to remove fly and sticky deposits.
- **Clean ring frame steel bottom rollers weekly** with a **brush or other suitable means** to keep rolls clear of sticky deposits.

Increase cleaning frequency across all stages to minimize fly accumulation.

3.6. Maintaining Optimal Spinning Conditions

Brazilian cotton performs better when processed at lower relative humidity and higher temperatures.

Maintain relative humidity and temperature as mentioned below:

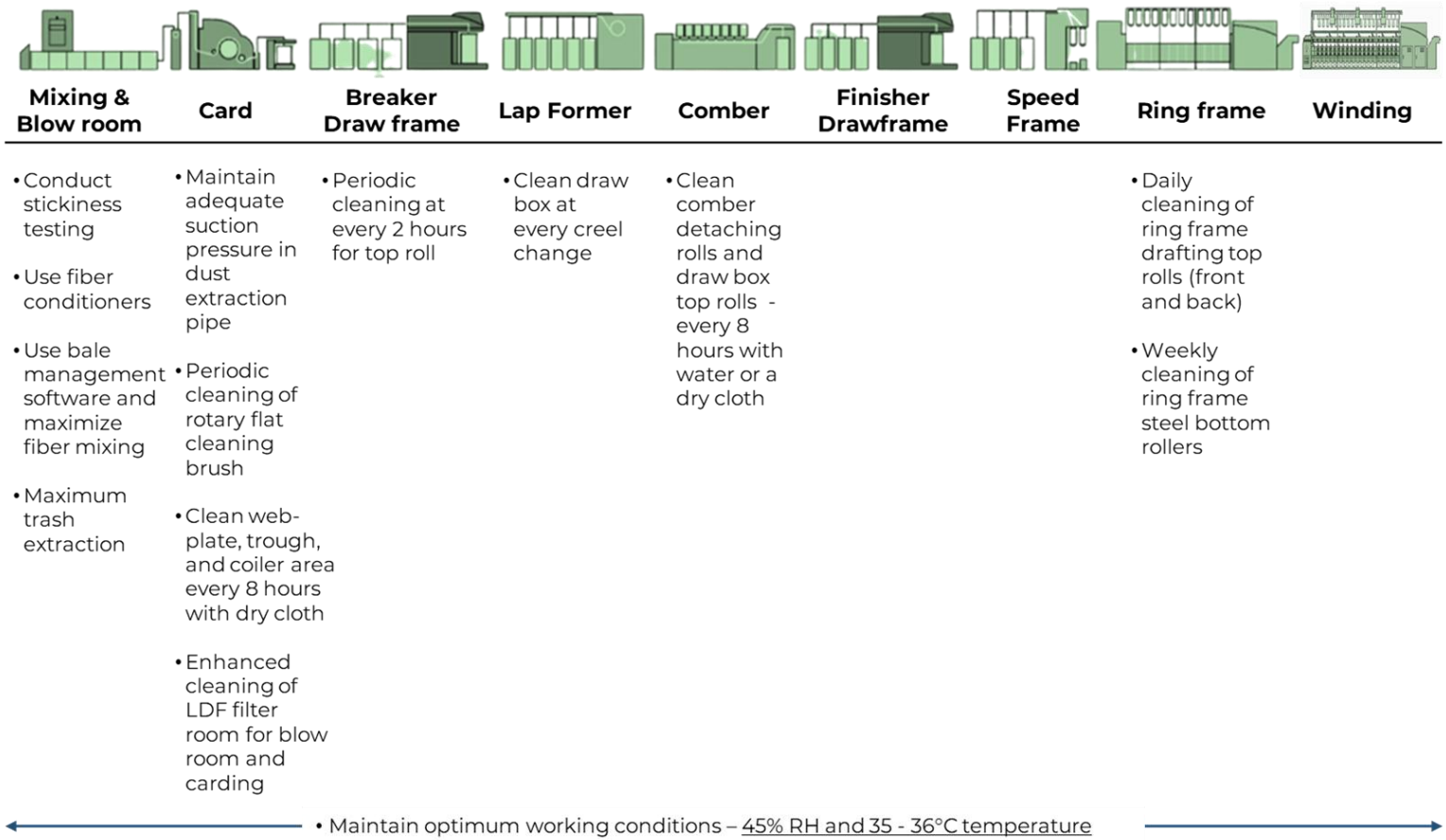
Table 7: Optimum Relative Humidity and Temperatures

