

Cane preparation – optimised technology

Fives Fletcher Limited
Advertorial

FIVES CAIL HAS IMPROVED THEIR IN LINE SHREDDER TECHNOLOGY AND HAS MORE THAN 30 INSTALLATIONS WITH CAPACITIES UP TO 825 TONNES PER HOUR. THIS NEW TECHNOLOGY CONSISTS OF TWO MAIN PIECES OF EQUIPMENT – A CANE LEVELLER AND THE SHREDDER, BOTH ABLE TO PROCESS EITHER WHOLE STICK AND OR BILLETED CANE. THE BENEFITS OVER CONVENTIONAL EQUIPMENT ARE: SMALLER FOOTPRINT, REDUCED INSTALLATION, MAINTENANCE AND POWER CONSUMPTION. THE IMPROVED CANE PREPARATION INCREASES OVERALL EXTRACTION, IMPROVES THROUGHPUT AND REDUCES BAGASSE POL LOSSES.

Historically

Cane preparation lines consist of one or two sets of knives often with a magnet before a gravity fed shredder. In such Fives Cail installations the power requirements for these units vary from 4 230 to 4 860 kW when installed on 2 135 mm carrier system handling 400 tch at 15 % fibre.

Requirements for a Modern Sugar / Ethanol factory

- Reduction in overall energy consumed
- Increased productivity, performance and throughput
- Reduced downtime and maintenance

In Line Shredder

Fives Cail developed and installed the first in line cane shredder in the 1990's which is able to process long and/or short cane without any prior knifing.

The shredder assembly consists of three main components: the feed drum, the shredder rotor and an anvil plate. Two additional pieces: a carding drum and a kicker are required to ensure a constant feed of cane to the shredder and the 1st mill.

Carding Drum

This drum contra rotates against the flow of cane, metering and compacting the bed of long cane fed to the In Line Shredder, and with short cane it "wipes off" the cane bed to achieve the desired bed height.

Feed Drum

The feed drum co-rotates with the carrier and compacts the cane mat which prevents whole sticks from being swept into the anvil by the rotating hammers.

Rotor & Hammers

Two designs are available: either a six or eight row configuration. They offer > 100 % coverage by the hammers which weigh approximately 22 kg and have a 3 mm hard facing and a reasonable life expectancy of 14 days.

Anvil Plate

The anvil plate has a clearance with the rotor (± 40 mm) and a 75 degree wrap around the rotor. Shear pins protect the motor and grid bars.

Kicker

This breaks up the very dense wet cane as it emerges from the shredder, reducing the density and improving the consistency of the feed to the first mill.

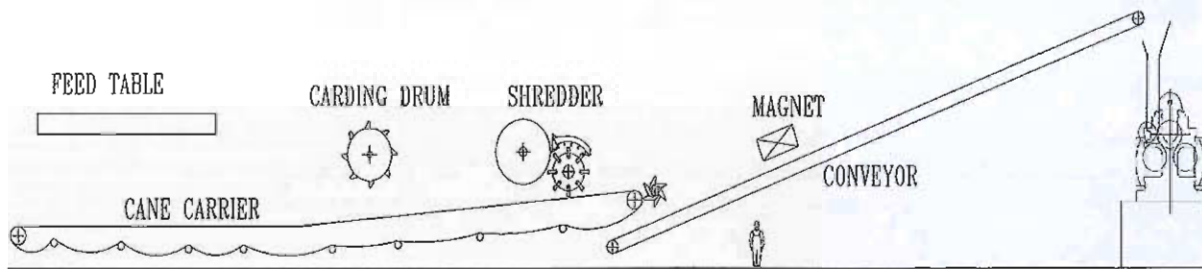


Figure 1: A Typical Cane Preparation Station with In Line Shredder

A typical In Line Shredder installation is shown in Figure 1.

For a carrier width of 2 135 mm and a crush rate of 400 t/ h at 15% fibre, the total installed power would be 2 138 kW.

In Line Shredders

The calculated tip speed should be between 88 and 99 m/sec, no gear reduction is needed for 50 Hz and 60 Hz synchronous motors Turbine drives should

be designed to operate with a minimum tip speed of 90m/s.

