PROCESSES

INCAUCA S.A.

COUNTRYSIDE

Countryside

The cultivation of sugarcane begins with the adaptation of the lands including the leveling and construction of works, which are mainly made to facilitate the movement of the water on the surface of the land during irrigation and to evacuate excess water when present, they facilitate mechanized work and the harvesting process, using works of topography, design, mapping information and Geographic information System (GIS).

Subsequently, soil preparation is done to provide a suitable environment for optimal seed germination and good crop development. The works carried out are descepada, sub-soiling,

plowing, harrowing and furrowing, tasks that help incorporate weeds and waste from previous crops, loosen the soil and give the best condition for it to have sufficient contact with the seed so that excellent germination is achieved.

Once the ground is ridged, it is time for the sowing which is performed by depositing the seeds that are pieces of 60 cm stems having between 3 and 4 buds. Subsequently, it is covered with a thin layer of soil, work done mechanically or manually, depending on soil and climate conditions.

Irrigation of sugarcane is done immediately after planting and repeated 15 days later. Watering is continued according to the schedule of the water balance, program that calculates the water needs of the plantation based on the capacity of the soil to retain moisture, evapotranspiration loss and contribution by rain. To irrigate we use nearby rivers, groundwater which is conducted by channels or pipes and is applied by gravity into alternating furrows or by sprinkler.

Soil sown with sugarcane should be restored of the nutritional elements absorbed by the plant in its growth cycle, thus the work of fertilization is done which is performed mechanically or manually.

Vinasse is applied as a potassium source (by-product of ethanol) enriched as microelements and microorganisms, urea is used as nitrogen source, taking into account the soil analysis and the results of field experiments carefully planned and carried out in soils with different fertility levels, complementarily, aerial applications of foliar fertilizers are made.

Weed control is performed chemically using herbicides that are applied with knapsack constant pressure pumps, especially in winter time and is complemented by manual controls.

	Additionally, in the ratoon (strains after the first cut) mechanical work is made such as the subsoil, which aims to loosen the soil after harvest. Subsequently, the cultivation work or esclarificación is performed, which is done mechanically to desterronar and loosen the soil surface, in addition to control inter-row weeds in the crop. Afterwards, hoeing is made, activity to be performed in the first three months of the planting. It involves removing soil from the inter-rows to lift the groove with the purpose of defending the sugarcane from winter moisture, channeling irrigation water in summer and its evacuation in the winter, at the time of harvesting it prevents the machinery to tread on the plantation. Eight weeks before harvest, ripening of sugarcane is performed in order to concentrate more sucrose at the time of the harvest. The process of growing sugarcane ends when it is between 12 and 14 months old, suitable for harvest time.
HARVEST	**Harvest** The harvesting process has the mission of timely provision of cane at the lowest cost and meeting the quality standards, according to the Factory requirements.

The sugarcane harvest includes the work of pre-harvest, application of ripeners, burning, cutting, lifting and transporting, which are conducted under the framework of the environmental legislation that governs it and with the least possible impact to communities.

The work of pre-harvest determines the degree of ripening of the cane, through sampling in the field. Subsequently, the application of ripeners is made and it is proceeded to define the fates of the sugarcane to be harvested, determining the type of cut either manually or mechanically, taking into account the restrictions of sugarcane burning.

For the work of sugarcane burning there are 34 weather stations that provide data of wind direction and speed in real time, in order to minimize disturbance to communities. This data source is also used for aerial application of ripening chemicals.

Manual sugarcane cutting is performed by trained personnel under the rules of the Management System for Safety and Health at Work. For mechanical cutting there are harvesting machines that cut the sugarcane into pieces of about 20 to 30 cm long and are deposited directly into the wagons.

The lifting of the sugarcane manually cut and organized in chorras in the field, is performed with machines that deposit it in the wagons. The Mill has two long sugarcane lifts for which the collators are used and eight chopped sugarcane lifts corresponding to sugarcane cut with harvesters.

The transport of sugarcane is made in sets of five wagons, two baskets if transportation is on national roads or four baskets if transportation is on internal roads. These trains are moved by tractor trailers from the field to the Mill.

Currently, the Mill has the Fleet SAP technology, which allows real-time monitoring of the location and operation of the equipment; it also generates historical reports related to their movements and good driving practices. This technology also allows controlling dispatch and consumption of fuel.

The harvesting process of Incauca S.A. has a capacity to supply 17,000 daily tons of sugarcane to the Factory.

FACTORY

Factory

The factory started its activity with a mill prospect of 2,000 metric tons per day. In 1970, the capacity was increased to 2,500 tons per day, in 1976 it reached 5,000 per day and in 1982 it reached 7,500 tons per day. Nowadays, Incauca's factory often exceeds its milling record, which has totaled more than 16,000 ton/day.

Sugarcane yards

The factory starts its work with the sampling process of sugarcane coming from the field to measure the quality and thereby making estimates of the sugar that can be obtained. Once the sampling is performed, transport vehicles pass through electronic scales for weighing and are then unloaded into the washing tables.

