

Manufacturing Process

Process: A) Sugar

- **Extraction of Juice**

The sugarcane is passed through preparatory devices like knives for cutting the stalks into fine chips before being subjected to crushing in a milling tandem comprising 4 to 6 roller mills. In the best milling practice, more than 95% of the sugar of cane is extracted into the juice.

- **Clarification**

The treated juice on boiling fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud is sent to rotary drum vacuum filter for removal of unwanted stuff called filter cake. It is discarded or returned to the field as fertilizer.

- **Evaporation**

The syrup will again have treated with sulphur dioxide before being send to the pan station for crystallization of sugar. Crystallization takes place in single-effect vacuum pans, where the syrup is evaporating until saturated with sugar. At this point “seed grain” is added to serve as a nucleus for the sugar crystals, and more syrup is add as water evaporates.

- **Centrifugation**

The massecuite from crystallizer is drawn into revolving machines called centrifuges. The perforated lining retains the sugar crystals, which may be washed with water, if desired. The mother liquor “molasses” passes through the lining because of the centrifugal force exerted and after the sugar is “purged” it is cut down leaving the centrifuge ready for another charge of massecuite.

- **Gradation & Packing**

The final product in the form of sugar crystal is dropped through pan section and this sugar is graded and picked in 50 kg bags. The grade of the sugar depends on the size of the crystal viz. Small (S) and Medium (M)

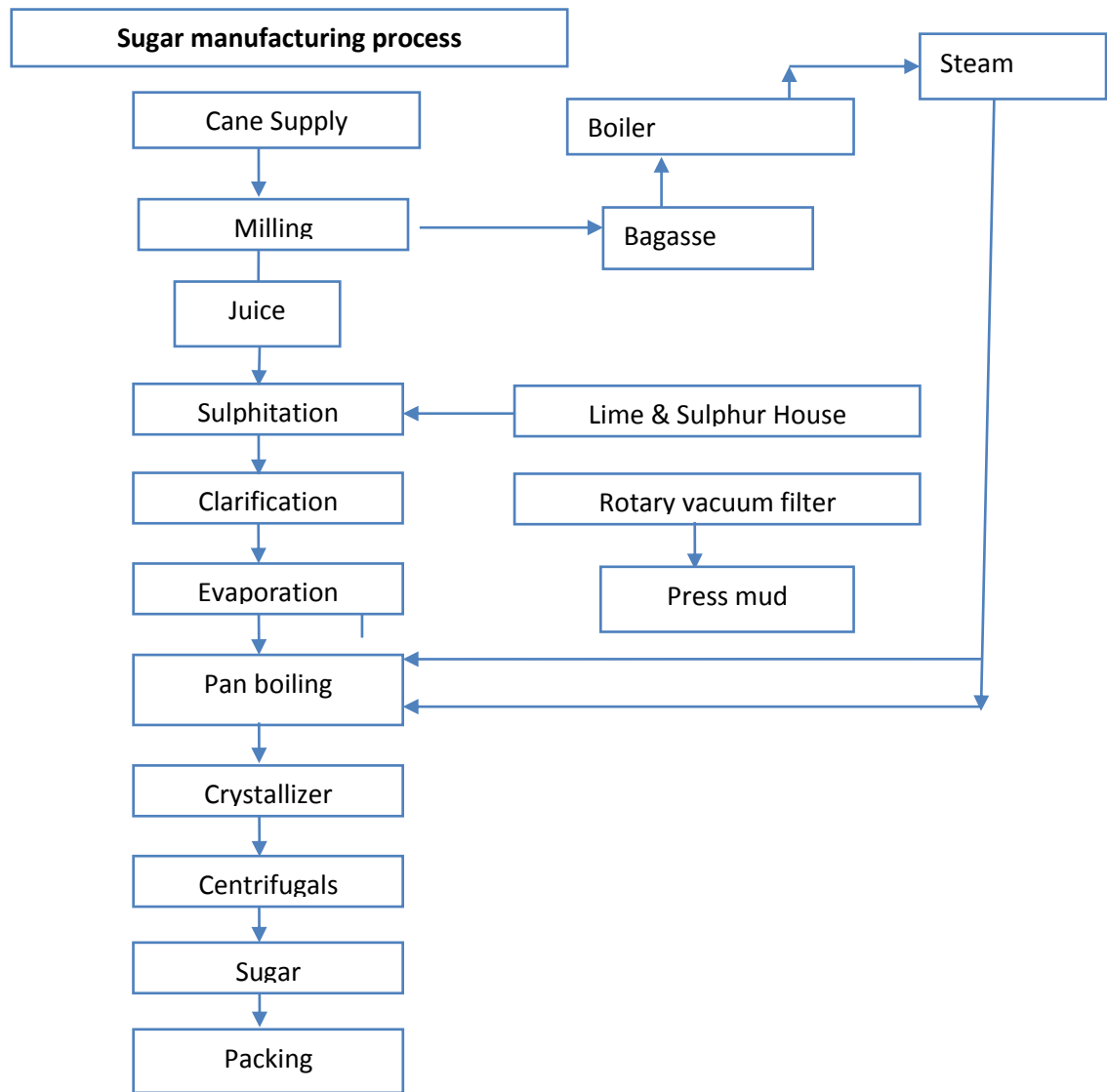


Figure: Flowchart Sugar Manufacturing Process

B) Co-generation

The proposed cogeneration, aims at improving the energy efficiency of the sugar factory significantly and enabling the plant to generate surplus power from its cane crushing operation. This surplus power will be exported to the state electricity grid. Energy efficiency and the export of power to the grid are made feasible due to the availability of high pressure and high temperature steam and by the utilization of the available bagasse. The flow chart for generation of the power in cogeneration as shown in following figure