Between 1992 and 2009 – 31 units with capacities varying between 110 and 825 tch have been installed.

Performance

Results from some of the factories are shown in Figures 2 and 3.

From these graphs it can be seen that the absorbed power for these shredders is normally around 40 kWh/ton fibre.

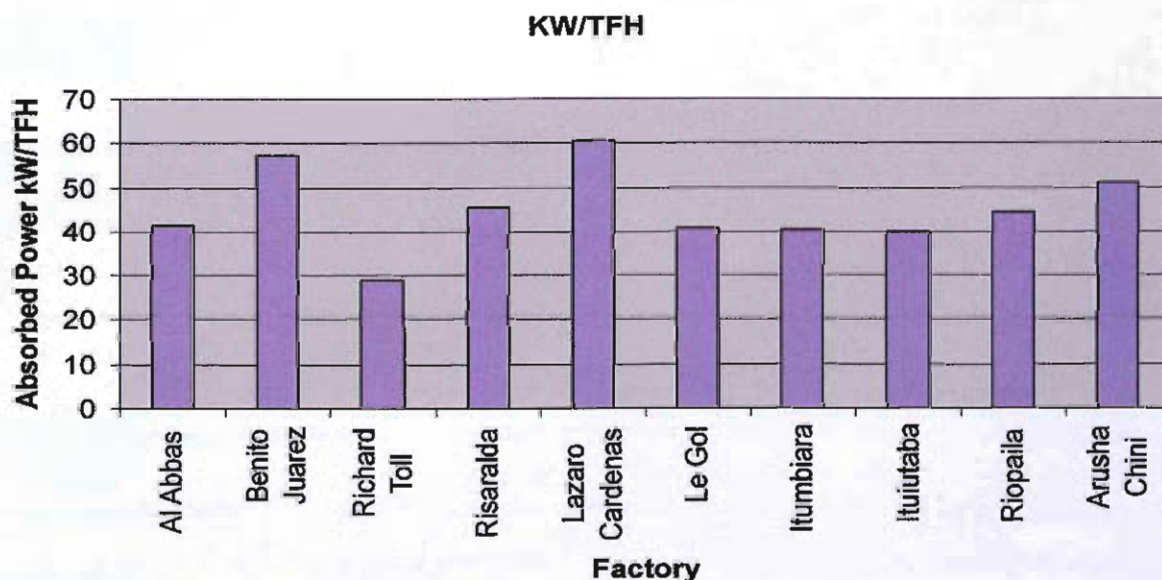


Figure 2: Absorbed Power kW/TFH

Actual Capacity vs Design Capacity

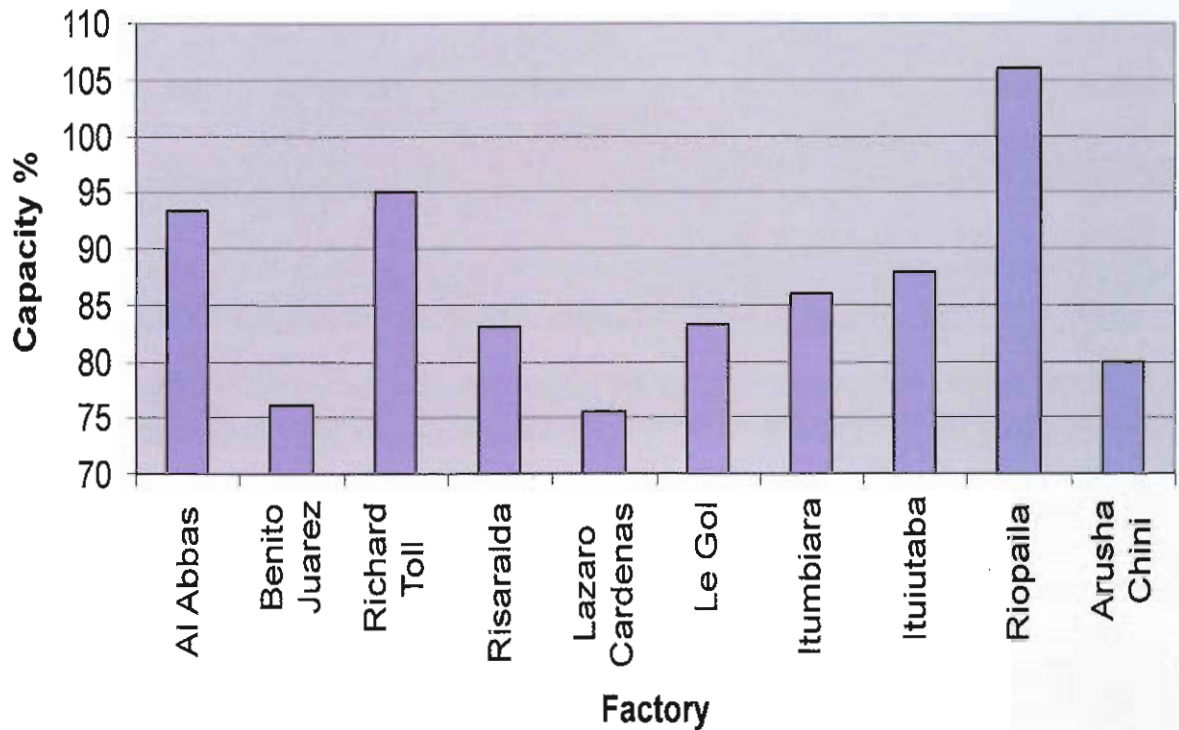


Figure 3: Power consumption and capacity of installed In Line Shredders

Advantages of the In Line Shredder:

- No preparation required.
- Will fit into an existing carrier layouts.
- Fewer carriers required – less maintenance.
- Smaller footprint for civils and lower height requirement.
- Versatile: it handles sand and rocks up to 300 mm in diameter.
- Long cane fibres reduces mill slippage and advantageous to boiler operations.
- Increased extraction from greater cell breakage.

- Shredder rotor and carrier width can be increased for phased expansions.
- Energy savings for 84' In Line Shredder at 400 tch and 15 % fibre.

In Line Shredder	=		=	3 180 kW
Cane knives + gravity shredder	=	In Line Shredder + 30 %	=	4 230 kW
Cane knives + preparator + gravity shredder	=	In Line Shredder + 53 %	=	4 860 kW

These values show significant energy savings allowing increased exportation of power. A shredder can increase overall performance by approximately the same amount as an extra mill.

- **Reduced maintenance and downtime:** Changing hammers takes approximately two hours every week or two. Fewer hammers than gravity shredders hence less maintenance.
- **Milling operations:** The addition of a carding drum and an In Line Shredder gives a very constant rate of feed improving operations and better mill performances.
