LG QuantumFlux™ Pressurized UF Membrane

Technical Service Bulletin 609

Data Logging and Performance Normalization

In order to properly troubleshoot UF module performance issues, identify system operational issues, develop cleaning and maintenance procedures and ensure the validity of the product/system warranty, it is critical that feedwater quality and system performance data be recorded and filed on a regular basis so that such information is readily available for review in the event of a performance problem or a warranty claim.

Why is Data Collection Important?

Because UF membrane performance can be affected by a variety of factors, such as a change in feedwater quality or a change in operating conditions, the only way to determine whether your membranes are performing as expected is through regular collection and routine analysis of feedwater quality and system performance data. This information can then be evaluated over time to determine whether membrane performance is tracking as expected or if adverse trends develop which then require corrective action. All data collected should be systematically logged and filed for future access to allow analysis of longer-term performance trends that may require troubleshooting or support a warranty claim.

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CAUTION

This is not an extensive list and does not constitute the only conditions for a valid warranty claim.
Refer to your project specific warranty document for all conditions that apply to your warranty

Why Normalize Data?

UF membrane performance will vary depending on feedwater characteristics, feedwater composition and operating conditions. Parameters such as feedwater temperature, feedwater turbidity, membrane fouling, or flux rate will change key membrane performance characteristics such as feed pressure, filtrate flow and filtrate quality.

To determine whether changed performance is the result of changed feedwater or operating conditions, or whether it is due to a change in actual membrane performance, operating data must be taken at regular intervals and then “normalized” to baseline reference conditions. Whether changed performance is apparent or actual can only be determined by comparing “normalized” performance over time with baseline performance. To ensure optimized membrane performance and a long service life, it is important that any changes in membrane performance be identified and corrective action be taken as quickly as possible. A complete record of normalized data is therefore essential for users to realize the best performance and longest operating life of LG Chem UF membrane modules.

Causes for Changes in Apparent Membrane Performance

Certain changes in the operating parameters of the UF system or train will result in changes in UF membrane performance. Such changes can result in an apparent or actual change in permeate flow or quality. Below is a list of the changed conditions that typically affect UF membrane performance

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Data Collection Procedures

The following tables identify the data to be regularly collected and the frequency of collection.

LG Chem UF Membrane Minimum Logging Requirements

UF Feedwater Characteristics - Required Data:

Parameter	Frequency of Collection	Comment or Unit of Measure
Temperature	Once per day (every 24 hours)	°C or °F
Turbidity	Once per shift (every 8 hours)	Nephelometric Turbidity Units
Feedwater Chemical Analysis	Once per month	

UF System or Each Train – Required Data:

Parameter	Frequency of Collection	Comment or Unit of Measure
Transmembrane Pressure (TMP)	Once per day (every 24 hours)	Record Feed, Concentrate and Permeate Pressure for calculating TMP
Feed Flow	Once per shift (every 8 hours)	
Filtrate Flow	Once per shift (every 8 hours)	
Cumulative Hours of Operation	Once per day (every 24 hours)	
Specific Flux	Once per day (every 24 hours)	Calculation

Operating or Maintenance Events for UF System or Each Train:

Parameter	Frequency of Collection	Comment or Unit of Measure
System or Train Start-up	As applicable	Record date and time
System or Train Shutdown	As applicable	Record reason for shutdown, date, and time
Membrane Cleaning-In-Place (CIP)	As applicable	Record reason for cleaning, chemical(s) used, method or procedure, concentration, date and time. Record results following cleaning.

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Data Normalization Equations

To calculate Trans Membrane Pressure, use the following equation:

$$\boldsymbol{TMP} = \frac{\boldsymbol{P}feed + \boldsymbol{P}concentrate}{2} - \boldsymbol{P}filtrate$$

Note

Pressures may be in psi or bar

TMP	Trans Membrane Pressure (psi or bar)
P feed	Train UF Feed Pressure (psi or bar)
P concentrate	Train UF Concentrate Pressure (psi or bar)
P filtrate	Train Filtrate Pressure (psi or bar)

To calculate the filtrate flux rate, use the following equation:

$J = 1440 * Q/A$ for U.S. units or $J = Q/A$ for SI units

J	Filtration Flux in liters/m²/hour (SI units) or gallons/ft²/day (US units)
Q	Filtrate flow (GPM or l/h)
A	Train membrane area (ft² or m²)

To obtain the Normalized Specific Flux (SF):

$$\boldsymbol{JSP} = \frac{\boldsymbol{J} * \boldsymbol{TCF}}{\boldsymbol{TMP}}$$

JSP	Normalized Specific Flux
J	Actual Filtration Flux in liters/m²/hour (SI units) or gallons/ft²/day (US units)
TMP	Calculated Trans Membrane Pressure in bar or psi
TCF	Temperature Correction Factor

TCF is calculated using the following equation:

$$\boldsymbol{TCF} = \mathbf{0.0239} * \boldsymbol{T} + \mathbf{0.443}$$

T	Actual temperature in degrees Celsius