



Sugar Research
Australia

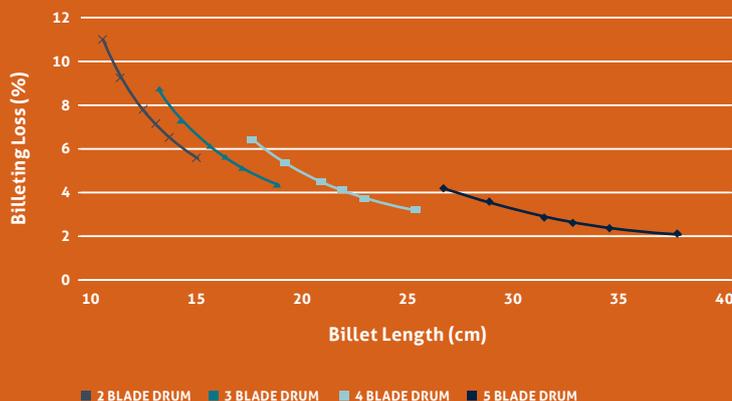
FEEDTRAIN OPTIMISATION

The quality of harvested sugarcane is affected by the length of the billets (see billet length factsheet) and billet quality (see assessing billet quality factsheet).

Chopper drum configuration, blade condition (sharpness) and feedtrain speed in relation to chopper drum speed have been shown to have a significant impact on billet quality and sugar loss.

Short and damaged billets are also a major contributor to harvesting losses which can be significant.

Increasing the number of chopper blades shortens billet length and increases losses as shown in the graph below.



FEEDTRAIN SETUP

Research indicates that the ratio between the surface speed of the feed rollers and the average chopper tip speed has a significant impact on sugar loss and cane quality.

Sugar loss, billet quality, billet length and consistency of length are optimised when this ratio is around 55-60%.

Trial results in QLD and NSW show that correctly matching the surface speed of the rollers to tip speed of the choppers can reduce chopper losses by 2% to 7% through:

- Enhanced evenness of feed resulting in uniform length, better quality billets
- Reduced juice loss in the chopping process
- Enhanced machine performance

As this ratio gets below 50% there is:

- Increased number of cuts and increased loss per cut
- Greater variability in billet length
- Increased billet damage, and
- Increased power consumption and blade wear.

OPTIMISED FEEDTRAIN

A feedtrain is optimised when the ratio between the surface speed of the feedtrain rollers and the tip speed of the choppers is around 55-60%

For best results, the butt-lifter should be at a surface speed of 80-90% of the surface speed of the other rollers in the feedtrain.

How do I check if my feedtrain is optimised?

Step 1: Using a Digital tachometer safely measure the speed in RPM of each of the feedtrain rollers and the chopper drum (RPM)

- There are 10 or 11 rollers in the feedtrain depending on manufacturer.
- If you do not have a digital tachometer please contact your local SRA branch for assistance.

Step 2: Calculate the average speed of the feedtrain rollers (RPM).

$$\text{Average roller speed} = \frac{\text{Sum of roller speeds}}{\text{Number of rollers}}$$

Step 3: Measure the diameter of the feedtrain rollers (mm).

Step 4: Measure the diameter of one of the chopper drums (mm) see image below.

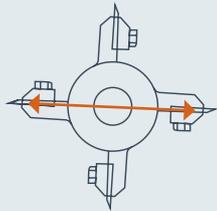


Image 1: Diameter of chopper drum

Step 5: Calculate the circumference of the feedtrain rollers and chopper drums (mm).

$$\text{Circumference} = \text{Diameter} \times 3.14$$

Step 6: Calculate surface speed of the feedtrain rollers and the tip speed of chopper drums (meters per minute).

$$\text{Surface or Tip Speed} = \frac{[\text{Measured Speed (RPM)} \times \text{Circumference}]}{1000}$$

Step 7: Calculate the feedtrain ratio (%).

$$\text{Feedtrain Ratio} = \frac{[\text{Feed Roller Surface Speed}] \times 100}{[\text{Chopper Drum tip Speed}]}$$

AN EXAMPLE:

Feedtrain

- Measured average roller speed = 185 rpm
- Measured diameter (feed roller) = 250mm
- Circumference = 250mm x 3.14 = 785mm (0.785m)
- Surface speed = (185 rpm x 785mm)/1000 = **145 meters per minute**

Choppers

- Measured drum speed = 210 rpm
- Measured diameter between blade tips = 15 inch = 381mm
- Circumference = 381mm x 3.14 = 1,200mm
- Tip speed = (210 rpm x 1,200mm)/1000 = **252 metres per minute.**

Feedtrain Ratio

$$= (\text{Feed Roller Surface Speed} / \text{Chopper Tip Speed}) \times 100$$

$$= (145 \text{ metres per minute} / 252 \text{ metres per minute}) \times 100 = \mathbf{57\%}$$

Therefore, in this example the feedtrain is optimised as the ratio of the feedtrain and chopper tip speed is between 55-60%.

HOW DO I OPTIMISE MY HARVESTER?

Optimising a feedtrain is fairly simple and requires changes to hydraulic motors and/or hydraulic plumbing. This will depend on the make and model of your harvester.

To complete the optimisation process follow these steps:

Step 1: Measure feedtrain rollers and chopper drums and calculate roller surface speed and chopper tip speed (see above) and record all information specific to your machine in the attached form.

Step 2: Contact your local SRA branch who will assist you in getting the technical information (specific to machine make and model) for you or your hydraulics expert to undertake the modifications required as per specifications.

Step 3: Make the changes as per the technical specifications.

Step 4: Remeasure feedtrain to confirm optimisation is within 55-60% roller speed to chopper tip speed ratio.

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