ILLOVO SUGAR LIMITED

TECHNICAL OPERATING PRACTICES

MODULE 1

CANE PREPARATION

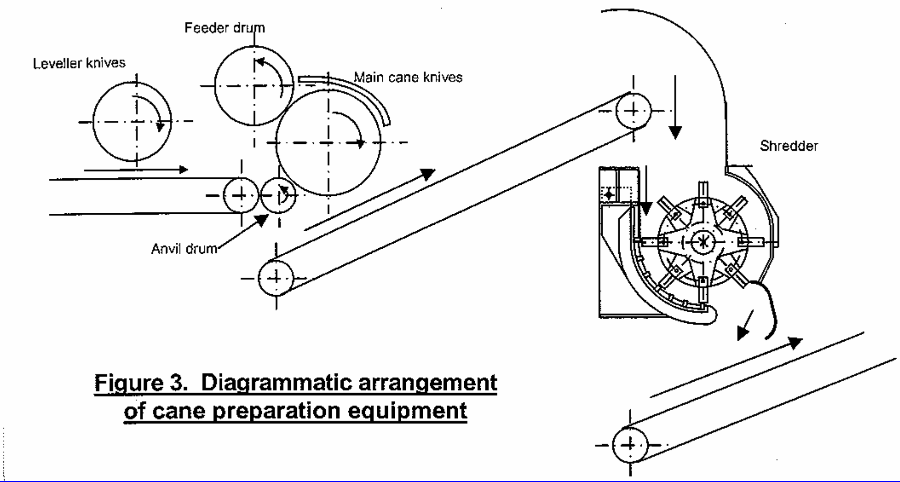

Figure 3. Diagrammatic arrangement of cane preparation equipment

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CANE PREPARATION

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1. GENERAL OVERVIEW

Cane can be transported to the sugar mill by various means, and is delivered to the cane yard after massing. Cane is generally loaded onto a feeder table that can then be fed onto a conveyor under controlled conditions to allow a smooth and consistent feed into cane preparation equipment.

Various methods are used to prepare cane, with equipment ranging from cane levellers, cane knives, and shredders before it is sent to the extraction plant (milling or diffusion).

The objective of cane preparation Is to rupture all the plant cells in the cane.
The cane stalks consists of core of pith held in the fibrous matrix, containing most of the plant cells and juice. The cane stalk also consists of other materials such as tops, trash, wax, sand and silt. Good preparation is to expose as much of the plant cells and trying to keep the fibre intact. Strands of thread like fibre and pith (fluffy in form) can be seen in well prepared cane.

Juice can be removed from cane by repeated crushing and washing (milling) or by washing alone (diffusion).

2. SAFETY

Maintenance

No person must enter a cane carrier while the shredder or cane knife rotors are still in motion. Prime movers and cane carriers must first be adequately isolated from all energy sources (Electrical or steam).

Where hammer and knife maintenance take place, care must be taken to ensure activities do not cause danger to other maintenance personnel in the same vicinity. Figure 1.2 is an example where the cane knives are situated above the shredder rotor. Falling knives could cause injury to personnel changing hammers on the shredder below at the same time.

Suitable Personal Protective Clothing must always be used.

RISK

Hot works permits must always be used when hot work is carried out for maintenance, especially near high risk areas such as belt conveyors.

Interlock checks should be done after every maintenance stop, and where equipment was bypassed for particular activities.

Turbine over speed checks must be carried out at least quarterly. The run down time should be recorded to identify abnormalities.

Turbine safety devices must never be tampered with. Defective safety devices must be repaired immediately. All turbines with an installed power of 1000kW must have electronic ESV's installed and functionally tested quarterly.

All conveyor head shafts and cane knife / shredder rotors must be crack tested annually.

Gantry cranes must be load tested annually by an AIA and verified fit for use. All cranes and lifting devices such as Hilo's used for cane offloading must have overload protection devices installed and functionally tested at least annually. All crane hooks must be marked for measurement and annually compared to the original installation.

Shredder rotor bearings must have lube oil flow protection installed that will trip the shredder in the event of low lube oil flow. An oil accumulator or run down tank must be installed to provide sufficient lube oil to the shredder rotor bearings in the event of a loss of supply lube oil. The sizing should be sufficient to supply lube oil for the full duration of the run down time. Generally shredders take between 10min & 20min to come to a complete stop. The minimum lube oil flow to the rotor bearings as described by the bearing supplier must be maintained at all times.

3. DETAILS AND SKETCHES

DELIVERY

Sugar cane in most regions of KwaZulu Natal is hand harvested. Often the farmer will burn the cane field just prior to harvesting, this rids the cane of leaves/foliage (trash), making it easier to harvest. Another advantage is that when the cane is delivered to the mill it is usually “cleaner” i.e. it contains less trash than unburned cane. The stalks of cane comprise of hard rind material. This rind encases masses of fibre containing sucrose bearing cells along with water, plus a certain amount of dirt, trash and other extraneous matter.

Cane typically consists of 15% dissolved matter, 15% fibre (insoluble) and 70% water. Included in the 15% dissolved matter is sucrose ***(on average between 10 and 14%)*** and this is what the miller buys from the farmer.

Cane quality plays an important role in the sugar manufacturing process. The Mill Group Board plays a central role in measuring and determining cane quality. Cane purity and the amount of ethanol present in the juice are important factors that may cause problems when processing the juice later. Leaving cane in the fields or cane yard for more than 24 hours can cause such problems.