Process stage	Relative Humidity	Temperature (°C)
Blow room	55±2%	34-35
Carding	50±2%	34-35
Preparation	45±2%	35-36
Ring frame	45±1%	36-37 (max 37.5)
Winding	50±2%	34-35

At these relative humidity and temperature levels, reduction in end breakage rates on ring frame and clearer cuts & periodic faults at winding is observed. Maintaining these levels also improves performance at all other stages. For colder external conditions, use of heating lamps in draw frame, comber and speed frame is effective.

In summary, the best practices for spinning Brazilian cotton are:

Figure 20: Summary of Best Practices



The best practices outlined across each stage of processing provide a practical roadmap for spinning Brazilian cotton. They highlight operational adjustments that improve consistency, minimize losses, and enhance yarn quality. Mills can achieve better performance and maximize the value of Brazilian cotton by following these steps along with process optimization as per yarn requirement.

4. Conclusion

The global perception study and subsequent spinning trials provided a practical roadmap for the industry to optimize Brazilian cotton performance. The findings confirm that Brazilian cotton is a reliable, sustainable, and cost-competitive fiber whose full potential is realized when mills adopt a systematic approach to manage quality variation and stickiness.

Issues such as kitti deposition in carding, fly accumulation in carding and lap former, fleece cuts in comber, random lapping on speed frame rollers, sticky deposition on top rolls in ring frame, etc. were reported by several spinning mills. However, the trial results demonstrated that with specific practices, mills can effectively address them.

Table 8: Results Achieved during Spinning Trials

Performance Parameters	Mill-1	Mill-2	Mill-3
Productivity	255 GPSS achieved against 245 GPSS (4% improvement)	237 GPSS maintained (same as with running mixing)	250 GPSS maintained (with improved ring frame working)
Yarn Realization	+/-76.50% achieved against +/-72% (+/-4.50% percentage points improvement against running cotton)	73.5% achieved against 75% in regular mixing (Australian, Brazilian and Greek)	76.4% The scope of improvement exists with waste management at carding & comber
Yarn Quality (IPI, RKM, Hairiness & Classimat)	Comparable with running mixing	Comparable with running mixing	Comparable with running mixing
Level of Contamination	Contamination free (fabric with running mixing was found to have contamination)	Contamination free (fabric with running mixing was also contamination free)	No instance of contamination reported.

The results show that through specific measures including routine stickiness testing, the application of fiber conditioners, mixing of cotton from multiple lots, gentle opening actions, maximum early-stage waste extraction, and enhanced cleaning schedules under optimized spinning conditions, spinning mills can mitigate stickiness issue and improve overall performance.

The mill trials also confirmed Brazilian cotton's suitability for contamination-sensitive applications, including bleach-white and pastel dyed fabrics. The recommended interventions are both practical and cost-effective.

Annexure: Case Studies

Mill-1

About Company

The company has an installed capacity of ~125,000 spindles and 2,200 rotors, producing ~33 KTPA of ring-spun yarn and 9 KTPA of open-end yarn. Its product portfolio includes carded, combed, and open-end yarns made from cotton and cotton blends, covering a count range from Ne 6s to 40s.