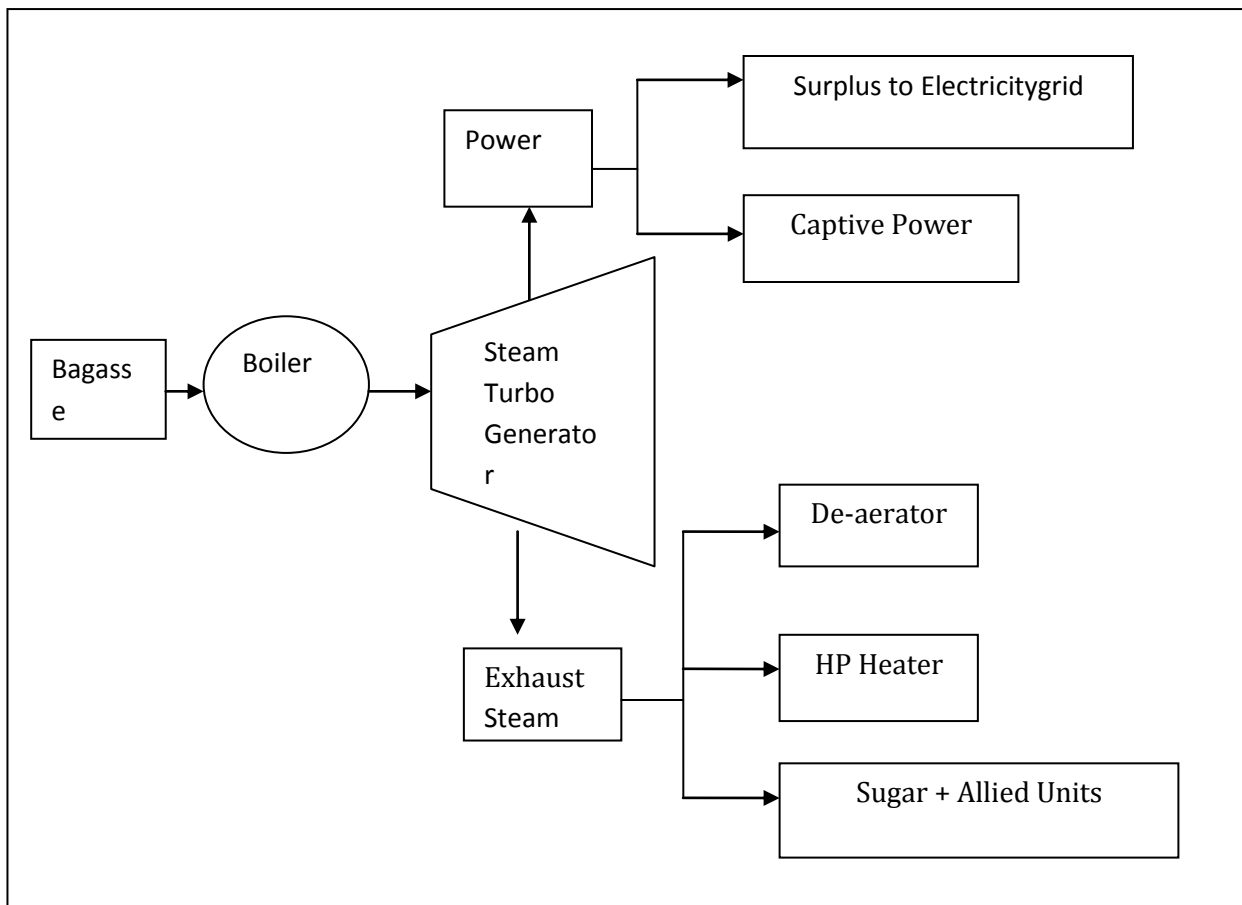


Figure : Schematic of Cogeneration process

C) Distillery Unit

The production process mainly involves fermentation and distillation process

Fermentation- Molasses is the chief raw material used for production of alcohol. Molasses contains around 50% total sugars, of which 30 to 33% are cane sugar and the rest are reducing sugar. During the fermentation, yeast strains of the species *Saccharomyces cerevisiae*, a living microorganism belonging to class fungi converts sugars such as sucrose or glucose present in the molasses in to alcohol. The continuous fermentation process involves addition of fresh nutrients medium either continuously or intermittent withdrawal of portion of nutrient for recovery of fermentation products. In continuous process, fermenter is in constant usage with little shut down and after initial inoculation of yeast culture, further inoculation is not necessary. Hence, continuous fermentation process will be adopted in the proposed unit.

Distillation- After fermentation, the next stage in the manufacturing process is to separate alcohol from fermented wash and to concentrate it to 95%. This is called Rectified Spirit (RS). For this purpose,

method of distillation is employed. After separation of alcohol, the remaining part is the effluent of the process i.e. spentwash and spent lees.

Re-distillation to manufacture Extra Neutral Alcohol (ENA)

ENA is prepared by re-distillation of the rectified spirit (RS) for the removal of impurities like higher alcohols, aldehydes and methyl alcohol. This is done by, remixing rectified spirit with soft water and distilling it in the ENA column.

Anhydrous Alcohol (AA)

Anhydrous alcohol is an important product required by industry. As per IS specification it is nearly 100% pure or water free alcohol. Alcohol as manufactured by Indian distilleries is rectified spirit, which is 94.68% alcohol. It is not possible to remove remaining water from rectified spirit by straight distillation as ethyl alcohol forms a constant boiling mixture with water at this concentration and is known as azeotrope. Therefore, special process for removal of water is required for manufacture of anhydrous alcohol.

The various processes used for dehydration of alcohol are as follows-

- i) Azeotropic Distillation
- ii) Molecular Sieves
- iii) Pervaporation / Vapour permeation system