TECHNICAL BULLETIN

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MAINTENANCE RECOMMENDATIONS FOR FIBER OPENING AND CLEANING PRIOR TO CARDING

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INTRODUCTION

Opening and cleaning prior to carding are important preparation steps in producing quality yarn and, eventually, quality end products. It is with these operations that we get the first chance to open the fibers for further processing. These operations must all work together. The fiber must be opened properly in order to be cleaned and must be cleaned properly to produce uniform, smooth and strong yarn.

The area of opening and cleaning is often one of the most neglected areas in textiles, yet it is an area, which can have a great impact on the quality produced -- especially in the area of trash and neps. This bulletin is designed to assist in the proper utilization, performance, and maintenance of equipment for these steps.

OPENING HOPPER

The basic functions of an opening hopper are to open the fiber into small tufts and then to blend them together. Opening is the primary function because it is difficult to clean large clumps of fiber. The more open the fiber, the easier it is to clean. In addition, better blending may be obtained from smaller tufts. Blending makes possible the mixing of the fibers so that normal variations will be more evenly distributed in the lap or card batt and finally in the yarn.

To maximize the opening process, the opening hoppers should run at least 85% of the time. If the run time is lower than 85%, it is a good indication that the hoppers are feeding larger tufts, which will result in a lower cleaning efficiency in subsequent cleaning processes. The adjustment of the run time should be made by speeding up or slowing down the lift apron and not by backing off the setting of the combing bar or combing roll to the lift apron. If the comb bar or roll is backed off too far from the spiked lifting apron, it allows large clumps to pass under, reducing cleaning efficiency.

Maintenance -- Opening Room/Opening Hoppers

The following routine is suggested for most hoppers:

- **General overhauling every 12 months.**

1. Run stock out of hoppers.
2. Inspect the lattices, replace worn aprons, broken slats, torn canvas, etc.
3. Clean out waste, especially that packed under slats.
4. Check length of pins, number and thickness of slats. If thickness differs, no standard setting is possible.
5. Shorten or replace lattices, which are too long or damaged. They should be short enough to permit future tightening.
6. Both sides of the apron should have uniform tension to prevent slippage and undue stretch.
7. Check condition of hackle comb (combing roll) and doffing rolls. Repair and replace as needed.
8. Set hackle comb (combing roll) and doffing rolls per manufacturer's recommendation.
9. If hoppers are equipped with grid bars under the doffing roll, the grid bars should be removed, cleaned, and deburred and set to proper setting.
10. Check condition of bearings and shafts. Replace as needed.
11. Check condition of all belts and pulleys. Replace and adjust as needed.
12. Check condition of all guards and covers before replacing.

Note: After hopper is back in production, check tuft size and production rate.

TOP FEED BALE PLUCKER

The functions of a bale plucker are to remove small tufts of fiber from each bale in a lay-down and distribute the fiber uniformly to the cleaning lines. The plucker should be adjusted to remove as small a tuft as possible while maintaining card production.

The bale plucker should run 85 to 90 percent of the time in order to clean the fiber and to assure proper blending.

Daily Cleaning and Inspection

Clean and check power supply chain.

Weekly

1. Clean safety lights and deflectors.
2. Clean control cabinet.
3. Clean the duct (inside and outside).
4. Clean all motors, removing any lint from the fan covers.
5. Clean the milling head and inspect for damage and loading.
6. Clean fiber from the track.

Monthly

1. Clean external sheet metal casing.
2. Clean all roller chains. (Check for proper tension.)
3. Clean all V-belts. (Check for proper tension.)
4. Clean and check counting mechanism.
5. Check run time of bale plucker. (This should be no less than 85%.)

Every 6 Months

1. Clean and check gears, motors and brakes.
2. Clean counter weight guides.

Yearly

1. Clean and check telescopic tube.
2. Clean and check suction pipes.
3. Clean and check cover-belt guide and sliding block.

CLEANING

The cleaning process has to do with the removal of foreign matter from the baled cotton. Although there are many manufacturers of cotton cleaning equipment, the principles used are basically the same. These principles consist of:

- picking and pulling, such as in an opening hopper,
- beating, which involves the use of rotating lags, blades and saw tooth cylinders,
- air movement, such as air jets and axi/flow type, and
- centrifugal force which is used to some extent in all cleaners.

Most textile mills select a combination of various type cleaners to suit their own application. This would depend upon the raw material being processed and the end product. It is possible to overwork fibers during the cleaning process by doing too much cleaning; therefore, it is better to do a good job of cleaning at each process and use only a few processes than to do a reasonable job at each process and have a large number of processes.

