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TANGENTIAL FLOW FILTRATION IN BIOPROCESSING

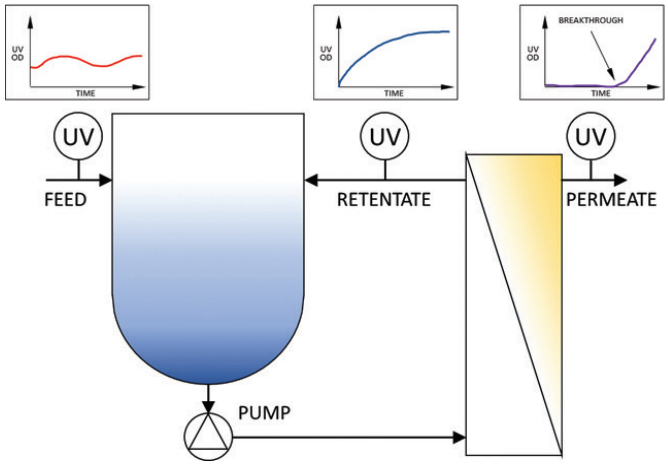
Efficient filtration is critical in bioprocessing to ensure maximum yields. UV absorbance monitoring is a common way to optimize filtration processes and detect when valuable product is being lost.

REAL-TIME MEASUREMENT OF PROTEIN CONCENTRATION IS KEY TO OPTIMIZING YIELDS

The main purpose of tangential flow filtration in bioprocessing is to concentrate a product previously filtered in an earlier step in the production process. The feed solution is circulated in a closed loop, passing through the filter. This filter is selected to provide retention of the product being concentrated while allowing unwanted/excess buffer and/or background material in the circulating solution to permeate through the filter material to drain away.

The installation of UV absorbance analyzers at strategic points in the filtration system can give real-time measurements of protein concentration, which allows optimal control of feed rates for maximum filter efficiency, reduction of loss through filter failure, and accurate determination of concentration end points. All of these measurements contribute to maximizing product yield in any given batch.

The diagram shows positioning of UV absorbance monitors in a typical filtration system where product feeds into the recirculation tank, retentate returns to the recirculation tank, and permeate flows to drain.



Feed concentration monitoring provides a valuable input into an overall control scheme to facilitate the adjustment of feed-flow rate and pressure, which keeps the process running at an optimal level.

Retentate monitoring provides a real time concentration signature of product retained in the circulation loop. It can be used in cascade with feed absorbance to control the amount of feed into the recirculation system, thereby keeping the loop concentration at an optimal level for filter operation. Once feed is complete, the monitor provides a measurement used to indicate retained product concentration change in the loop. When the rate of

change reaches a “plateau”, the process end point has been reached.

Permeate monitoring ensures that product is not being lost through the filter membrane. Under normal operation, the monitor will provide a flat line “zero” absorbance output. If product starts to breakthrough the filter, the measured absorbance will rise indicating a loss condition caused by either a failure of the filter media or too great a concentration in the retentate side. Once a breakthrough trend is observed, the process is usually halted.

Correct selection and installation of UV monitors is critical in every case as incorrect selection can lead to disappointing results. Unfortunately, there is no one-size-fits-all monitor that will give excellent results over many different processes. Each UV analyzer needs the right configuration in terms of optical wavelength and pathlength in order to provide clear and continuous monitoring that produces the resolution and repeatability needed for concise concentration determination.

UV analyzers which have poor response or truncate/ clip detection peaks will not provide the information necessary to operate a filtration system at its optimum point and this can lead to loss of valuable product. As a general rule, when measuring absorbance at the same wavelength, retentate monitors will have a much shorter pathlength than permeate monitors while feed monitors will have a pathlength in between the two.

KEMTRAK UV ABSORBANCE MONITORS PROVIDE:

- Drift free measurement
- Low noise
- Exceptionally long light source life
- Zero cell hold up volume
- Single, dual, or referenced wavelength measurements

KEMTRAK UV ANALYZER FEATURES:

- Wide range of inline flow cells
- Material certification as standard
- FDA/USP Class 6 compliant materials
- Fiber optic based – no electrical connections in “wet” areas
- Optional single use system