

X-FLOW MEMSCAN

PREVENTIVE MEMBRANE LIFE SCAN

SERVICE LEAFLET

GENERAL INFORMATION

Membrane elements aging over time is a fact; however, the aging speed depends on many external factors such as plant settings, feed water quality, and cleaning frequency. The combination of these factors can even work as a catalyst for increased aging and unplanned system failures leading to excessive operating costs.

FACT

You don't know exactly when membranes will fail

FACT

Superior plant performance and membrane efficiency is required to minimize operating costs and increase reliability

FACT

With MemScan you know where you stand

Knowing when your membrane elements need to be replaced gives the possibility to implement a proper (phased) replacement plan and allocate budget in a timely manner.

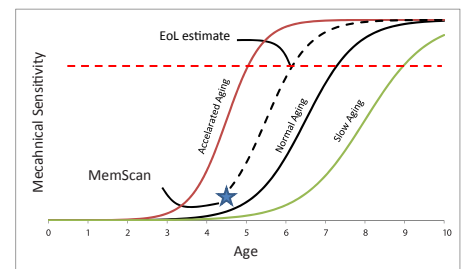
MEMSCAN

Performing a MemScan is a preventive action. Monitoring the physical condition of the membranes gives you information on the residual lifetime and tells you when you need to act, allowing for improved predictability and budget management.

MemScan also helps select the correct cleaning agents and tells you what is causing the damage to your membranes. Knowledge on fouling, the cause for damage or loss of performance can help with cleaning and preventing further damage and minimizes unnecessary plant stops and loss of production.

Performing a MemScan on a membrane element is a destructive action. After a visual inspection and module integrity test is completed, Pentair research engineers conduct an extensive membrane fiber autopsy. Several fibers are tested on a variety of aspects such as permeability, strength, and fouling. The test results are compared against the values known from the original batch tests.

MEMBRANE LIFETIME



The aging of membrane material is a complex phenomenon that depends on many factors. As the membrane material ages, it becomes more sensitive to mechanical forces that can result in membrane failures. The relation between age and the mechanical sensitivity is described by an S-curve: most of the mechanical strength is lost in a short period preceding the end of the membrane life. MemScan combines a review of the membrane history with a measurement of the actual status to estimate the resulting lifetime expectation.

| LIFE SCAN CHECK | LIFE SCAN RESULTS | LIFE SCAN ADVANTAGE |
|---|--|--|
| <ul style="list-style-type: none"> Integrity Permeability Fouling Scaling Inner surface Outer surface Cross section Compaction Tensile strength Collapse pressure Burst pressure | <ul style="list-style-type: none"> Residual lifetime expectation Membrane failure risk Damage causes Cleaning advice Elemental fouling detail | <ul style="list-style-type: none"> No unnecessary downtime Damage prevention Effective cleaning Increase plant predictability Minimized operational expenditures Increased system throughput |

X-FLOW MEMSCAN

PREVENTIVE MEMBRANE LIFE SCAN

SERVICE LEAFLET

MEMSCAN STEPS

INSERT INVESTIGATION

The first step during the MemScan research is a general visual inspection of the complete membrane element. The general state of the membrane element casing is recorded and finally, an integrity test is performed. Possible leaks are marked and checked later in the examination.

MEMBRANE EXAMINATION

For the membrane examination, the casing of the membrane element is removed and several membranes are selected for a more detailed research. On the membrane level, the permeability and mechanical strength are checked and compared with the original batch figures.

More detailed information on the membrane inner and outer surface is received with the SEM (Scanning Electron Microscopy) analysis. SEM analysis and potential fouling concerns can be identified with a ED. Fouling on the membrane element detail level is found with an EDX (Energy Dispersive X-ray) analysis.

RESIDUAL LIFETIME TEST (RLT)

Another examination available through a Pentair Memscan is the residual life expectancy evaluation. The "RLT" evaluates and compares a membrane's mechanical strength, age, and plant operational conditions for projecting a membrane's life expectancy. Knowing what to expect out of the performance of your system can lead to major cost savings and performance benefits.

CLEANING TEST

Optional to the basic MemScan, a cleaning test can be performed. In this test, several cleaning agents are tested for their cleaning capacity on the fouling found with the EDX analysis.

EDX ANALYSIS

- EDX analysis (Energy Dispersive X-ray) is used to determine the elemental composition of the inner and outer surfaces of the membranes.
- Fouling or particles can be identified with this analysis.
- EDX-spectra from the inner and outer surfaces of used membranes is compared to EDX-spectra of **new membranes**. These spectras are taken before any cleaning is performed at Pentair X-Flow.

SEM ANALYSIS

- SEM analysis (Scanning Electron Microscopy) recognizes defects and fouling and is used to determine the integrity of the membranes:
 - Outer surface
 - Inner surface
 - Cross section
 - Recognize defects and fouling

CLEANING TESTS

- Based on the results of the EDX analysis, several cleaning tests are performed on used membranes such as:
 - NaOCl
 - HCl
 - NaOH
 - NaOH with NaOCl
 - Citric acid

POLYMER / CRASH TEST

Some UF pretreatment systems require the use of coagulants in combination with polymers as flocculation aid. These polymers assist in growth and settling of the flocs, but can potentially cause irreversible membrane fouling if they carry over from the pretreatment onto the membranes. Pentair X-Flow has a testing program to evaluate these chemicals.

