

## ➤ Key Equipment Features

### ➤ Cane Preparation

#### ▪ Shredders

The in-line shredder system comprises of a leveller unit installed on the cane carrier downstream of the shredder which prepares the cane mat at an even depth for presentation to the shredder. The shredder has a rotor complete with hammers all mounted in a fabricated housing complete with anvil bars and drum feeder.

If installed in an existing system all cane knives can be removed.

#### Advantages

- Continuous and steady feed of cane
- High percentage of open cells on cane
- Increased extraction
- Well prepared cane with long fibres
- Low energy consumption at mills as less pressure is required to open the juice cells
- Preparation Index (PI) up to 92%
- Can handle full length or chopped cane.

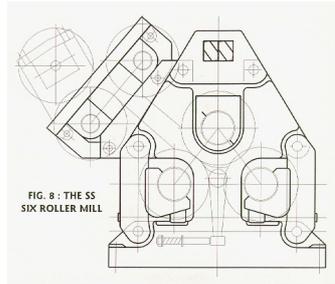
#### ○ Milling

##### ▪ Two roller mill

The two roller mill has no trashplate therefore less power is absorbed compared to conventional three roller mills. A chuteless toothed roller pressure feeder (TRPF) system can be installed as an integrated assembly to further improve efficiency. The system provides the following advantages

- 25% reduction in energy.
- Guaranteed bagasse moisture of 48%
- 40% reduction in maintenance costs.
- Drive can be provided by steam turbine, electric motor or hydraulic motor.
- Reduced civil costs and in the case of a new installation a smaller mill house building would be required.

##### ▪ Three, Four, Five or Six Roller Mills



#### ▪ **Internal Draining Roller**

By replacing your regular rollers with internal draining rollers, you can;

- Improve feeding
- Eliminate re-absorption
- Lower bagasse moisture
- Improve boiler efficiency
- Increase mill extraction
- Increase mill capacity

Drainage is facilitated by 12 to 16 horizontal holes connected through a number of nozzles provided in the groove root. When bagasse is compressed by the rollers (in two nips) the pressure in the zone is very high, which forces the expressed juice out through the nozzle and the horizontal drainage system to exit in the special juice rings provided.

Our internal draining roller is designed to increase the material strength at vulnerable areas by casting the shell with special material tubes (for horizontal drainage). This increases the strength by the chilling action and provides a smooth surface which prevents build up of bagasse in this area. Due care is taken to select the correct shrinking tolerance, temperature control during shrinking and selection of pitch for drainage.

The roller efficiently drains juice extracted from all three nips, with almost 40% of the nozzles fed under pressure. This eliminates flooding and minimises re-absorption. Approximately 15% of the total amount of juice removed here reduces the weight of the material to be handled by the mill. Compared to conventional milling, moisture is further reduced by 10% for the first mill and about 4% for the last mill with reduction in pol in bagasse.

#### ▪ **Rotary Screen**

Continuous juice screening is effected on a metal-to-metal welded wedge bar type screen (see below details of screen construction) fitted on a cylindrical drum, horizontally mounted

with an appropriate slope towards the non-drive end. The angle of inclination can be adjusted to suit change in capacity or cane conditions. This unique feature can be achieved by adjusting a simple jack system and locking in the desired position to achieve the highest efficiency based on exacting conditions.

Unlike the stationary parabolic screen the entire screen area of the rotary screen is fully utilised and hence maximum efficiency is achieved. The dynamic movement of the screen allows utilisation of a smaller sized wedge bar opening, for removal of the smallest bagacillo particle contained in the juice. The diameter, the length of screen, the speed of rotation and its inclination are designed to ensure that the projectile formed by the solids facilitates complete drainage of juice. The direction of rotation ensure that maximum juice is removed in the first 30% section of the screen and the balance is de-watered in the remaining 70% section. As a standard accessory, our unit is provided with an automatic screen cleaning device which periodically applies hot water through flat cone nozzles. This ensures a clean screen surface throughout the operational period.

### **Special Wedge Wire Screen**

Sudeco's welded wedge wire screens are extremely strong and more clog-resistant than conventional screens that use wire mesh screens or perforated plate.

Our welded wedge wire screens are manufactured from stainless steel V-shaped profile wire, utilising a unique *Metal-to-Metal* fusion argon weld technology in its construction instead of the conventional Resistance type weld. The *Metal-to-Metal* welding provides greater strength, precision and longer service life than the resistance welding.

### **Conventional Resistance**

#### **Welded Screen Panel**

**V**



### **Sudeco's *Metal-to-Metal***

#### **Welded Screen Panel**

**V**



The continuous feed, i.e. mill juice containing suspended solid particles comprising fine bagacillo particles, enters from the drive end of the drum through a distributor. The screened juice is collected in the sloping half of the cylindrical trough for fast removal of strained juice and passing on to the strained juice receiving tank. This eliminates the possibility of creating stagnant areas which may create growth of micro-organisms. The solid mass continuously rolls on the wedge bar screen during its trajectory movement towards the non-drive end where it is discharged directly on to the cane being fed to the mill.