Excessive sand, trash etc. can cause untold problems with operational controls and cause high wear on plant and machinery, resulting in high maintenance costs. It is therefore important to monitor the cane delivered to the plant and to advise farmers when purity levels are low, ethanol levels are high or there are excessive amounts of field dirt and cane trash present in their cane.

Sugar cane is delivered in bundles or loads to a storage area in the cane yard thereafter it is loaded onto an auxiliary carrier which feeds a main carrier or it is delivered directly from Hilos onto auxiliary carriers then fed onto the main carrier. The main carrier is usually constructed of steel slats and conveys the cane at a height of ± 1 meter to the first set of cane knives.

Typically a main carrier houses a set of leveller knives, followed by a set of heavy-duty knives and then a shredder. Some mills have a whole stick shredder, which normally has a leveller drum to provide an even feed of cane to the shredder.

Note: The skill and vigilance of the carrier operator, who feeds the cane onto the system, is critical for ensuring consistent and even cane feed rates are maintained. However, one should not rely on an operator to avoid chokes – ideally the carrier speed should automatically slow down when high amps/nozzle box pressure are registered on the knives.

CANE PREPARATION

By cane preparation we mean ***cutting and shredding of cane to reduce the*** size and nature of full cane stalks into regular and finely divided sections so that the majority of sucrose bearing cells are either opened fully or partly fractured and exposed, to allow complete extraction either by milling or diffusion. **The aim of cane preparation *is to expose the cells in the cane containing sucrose to the extraction process.***

Cane preparation is done by the cane knives and the shredder – the purpose of which is two-fold:

1. Opening of the cells.
2. Increasing the bulk density.

Cane	Open Cells	Bulk Density (kg/M3)
Whole cane	< 5	125 –160
After Knifing	70 – 80	240 – 320
After Shredding	90 – 94	640 - 800

The preparation of cane is measured in two ways. The Sugar mills with Diffusers in their processing line use the Diffusion Rate Index (DRI) and those who have a milling tandem will use the Preparation Index (PI).

DRI

The DRI method is a rapid method of determining how effectively your prep line is working. Samples can be processed in 10-15 mins. The process determines how fast water, passed over the sample, will reach a predetermined conductivity (conductivity represents an apparent sucrose content in the water). The apparatus consists of a sample pot through which water is circulated, in which the conductivity rise is measured as a function of time. DRI is defined as the time rate constant in seconds, of an exponential equation that best fits the data obtained. In the Illovo SA Operations mills a DRI figure of 5.5 – 7.5 was found to be the required target.

Principle of operation

A mass of cane is placed in a basket. Water is circulated through the basket. The brix in the cane is slowly transferred to the water. A measure of the brix concentration in the water as a function of time is obtained using conductivity techniques.

The concentration of the brix in the water is modelled with the mass transfer equation:

$$C = C_{\infty}(1 - \exp(-t/\tau)$$

Where

t – time

τ – time constant

C – concentration at time t

C_{∞} – final concentration

The time constant, τ, indicates how easily the brix could be removed from the particular preparation and is what is known as DRI or diffusion rate index.

Installation

The following are requirements for the installation of the DRI machine

Level surface: at least 450mm widex550mm deep.

Water connection: ¾" B.S.P. connector to connect to a standard washing machine pipe.

A drain, such as a sink, that is lower than the surface.

Power supply: 220V AC 50Hz.

Sample Preparation

NOTE: The machine works on the principle that the water washes the sample as it circulates. It is therefore ***critical that the sample must be distributed evenly in the basket and the sample must be representative***. If balls of cane are placed in the basket instead of a homogeneous layer, errors **will** result.

To achieve a repeatable result, the following steps are required.

Take a sample from the DAC station following the normal procedure.

Empty the sample onto a large sheet of plastic.

The sample must be separated into individual strands. This is done by taking a handful at a time and rolling it in a circular motion allowing the separated fibres to fall back onto the plastic.

All the cane in the sample must be separated using this technique.

The cane must then be mixed to give a uniform distribution of components (pith, fines and fibre) over the sheet of plastic. To do this, lift each corner of the plastic and roll the sample towards to the opposite corner. Repeat this for all four corners.

Level the mass of cane by hand to a layer of ± 50mm to 100mm thick.

In the levelling process, the fines will tend to settle to the bottom. It is therefore essential that, when the basket is filled, cane from the entire thickness of the layer is taken each time.

Operation

Install the machine on a level surface with power, water and drain.

Switch on the machine and wait for the rinse prompt. Ensure the cane pot is empty and press the button as indicated.

When the rinse is complete, remove the cane basket and fill with the prepared sample of cane. Take manageable handfuls from the layer of prepared cane ensuring that the entire thickness of the layer is taken each time.

Spread each handful of cane evenly in the basket without compressing it. Repeat this until the basket is full (± 500g sample).

Press the button to start the measuring cycle. After about two minutes, the result will be displayed.

- Once the cycle is complete, empty the basket immediately. Rinse the sample basket and the top and bottom sieves. Reinstall the sample pot into the machine and press the button to rinse.

NEVER leave the spent cane in the basket for extended periods of time as this will lead to bacterial growth and fowling of the detector. If the machine stands for more than twenty minutes, it will automatically fill with water and circulate the water to limit the bacterial growth. When the forced rinse is completed, you will once again have the opportunity to empty the basket and perform the normal rinse.

