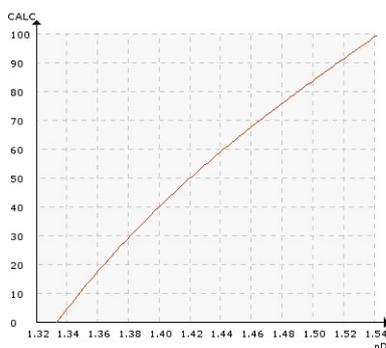


CARAMEL, CHOCOLATE FILLING, MARSHMALLOW

Typical end products

Cooked sugar confections such as caramel, chocolate filling, candies, jelly beans, marshmallows and dulce de leche.

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



Introduction

Sugar confections are food products rich in sugar and carbohydrates. Sugar confections include candies, chocolate fillings, chewing gum, marshmallows and other sweet items which are made mainly from sugar. In some cases, chocolate confections are considered a separate category, as they are made from chocolate and can be sugar-free.

Sugar and chocolate confectionery is a large and ever-changing industry. In order to meet the quality and demand, manufacturers need sophisticated technology and equipment to process the ingredients.

Application

Sugar confections and chocolate fillings are produced by preparing a diluted mixture of the ingredients, and then concentrating the sugar content to the desired level by cooking and evaporating the water.

The ingredients are mixed either in a pre-mixing vessel and then transferred for cooking or added directly in the cooker. The cooker is a heated vessel, usually a jacketed vessel, equipped with scrapers, where water is evaporated from the liquid for raising its sugar content to a set level. The final Brix of the mixture determines the flavour, consistency, and overall quality of the final product.

The ingredients used, as well as the cooking conditions are defined by the type of final product. For example, to produce caramel, sugar is dissolved in water to prepare a liquid syrup which is thickened in a cooker. The cooking of the syrup also gives the final product, caramel, its distinctive color. The final sugar concentration ranges between 85-95 Brix, and it should be monitored closely and reliably to ensure high quality and to avoid re-processing. If the moisture content is higher than desired, it will affect the consistency and increase the risk of mold formation. If the moisture content is too low, the caramel may dry faster than is desired, making upstream processing difficult.

Instrumentation and installation

The K-Patents Sanitary Process Refractometer PR-43-A measures continuously the Brix level of the cooking solution and provides real-time information to determine the end-point of cooking and to ensure a consistent product quality. Typical concentration in this application ranges between 85-97 Brix, at a temperature of 100-130 °C (210-266 °F).

The refractometer can be installed directly in the cooker or in the cooker's outlet pipe. In a batch process, the K-Patents Flush mounted refractometer PR-43-AP-T is installed at the bottom of the vessel through an APV Tank Bottom Flange. The refractometer is specially designed for vessels with scrapers and mixers and can also be installed through steam jackets.

For a continuous cooking, the refractometer is installed directly at the outlet of the cooker. The refractometer provides Ethernet and 4-20 mA output signals that can be used to control the valves and redirect the product as needed. If the Brix level after cooking is out of specifications, the refractometer sends a signal to the process controller to open the valve and recycle the product for re-processing and for adjusting the ingredients ratio. Another refractometer can be installed at the pre-mixer to ensure the right feed concentration to the cooker.

The K-Patents refractometer measurement is continuous and not affected by suspended particles or bubbles. The real-time information provided by the refractometer eliminates the need for sampling and reduces processing time. Continuous measurement is particularly important in cookers that work under vacuum. The refractometer prevents disrupting the process and saves valuable processing time.

In installations directly in the cooker, the Teflon scrapers keep the prism clean during the cooking process. Other installations may require a prism wash.

The K-Patents refractometer PR-43-A is a useful tool for sugar confectionary and filling cooking. The accurate, reliable and continuous measurement by the refractometer ensures the final product meets the specifications, reduces processing time and guarantees a consistent product quality.

Instrumentation	Description
	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.
	K-Patents 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.
	K-Patents Sanitary Flush Mounted Refractometer PR-43-AP-T for hygienic flush mounting installations in cookers, cooling crystallizers and other vessels that have scrapers or mixers. Installation through an APV Tank bottom flange.
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.
Automatic prism wash	Prism wash is required in applications where flow velocity is below 1.5 m/s (5 ft/s) or where dry solids exceed 40 %. The wash media is aseptic steam. The components of a steam wash system are refractometer PR-43-AP-L42 with insertion length of 42 mm, Side flow cell SFC-HHSS-H10/15/20/25, Aseptic steam valve ASV-H/ESS-H05, and Multichannel user interface MI for automatic prism wash diagnostics and control.
Measurement range	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.