Most cleaners use grid bars in conjunction with the various types of beaters. Fiber passes over the grid bars by the rotating beaters, and trash falls out through the grid bars. The grid bars are usually set to about ½" from the beaters. The angle of the grid bars should be set to remove the desired amount of waste. Beaters and grid bars should be in good condition at all times.

When using lag or blade-type beaters, the leading edge should be sharp. When the edges become rounded or very smooth, the beater should be turned, sharpened, or replaced. Dull beaters cause neps.

Where Kirschner or pin beaters are used, the beater slats should be replaced every six months or any time they become dull or damaged. Again, this is important in controlling neps.

Air-jet cleaners are used as part of a beater-type cleaner. When the fiber is doffed off the beater, it is picked up by an air stream; however, before the fiber reaches the air stream, the heavier trash is thrown out through a slot by centrifugal force.

Saw-tooth type beaters are usually used as fine openers. The function of the fine opener is to open and prepare the fiber for chute-fed cards. It is equally important to keep the saw tooth wire in good condition and the grid bars clean and free of burrs.

Maintenance Recommendations

- **General overhauling frequency every six months.**

1. Remove all guards and covers.
2. Take out and clean feed rolls, gears; smooth out nicks, dents, and replace worn parts.
3. Check beater bearings and shafts, clean old grease from bearing and housing and renew.
4. Inspect, renew, and polish damaged or rounded beater pick. Evaluate the possibility of turning beater to obtain new working edge.
5. Take out grid bars, clean, deburr, straighten and polish.
6. Set beater to feed roll on cleaners equipped with feed rolls.
7. Set cut-off plate to beater on cleaners equipped with cut-off plates.

8. Line grid bar brackets and replace bars.
9. Set grid bars to beater and grid bar angle.
10. Adjust all safety latches.
11. Check all belts, replacing any that are worn.
12. Adjust all belts for proper tension.
13. Check condition and replace all guards and covers
14. After cleaner is back in production, check waste percent.

Note: Cleaners equipped with Kirschner beaters should have beater lags replaced every six months.

MULTIPLE WIRE WOUND ROLL CLEANERS

Multiple wire wound roll cleaners can range from two to four wire wound rolls with mote knives on the first roll, and sometimes on the second roll, with other cleaning points throughout the multiple roll system.

This type of cleaner is very aggressive, opening cotton tufts to single fibers, resulting in very high cleaning efficiency.

The feed should be adjusted to run 85 to 90 percent of the time for better cleaning and to reduce fiber damage.

Maintenance Recommendations

Weekly

1. Clean control cabinet.
2. Clean gear and drive motors.
3. Clean lights and deflectors on safety barriers.
4. Clean by suction inside waste compartment.
5. Clean all suction points.

Monthly

1. Clean interior frame walls.
2. Clean all roller chains; check tension.
3. Clean and check all gears.
4. Clean interior roller covers.
5. Clean all V-belts and check for proper tension.

Every 6 Months

1. Clean all gear and drive motors.
2. Clean and check all servo-drives.

Note: Wire on all rolls must be sharp and free of damage.

PICKERS

The function of a picker is to produce an even lap that is free of neps and low in nonlint. If the picker produces an uneven lap yard to yard, from start to finish, it is difficult to produce an even card sliver. The picker is also the last cleaning machine before carding. Every lap from the picker should be weighed and the weight recorded. Laps that are too heavy or too light should be rejected in order to control card sliver weight. Tapered laps indicate uneven loggerhead pressure or fiber tagging in the screen section. This problem should be corrected at once, should it occur.

Daily Cleaning and Inspection

Stop pickers at the beginning of each shift, opening all doors and covers. Remove waste from waste chambers, pick fiber from grid bars and screens. Check and clean tags throughout the beater and screen section. Check and clean fiber buildup from the split lap preventer.

Check condition of beaters--both blade and Kirschner. If damaged, report to management or repair.

Maintenance Recommendations for Pickers

General overhauling frequency every six months.