Once the normal rinse is complete, the machine can stand until the next sample is scheduled. Once a shift, the machine must be washed out with 30 ml household bleach. To do this, press the button while the machine is filling for the rinse cycle. Add the bleach when prompted and wait for the wash to complete. After the bleach rinse continue as normal.

Maintenance

If the machine is operated correctly, very little maintenance should be required. Apart from the bleach cycle at the end of the shift, simply wiping out the main water tank and occasional cleaning of the sieve on the white cap at the front of the machine is all that is required.

PI

The percentage of open cells is expressed as preparation index (PI) and is established as follows:

Two samples of prepared cane are mixed with equal quantities of water. The brix of the first sample is measured after breaking all the cells in a blender. The brix of the second sample is measured after gently tumbling. The PI of the prepared cane is calculated by dividing the second sample result by the first sample result and multiplying the answer by 100.

e.g. $$\frac{13.7}{14.9} \times 100 = 92\%$$

CANE PREPARATION MILLING TANDEM

The Cane preparation index (PI), should be between 90 and 92%; if the PI is too low then the cells of the cane are NOT exposed and poor extraction will result. If the PI is too high then the cane will be too finely chopped, the fibres will be short and you could get dropping at the mill resulting in poor extraction.

CANE PREPARATION DIFFUSER

The preparation of the cane is critical to the operation of the diffuser, as this will directly affect the percolation within the diffuser. The portion of material extracted by simple washing-displacement will depend very much on particle size. In the case of diffusion about 98% extraction is possible.

To provide for washing-displacement of the juice fraction, uniform thermal denaturation and extraction within the shortest possible time, it is necessary that the particles are the correct size. The shape, size and rigidity of the particles are important, as it has a direct influence on the distribution of the extraction liquid throughout the cane bed.

The particle size in cane diffusion depends on the quality of mechanical cane preparation in front of the diffuser. The DRI required for cane diffusion should be between 5.5 and 7. (See table above).

Apart from the DRI, one should also attempt to provide a coarse prepared cane texture, if the preparation is too fine, then the bagasse can mat, this will have an adverse effect on the rate of percolation. If the preparation is too coarse thermal denaturation will not be efficient resulting in lost extraction. In general there should be long fibers and there should be **NO** whole stick or lumps of cane stuck to the rind.

The quality of cane, that is % fibre, amount of pith, dirt, trash and other extraneous matter in the cane, can cause percolation problems and it may be necessary to **lower the bed height and increase the diffuser speed slightly**.

A reasonable uniform preparation of the cane is an absolute necessity. Correct operation of the cane knives together with the maintenance of ***cutting edges*** to obtain uniform preparation is essential. Optimum extraction and acceptable bagasse moistures are not possible if whole sticks of cane are delivered to the mills or diffuser.

CANE PREPARATION PROCESS

Knifing (Billeting)

One of the purposes of knifing is to level the cane bed and reduce the particle size thus ensuring an even feed of acceptable feedstock is delivered to the shredders. An important observation is to ensure that no whole stick cane is being fed into the shredder and that the cane is not over prepared. ***(Cut too fine, over knifing will result in short fibres causing flooding in the diffuser and poor mill feed characteristics.)***

Knife Design (This varies from mill to mill)

A cane knife set consists of a horizontal shaft mounted across the width of the main carrier fitted with blades (knives). The blades are secured to a hub fixed to the shaft. Blades can be either fixed or swing blades. The latter are preferred when rocks are prevalent in the cane.

A set of knives consists typically of 32 - 64 blades spaced between 25mm and 50 mm apart. There are various types of knives, a typical dimension of which is 400mm x 100mm x 20mm, with a weight of about 10 kg.

Generally two basic knife designs are used, these are the chamfered “sharp” knife (used in UK, ES) and the “blunt” knife (used in SZ, PG, GH, ES). On chamfered knives, only the leading edge should be chamfered and not the top edge. Some mills use heavy knives in order to overcome knives bending from rock damage.

When using sharp knives, only one side of the knife tip should be hardfaced on the backside of the chamfered edge and the hardfacing should be broad enough to prevent the knife wearing through the hardfacing where rapid deterioration will occur once the hardfacing has been “bypassed”.

When installing new knives some mills may stamp the date on them so that records can be kept of how long the knives last under different types of cane supply conditions. The higher the extraneous matter, (loose and adhering trash, tops, roots, sand, etc), the higher the wear on the knives.

Under harsh conditions it may be necessary to increase the area of hardfacing on the knife tips in order to extend the "life cycle". This should be monitored, as excessive hardfacing can be costly.

The speeds at which the knives operate also determine wear. Knife speeds vary between 500 and 960 rpm with a sweep diameter of between 1500 and 2000mm - the tip velocities ***should be to the order of 65 to 70 meters*** per second. The rotor speed will depend on the diameter of the installation.

Where there are leveller knives, these can be up to 1.2 meters off the deck of the main carrier. Thereafter the distance between the cutting circle and the carrier slats ranges from 200mm at the first set of knives, down to ± 20mm at the second set.

Knife Maintenance

Most knives are designed with replaceable tips. When these are worn, the old tip is cut off and a new tip welded in place. Good welding preparation and practices are necessary to ensure that the new tip is secured.

The Knives are fitted to the Knife Palm and it is important to check that the knives fit correctly into the palm as excessive movement of the knife within the palm will cause point loading on the retaining key and "keep" plate resulting in plate failure.

