Sugar extraction – step by step

Description of the steps from harvesting to customer

Sugar for baking, decorating and enhancing

Sugar for drinks (white)

Sugar for drinks (brown)

Sugar for preserving and jam making

Versatile energy source

Sugar has been an ingredient in popular traditional dishes for many decades. Whether sugar is an intrinsic natural constituent of food, or an added ingredient, it always supplies four kilocalories per gram – just like any other carbohydrate (e.g. starch). In addition to its sweet taste, sugar also enhances the colour and texture of dishes. It is also a natural preservative – e.g. in jam.

SweetFamily

Basic sugar

Sugar for baking, decorating and enhancing

Sugar for preserving and jam making

Sugar for drinks (white)

Cane sugar

Sun Sugar

It produces an especially pure and high quality type of sugar: refined sugar.

Storage

The finished product is dried, cooled and transported on conveyor belts into large silos. This sugar forms the basis for a range of different types of household sugar. However, most of the sugar is supplied in bulk or liquid form to the food and beverages industry.

Energy production

Excess electricity is sold to the regional energy companies. Beet sugar factories have their own very efficient cogeneration energy plants – this means they are producing and utilizing both heat and electricity for the sugar extraction process.

Sugar beet is the plant with the highest sugar concentration in Europe, weighs around 1 kg and contains around 75% water. The remaining 25% consists of sugar, non-sugar substances and insoluble sugar beet pulp. Just like every other green plant, sugar beet is able to convert the energy of sunlight into chemically bound energy (photosynthesis) and manufacture sugar. Continuous advancements in plant breeding and cultivation methods have enabled the sugar concentration in today’s sugar beet to reach 17 to 21% and have also boosted the yields per hectare.

Sugar beet harvesting

Sugar beet harvesting and processing starts in September during the sugar beet campaign. The sugar beet is then unloaded in the sugar beet yard. The beet is then taken by a conveyor belt ready for transport, the next station for the sugar extraction process.

Sugar beet sampling and washing

Already pre-cleaned while it was being loaded for transport, the next station for the sugar beet on arrival at the factory is sample taking. Sugar beet samples are taken from every load to analyse the quality in the factory. The sugar beet is then unloaded in the sugar beet yard. The beet is then taken by a conveyor belt directly to the beet washing station. After being washed, cutting machines then hack up the sugar beet into small pieces which are then transported into the extraction towers. Hot water in the towers separates the sugar from the sugar beet pulp. This produces a sugar solution called the raw juice. This then heads for the juice purification plant.

Juice purification

In this part of the process, sugar is separated from non-sugar substances with the help of lime and carbon dioxide. The pre-liming and main-liming is followed by carbonation. Filtering the resultant liquid twice leaves behind a clear, light yellow thin juice with a sugar content of 16%. The lime filtered out beforehand is called carbolime and is a valuable fertiliser used in agriculture.

Juice thickening

Water is removed from the thin juice in several stages in the evaporation plant until a thick juice with a sugar content of around 75% has been produced. The evaporation installations are interconnected so that the water vapour that is generated can be used to heat the next stage. This optimises the energy consumption.

Crystallisation

The golden-brown syrup (thick juice) produced in this way is evaporated further in the boiling station. This operates at a low pressure so that the water boils at a low temperature of between 65° to 80° C to prevent the sugar from caramelising and darkening. Sugar starts to crystallise out of the juice when it reaches a certain concentration. Seed crystals in the form of ultratine sugar ensure the formation of uniform sugar crystals. This process gives rise to a viscous slurry called massecuite which is fed into mash tanks. Stirrers in the tanks ensure that the massecuite is continuously agitated to allow the sugar crystals to grow in the concentrated sugar solution until they reach the required size.

Centrifuging

The massecuite then flows from the mash tanks to the centrifuges, where the crystals are separated from the syrup. The strong centrifugal forces push the syrup sticking to the crystals through the sieve sleeve of the centrifuging drums. Steam is then used to remove any remaining syrup from the sugar crystals. The sugar is now white. When looked at close up, a sugar crystal is actually clear and transparent, it only looks white because of the light refracted by the numerous small crystals.

If this white sugar is then re-dissolved and crystallised out again, it produces an especially pure and high quality type of sugar: refined sugar.

Sugar and more

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