Table 9: Key Technical Parameters

Particular	Details
Trial Quantity	200 tons, 100% Brazilian cotton
Regular Quality	100% Indian Cotton
Yarn Counts	16s CCW, 20s CCH, 24s CCH, 30s CCH, 34s CCH
Fiber Parameters	Mic: 4.42; Length: 29.19 mm; Strength: 30.65 gtex; Trash: 2.87%

Process-wise Issues and Interventions

Carding

Figure 21: Higher Kitti & Fly Deposition

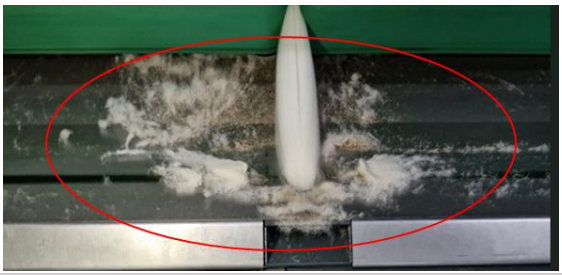
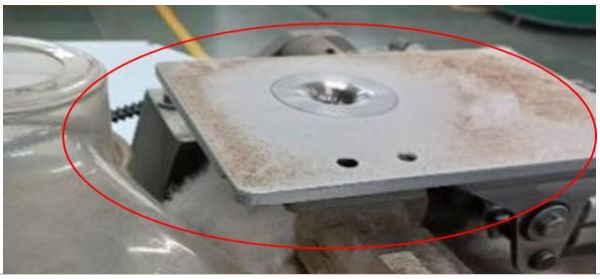


Figure 22: Fiber Choking at Coiler Calendar Roll



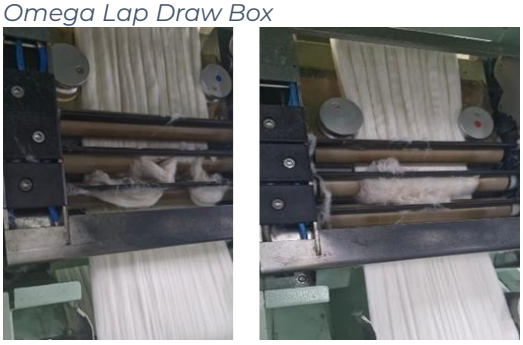
Issues	• Excessive kitti and fly deposition on carding web plates • Fiber choking at the coiler calendar roll with kitti build-up
Reasons	• Lower waste removal at CLP (pre-cleaner) • Higher fiber rupture in CLU (universal cleaner) • Lower suction pressure in hoods/licker-in • Stickiness in fiber and kitti deposition
Interventions	• RH reduced to 45% & temperature increased to 35–36°C • Grid bar setting in CLP changed from 1.50/2.0 to 2.5/3.0 • Feed roller to beater setting in CLU changed from 1.5 to 3.5 • Beater speed of CLU changed from 600 to 515 rpm • Suction pressure in card changed from 750 to 850 bars • Cleaning frequency increased from one time/shift to four times/shift in carding

Results	• CLP waste increased from 0.46% to 1.10% • CLU waste decreased from 1.10% to 0.60% • Card breakages optimized to 12-13/card/day against 5-6/card/day in Indian cotton

Comber

Figure 23: Higher Fleece Cuts

Figure 24: Higher Fly Accumulation in Omega Lap Draw Box



Issues	• Fleece cuts observed at comber • Slightly increased fiber accumulation at the Draw Box in the Omega Lap
Reasons	• Lower detaching roller diameter and high pressure • Stickiness in fiber and kitti
Interventions	• RH reduced to 45% and temperature increased to 35-36° C • Detaching roller pressure decreased from 5 bar to 4 bar • Detaching roller diameter maintained <24 mm from initial 24.1-24.5 mm • Liquimix coated detaching rollers were used • Noil index changed from 8.0 to 7.7 • Strippers were removed from the detaching roller • Cleaning frequency increased from once/shift to four times/shift
Results	• Fleece cuts were optimized, final breakages/comber/hour maintained at 3-3.5 against 2-2.3 in Indian Cotton • Noil% in 100% Brazilian Cotton is 14.75%, 13.5% lower as compared to 17.05% in Indian Cotton