When using "sharp" knives it is important to assemble them correctly - the outer knives, closest to the side casing should have the chamfer facing inwards, all other knives should be positioned alternatively.

Broken or "lost" knives should be replaced immediately as the continued operation of the cane knives in an unbalanced condition will reduce the bearing life besides allowing excessive whole stick cane through, resulting in insufficient cane preparation.

Shredder (Specifications vary from mill to mill)

The purpose of the shredder is to break open the sucrose bearing cane cells into the longest possible fibres whilst achieving a preparation index (PI) of between **91 and 92%**. Open cells render the cane more available for the action of imbibition and increase the bulk density of the feed into the mill/diffuser thus increasing plant capacity.

The main feature of a shredder is its rotor, which supports between 8 and 12 rows of hammers that are fixed to the rotor by means of hammer bars. The swing of the hammer is small and therefore there is little wear on hammer bars and hammer pivot holes. A typical shredder has ***between 150 and 200 hammers*** that cover the full width of the shredder to ensure that all cane passing through is processed. Hammers are about 350mm x 100mm x 50mm and weigh between 17 and 20 kgs each.

The rotational speed of shredders is between 900 and 1200 rpm - with a sweep diameter of ***between 1500 and 1780mm***. Hammer tip velocities should be maintained around **90 to 95** meters per second.

The hammers beat the cane against a *washboard* of square sectioned anvil bars spaced about 200mm apart. The working face of the hammer is normally hardfaced to reduce wear. The wear rate of the hammer face depends largely on the amount of fibre and extraneous matter (sand etc.) present in the cane.

Figure 1.1 shows a typical shredder arrangement.

Shredder side view

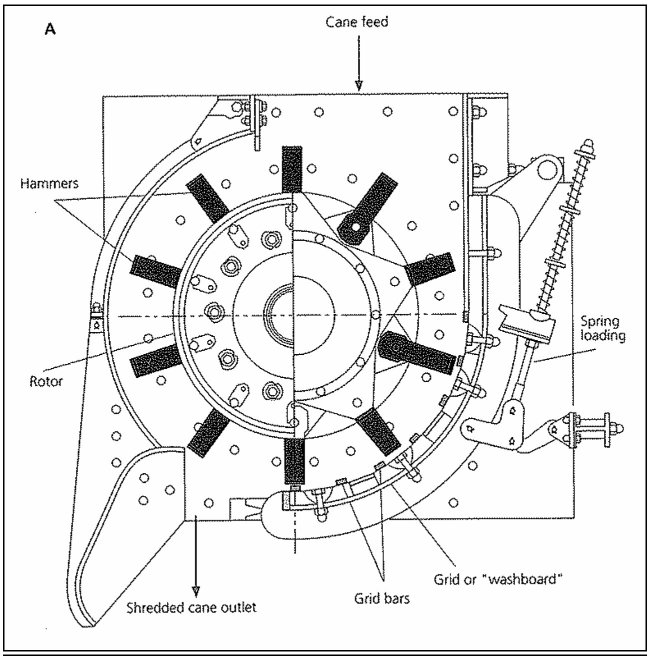


Figure 1.1

Windage plates

Windage within a shredder could cause endless problems. Excessive windage can cause cane recirculation within the shredder, reducing the effective throughput. This is normally seen when heaps of shredded cane discharges from the shredder, rather than a steady flow. Excessive hammer wear is also noticeable. To prevent this scenario, windage plates are installed in strategic places, normally a 16mm plate across the width of the shredder, and about 15mm to 20mm from the hammer tips.

Shredder Washboards

The washboard of a shredder covers a working arc of 90%. Fitted across the washboard are anvil bars spaced about 200mm apart. Shredding occurs when the rotating hammers beat the cane into a fibrous mattress as it passes between the hammers and the washboard.

The clearance between the hammer tips and the anvil bars vary in a sweeping action from entry to discharge between 40mm and 0mm.
Washboard settings are critical to cane preparation; it is therefore advisable to have a jig fixture for checking the radial curvature and axial straightness of the washboards whenever maintenance of the washboard is required.

Settings are dependent on crush-rate and cane quality and **should be checked each shift**, to see that they are correct and that the shredder is operating at optimum performance.

Trash cane provides endless problems feeding into the knives and shredders and can significantly reduce throughput. The cane quality may influence the settings on the shredder and cane-knife washboard, as some cane may simply disintegrate (beginning of the season), having short fibres. Pulling in the wash boards on either the shredder or cane knives, and altering the speed of the shredder can alter the PI.

Once a washboard gives poor preparation it needs to be changed. The different mills change at different intervals ranging from every 3-4 weeks (PG, UK) to a whole season (NB, ES). Some washboards have replaceable anvil bars made from material EN57. These anvil bars are clamped in place and do not require hardfacing.

Deep pocket washboards are used by NB and ES which are relatively new to our industry and have very good life. They are easy to repair and are primarily a fitting job. The downside to these washboards is the initial cost of manufacture.

It is good practice to Record all data relating to crush speeds - cane quality and ideal washboard settings, for later reference when conditions change.

Figure 1.2: Diagram of a typical shredder feeding arrangement.