- **Breaker Section**

1. Remove beater in order to turn or sharpen (blade type). Clean and check bearings and shafts for wear; repack bearings with grease.
2. Clean beater chamber.
3. Dismantle feed and draw rolls; scour, polish and clean.
4. Check bearings, shafts, gears and keyways.
5. Remove grid bars, clean, straighten and sharpen.
6. Clean grid bar brackets.
7. Assemble feed rolls and draw rolls.
8. Install and set beater, including stripper bar.
9. Assemble and set grid bars to the three setting points:
    - distance between bars and beaters
    - distance between bars
    - angle of bars.
10. Check fan, shafts, and bearings for wear. Replace as needed.
11. Keep observation glass clean at all times.
12. Remove and inspect both top and bottom screens (if picker is equipped with two screens), replacing any bent or damaged screens, shafts and bearings.
13. Remove draw rolls; clean, check bearings and journals for wear. Replace as needed.
14. Make sure all air seals are fitted correctly to control the air flow.
15. Clean and check all gears, shafts and bearings of feed roll and draw roll drive.
16. Make sure all bolts and nuts are tight.
17. Lubricate bearings, inspect grease fittings and connections to make sure they are tight.
18. Check waste percent after picker is back in production.

- **Blending Reserve**

1. Remove all guards and covers.
2. Remove feed rolls. Check bearings and shafts.
3. Check cotton conveyors for condition and correct tension. Give particular attention to guide pulleys and shafts.
4. Check all drive gears, shafts and bearings. Replace as needed.
5. Inspect doffer beater, shafts and bearings. Smooth out dents or nicks.
6. Remove grid bars from under doffer. Clean, deburr, and polish before remounting. Set to proper angle.
7. Clean and polish cotton reserve box, making sure there are no burrs and that all sides are smooth and free of dirt build-up.
8. Remove draw rolls in the bottom of the reserve; clean, and remove dents and nicks on rolls. Check bearings, gears and journals.

- **Finisher Beater and Screen Section**

Repeat operation described for breaker beater and screen section, plus checking pins on Kirschner beater. If pins are dull, bent, broken or missing, replace lags and make sure beater is properly balanced and set.

- **Evenner Motion**

1. Take off chain links and levers; remove evenner pedals and clean them thoroughly.
2. Check pedal bearing and bar for wear. Turn bar or replace as needed.
3. Graphite all moving parts and on top of pedals.
4. After installing pedals, check the pedal surface over the full width alignment. They must be smooth from one to another and without open spaces between pedals.

- **Cross Lever**

Take off weight and remove lever. Check all bearing surfaces. Check and sharpen all knife edges and recondition bearing. Take out, clean and oil stud.

- **Connecting Link**

Inspect set screw on the connecting link. Clean and repair point and bearing hole.

- **Turnbuckle, Rods and Ball Crank**

Take out the studs from both ends of the rod; clean and reassemble so that there is no play and they operate freely. The rod threads should be clean and the turnbuckle set to allow ample adjustment in either direction.

- **Cone Box**

1. Dismantle the belt shipper in the cone box. The pivot points of the belt shipper have roller bearings which should be thoroughly washed and lubricated. Eliminate play in studs and bearings. Check shipper rods, fingers, etc.
2. Examine the condition of the cone belt. Remove any dressing or grease from cone and belt. The belt must transmit the rotation of the bottom cone to the top cone without excessive slippage. It is

important that the fine pedal movement is transmitted to the evenner roll.

- **Calender Section**

1. Remove gear covers.
2. Wash and clean gears and bearings. If stack rolls are worn or damaged, they should be built up (metalized) to their standard diameters.
3. Check calender roll drive. The cross shaft bearings should be overhauled and properly aligned so that it runs with a minimum of noise.
4. Check gears with gear diagram when refitting.
5. Check and clean drop shaft, gears, studs and levers.
6. Dismantle, check, and clean gears on driving side. Make sure keys fit properly.
7. Check lap-measuring device, safety knock-off, and calender pressure assembly to ensure they are adjusted correctly to obtain good operating conditions and lap quality.

- **Loggerhead Assembly**

1. Clean and inspect the rolls in the head, replacing those which are defective.
2. Clean and repack roller bearings.
3. The studs which act as guides for the rack assembly should be kept in good condition. The rack and gear teeth should be clean and properly adjusted.
4. Entire motion should move freely, with a minimum of play.
5. Both heads should be the same height to avoid tapered laps. Adjustments of more than one tooth are made by properly inserting the rack. Less than one full tooth in adjustment is made through the dog and check nut on the rack shaft.

- **Final Remarks**

1. All belts should be clean, redressed and shortened when necessary. V-belts should have the proper tension so that when multiple belts are used, all of them will carry the same load.
2. Beaters and screen covers should fit tightly, and all hinges and handles must be in place.
3. Glass windows should be clean to allow observation of the cotton flow to the screen. The evenness of the cotton distribution and sheeting should be checked and regulated by correct damper adjustment.
4. Safety latches should be in proper condition so that they are securely fastened and slide easily.
5. Laps from all pickers should be approximately the same diameter.