Preparation of Sugarcane

Sugarcane cleaning is performed to remove the foreign matter that it has when reaching the process.

The washing tables deliver the sugarcane to drivers that send it to two tandems of mills which have shredders to fractionate the sugarcane to break the crust and facilitate extraction of the juice in the mills.

Milling

Currently, Incauca has an installed milling capacity of more than 17,000 tons of cane per day, distributed over two tandem mills. Each tandem is composed of six mills and each mill consists

of four rollers. These rollers are large cylinders that are responsible for compressing the sugarcane to extract the juice. The residue called bagasse passes from one mill to the other to extract as much juice as possible.

To the material coming out of each mill is added juice from the immediately following mill, in order to extract as much sucrose from the sugarcane. Before the bagasse passes the last mill, water is added in order to improve the extraction of juice and sucrose.

The extracted juice is passed through filtration systems that have meshes responsible for separating as much bagacillo juice as possible, sending the raw juice to the process and returning the bagacillo to the mills.

Steam and Power Generation

The bagasse with low moisture content that comes from the last mill is sent to the boilers to be used as fuel for steam generation. Part of the live steam generated is used in turbine generators, which produce electricity required by the factory and a surplus that is sold to the public net.

The remaining live steam is used to drive the turbines mills, where after performing its work it is expanded and leaves the process as exhaust steam, which is used in the clear juice pre-evaporators.

Sulfation, Weighing and Alkalizing

The raw juice is passed through a system of sulfation in order to avoid the production of colored compounds during the following processes. Sulfur is burned to produce sulfur dioxide (SO2) which is placed in contact with the juice through ejectors.

Subsequently, the juice passes through the weighing scales for the purpose of evaluating the performance of the process and the amount of juice resulting from the sugarcane processed.

The sulfited juice is pre-limed with the addition of milk of lime to prevent inversion of sucrose and is sent to a first heating to give it later the second alkalization.

Heating and Clarification

The alkalized juice goes to the next heating stage to activate the reactions between lime and phosphorus oxides present in the juice and precipitating the organic and inorganic impurities in the subsequent clarification.

Subsequently, the juice is fed to a low retention time fast clarifier in which impurities in the juice are precipitated by gravity. The clarification process is helped with the addition of flocculant which in contact with the juice retains the impurities and precipitates them.

Filtration

Sedimented sludge in the clarifier is taken to the filters station where hot water is applied to it to extract the sweet juice it contains.

Filtration consists in taking sludge and adding bagacillo (fine particle bagasse) thereto to give it greater consistency and improve filterability, processing it in filters that remove the liquid portion, called the filtered juice, leaving a dry cake called filter cake, which is sent to the composting process for the production of organic fertilizers. The filtered juice is returned to the heating process of juice to be reprocessed in the fast SRI clarifier.

Evaporation

The clarified juice is pumped into a quintuple effect evaporation system to eliminate part of the water it contains. By means of steam and vacuum, evaporators concentrate the juice from 15-68° Brix, resulting in treacle or syrup.

Clarifying treacle

The treacle passes through a sulfation process in order to remove color and subsequently being sent to clarification. This is a process where Phosphoric Acid, Lime, small bubbles of micronized air and flocculant are added to the treacle to coagulate and remove impurities.

Crystallization

For crystallization of sucrose a two temper system is used. The different tempers are produced in continuous tachos and batches.

Centrifugation

The massecuite is sent to the centrifuge where the honey is separated from the sugar crystals. Hot water is added to decrease the sugar color. Honey is sent to a storage tank where it is subsequently used in another process of crystallization and centrifugation, where honey B, which is the raw material for alcohol production is obtained.

Packaging and Storage

Dry and cold sugar is carried to hoppers that feed the sugar to packaging devices in the different presentations for the national and international markets. Once the sugar is packaged, it is carried

to the finished product warehouses where it is stored and / or loaded onto vehicles for distribution.

Drying

Part of the sugar produced that leaves with less than 1% moisture should be dried before packaging; to this end it is passed through rotary dryers in which wet sugar is contacted countercurrent with dry air, to reduce the moisture content of the sugar. The remaining sugar gets out of the centrifuges and is sent directly to the refiner to produce refined sugar.

Sugar Refinery

The transformation of white sugar in refined sugar begins with the dissolution of white sugar with hot water up to a concentration of 65° Bx, obtaining a material called melted liquor, which is heated to activate the reaction between the impurities and chemical inputs added subsequently (calcium saccharate, phosphoric acid and bleaching).

This material enters into the liquor clarifiers, to effect the impurities separation, which is done by means of flotation (using micronised air) because the particles removed in this process are light.

The clarified liquor is sent to the filtration process, so to retain in two stages the small particles that were not removed in the clarification process.

The filtered liquor is evaporated up to 70° Bx and subsequently is sent to the bins for its crystallization.