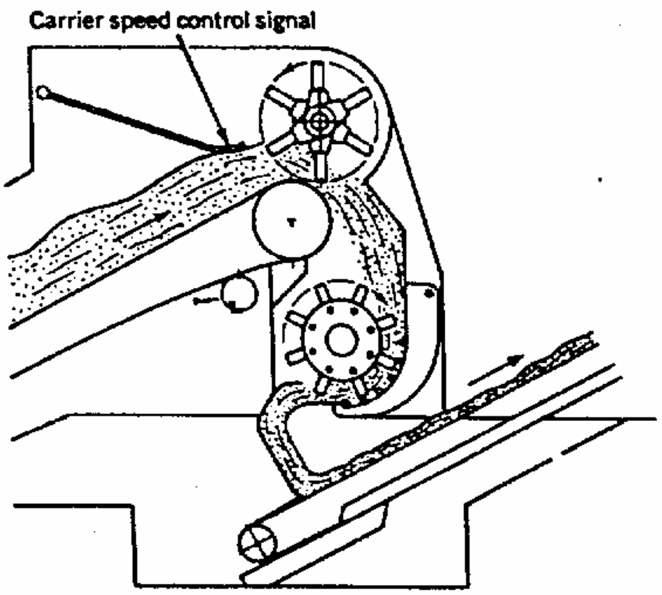


Figure 1.2

Figure 1.3: General layout of whole stalk shredder installation

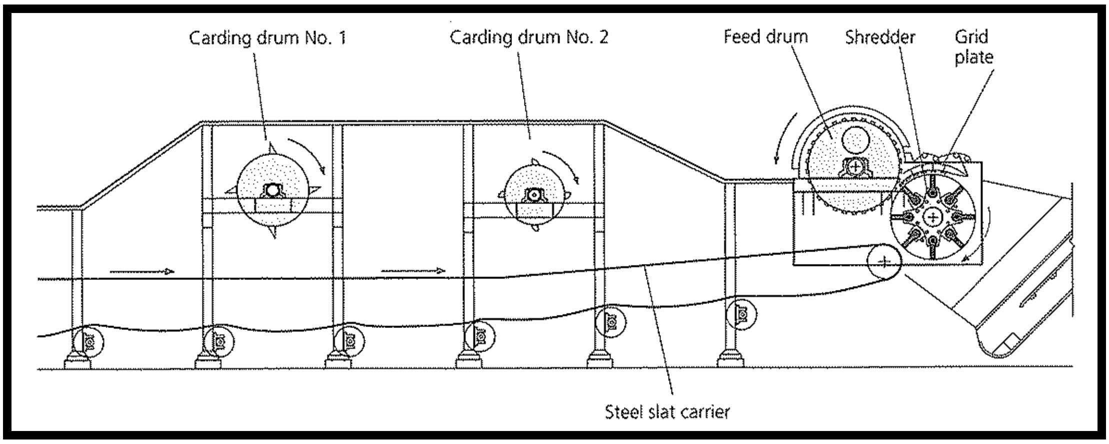


Figure 1.3

Whole stick shredder

It is vitally important to get a steady and constant height feed into the shredder, and so it is preceded by one or two carding drums. A large diameter feeder drum compresses the cane feed into the shredder.

This arrangement has the advantage of doing the job of knifing and shredding in one operation, thus the cost saving of installing and maintaining cane knives. Although this type of shredder requires a larger installed power than conventional shredders, less power is required for cane preparation on average.

The clearances and ratio's between various components are critical. The following are guideline for the successful operation.

The clearance between the feeder drum and overhead washboard must be close enough to prevent recirculation of shredded cane.

The hammer tip to anvil bar of the feeder drum can range between 30mm – 50mm. As some shredding is done on the feeder drum, a too small clearance will wear the anvil bars away on the feeder drum.

The ratio of the first carding drum height – slat carrier / feeder drum height - slat carrier should not exceed 1.5:1. The compression of cane between the slat carrier and feeder drum should be sufficient to prevent cane slippage, however should not be such that juice is expressed from the cane. Ratios at some mills are as follows: NK = 1.48:1, NH = 1.32:1, UB = 1.5:1.

Hammer Maintenance

The speed at which the shredder operates will determine hammer wear. Any increase in shredder speed will increase the hammer tip velocity and increase wear. Also the ash % cane has a direct impact on wear.

There are various hammer designs, standard rectangular and hammers with heads. Hammers are hardfaced to reduce wear. In order to balance the "shredder" it is important that hammer weights are equal and that the hammer meets all the measurement tolerances when delivered from the supplier. Check these from time to time as often the supplier's quality control is not maintained and specification deviations occur. Hammers are generally constructed from material grade 300W SABS 1341.

