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ROLLER GINNING UPLAND COTTON AT HIGH CAPACITIES

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Abstract

An extractor-feeder and roller gin stand was modified in an attempt to gin upland cotton at an elevated rate. Modifications included speeding up the ginning roller, rotary knife, and cylinders on the extractor-feeder, and increasing the force between the ginning roller and stationary knife. Choke-up problems were encountered early on with the extractor-feeder. A ginning rate of 4 bales per hour was obtained; this is in comparison to a standard rate of about 1 bale per hour.

Introduction

The objective of the study was to improve the efficiency of the roller gin stand to allow ginning upland cotton at an acceptable rate without compromising the fiber or cottonseed properties. The roller ginning process, when compared to saw ginning, does the least amount of damage when separating the fiber from the seed. However, roller ginning is a slow process and consequently not used to gin upland cotton. This research may make it economically feasible to roller gin upland cotton.

Discussion

A Consolidated HGM roller gin stand was used for the study. Initial modifications to the roller gin stand included (1) replacing the 15 horsepower motor that drives the ginning roller with a 50 horsepower unit, (2) replacing the 5 hp that drives the extractor-feeder cylinders with a 10 horsepower unit, and (3) installing an air-impingement cooler to reduce the operating temperature of the ginning roller. The operating parameters of the modified roller gin stand included (1) a ginning roller speed of 360 rpm instead of the standard 120 rpm, (2) a rotary knife speed of 1218 rpm instead of the standard 416 rpm, (3) a ginning roller air pressure of 60 psi instead of the standard 45 psi, effectively changing the roller-to-stationary knife force from 60 to 90 pounds per inch of roller width, and (4) cylinder speeds on the extractor-feeder of 1125 rpm instead of 750 rpm.

Test runs made in early 2002 yielded a ginning rate using upland cotton of 4 bales per hour. The typical ginning rate of an unmodified roller stand using upland cotton is about 1 bale per hour. However, problems were encountered with the extractor-feeder. Seed cotton was jamming at the exit of the last cleaning cylinder on the top row, and seed cotton exiting the last cleaning cylinder on the bottom row was simply being thrown upward with gravity being the mechanism that directed the seed cotton to the ginning point.

The exit point on the top row of cleaning cylinders was enlarged by cutting away part of the screen enclosure, and this eliminated jamming of the seed cotton. To better direct the seed cotton to the ginning point, a “kicker” cylinder was installed at the exit point on the bottom row of cleaning cylinders. Also, an opening was made at the rear of the feeder to exhaust the dust from the bottom row of cylinders. Consolidated Cotton Gin Company, the original manufacturer of the roller stand and feeder, installed the kicker cylinder and air exhaust. Figures 1 and 2 show a side view of the extractor-feeder before and after being modified, respectively. Figure 3 is a side view of the extractor-feeder and roller gin stand.

Summary

Test runs with the modified extractor-feeder were made in late 2002. Power measurements show that the ginning roller required 34 input horsepower, and the rotary knife required about 2 horsepower. Temperature of the ginning roller was between 200 and 220 degrees Fahrenheit, but if the feed was cut off to the stand and the roller-to stationary pressure not released immediately, roller temperature rocketed to 350 degrees Fahrenheit in matter of seconds. Safeguards need to be implemented to immediately kick the ginning roller out if the seed cotton feed stops.

Future work on this project includes (1) increasing the ginning rate to more than the 4 bales per hour already obtained, (2) installing an additional cooler to keep the ginning roller temperature at an acceptable level, (3) running a formal experiment to determine the fiber and cottonseed properties.