Speed Frame

Figure 25: Random Lapping on Bottom Rolls

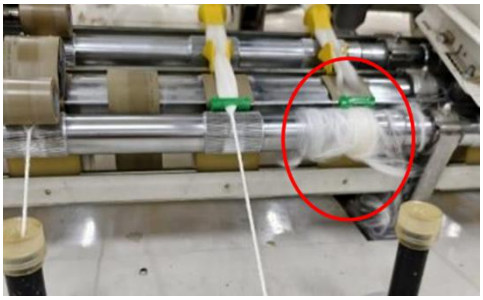
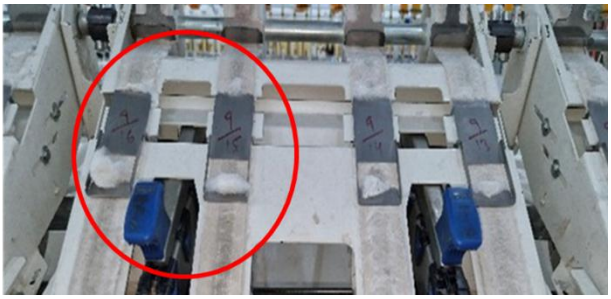


Figure 26: Fly Accumulation on Top Clearer



Issues	• Random lapping on the bottom rolls in speed frame • Higher fly accumulation at top clearer at speed frame
Reasons	• Stickiness in fiber
Interventions	• TM increased from 1.32 to 1.36 • RH reduced to 45% and temperature increased to 35-36°C • Cleaning frequency of drafting zone increased
Results	• Reduction in fly accumulation due to increase in cleaning frequency • Optimization of speed frame breakages while ensuring no undrafted issue occur in ring frame

Ring Frame & Winding

Figure 27: Fly and Sticky Deposition on Top Back & Front Cots

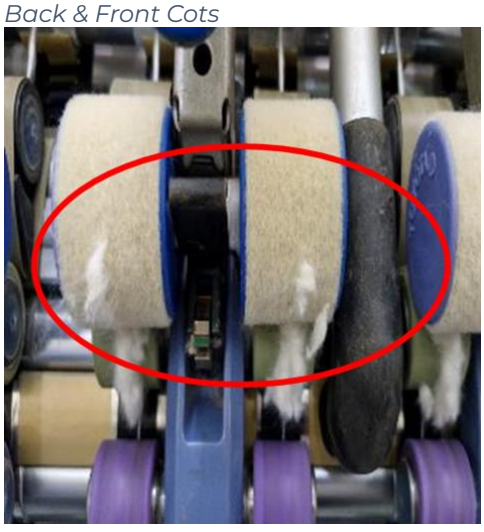
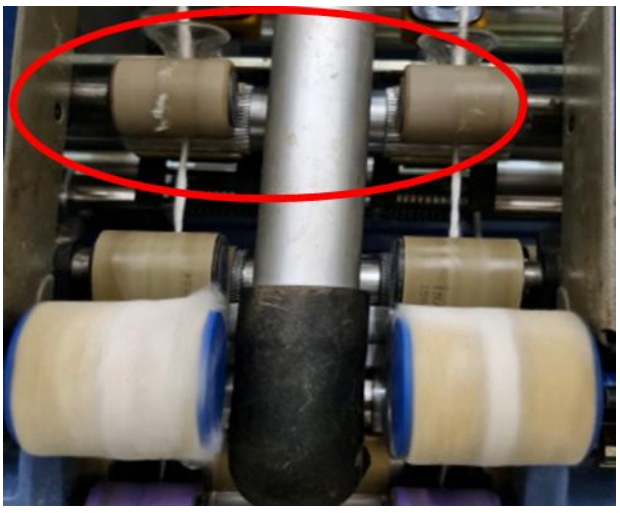


Figure 28: Sticky Deposition on Rolls



Issues	• Excessive fly and sticky deposits observed in the drafting zone of the ring frame, particularly on the top back and front cots, even when top clearers were in use with Brazilian cotton. • Higher FD & PP cuts in winding