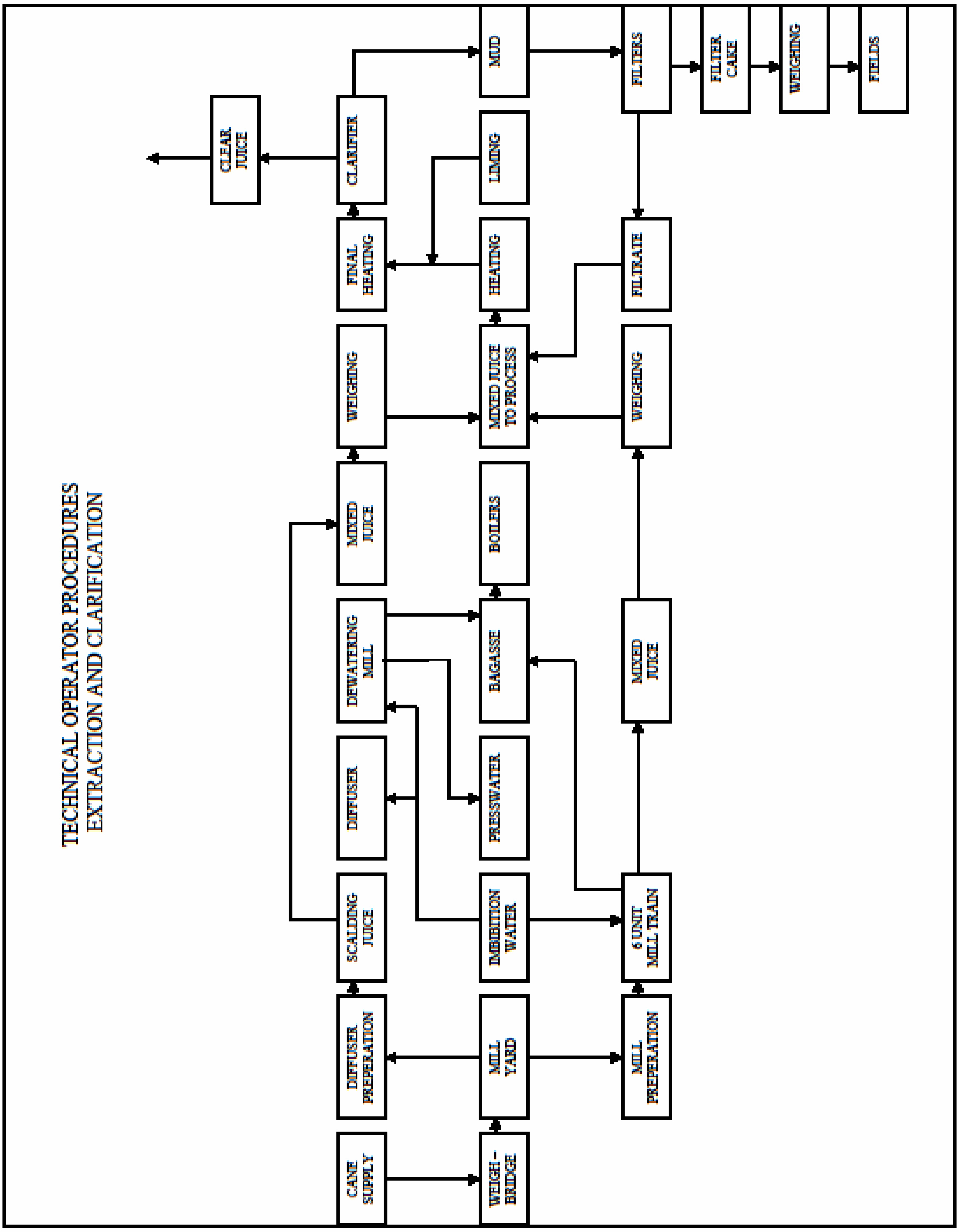
There are two methods to achieve balance. The first is to bring all the hammers to a specific weight and the second is to make a table of weights and install the hammers in opposite balanced weights and colour code and number the opposing rows of hammers. The one method offers little planning but may require substantial time for building up etc to make the exact weight. The latter option needs strict control to prevent the incorrect installation and having an unbalanced rotor.

Check the clearance of the hole in the hammer on the hammer bar to see that it is not excessive as this may cause balance and setting problems. The recommended clearance is a loose running fit of approximately 0,2mm to 0,5mm.

Broken hammers should be replaced immediately, as the continued operation of the shredder in an unbalanced condition will reduce the bearing life.

Table of Hammer Hardfacing Products used

Mill	**Hardfacing**
SZ	Duracor 59 - Afrox
PG	2.8 Trico
ES	Hammerarc 105 – Selrod
UK	CR 70 T3 - Afrox