Acknowledgments

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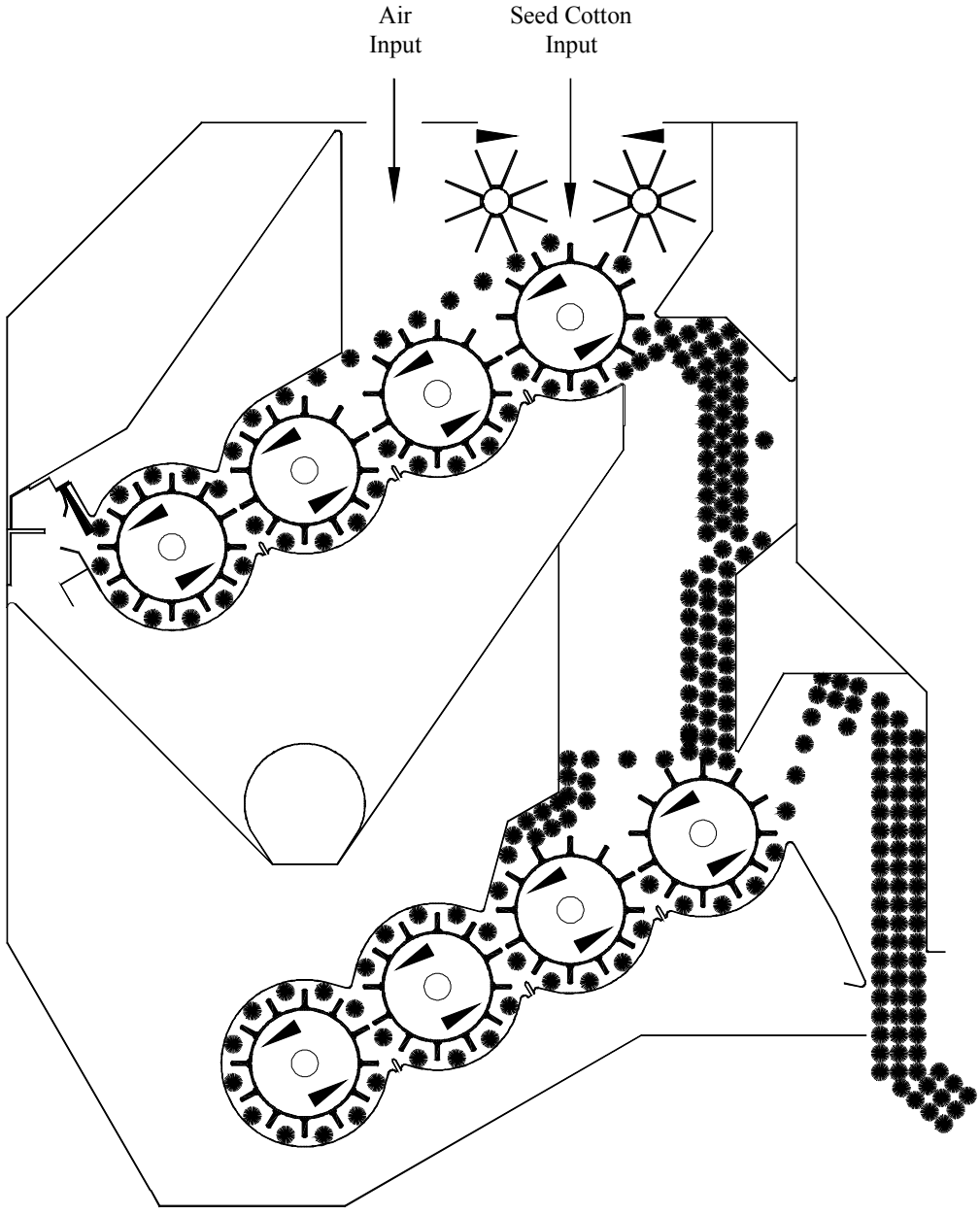

Figure 1. Side view of extractor-feeder before modifications.

