BEET SUGAR JUICE

Typical end products
Sugar for sweetening soft drinks, beer brewing, pastries, preserves, sausages, beverages, sweets, confectionery, ice cream, liqueurs, pharmaceuticals, etc.

Chemical curve: R.I. per BRIX at Ref. Temp. of 20˚C

Introduction
In the manufacture of sugar from beet, the extraction step aims at extracting the sucrose from the beet cells with hot water by a countercurrent principle. This process is known as diffusion.

The products from extraction are beet pulp and raw juice. The beet pulp can be used for cattle feed or can be modified to obtain fibers for human consumption. The raw juice is further processed to finally make the sugar crystals.

Application
After the beets are thoroughly washed, they are passed through the slicers, where they are cut into long, thin strips or cossettes. The cossettes, upon entering the continuous diffuser, are elevated by means of a perforated flight scroll or similar device. Countercurrent water is introduced at the upper end of the diffuser. The diffuser is steam-heated by means of external jackets. The extracted sugar leaves the diffuser at a concentration of 10 to 15 Brix, which accounts for about 98 % extraction of the beets.

Control of the whole extraction process is complex. Precise real-time data from different areas of the diffuser tower is required. Accurate control of the concentration levels saves energy by minimizing the amount of water, which has to be evaporated later in the process.

Instrumentation and installation
Vaisala K-PATENTS® Process Refractometer PR-43 allows precise control of the extraction process and fast detection of process disturbances.

The refractometer is installed in the press water line, where it measures the sugar concentration of the water separated from the pulp. As this water is recycled to the upper part of the diffuser, it is important to obtain accurate concentration readings. The typical range is 0-5 Brix and the temperature is 60 ºC (140
Sanitary Compact Refractometer PR-43-AC for hygienic installations in small pipe line sizes of 2.5 inch and smaller. The PR-43-AC refractometer is installed in the pipe bend. It is angle mounted on the outer corner of the pipe bend directly, or by a flow cell using a 3A Sanitary clamp, I-clamp or Varinline® connection.

Sanitary Probe Refractometer PR-43-AP for hygienic installations in large pipes, tanks, cookers, crystallizers and kettles and for higher temperatures up to 150°C (300 °F). The PR-43-AP refractometer is installed in the pipe line or vessel through a 2.5 inch or 4 inch Sanitary clamp, I-clamp, APV Tank bottom flange or Varinline® connection.

Process Refractometer PR-43-GP is a general industrial refractometer for pipes and vessel installations. The PR-43-GP can be installed with 2, 3 and 4 inch flange and 3 inch Sandvik L coupling process connections and a variety of flow cells for pipe sizes of 1 inch and larger.

Concentration measurement at the diffuser tower outlet also provides valuable data for balancing the process. The refractometer should be installed after a stone trap. Due to the impurities present in raw juice, prism cleaning with steam is recommended.

Another refractometer at the midpoint of the extraction tower measures the Brix of the liquid, so that the fluctuation of the sugar content in the cossettes leaving the tower can be detected at the earliest possible stage. Then, by regulating the flow of raw juice, optimum efficiency, reduced energy costs and minimized sugar loss can be achieved.

### Instrumentation Description

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### User Interface

Selectable multichannel MI, compact CI or a web-based WI user interface options allow the user to select the most preferred way to access and use the refractometer measurement and diagnostics data.

### Measurement range

Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.

°F). The pipe diameter should be reduced just before the refractometer, so that a flow rate of 1.5 m/s (5 feet/s) is achieved. Automatic prism cleaning with steam is recommended at this point of the process.

Concentration measurement at the diffuser tower outlet also provides valuable data for balancing the process. The refractometer should be installed after a stone trap. Due to the impurities present in raw juice, prism cleaning with steam is recommended.

The in-line and real-time measurements improve the extraction control significantly. The optimum compromise balance between juice flow and water evaporation can be achieved, and costly and time-consuming manual sampling avoided.