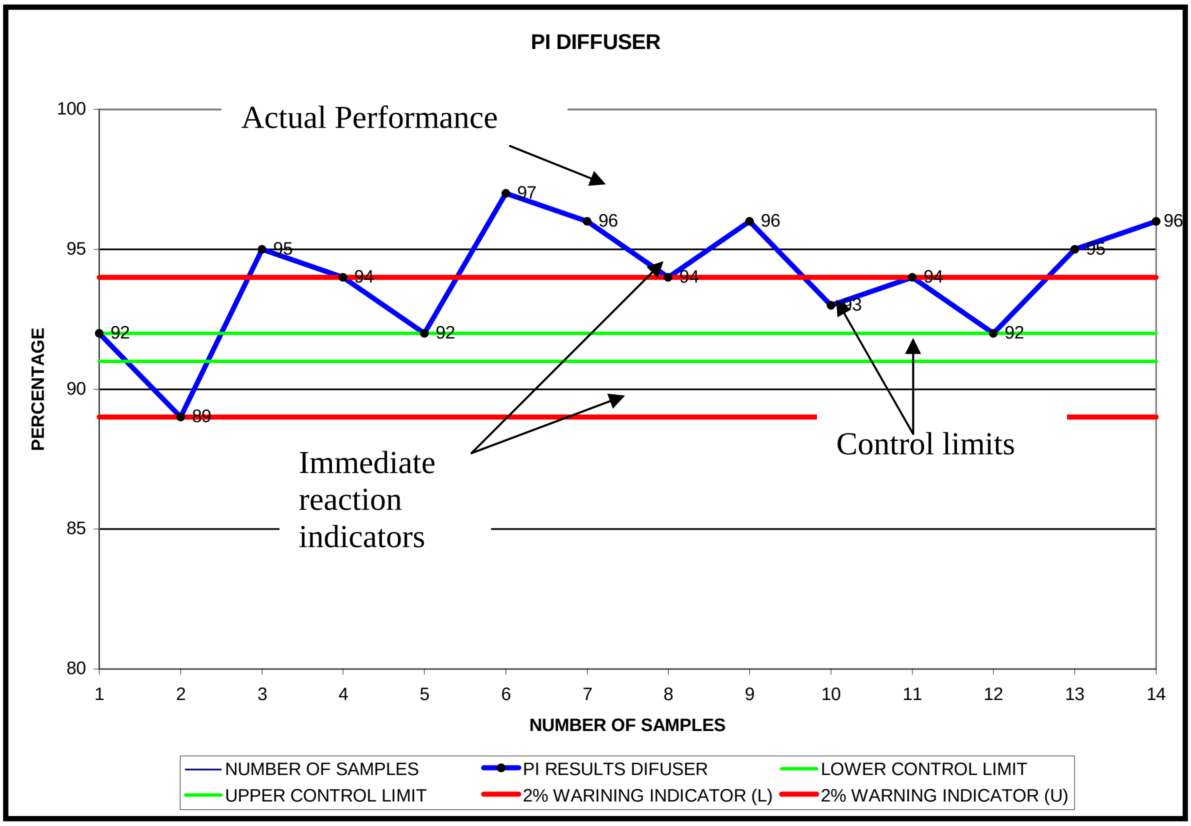
STATISTICAL PROCESS CONTROL

Cane Preparation

Because of the number of variables that have an effect on cane preparation, such as cane quality etc. It is advised that at least 6 samples be analysed before deciding whether the PI is out of control. However, under world-class operating conditions, if a deviation from the control limit exceeded say 2%, the sampling frequency would be increased from I in 24 hours to say 12 in 24 *hours.* This information could then be effectively used to determine whether the cane preparation process is out of control or whether the deviation has been caused by a once-off cane quality problem.

Under current operating philosophies the PI (or DRI) index can remain out of control for up to 4 –5 days before being corrected.

ACTUAL DIFFUSER PI PROFILE

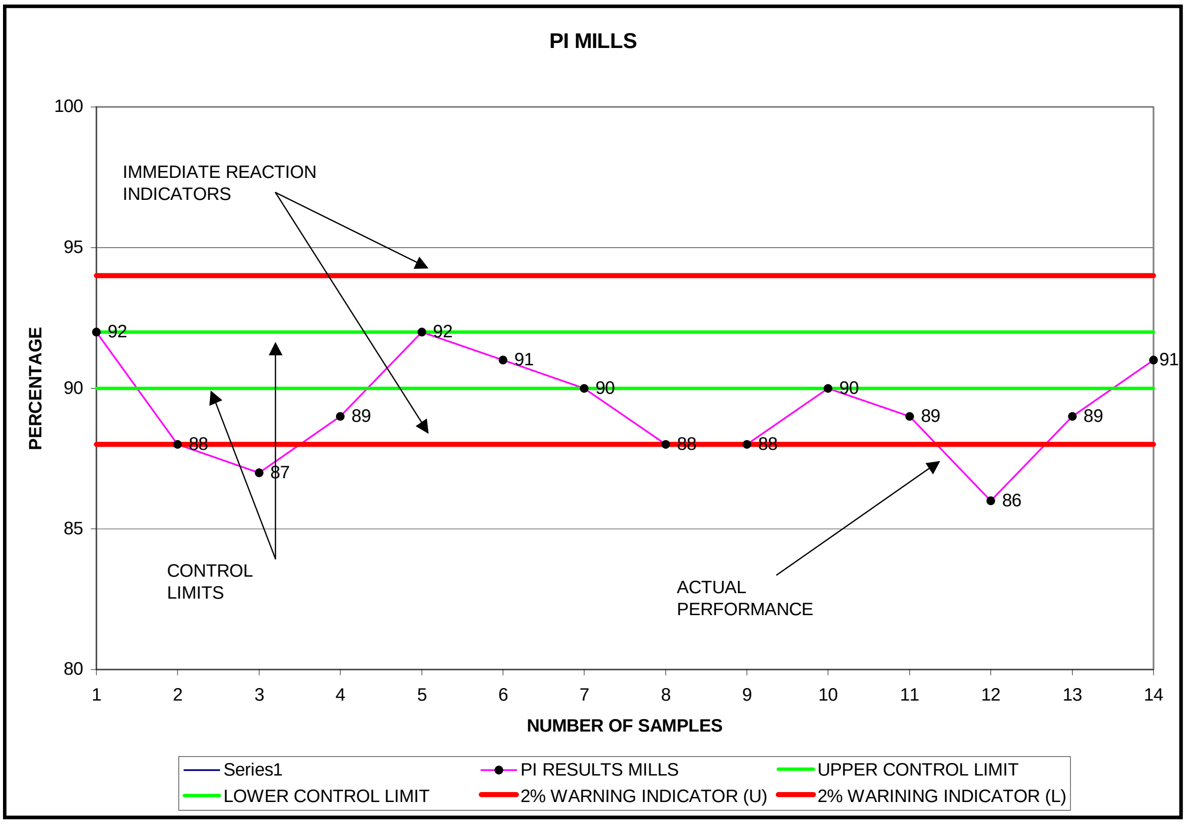


This type of graphical presentation can be made available at the point of operation. Ideally the data should run from week to week on a "rolling average" basis for that week. As the week progresses so the Shift Foreman will get an increasingly more accurate "picture" of what is happening. If deviations persist then the data can be used as *a highly effective tool for problem solving.*

In reference to the above graph, a PI of 94% and above or 89% and below are considered to be process deviations. The example shows the process being out of control for **71%** of the time.

