SWEETENERS: DEXTROSE, FRUCTOSE, GLUCOSE SYRUP, SORBITOL

Typical end products
Sweeteners for beverages, beer brewing, jams, preserves, sweets, confectionery, ice cream, liqueurs, pharmaceuticals, etc.

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

Introduction

Sweeteners are produced by converting the starch components (i.e. glucose) into compounds with the same chemical form (i.e. fructose) by isomerization.

The isomerization reaction requires some divalent cations from salts for catalytic activity. On the other hand, some cations may inhibit the reaction.

Proper demineralization of the liquor prior and after isomerization is essential. Demineralization before the reaction enhances the reaction rate. After isomerization it removes the trace components picked up during isomerization to ensure high product quality.

Application

Demineralization is usually performed through anion and cation exchange resins. The decolorized syrups are treated in ion exchangers to remove the salts and ionic content that increased, when chemicals such as acids, bases and calcium were added during the process.

Six-bed ion-exchangers are the most common ones. They have three beds of cation and three beds of anion columns. One bed is always at the regeneration phase. The cation resin is used in the hydrogen form (H⁺), thus, it must be regenerated with an acid, in this case, with a strong Hydrochloric acid HCl. HCl controls the pH of process water streams providing water purity, demineralizes water and rinses cations from the resins. The cation resin removes hardness from water while it is also alkaline.

The anion resin is used in hydroxyl form (OH⁻), thus, it must be regenerated with a strong alkali, such as sodium hydroxide (NaOH). Alkaline environment softens the solution by removing strong acids.

Before regeneration can take place, the columns must be rinsed with water to remove any sugar residue. This operation is usually referred to as sweetening-off.
**Instrumentation and installation**

The K-Patents Process Refractometer PR-43 monitors the interface between the product and the rinse water, which is pumped through the ion exchange columns prior to the regeneration process. Typically, the K-Patents refractometer sensor is installed in the waste line, before the diversion valve. Because of its fast response, the refractometer instantly detects the liquid in the pipe (due to its unique refractive index value) and ensures it is directed to the right line.

The refractometer’s output signal can be used for process control. If the dissolved solids concentration in the process stream increases above a set point (typically from 0.5 % to 2.0 %), the stream is automatically diverted to the sweet water storage. At below the set point, it is released into the sewer.

Optical analyzers typically have an extremely short response time to fluctuations in product concentration. The K-Patents refractometer detects the cutting point rapidly ensuring faster operation and increased productivity.

The typical measurement range after the ion exchange is 0-30 Brix and the process temperature is about 45 ºC (113ºF).

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<th>Instrumentation</th>
<th>Description</th>
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<tr>
<td>Instrumentation</td>
<td>K-Patents 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.</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. |

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