Introduction

Fruit juice concentration by evaporation is one of the oldest and well-known methods for preserving fruit and vegetables and their derived products. This operation consists in removing part of the water content of the juice, so that all the solid components such as fruit sugars, minerals and vitamins are left in a more concentrated solution.

Juice evaporation is performed to lengthen the shelf life, minimize packing and storage, facilitate transportation and simplify the handling of the concentrated product.

Application

After the juice is extracted from the fruit, it is screened and purified, for example by centrifugation. The concentration of the juice at this stage varies from 9 to 12 Brix. The inconsistency is due to various factors such as the fruit quality, origin and annual rainfall. To balance the differences in concentration, the juice is sent to a primary tank, before it is evaporated.

For fruit juice concentration, a three stage falling film evaporation plant is commonly used. The evaporators usually operate at a constant boiling rate. In the evaporation process, the concentration value is typically increased from 10 to 65 Brix.

Instrumentation and installation

The K-Patents Sanitary Refractometer PR-43-A is the ideal instrument for concentration monitoring in food and beverage processing. The refractometer meets the strict requirements for hygienic processing and is available with 3-A Sanitary and EHEDG certifications.

The refractometer is mounted directly on the evaporator outlet to ensure the target concentration is achieved and to guarantee a high-quality product. The refractometer provides Ethernet and 4-20 mA output signals that can be connected to the process controller to regulate the final Brix concentration by automatically adjusting the evaporator inlet flow or steam flow.

For instance, if the Brix value increases, the valve allows higher product flow rate through the evaporators. This brings the Brix value back to the set-point. Typical measurement range is 30-80 Brix.
### Instrumentation Description

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<tr>
<th>Instrumentation</th>
<th>Description</th>
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<tr>
<td>K-Patents Sanitary Compact Refractometer PR-43-AC</td>
<td>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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<tr>
<td>K-Patents Sanitary Probe Refractometer PR-43-AP</td>
<td>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.</td>
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### User Interface

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.

### Prism wash systems

Prism wash system components are a refractometer with integral wash nozzle mounted at the refractometer probe or in a flow cell, wash supply line components and a Multi user interface MI with relay module for prism wash diagnostics and control. Alternative wash media can be used for wash, e.g. steam, high-pressure water and warm water (hot condensate).

### Measurement range

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