TROUBLESHOOTING

OPENING HOPPERS

A. Hoppers Feeding Large Clumps

Probable Cause	Solution
1. Comb bar or combing roll set too far from lift apron.	1. Set comb bar or combing roll closer to lift apron.
2. Comb bar or combing roll too slow.	2. Speed up comb bar or combing roll as needed.

B. Hopper Production Not Equal

1. Comb bars or combing rolls not properly set.	1. Set comb bars or combing rolls the same on each hopper.
2. Surface speed of lift apron not equal.	2. Check tension on lift and bottom aprons.
3. Comb bars or combing rolls running at different speeds.	3. Check all pulleys and belts.
4. Different type pins on lift apron.	4. Check pins on all lift aprons for height, length, number of pins per row, and diameter.
5. Different type of comb bars or combing roll.	5. Check teeth on comb bars or pins on combing rolls.
6. Hoppers being fed unevenly.	6. Maintain a consistent level of stock in hoppers at all times.

C. Hoppers Stop Too Often

1. Hoppers too full.	1. Don't overfill hoppers.
2. Comb bars or combing roll set too far from lift apron.	2. Set comb bars or combining rolls closer to lift apron.
3. Lift apron speed too fast.	3. Slow down lift apron to desired speed.

D. Hoppers Running Too Much

1. Hopper choked.	1. Remove choke and start hopper.
2. Belt broken on hopper.	2. Repair or replace belt.
3. Hopper level too low.	3. Maintain proper level in hopper.

OPENING HOPPERS (continued)	
E. Lift or Horizontal Apron Too Slow	
Probable Cause	**Solution**
1. Apron too loose. 2. Choke in apron. 3. Belts loose.	1. Adjust apron tension. 2. Remove choke and check tension on apron. 3. Check for loose belt and adjust.
F. Drive Motor Overheating	
1. Hopper choked. 2. Bearing bad on hopper. 3. Motor going bad.	1. Remove choke and restart. 2. Check all bearings and replace any bad bearing. 3. Have motor checked by an electrician.
G. Lift or Horizontal Apron Rubbing the Sides	
1. Apron not adjusted properly. 2. Choke in apron. 3. Bearing bad on apron shaft. 4. Apron inside belt broken. 5. Guide pulley slipped on apron shaft. 6. Apron too wide for hopper.	1. Adjust apron as needed. 2. Remove choke and check adjustment. 3. Replace bad bearing and readjust apron. 4. Repair or replace apron. 5. Adjust pulley as needed. 6. Replace with proper apron.
H. Losing Good Fiber Under Hopper	
1. Seal bad under lift and horizontal apron. 2. Screen under lift apron damaged. 3. Horizontal apron damaged.	1. Replace seal and reset. 2. Check screen for damage and replace as needed. 3. Check apron; repair or replace as needed.
I. Hopper Noisy	
1. Pulley loose. 2. Gears worn. 3. Gears need lubrication. 4. Bearing bad on hopper or motor. 5. Guards and covers loose. 6. Hopper choked up.	1. Check pulleys; adjust and replace if damaged. 2. Replace as needed. 3. Lubricate gears with proper lubrication. 4. Check and replace bearing as needed. 5. Check for loose guards and covers, making sure they are not touching the pulleys. 6. Unchoke hopper as needed.

TOP FEED BALE PLUCKER	
Frequent Feeder Stopping	
Probable Cause	**Solution**
1. Cards out of production. 2. Feeder taking too much fiber from each bale. 3. Bales not allowed to bloom.	1. Check to see if all cards are in production. 2. Adjust feeder to take off less fiber from each bale. 3. Bales should be opened and allowed to set for 8 to 24 hours before feeding.
CLEANING EQUIPMENT	
A. Cleaner Removing Too Little Waste	
1. Grid bars out of adjustment. 2. Grid bars dirty. 3. Grid bars set too far from beaters. 4. Beater speed too slow. 5. Lint built up under grid bars.	1. Adjust grid bars to a greater angle. 2. Remove grid bars; clean and replace. 3. Set grid bars to manufacturer's recommendations. 4. Increase speeds to manufacturer's recommendations. 5. Check condition of grid bars; check the amount of air pulling up through the grid bars -- too much air will cause lint buildup.
B. Cleaner Not Cleaning	
1. Grid bars not set properly. 2. Too little run time. 3. Tufts too large feeding into cleaner. 4. Pulling air through step cleaners. 5. Production too high.	1. Set angle of grid bars for maximum waste removal. 2. Adjust feed on opening line to run at least 85% of run time. 3. Check opening hoppers. 4. Check exit transitions. Fiber should free fall out of cleaner in an air stream for transporting. 5. Check manufacturer's recommendations for maximum production. (Do not exceed).