	• Higher alarm bobbins
Reasons	• Stickiness in fiber
Interventions	• RH was reduced to 45% & temperature increased to 35-36° C • Cleaning frequency increased for bottom roll & drafting zone • FD setting changed from closed to open
Results	• Reduction in fly deposition in ring frame • FD and PP cuts observed at 60-65/100 km, ~30% higher compared to 45-50/ 100 km in Indian cotton • Alarm bobbin optimized to 60-90/day/RF, higher by ~50% compared to 25-50/day/RF in Indian cotton

Results Achieved

- 255 GPSS for 30s CCH yarn was achieved, with a 4% improvement over the previous 245 GPSS in Indian Cotton.
- The process consistency reached +/-76.5%, which is a 4.5 percentage point improvement over the previous +/-72.0%.
- Overall performance was found to be comparable with the running mixing.
- The resulting fabric was contamination-free, unlike the fabric from the running mixing, which was found to have contamination.

Mill-2

About Company

The company has an installed capacity of ~165,000 spindles, producing approximately 45 KTPA of ring-spun yarn. Its product portfolio includes ring-spun yarns made from cotton and cotton blends, covering a count range from Ne 26s to 40s.

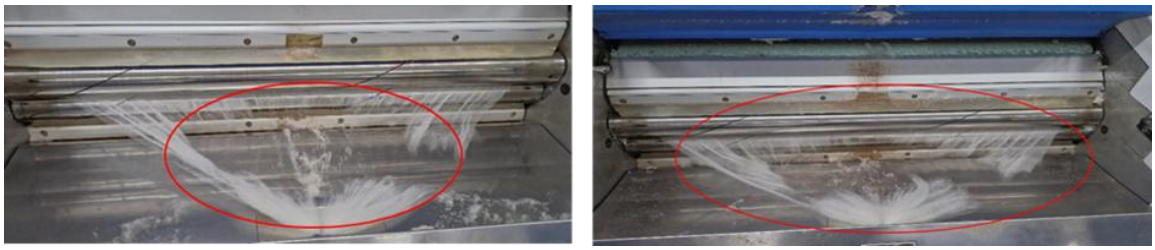
Table 10: Key Technical Parameters

Particular	Details
Trial Quantity	12 tons, 100% Brazilian cotton
Regular Mixing	Australian: 45%, Brazilian: 33% and Greek: 22%
Yarn Counts	30s CCH
Fiber Parameters	Mic: 4.20; Length:29.90 mm; Strength: 30.60 gtex; Trash: 1.76%

Process-wise Issues and Interventions

Carding

Figure 29: Higher Kitti & Fly Deposition on Web Plate at Carding

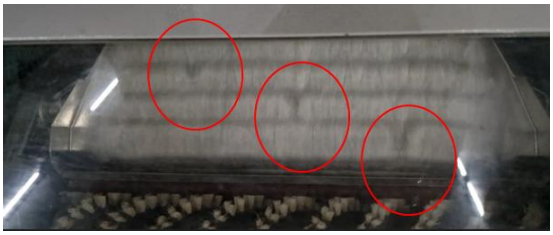


Issues	• Higher kitti & fly deposition on web plate at carding
Reasons	• Stickiness in fiber and kitti
Interventions	• Miracle 869 is sprayed manually on the outer surface of all Brazilian cotton bales at a rate of 1 liter of oil/ton and 1 liter of water/ton to mitigate the stickiness issue. After application, the bales undergo a 16-hour conditioning • Beater speed of CLP changed from 650 to 550 rpm
Results	• Lesser kitti deposition in card and fly accumulation on the web plate

*Note: The application of fiber conditioner has also reduced fly accumulation in omega lap, comber and speed frame.