- **Mill protection:** No magnet is required before the shredder but is recommended between the shredder and the 1st mill to remove any ferrous metals, thus the mill is protected from both rocks and ferrous metals.

Disadvantages

- The installed power for the shredder rotor is generally higher than for a gravity shredder.
- A slat carrier is recommended.

Conclusion

Fives Cail manufactures and supplies many different types of cane preparation equipment including both main types of heavy industrial shredder (Fives Cail in line design as well as the Fives Fletcher gravity design).

For new installations or upgrades the following needs to be considered when calculating the operational and financial advantages:

- Increased co-generation potential.
- Lower overall installed power.
- Reduced civil, installation, routine and off-crop costs.
- Reduction in off-crop fuel consumption due to increased bagasse stocks.

- Reduced down-time – simplified installation.
- Reduced man hours and materials for refurbishment of hammers and knives.

There are genuine advantages to be gained from an In Line Shredder. Reduced energy, installation, civil and maintenance costs allow factories to operate at a higher efficiency levels.

Acknowledgements

The author would especially like to thank the following factories and their personnel for their co-operation and the results obtained, without which this paper would not have been possible:

- Al Abbas (Pakistan)
- Arusha Chini (Tanzania)
- Benito Juárez (Mexico)
- Itumbiara (Brasil)
- Ituiutaba (Brasil)
- Lazaro Cardenas (Mexico)
- Le Gol (Reunión Island)
- Richard Toll (Senegal)
- Riopaila (Colombia)
- Risaralda (Colombia) ☺

*Article written by Steve Inskip
Fives Fletcher Limited, Derby, England
steve.inskip@fivesgroup.com*