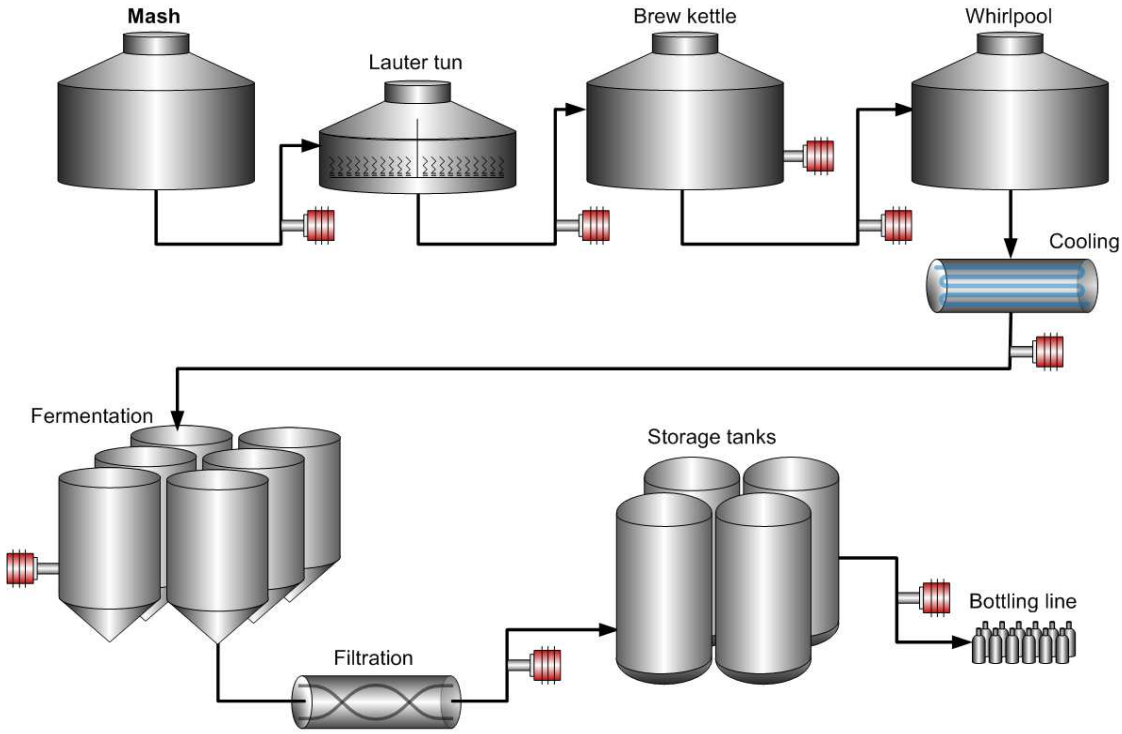
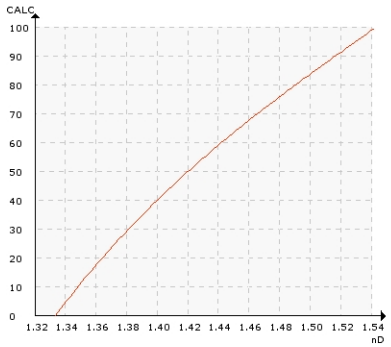


BEER

Typical end products

Beer

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



Introduction

The first step in the beer brewing process is the preparation of malt grains. The extract received from the processing of this raw material is called wort. The second step is fermentation by yeast. The last steps are conditioning and final filtration. After filtration, the beer is ready for bottling.

Instrumentation

The K-Patents Sanitary Process Refractometers are commonly used at many stages of the brewing process to determine the concentration of dissolved solids, by taking optical measurements of a solution's Refractive Index. The K-Patents Process Refractometer can be calibrated in Plato, Brix, Ballling, gravity or density, depending on which standard scale is applied by the brewery.

The K-Patents Sanitary Refractometers are 3-A approved and EHEDG tested to comply with the highest hygiene requirements of beer production.

1. Mash Tank

Mashing determines the final structure of the beer. The mash goes through a series of temperature rises, which allows complex reactions to take place. Amino acids are supplied for the yeast growth and large proteins are broken down. Crushed mash is dissolved into water. The K-Patents refractometer is used to measure the concentration of the mash in water at the outlet pipe in order to maintain a consistent concentration. Automatic prism wash with steam or high pressure water is recommended for this application.

2. Lauter Tun

Lauter tun is a vessel used for the extracted wort separation. The solids in the lauter tun are rinsed

with water to separate the clear liquid wort. The liquid concentration gradually decreases during the rinsing, and the K-Patents refractometer output signal is used to detect the shut-off point for the rinsing. The refractometer therefore prevents excessive use of water. Automatic prism wash with steam or high pressure water is recommended for this application.

3. Wort Boiler (Brew Kettle)

In the wort boiler, hops are added and the brew is boiled to achieve a certain strength or gravity. This partial process in the brewery is absolutely essential for the quality of the final beer. The K-Patents refractometer is installed directly on the boiler to measure the wort strength/gravity. It provides an instant feedback when the wort has reached its required strength. No by-pass arrangements are required. The purpose is to eliminate sampling, optimize the boiling time, and to improve beer consistency and quality. Automatic prism wash with steam or high pressure water is recommended for this application.

4. Hot Wort from Boiler to Whirlpool

The K-Patents refractometer is installed in the wort boiler outlet to monitor the quality of the wort. Before the wort goes on to the next stage, solids are removed from the liquid by using a whirlpool. All hops and other solids are forced to the center of the whirlpool. When the whirlpool is stopped, the solids settle at the bottom, forming a fairly solid central cone. The liquid can then be drained off.

5. Chilled Wort from Heat Exhanger

The wort is cooled down to the correct temperature for the yeast. The K-Patents refractometer is used for quality control, by a way of measuring the cold wort before it enters the fermentation process. This is an alternative measurement to point 4.

6. Fermentation

In fermentation, the yeast metabolizes sugars and amino acids, and converts them into alcohol. The change in total concentration is continuously detected by the K-Patents refractometer, in order to monitor the conversion rate, the degree of fermentation and the alcohol volume%.

7. Filtering

After fermentation, the beer is allowed to rest and the suspended yeast to settle. The K-Patents refractometer provides a quality control measurement for the wort filtering output.

8. Filling Line Interface Detection

The K-Patents refractometer instantly detects the product-to-product and product-to-CIP cleaning interfaces in bottling. The K-Patents refractometer output signal can be utilised for quality control monitoring, ensuring correct product-to-bottle selection and the product quality being within specification.

If the same filling station is used for different products, the K-Patents refractometer can be used for automated monitoring and controlling of the CIP cleaning process, allowing products to be switched freely. This results in an increased productivity, without detriment to end product’s quality and safety.

Instrumentation	Description
	K-Patents Sanitary Compact Refractometer PR-23-AC for small pipe line sizes of 2.5 inch and smaller. The PR-23-AC sensor 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 or Varivent® connection.
	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℃ (300 ℉). Installation through a 3A Sanitary clamp.
Automatic prism wash:	Prism wash with steam: The components of a steam wash system are a sensor with integral steam nozzle mounted at the sensor head, a shut-off valve for steam line and an indicating transmitter equipped with relays to drive the wash valves. Prism wash with high pressure water: The components of a high pressure water system are a sensor with integral water nozzle mounted at the sensor head, a high pressure pump together with a power relay unit and an indicating transmitter equipped with relays.
Measurement range:	Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.