The resultant massecuite is sent to centrifuges for separating the sugar crystals from the liquid material called syrup. The syrup is sent back to the bins for its use and the sugar is sent to the drying and cooling process for its subsequent packaging in presentations of 1 ton, 50 kg, 25 kg, 2.5 kg, 1 kg, 1 lb and 5 g .

FUEL ALCOHOL

Fuel Alcohol

In response to the need raised by the Government and the vision, commitment and leadership of the Ardila Lülle Organization, Incauca launched on October 28, 2005 the first Fuel Alcohol

plant, the largest and most modern in the country, with a production capacity of 350,000 liters of alcohol per day in continuous operation.
Ethanol is used as an additive to fuel to improve octane rating and reduce pollution generated by the combustion gases. Since October 2005, the mixture is composed of 90% fuel and 10% ethanol, as required by Colombian law.
Alcohol distillation is a process that mainly consists of four stages: Fermentation, Distillation, Vinasse Evaporation and Dehydration.

Fermentation

The main raw materials used in the distillery are honey B, treacle and clarified juice, from the sugar factory.

The fermentation process consists of converting the sugars present in the raw material coming from the mill in ethanol and carbon dioxide, through the action of yeast.

The fermentation takes place via a continuous process of five reactors working in series, where the chemical reactions of transformation of sugar into ethanol and carbon dioxide are carried out. Leaving the last fermenter, a product known as must or fermented wine is obtained containing a concentration of 9% (v / v) alcohol. It also contains water, solids and yeast, which is recovered in the sedimentation tank to be used again in the process.

The recovered yeast is sent to the acidulation tank where a collision with sulfuric acid is performed to reduce present bacterial contamination and is recirculated again to the fermenters to continue the production process.

The must or fermented wine or is sent to the distillation process to continue the separation of the produced ethanol.

Distillation

In distillation the fermented must is purified to obtain alcohol with a purity of 96% (v / v) . To do this, the plant has two distillation columns in series that are vacuum operated, thereby increasing the energy efficiency of the process.

Distillation is a separation process by differences in the boiling points of the components of a mixture, which when subjected to heat, the most volatile compounds such as alcohol are evaporated and concentrated in the vapor phase.

The fermented must coming from the fermentation section contains 9% alcohol, in addition to water, gases, dissolved solids and other compounds to be removed. To do this, it is sent to the Mostera column where two products are obtained: from the top are obtained gases with an alcohol concentration of 40-50% v / v which are sent to the second column called the rectifier. On the bottom a liquid stream called vinasse is obtained. 60% of vinasse generated is sent to the fermentation section and the remaining 40% to the vinasse evaporators where it is concentrated for later use in composting.

The final ratio of concentrated vinasse produced is 1.6 - 2.0 liters of vinasse per liter of anhydrous alcohol.

From the second distillation column is obtained rectified alcohol with a concentration above 96% v / v which is sent to the dehydrating zone. From the intermediate plates of this column Fusel oil is extracted and from the bottom are obtained flemazas, which are sent to the wastewater treatment plant.

Dehydration

Alcohol purified during the distillation contains 96% v / v ethanol and 4% v / v water. So that this alcohol can be used as fuel, it is necessary to remove more water.

Dehydration occurs on the molecular sieves, which by means of a synthetic resin retain water contained in the rectified alcohol to obtain as product dehydrated alcohol with a minimum concentration of 99.5% ethanol, meeting the specifications for use as fuel alcohol.

The dehydrated or anhydrous alcohol is condensed and cooled for storage.

Storage

The distillery has a storage and dispatch area for the finished product.

There are two 112 m3 tanks to receive anhydrous alcohol where the distillery production is conducted and quality tests are performed. Anhydrous certified alcohol is stored in three tanks of three million liters each, for up to 25 days of inventory. In addition, there is a tank for rectified alcohol (595 m3), one for impure alcohol (75 m3), Fusel oil (10 m3) and fuel (152 m3), all built in carbon steel.

Fire protection system

The distillery has a latest technology fire system, consisting of a smoke, alcohol vapor and flame detection system working together and associated with two rings of water against fire and water-foam (AR-AFFF alcohol resistant).

Waste Water Treatment Plant

The wastewater treatment plant of the distillery receives the flemazas and the condensates of the concentration of vinasse.

Composting

The composting plant of INCAUCA is a system of treatment of industrial waste of the manufacture of sugar and fuel alcohol, comprising crop residues, filter cake, bagasse ash, bagasse and vinasse.

It has two treatment plants: Composmatic and Backhus. The first with an installed capacity for processing 150 tons of solid waste and 50 tons of vinasse; the second with a capacity of 550 tons of solid waste and 150 tons of vinasse, for a total treatment of 900 tons per day of organic waste.

The treatment is performed within 70 days of digestion of the organic matter present in the waste until obtaining the compost product, which is an organic soil conditioner.

The plant has an installed capacity for the production of compost of 300 of tons per day.


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