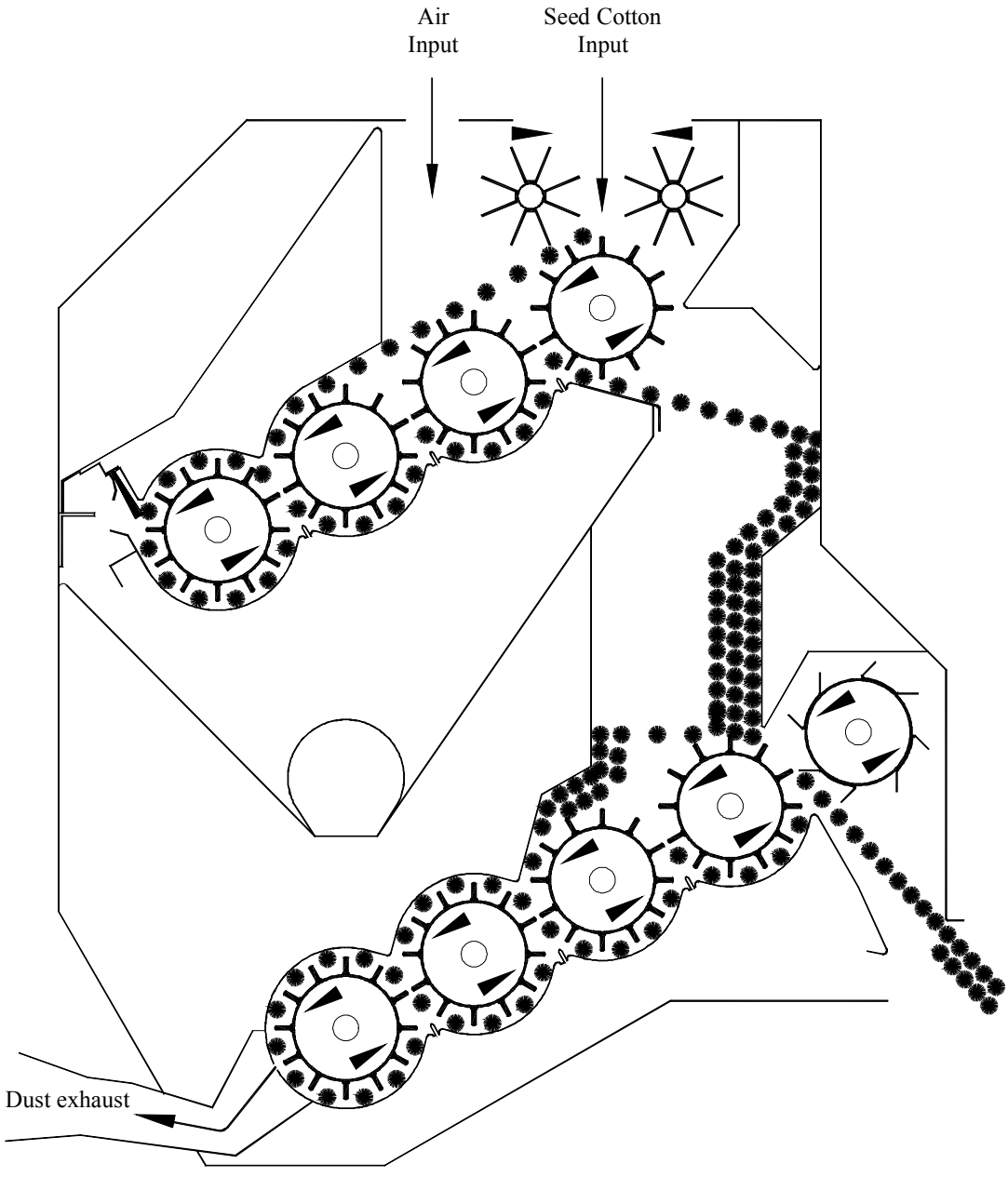

Figure 2. Side view of extractor-feeder after modifications.

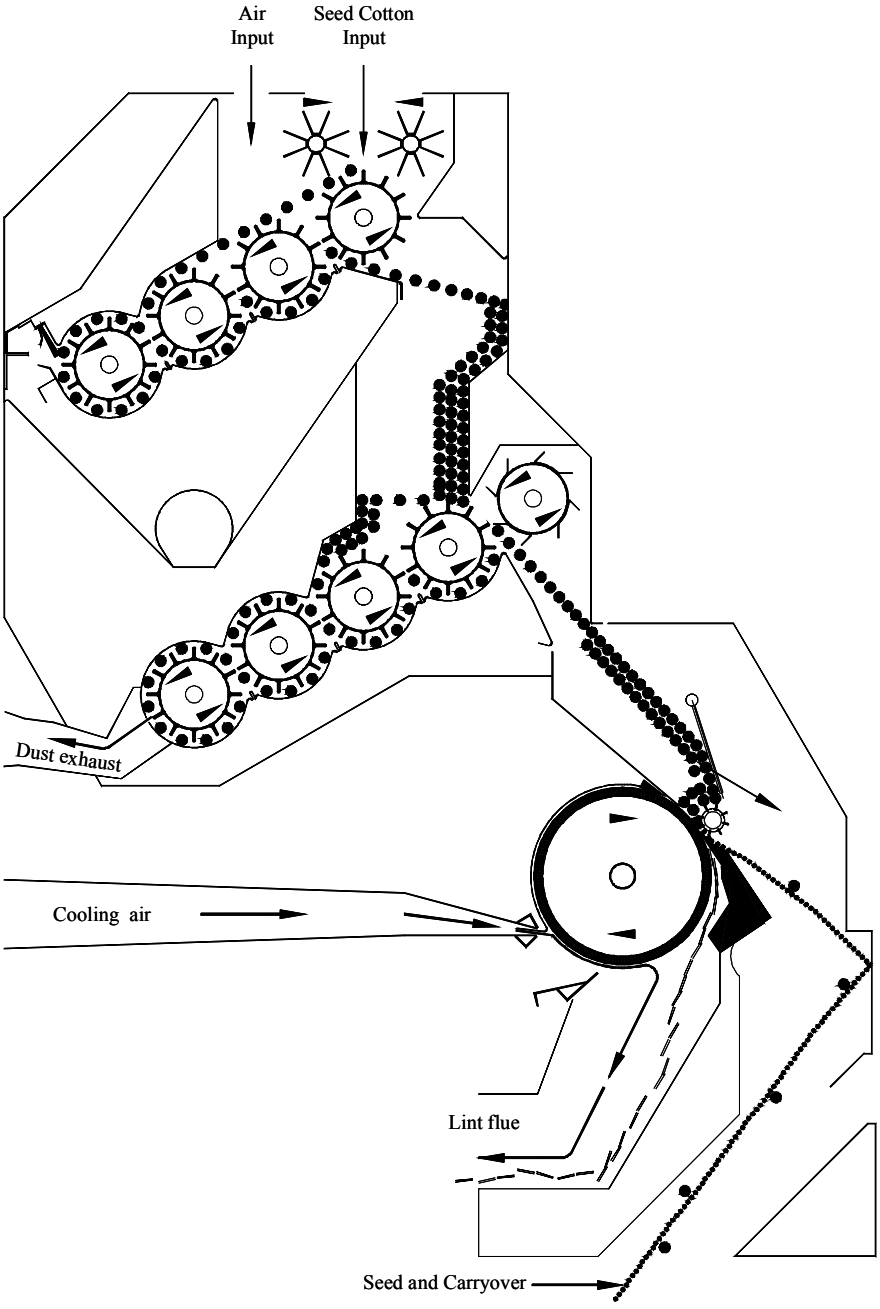

Figure 3. Side view of extractor-feeder and roller gin stand.