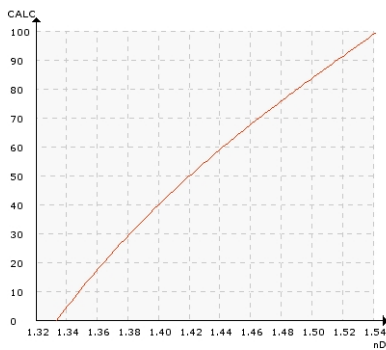


## BEET SUGAR

### Typical end products

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

The K-Patents Process Refractometer provides an accurate in-line Brix and concentration measurement system for the beet sugar refining process. The performance of all basic steps in the process from diffusion (1), juice purification (2), evaporation (3), to crystallization (4), can be optimized. In addition, improvements can be achieved in the production of molasses dried beet pulp pellets for animal feed and

in sugar recovery from the molasses. Molasses, in beet sugar manufacturing, is the final syrup which is centrifuged from the sugar crystals after repeated crystallizations.

## Diffusion

After reception at the processing plant, the beet roots are washed, mechanically sliced into thin strips called *cossettes*, and passed to the diffuser, a processor used for the extraction of sugar content into a water solution. The diffuser process is slow, which makes it important to monitor the progression of the concentration. The K-Patents Process Refractometer provides rapid detection of process disturbances. Control of concentration levels saves energy by minimizing the quantity of water that requires evaporation during further processing. Diffuser plant output calculations can be made utilizing the Process Refractometer.

## Juice Purification

The diffusion juice contains, in addition to sucrose, some non-sugar impurities. The process of liming and carbonation is in two steps, i.e. first and second

<b>SUGAR AND SWEETENERS</b>	
<b>APPLICATION NOTE</b>	<b>1.01.00</b>
<b>BEET SUGAR PROCESS</b>	

carbonation. The first step is primarily for the removal of sludge. In the second step, a further addition of carbon dioxide is made in order to remove the lime which remains in the solution. The resulting solution is called thin juice.

### Evaporation




The thin juice is heated and pumped to the multiple-effect evaporators to make thick juice. The dissolved solids concentration is raised from its initial concentration to 50-65%. The K-Patents Process Refractometer assists in regulation of product flow to best suit evaporator capacity, thus saving energy.

### Crystallization

The next step consists of crystallizing sugar from the standard liquor by pan boiling or in vacuum pans. Crystallization continues until the required crystal size has been achieved.

Thick juice is fed to the crystallizers. Recycled sugar is dissolved into it, and the resulting syrup is called mother liquor. The liquor is concentrated further by boiling in large vacuum vessels, seeded with fine sugar crystals. These crystals grow, as sugar from the mother liquor forms around them. The resulting sugar crystal and syrup mix is called a *massecuite*. The *massecuite* is passed to a centrifuge where the liquid is removed from the sugar crystals. The remaining syrup is rinsed off with water and the crystals dried in a granulator using warm air.

The remaining syrup is fed to another crystallizer from which a second batch of sugar is produced. This sugar ("raw") is of lower quality with a lot of color and impurities and is the main source of the sugar that is dissolved back into the mother liquor. The syrup from the raw is also sent to a crystallizer. From this a very low-quality sugar crystal is produced (known in some systems as "AP sugar") that is also re-dissolved. The separated syrup is molasses, which still contains sugar, but too much impurity to undergo further processing economically.

<b>Instrumentation</b>	<b>Description</b>
	K-Patents Sanitary Compact Refractometer PR-23-AC for small pipe line sizes of 2.5 inch and smaller.  The PR-23-AC sensor 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 or Varivent® connection.
	K-Patents Sanitary Probe Refractometer PR-23-AP for installations in large pipes, tanks, cookers, crystallizers and kettles, and for higher temperatures up to 150°C (300 °F). Installation through 3A Sanitary clamp.
	K-Patents Process Refractometer PR-23-GP is an industrial refractometer for large pipe sizes and tanks, cookers, crystallizers and kettles. Installation through a flange or clamp connection.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.