- **Purification**

- **Short Retention Clarifiers (SRT)**

- The SRT is of the trayless design offering greatly reduced turbulence and resultantly allows faster settling and less turbid solution on discharge.

We have a special in-built design feature in our flash tank in order to promote effective mixing of co-polymer and mixed juice which achieves a more efficient mixing effect. In this respect polymer is mixed in a semi turbulence zone after complete removal of air by flashing. The turbulence zone later passes through a laminar flow where, although settling is not allowed to occur, a certain time lapse of a few seconds is allowed during the upward flow of the already mixed juice and polymer solution. This effect greatly encourages floc building of dispersed flocs, so that a ready material is fed to the single tray clarifier. This feature greatly enhances the settling characteristics, to the extent that a settling rate of 125 to 150 mm per minute is achieved. This particular unique aspect of our proposed unit allows one of the lowest retention times in the range of 35 to 40 minutes.

*Features of our Design*

- Good clarification is achieved with less retention time.

- Brilliant clear juice, free from any suspended solids such as bagacillo particles.
  - Less retention time, hence less risk of sucrose inversion loss.
  - Specially designed flash tank which performs multiple functions, such as flashing to ensure maximum removal of dissolved air, homogeneous mixing of flocculent polymer and building up of thin fragile flocs into thick and dense flocs, for enhancing mud settling properties.
  - Less temperature drop due to less juice holding volume and less heat exposed area.
  - Compact mud formation for achieving better filter performance.
  - Less formation of colouring matter due to reduced risk of heat exposure.
  - Simple maintenance – mud outlet valve is the only valve that requires regular operation.
  - Optimum consumption of polyelectrolyte flocculent by homogeneous mixing with juice at the special flash tank. The cost involved in polymer addition is quite affordable and economical considering the multifold advantages gained.
- **Decanter Centrifuges for Muddy Juice.**  
 Sugar mills, throughout the world, have conventionally used rotary vacuum drum filters (RVDF) to dewater the sugar mill mud that is produced after lime treatment of the sugar juice and subsequent sedimentation in short retention time clarifiers (SRTC) or in conventional clarifiers. An alternative technology for clarification of the sugar muddy juice and dewatering of the sugar mud, using decanter centrifuges (henceforth referred to as “decanters”) has been established with encouraging results. The advantages that have been found using decanter technology are:
- Increase in the recovery of sugar by maximizing mud cake dryness.
  - Less power required than that of a vacuum drum filter
  - Smaller area required for the installation than that of a vacuum drum filter

- Reduction in power consumption required for mud dewatering.
- No bagacillo is required as a filter aid and therefore this is available for power generation.
- Easy disposal of the mud due to the very low moisture content and reduced quantity, with no bagacillo.
- Lower steam consumption in the sugar juice evaporator, since there is no wash liquor to dilute the juice.
- Avoid or reduce inversion losses arising out of longer residence time in the RVDF system and bacteria associated with the addition of bagacillo as filter aid.
- Smaller foot print thereby saving space and civil expenditure compared to the RVDF.



## ○ **Evaporation**

### ▪ **Falling Film Evaporators**

The falling film evaporator offers a higher heat transfer coefficient than that of other designs due to its uniform wetting rate and thin film formation within the tube.

A highly efficient stainless steel poly baffle system is provided either inbuilt within the main evaporator body or else externally on the outlet condensate piping to prevent sugar laden water droplets being entrained in the vapour.

The design provides the following advantages

- Good steam economy
- Uniform flow in each tube thus ensuring effective heat transfer coefficient.
- The upper section can be removed to allow for cleaning.
- Minimal colour increase due to short retention
- Effective recovery of non condensable gases
- Fully automated operation and control

Also available from our range

- Roberts Rising Film Evaporators
- Semi Kestner Evaporator

○ **Crystallisation**

- Continuous Vacuum Pan

Sudeco's continuous vacuum pan is suitable for use on all types of raw cane and beet sugar massecuites. Sugar crystals are grown from a seed massecuite or magma to the desired size on a continuous basis. This results in stabilisation of vapour loading on the evaporator and condensing systems. Syrup or molasses is also fed continuously, which reduces storage volumes. Additionally, there is increased plant utility as less time is lost due to repeated dropping of strikes, steamout, re-charging and boil down.

The reduced massecuite head of the continuous vacuum pan results in lower massecuite temperatures. This, combined with the increased heating surface to volume ratio compared to batch pans, means lower pressure vapours can be used which improves the overall factory heat economy

Advantages

- High heating surface volume ratio.
- Streamlined flow through multiple compartments with no channelling or short circuiting.

