BEET SUGAR AND GREEN SYRUP

Typical end products
Animal food, food additives, chelating agent, rum, industrial ethanol, alternative fuels, yeast, organic chemicals, etc.

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

Introduction

After each crystallization step, the massecuite is centrifuged to separate the sugar crystals from the liquid phase (mother liquor or syrup). The syrup left from the final crystallization stage is called molasses and intermediate syrup is referred to as green syrup.

Molasses is a viscous product which still contains a high amount of sucrose, up to 60 % on dry basis. This sugar is still of considerable value and it needs to be extracted and recycled within the crystallization plant to maximize production.

Application

A method occasionally used in Europe for molasses desugarization is the Quentin process, in which the potassium and sodium in beet juice are replaced by magnesium through ion exchange. Quentin is an ion exchange column. Alkaline ions (potassium/sodium) are exchanged with magnesium to reduce the solubility of sugar in water. This allows a higher proportion of sucrose to be crystallized but obviously produces molasses with lower sugar content (about 5% less), increased magnesium level, and reduced potassium and sodium levels.

The performance of the ion exchange column is improved by a stable syrup concentration.

Instrumentation and installation

The K-Patents Process Refractometer PR-43 is used to control the feed to the Quentin columns, giving a constant load. This allows the ion-exchange resins to function longer, and results in higher efficiency of the desugarization process. Typical concentration range of molasses to Quentin is 60 to 80 Brix and typical temperature 85 ºC (185 ºF). A minimum flow velocity of 1.5 m/s (5 feet/s) is recommended.

The PR-43 refractometer is also used to check the concentration of the final molasses to ensure that it is above the lowest concentration limit specified by the buyer. The refractometer provides Ethernet and 4-20 mA output signals for real-time control of dilution to avoid uneconomically high concentrations.

Typical concentration range is 70-85 Brix and typical process temperature is 80 ºC (176 ºF).
### Instrumentation Description

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<thead>
<tr>
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<tbody>
<tr>
<td>K-Patents Sanitary Compact Refractometer PR-43-AC</td>
<td>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.</td>
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<tr>
<td>K-Patents Sanitary Probe Refractometer PR-43-AP</td>
<td>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.</td>
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<tr>
<td>K-Patents Process Refractometer PR-43-GP</td>
<td>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.</td>
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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.

### Prism wash systems

Prism wash system components are a refractometer with integral wash nozzle mounted at the refractometer probe or in a flow cell, wash supply line components and a Multi user interface MI with relay module for prism wash diagnostics and control. Alternative wash media can be used for wash, e.g. steam, high-pressure water and warm water (hot condensate).

### Measurement range

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