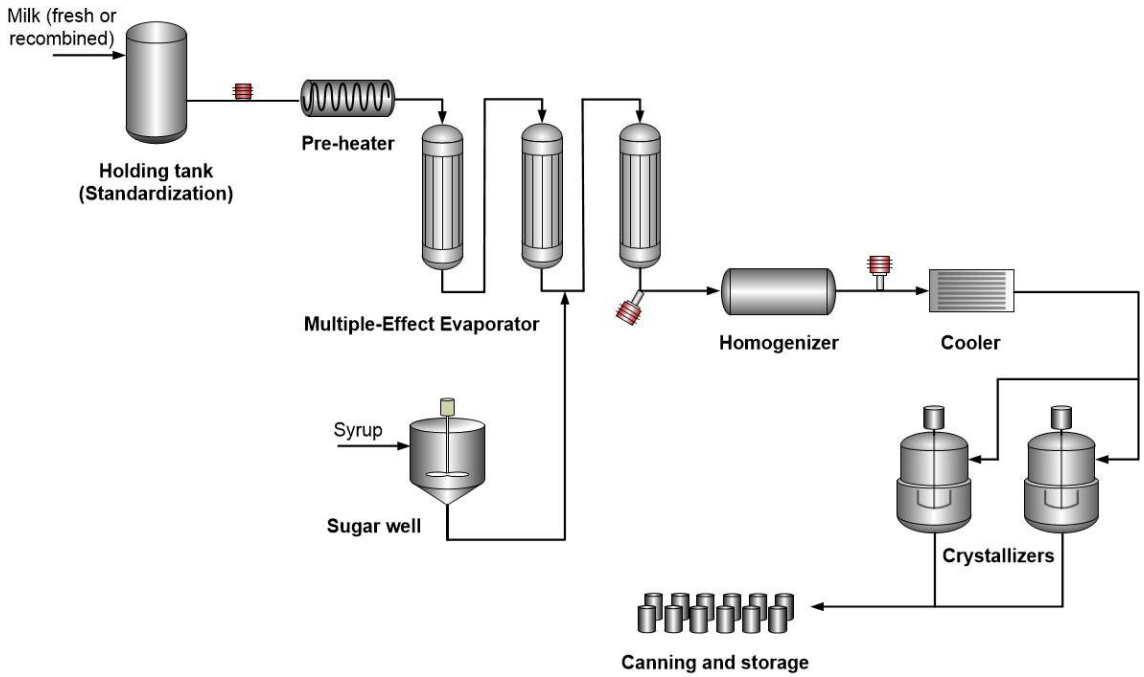
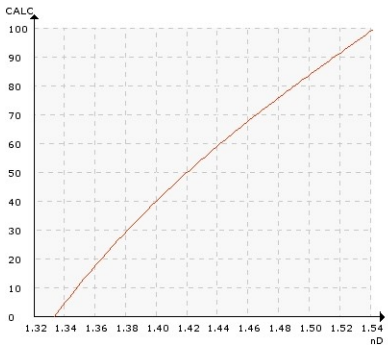


SWEETENED CONDENSED MILK

Typical end products

Sweetened condensed milk.

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



Introduction

Sweetened condensed milk is a product obtained simply by evaporating milk to decrease the water content and adding a sweetener. The sweetener can be sucrose, dextrose or any other natural sugar.

This product was invented as a way to preserve milk. The sugar content in the sweetened condensed milk increases the osmotic pressure to such levels that most of the microorganisms are destroyed.

Sweetened condensed milk is typically used in the making of many sweets and desserts.

Application

Sweetened condensed milk can be produced from whole or skim milk. The first step in this process is the standardization of fat and solids-not-fat to a level that meets legal standards.

A pre-heating step follows to stabilize the milk and destroy microorganisms. The pre-heated milk is pumped to the evaporator where the solid content is increased by the removal of water.

A multiple-effect evaporator operating under vacuum conditions is typically used to raise the solids concentration to 30-40%.

Sugar is added as a dry solid either before evaporation or as a syrup during the process. It is important to accurately monitor the quantity of sugar added as the shelf-life of the milk depends on the osmotic pressure being sufficiently high. The sugar ratio in the milk is generally between 62.5 – 64.5 %.

The amount of sugar required can be predicted from the total dissolved solids content in the fresh and the evaporated milk.

After evaporation, some manufacturers homogenize the milk to regulate the viscosity of the end-product. The sweetened condensed milk then moves on to cooling and crystallization. After this, the milk is ready for canning or packing.

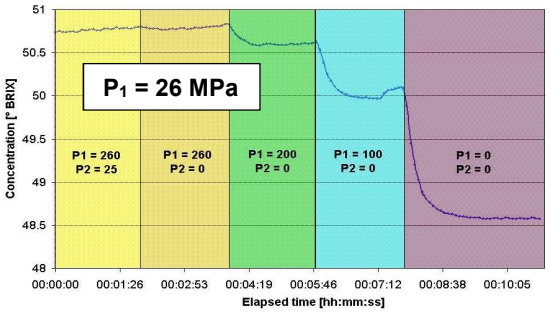
Instrumentation and Installation

K-Patents Sanitary Process Refractometer PR-43-A accurately controls the Total Dissolved Solids (TDS) content of the milk in real-time to obtain a high-quality product with a long shelf-life.

The PR-43-A is used for standardization after the holding tank to achieve the precise solids content required to meet legal standards. Accurate TDS measurement in the fresh milk also helps to determine the exact amount of sugar required for addition before or during the evaporation step.

A refractometer after the evaporation step monitors the performance of the evaporators and helps to achieve the desired concentration of the milk.

If the manufacturing process involves a homogenization step, a third refractometer can be installed after that stage. K-Patents refractometer detects fat globules as long as they are smaller than 6 µm. This globule size can be achieved by adjusting the pressure of the homogenizer. The recommended homogenizer's primary pressure is P_1 = 26 MPa (260 bar).



The PR-43-A can be calibrated to read the factory's preferred scale, either Brix or Total Dissolved Solids. Moreover, the PR-43-A provides real-time process control through Ethernet and 4-20 mA output signals.

Usually a prism wash system is not required except for when the dry solids content exceeds 40 % or the flow velocity is below 1.5 m/s. For these conditions, the K-Patents PR-43-AP-L42 with steam prism wash, aseptic steam valve ASV, and side flow cell is recommended.

K-Patents Process Sanitary Refractometer PR-43-A complies with all high standards required for safe food processing and for achieving a high-quality product. The refractometer is 3A Sanitary and EHEDG certified and it withstands both CIP and high temperature conditions.

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 can be directly mounted on the pipe, or by a flow cell using a 3A Sanitary clamp or Varivent® connection. The user interface of the refractometer can be installed locally in the field, remotely in the control room or in both locations by connecting several user interfaces in a network.
	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 through side flow cell SFC 2.5 inch or a vessel through 4-inch Sanitary clamp. The user interface of the refractometer can be installed locally in the field, remotely in the control room or in both locations by connecting several user interfaces in a network.
Automatic prism wash:	Prism wash with 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. The wash is used in applications where flow velocity is below 1.5 m/s (5 ft/s) or where dry solids exceed 40 %.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.