- Minimum hydrostatic head above the top tubeplate.
  - Entrainment prevention through introduction of our poly baffle arrangement.
  - Uniform quality of massecuite and crystal, very stable operation.
  - Maximum exhaustion of mother liquor.
  - Uniform load of power and vapour / steam.
  - Low temperature vapours used for boiling.
- **Batch Vacuum Pan**  
Sudeco's low head batch pans are designed to provide uniform distribution of steam or vapour along with uniform and quick distribution of feed material with good ratio of heating surface to volume. The down-take diameter is designed to be around 40% of the pan diameter so as to facilitate good movement of massecuite.

The units also have provision to effectively remove condensate and non condensable gasses.

A poly baffle arrangement along with centrifugal arrestor is provided for effective entrainment removal.

Variable speed mechanical circulators are available.

Calandrias can be offered fitted with conventional round tubes or of the honeycomb design.

- **Vertical Crystallizer**  
Sudeco's cooling crystallizer is based on vertical design with stationary cooling tubular coils suitably positioned to facilitate economical heat transfer within low grade massecuite across the entire cross section of the crystallizer in order to remove as much sucrose from mother liquor by continuing the crystallization process of crystals that are already formed.

Advantages

- Retention times are defined for high yields
- Handling of cool high viscous massecuites is difficult therefore at the top section of the crystallizer we have a

batch of coils to raise the massecuite temperature before discharge.

- Vertical design thus requiring small footprint and civil foundation.



- **Vacuum Crystallizers**

Cylindrical fully enclosed vacuum crystallizers are provided at the vacuum pan station to allow massecuite or magma to be cut between pans or simply stored in times of high production.

- **'U' Shaped Crystallizers**

Air or water cooled crystallizers are available for exhaustion of mother liquor on high grade massecuites.

- **Condensers**

Sudeco's multispray multi jet condenser has special nozzles that converge inside the throat at a designed apex angle for proper ejection of non-condensable gasses to create the desired vacuum.

The strainer box is at 18 degrees so that, by opening a hand-hole at the bottom, it allows extraneous matter to be removed easily.

The design of the jet box is specially designed to overcome any constraints in drainage of condensate water.

#### Advantages

- Minimises wear and tear of vacuum equipment
- Reduced cost of maintenance
- Increase in time efficiency
- Decreased water consumption
- Decreased power consumption
- Improves and stabilises the performance of the evaporators and vacuum pans.

- Improves the rate of sucrose crystallization
- Maximises recovery of sucrose

## ○ **Heat Exchangers**

### ▪ **Direct Contact Heater**

Direct contact heaters (DCH) are an alternative to the plate and tube type units. However DCH units have a high heat transfer coefficient due to the absence of liquid film resistance as in the tube design, condensing vapour resistance, scale and tube / plate material resistance. The units operate at an approach of around 1° C whereas the shell and tube / plate is normally 5 to 7°C.

#### Advantages

- Vapours are fed so as to promote counter current operation with effective utilisation of latent heat.
- Lower temperature vapours can be utilised.
- No need for condensate lines, standby bodies or cleaning during the season.
- The unit is designed for minimum pressure losses.

Plate and tube heat exchangers are also available in our range

## ○ **Sugar Drying**

Our sugar dryer is of the vibratory fluidized bed type whereby heated air is introduced into the dryer in order to lift and maintain the feed in a fluidised state. Air is introduced into a wind box or plenum via a forced draft fan and is distributed through a perforated plate. The fluidisation provides intimate contact between each sugar particle and the air stream creates an extremely efficient transfer device.

Sugar is cooled before discharge and all heating and cooling air introduced to the dryer is controlled by instrumentation respective to product flow, temperature and moisture levels.

Dust contained in the exhaust air is passed to a cyclone where fine sugar particles are removed. Exhaust air is then transferred to a scrubber which removes sub-micron particles by means of water spray.

The entire dryer system is controlled by a PLC

#### Advantages

- The dryer / cooler installation is easy to use and is a simple and reliable process.
- All product contact parts are manufactured in stainless steel.
- Due to the short retention time in the dryer / cooler, along with the gentle handling of product, there is no degradation of product.
- The level of fines in the main product stream will be reduced because of fines removal in the dryer / cooler.
- De-dusting of the exhaust air in the cyclone / scrubber system ensures that there is no loss of sugar in the system. Moreover, there is no need for a separate melter as fines from the scrubber are added to the discharge box of the scrubber.

#### ○ **Automation**

Given the different process steps in sugar manufacture, it is essential to keep an eye on the entire workflow at both process and plant management if production is to be optimised. Automation is therefore an essential part of modern processing facilities as it plays a big part in keeping production costs down, while at the same time improving transparency, quality and availability of your production on a long term basis.

Automation is an integral component of any of our plant supply and it ensures that our clients enjoy competitive edge due to

- Efficient use of plant and equipment
- Streamlined low power consumption
- Use of modern maintenance techniques leading to higher plant availability and lower maintenance costs.
- Better cane / beet / raw sugar management logistics.
- Better production to manpower ratio.
- Consistent high quality product.
- An integrated plant operation philosophy.