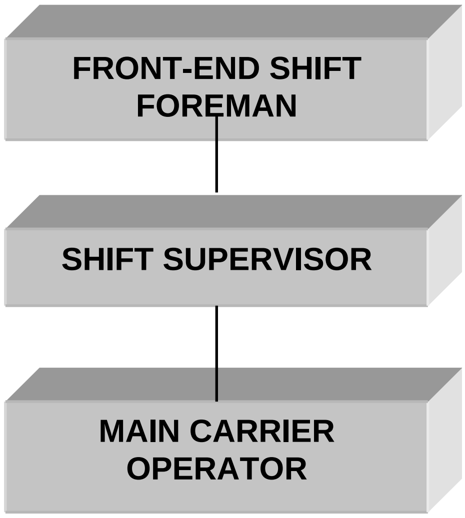
The same analysis would apply to the milling PI.

ACTUAL MILLING PI PROFILE



In reference to the above graph, a PI of 94% and above or 88% and below are considered out of control. The process shows the PI being out of control for **36%** of the time.

Responsible Personnel



Optimisation

In order to optimize cane preparation and delivery to the mills/diffuser the following must be controlled:

Carrier Operation

1. **CARRIER**

   Wherever possible avoid erratic carrier feed loading and speeds - maintain constant feed rates and avoid stopping the carrier.

2. **CANE BED**

   Control the cane bed height by manipulating carrier feed and speed in order to maintain a constant bed height thus avoiding "high" loads which could result in chokes.

3. **FEED "GAPS"**

   Manipulate carrier feed rates and speed in order to eliminate "gaps" in the feed bed thus maintaining an even flow of cane to the knives.

4. **CANE QUALITY**

Observe the cane quality on the carrier, adjust the carrier feed rate accordingly and notify the Control Room Operator. (High levels of trash or "old" cane can cause chokes if fed too rapidly into the knives).

5. **FOREIGN MATTER**

Watch for any foreign materials (rocks, chain etc.) in the cane - if foreign matter is detected stop the carrier and have the material removed.

Note: ***The skill and vigilance of the carrier operator, who feeds the cane onto the system, is critical for ensuring consistent and even cane feed rates are maintained. However, one should not rely on an operator to avoid chokes – ideally the carrier speed should automatically slow down when high amps/nozzle box pressure are registered on the knives.***

Material and Machinery

CANE QUALITY

If the cane quality is poor it may necessitate slowing down the plant in order to avoid chokes. (High levels of communication are required between the carrier operator and control room).

CHECK THE KNIVES

It is important to constantly monitor how the knives are performing – the following need to be observed:

(a) Settings
(b) Speed
(c) Balance
(d) Effectiveness

CHECK THE SHREDDER

Cane preparation is important, the PI must be within control (91% to 93%) or DRI between 5.5 and 7. Check the following:

(a) Washboard settings
(b) Speed
(c) Balance

Effectiveness (the PI/D

4. TOPS CHARTS

TECHNICAL OPERATING PRACTICES
CANE PREPARATION

RESPONSIBILITY: **FRONT END FOREMAN, SHIFT SUPERVISOR, MAIN CARRIER OPERATOR**

KEY PERFORMANCE AREAS

In order to optimise cane preparation and delivery to the mills/ diffuser,
The following must be controlled:

CARRIER OPERATION

1. Spiller Table operation:	Avoid any gaps in the cane feed on CI carrier.
2. Cane Carrier Bed Height:	Maintain a constant cane height in CI carrier and avoid creating any gaps but do not overfeed. Consistent acne feeding is imperative for effective throughout control.
3. Cane Quality:	Observe the cane quality on the carrier, adjust the carrier feed rate accordingly and notify the control room operator. (High levels of trash can cause chokes if fed to rapidly into the cane preparation equipment.
4. Foreign Matter:	Watch for any foreign materials (rocks, chains etc) in the cane. If foreign matter is detected stop the carrier and have materials removed.

MATERIAL & MACHINERY

1. Cane Preparation:	Cane preparation must be monitored and the washboard a DRI of 6-7.

SUGAR ILLOVO GROUP

6. EVALUATIONS

NAME:________________________________

DATE:_________________

1. **What safety precaution must be taken before maintenance hammer or knife changes are done to shredder and cane knife rotors?**

---(3)

2. What checks must be done to cane offloading and preparation equipment to satisfy the Illovo Group Risk and Statutory requirements and at what intervals must this be done?

---(8)

3. Explain the definition of "cane preparation" and why is it important to prepare cane?

---(2)

4. What methods are used to measure the preparation of cane and what are the ideal values of each method?

---(2)

5. What cane feeding and preparation operations are necessary to ensure the best extraction results are achieved?

---(4)

TOTAL %

TRAINER: ______________________