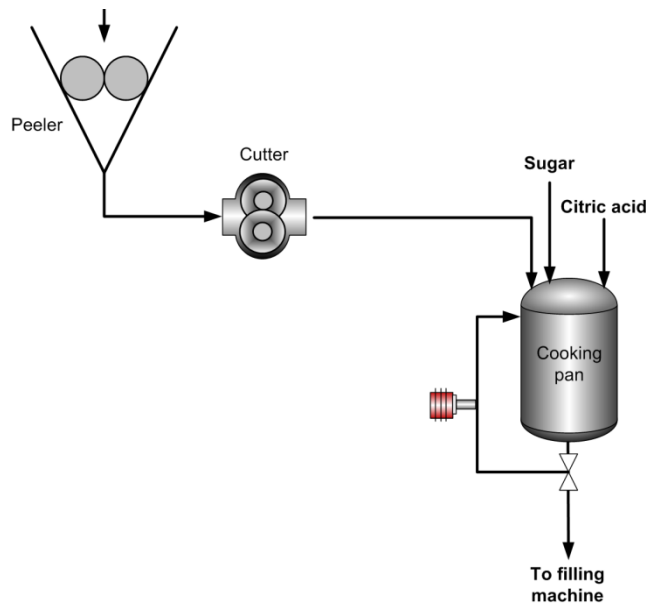


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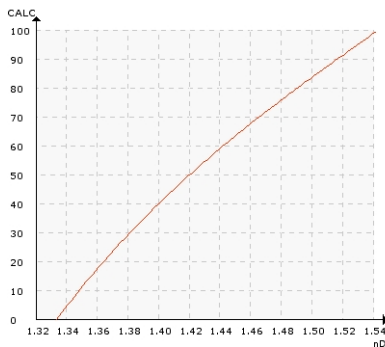


JAM, JELLY, MARMALADE

Typical end products

Jams, jellies, marmalades, etc.

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



Introduction

Jams and marmalades are manufactured using a boiling process, through which an adequate sugar exchange is achieved to produce a stable finished product for storage.

The K-Patents Process Refractometer provides an accurate in-line Brix measurement, which helps to optimize the cooking process. The batch can be monitored throughout the process in all types of cookers. Traditionally, it has only been possible to observe Brix levels off-line through batch sampling in the final stage of the process. Now quality control functions continuously throughout the whole process and corrective actions can be instigated immediately if the batch reaches unusually low or high Brix levels. Use of the K-Patents Refractometer eliminates the need for sampling, improves product consistency and critical product quality attributes, and optimizes

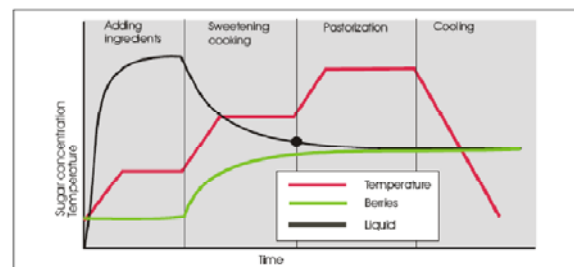
sugar usage. Uniform product quality can be achieved by continuous monitoring. Typical measurement range is 10-70 Brix (jam cooking) and 50-85 Brix (marmalade cooking), and the process temperature is about 70-90°C (158-194°F).

Application

Cooking a jam batch takes 1-3 hours and batch size can vary from 500 to 3000 kg (1100 to 6600 lbs). Batch processing can be divided into four phases:

- 1. Adding Ingredients:** Berries, fruits, pectin and sugar are mixed with water. Frozen berries thaw as temperature slowly increases.
- 2. Sweetening Cooking:** Berries and fruits absorb sugar from the liquid until equilibrium is achieved. The temperature of this process is below 90°C (194°F). This phase is not required if there are no solid substances present in the medium.
- 3. Pasteurizing:** Cooking temperature is raised up to 100-150°C (212-302°F) for 10-20 minutes to destroy any bacteria.
- 4. Cooling:** The jam is cooled down to 20-40°C (68-104°F) before the vessel is discharged. Aromas can be added during this phase.

Changes in the sugar content, temperature and liquid at different cooking phases:



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Installation: Open Boiling Pan

The open boiling pan is a traditional cooker type in which the jam is steam heated from the bottom. A scraper or agitator prevents the jam burning from the contact with the hot pan.

The K-Patents Sanitary Probe Refractometer PR-23-AP sensor is installed in a pipe line or vessel using a 2.5 inch or 4 inch Sanitary clamp. The flush mounted K-Patents Sanitary Refractometer PR-23-APP sensor is designed for vessels containing scrapers and mixers. These sensors can also be installed through steam jackets. The PR-23-APP sensor is installed on an APV Tank bottom flange.

Installation: Vertical Vacuum Cooker

The vacuum cooker is more efficient than the open pan type. During heating and pasteurization the high pressure prevents over cooking and the berries remain unbroken.

The K-Patents Flush Mounted Refractometer PR-23-APP sensor is installed in the vessel bottom, where it is in continuous contact with the jam and where the cooling effect from the vessel is at its best.

Installation: Horizontal Vacuum Cooker

An Ala vacuum cooker is horizontally mounted and has double the capacity of vertical pans. These cookers are fitted with a heat exchanging agitator/scraper.

They also contain a spiral coil heater, which enables faster heating and cooling either under overpressure or under vacuum. The K-Patents Sanitary Probe Refractometer PR-23-AP/APP sensor can be installed either via the steam jacket or at the end of the pan (avoiding having to cut an opening through the steam jacket).



Installation: Pipe Cooker

The pipe cooker is a continuous flow cooker, where the whole cooking process takes place at. Berries, fruit, sugar pectin and other ingredients are mixed and preheated, and then pumped through the cooking tubes for further heating. After cooking, the product is passed through cooling pipes before packaging. The flow velocity is 0.1 m/s for the whole process.

The K-Patents Sanitary Probe Refractometer PR-23-AP sensor is installed after the cooking phase to read the end product concentration, since the sweetening of the berries occurs during heating. At this point, the temperature is at its highest and the risk for prism coating due to low product flow rate is avoided.

The K-Patents refractometer can also be installed in the feeder tank to estimate the product concentration and to determine the additives quantities to be introduced during cooking, thus optimizing cooking time.

Prism coating is rarely an issue because the batch processing times and CIP cleaning intervals are short.

Instrumentation	Description
	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 a 3A Sanitary clamp.
	K-Patents Sanitary Flush Mounted Refractometer PR-23-APP for hygienic flush mounting installations in cookers, cooling crystallizers and other vessels that have scrapers or mixers. Installation through an APV Tank bottom flange.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.
Pressure range:	-1...5 bar

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