Comber

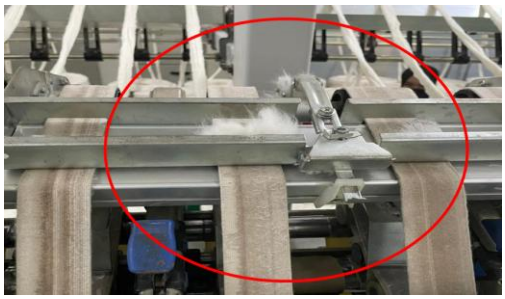
Figure 30: Higher Fleece Cuts



Issues	• Higher fleece cuts
Reasons	• Higher detaching roller pressure • Stickiness in fibers
Interventions	• Detaching roller pressure reduced from 5 bar to 4 bar
Results	• Observed fleece cut in 9-10 heads in 16 combers in 100% Brazilian cotton against 5-6 heads in 16 combers in regular mixing

Speed frame, Ring frame and Winding

Figure 31: Fly Accumulation on Top Clearer



Issues	• Fly accumulation on top clearer at speed frame is higher as compared to regular mixing • Higher breakages in speed frame • Higher ring frame breakages
Reasons	• Lower TM in speed frame • Stickiness in fibers
Interventions	• TM can be increased up to 1.35 off 1.30 upon ensuring that no undrafted issues are observed at ring frame to reduce breakages • RH and temperature maintained at <45% and >35˚C • Clean top cots at ring frame with dry cloth based on sticky deposition level
Results	• Reduced fly accumulation, minimization of speed frame breakages • Observed 2.5 breaks per 100 spindles per hour at ring frame against 1.37 per 100 spindles per hour in regular mixing

Results Achieved

- 237 GPSS was achieved in 30s CCH yarn, which was comparable to regular mixing.
- The yarn realization reached 73.5%, which can be improved further to 74% against 75% in regular mixing.
- Overall quality was found to be comparable with the running mixing.
- The resulting fabric was contamination-free.

Mill-3

About Company

The company has an installed capacity of ~41,000 spindles, producing approximately 11 KTPA of ring-spun yarn. Its product portfolio includes combed compact yarns across a count range from Ne 26s to 40s.

Table 11: Key Technical Parameters

Particular	Details
Trial Quantity	Brazilian: 60% and US: 40% (Regular Mixing)
Yarn Counts	30s CH
Fiber Parameters*	Mic: 4.15; Length: 30.48 mm; Strength: 30.00 gtex

Note: Fiber Parameters are of Brazilian Cotton

Process-wise Issues and Interventions

Blow room and Carding

Issues	• Higher fly in Brazilian cotton • Higher waste extraction in carding • Choking in suction hood
Reasons	• Stickiness in fibers • 8.0% waste extraction in carding
Interventions	• B21 uniclean cleaning intensity increased from 0.5 to 0.8 • B21 uniclean relative amount of waste increased from 3 to 6 • A79 - fine opening (pin type) cleaning intensity reduced from 0.6 to 0.3 • Carding cylinder speed reduced from 750 to 700 rpm • Carding licker-in speed reduced from 1,400 to 1,200 rpm • Cleaning of suction hood
Results	• Waste has been reduced to 5.5%

Drawframe

Figure 32: Change in Drafting Roller Coating Condition

Issues	• Change in drafting roller coating
Reasons	• Deposition of dust, fiber fly and contamination on the drafting rollers
Interventions	• Cleaning of top rollers and clearers at every 2 hours interval
Results	• Reduction in deposition of dust, fiber fly, and contamination

