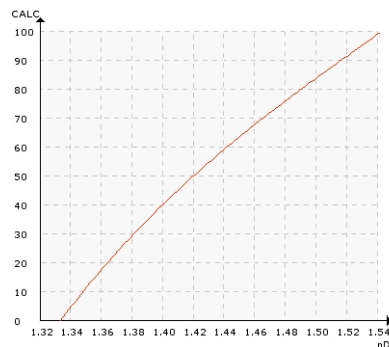


PROTEIN RETENTATE

Typical end products

Concentrated and filtered protein

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



Introduction

Diafiltration is a technique using ultrafiltration (UF) membranes to separate the components of solutions and suspensions based on their molecular size, although other factors such as molecular shape and charge can also play a role. Molecules larger than the membrane pores in the UF membrane will be retained at the surface of the membrane while solvent and smaller solute molecules will pass freely. This process of molecular exclusion at the UF membrane surface leads to concentration of the protein solute in the retained fraction. The protein solute (retentate) can then be recovered from above the membrane.

Application

Purified protein solution from the feed tank is pumped to the membranes for filtration. Pressure is

applied to force the feed against the membranes. At this point, small protein molecules are filtered and pass through the membrane pores, while large molecules form the concentrated protein retentate. In a continuous diafiltration process the buffer is added into the feed tank at the same flow rate as the filtrate is removed. This allows the volume of the fluid in the process to be kept constant while the smaller molecules pass through the filter and are washed away. Then under applied pressure the retained protein retentate proceeds to the feed tank for further circulation.

It is of utmost importance to control the retentate concentration as it affects the permeability of the smaller molecules through the membranes. In particular, the permeability of a molecule through a membrane is determined by measuring the concentration of the molecule in the filtrate compared to the concentration in the retentate under specified conditions.

Depending on the required concentration of biomolecules in the retentate, the process can be either a batch process or a continuous process.

Instrumentation and Installation

K-Patents PR-23-AC Pharma Refractometer provides an accurate real-time measurement of the protein concentration. The refractometer aids in controlling and adjusting concentration levels after ultrafiltration.

Refractive Index technology is used to replace traditional A280 measurements to determine highly concentrated protein solutions off-line. The K-Patents

Pharma Refractometer PR-23-AC measures the protein concentration in-line at the manufacturing scale, thus ensuring the capability of reading index values in real-time conditions that correspond to high protein concentrations (>100 g/L). The refractometer's measurement sensitivity can detect inadequate mixing of highly viscous process streams over time through trending process data.

The 4 to 20mA DC output signal can be tied-in directly to Data Acquisition Systems allowing for real-time protein concentration monitoring. The data can also be downloaded to a computer via an Ethernet cable.

Typical installation of the K-Patents' Pharma Refractometer PR-23-AC sensor is on a pipe bend. It is either angle mounted directly on the outer radius of the pipe bend or by using the Pharma Miniflow Cell PMFC-HSS with the PR-7605-SS table top stand. With proper installation the best flow conditions and self-cleaning effect can be achieved.

Typically, prism wash is not required for these applications, since most facilities use CIP cleaning every 10-20 hours.

The high accuracy control achieved with K-Patents precise in-line concentration measurements improves end product quality and reduces operating costs. Additionally, the K-Patents Pharma Refractometer PR-23-AC has a built-in web server that can be accessed via Ethernet, which significantly improves its ease-of-use. Obtaining real-time measurement data displays and diagnostics, altering instrument configuration settings or updating program versions can all be done remotely.

Instrumentation



Description

K-Patents Pharma 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 Pharma Miniflow Cell PMFC-HSS with PR-7605-SS table top stand.

Measurement range:

Refractive Index (nD) 1.32000 – 1.5300, corresponding to 0-100 Brix.