CLEANING EQUIPMENT (cont'd)	
C. Cleaner Producing Neps	
Probable Cause	**Solution**
1. Beaters dull. 2. Beater not set properly to feed rolls. 3. Setting between cut-off plate to beater. 4. Production too high for cleaner.	1. Check condition of beater lags, blades or pins (must be sharp and free of damage). 2. Set beater to feed roll to manufacturer's recommendations. 3. If cleaner is equipped with a cut-off plate, set plate to manufacturer's recommendations. 4. Check manufacturer's recommendations for maximum production. (Do not exceed.)
D. Cleaners Noisy	
1. Cleaner choking. 2. Bad bearing. 3. Beaters out of balance. 4. Loose pulley. 5. Guards loose. 6. Pulley rubbing guard. 7. Loose beater lags.	1. Stop cleaner and clean. 2. Check all bearings. Replace as needed. 3. Check all beaters and balance as needed. 4. Check all pulleys; tighten or replace as needed. 5. Check guards and tighten as needed. 6. Check pulleys and adjust as needed. 7. Check beater lags and repair as needed.
MULTIPLE WIRE WOUND ROLL CLEANERS	
A. Cleaner Producing High Neps	
1. Wire on rolls dull or damaged. 2. Roll not set properly. 3. Run time not high enough.	1. Replace wire as needed. 2. Set rolls to manufacturer's specification. 3. Adjust feed to assure 85 to 90 percent run time.
B. Cleaner Not Cleaning	
1. Run time too low. 2. Mote knives or baffles not set properly.	1. Adjust feed to assure 85 to 90 percent run time. 2. Adjust mote knives and baffles to manufacturer's specification.

CLEANING EQUIPMENT (cont'd)	
C. Drive Motor Overheating	
Probable Cause	**Solution**
1. Rolls loading. 2. Bearing bad on cleaner. 3. Motor going bad.	1. Check wire condition. 2. Check all bearings. Replace as needed. 3. Have motor checked by an electrician.
PICKERS	
A. Uneven Lap	
1. Choke in beater or screen section. 2. Worn or damaged air seals around screen section. 3. Air dampers out of adjustment. 4. Evenner motion. 5. Beaters. 6. Bad feed roll bearings. 7. Calender rolls. 8. Gearing. 9. Calender roll pressure. 10. Loggerheads. 11. Pneumatic cylinder on loggerhead assembly. 12. Split lap preventer. 13. Blender reserve. 14. Grid bars.	1. Check beater and screen section for tags; clean beater and screens. 2. Check all seals. Replace as needed. 3. Adjust air dampers. 4. Check evenner motion, making sure all pedal linkage works freely. 5. Check beaters for damage. Replace as needed. 6. Check feed roll bearings; repair and replace as needed. 7. Check calender rolls for damaged surface and bad bearings. 8. Check all gears for wear and how they fit on each shaft. 9. Check calender roll pressure, maintaining the same on both sides. 10. ▪Check pressure on both sides. ▪Level loggerheads. ▪Check rollers in loggerheads. 11. Check cylinder to assure it lets off evenly. 12. Check split lap preventer for burrs or damage. 13. Check stock level. (Lift apron feeding reserve should run 90-95% of run time.) 14. Check grid bars for burrs and damage.
B. Picker Running Slow	
1. Belts loose. 2. Bearings bad.	1. Check belts and adjust as needed. 2. Check bearings and replace as needed.

PICKERS (cont'd)	
C. Fiber Moving Too Slow from Beater to Screen	
Probable Cause	**Solution**
1. Back pressure from filter. 2. Dampers. 3. Fan.	1. Check filter for choking. 2. Check dampers and adjust. 3. Check for the following: ▪Loose belt or bad bearings. ▪Speed of fan. Adjust to manufacturer's recommendations.

RESEARCH AND TECHNICAL SERVICES

Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- Agricultural research leads to improved agronomic practices, pest control, and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.

- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.

- Computerized fiber management techniques result from in-depth fiber processing research.

- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.

- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.

- A fiber-to-yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.

- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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