Ring Frame & Winding

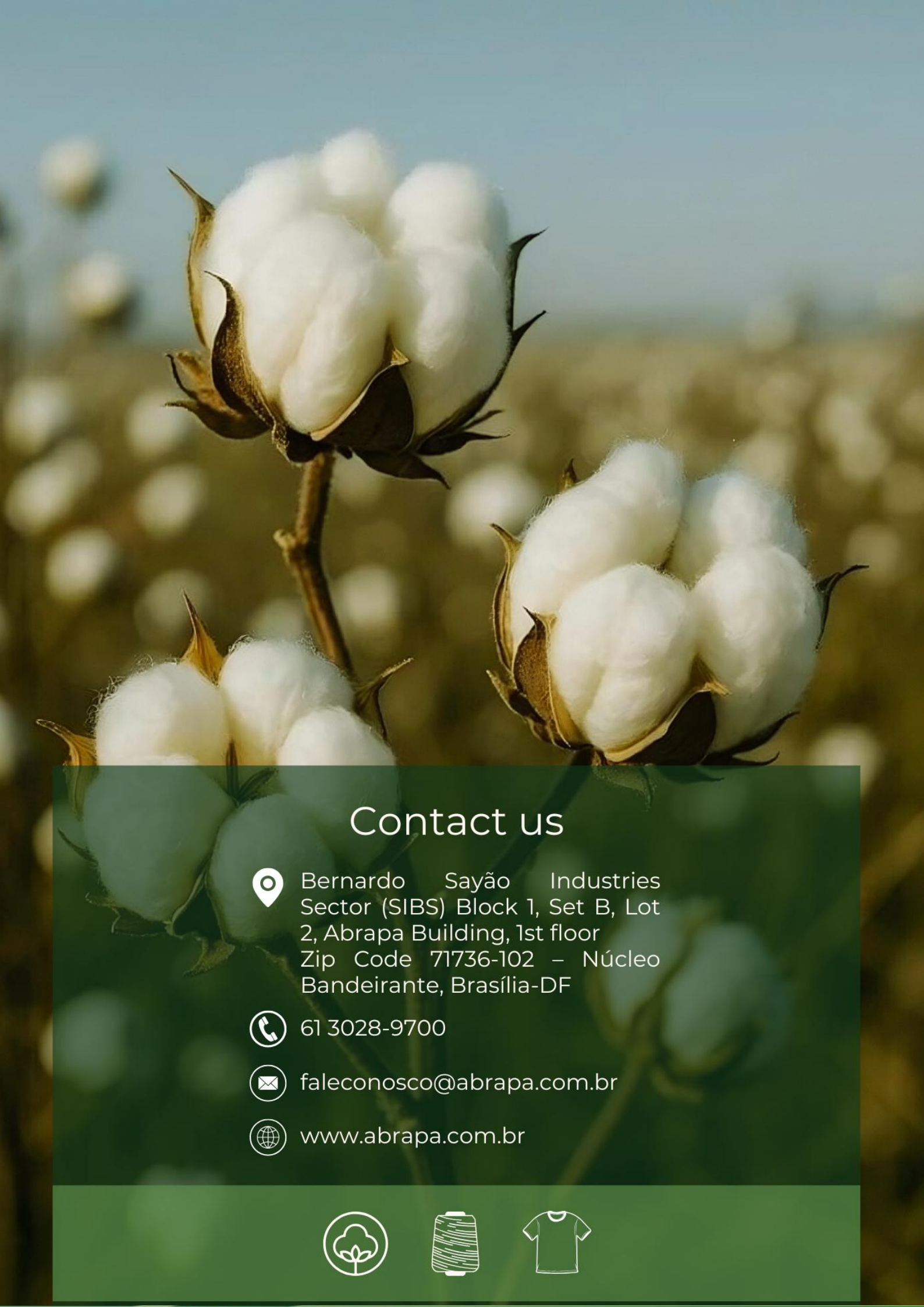
Figure 33: Sticky Deposition on Back Top Rolls

Issues	• Excessive fly is sticking to the back top rolls of Rieter ring frames • End breakage rates of 6.0-7.5 breaks per 100 spindles per hour were recorded, significantly higher than the industry benchmark of below 4.0
Reasons	• Stickiness in fibers

	• Higher breaker draft of 1.2
Interventions	• Cleaning of top cots at ring frame with dry cloth based on sticky deposition level • Reduce breaker draft to 1.14 • RH reduced from 51.5% to 48% and temperature increased from 35.5 to 36.6˚ C
Results	• Reduction in fly and sticky deposition on ring frame • Optimization of end breakage rate

Results Achieved

- Balanced waste extraction at carding and combing, maintaining the recovery level at ~76.5%, will improve yarn quality levels.
- Productivity of 250 GPSS in 30s Ne was achieved which was comparable to the current results.
- Reduction in end breakages on ring frame by ~22% and reduction in cuts by 15%.
- Reducing the breaker draft lowers end breakages, resulting in potential for productivity improvement.



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