

Brackish Nanofiltration Plant Case Study

SKID 1 – Osmonics Membrane System

MASAR Technologies, Inc., has conducted a trial for its **SilentAlarm™** software at this 2.4 MGD (9,090 m³/day) plant, with Osmonics nanofiltration membranes. The well water feed TDS was around 765 ppm and the conversion ranged between 78%-84%. The plant experienced a biofouling history, followed by multiple cycles of cleanings (CIPs). Together with Skid 1's operating data, covering around 3,700 hours of cumulative hours of operation, the the monitoring regime being utilized at the plant at that time, namely, **monitoring the membrane DP and the so-called Fouling Factor**.

The evaluation conducted using the **SilentAlarm™** software revealed a different outcome in the plant's fouling history that went undetected by the plant's monitoring system using the standard ASTM normalization method (*ASTM D-4516*). As Fig. 1 clearly shows, the sudden increase in the DP and corresponding decrease in the calculated Fouling Factor did noticeably not start until 1000 hours of operation. However, as Fig 2 below shows, our **Fouling Monitor (FM)** calculated by the **SilentAlarm™** (*red curve in Fig. 2*) showed something is happening in the system (*i.e., fouling or scaling*) as early as 100-200 hours into operation (*red-circled region in Fig. 2 and Fig. 3*). Within this region, the **FM** went from an average of 0.66% to 3.3%, an almost 5-fold increase. The membrane DP measured by the plant, only showed a modest increase of about 0.4-0.5 bar, which apparently did not sound any alarms of any fouling or performance issues (*as compared with the 2.0 bar increase in the average DP in the period after the first 1,000 hours of operation when the fouling was detected by the plant*).

During the same period, ASTM-normalized flux decline shows an increase of 13.5%. When the plant was re-started, the **FM** started very high then after the first cleaning and averaged around 4%, which was basically maintained throughout subsequent cleaning cycles. That confirms your findings that cleanings were effective in controlling the rate of fouling (*blue circled region in Fig.2*), and plant's productivity/salt passage requirements, although the plant was never brought back to the initial non-fouling status (*FM less than 1%*).

Had the **SilentAlarm™** software been used as a real-time performance and fouling monitor at the plant, it would have alerted the plant operator of the first event of fouling at 100-200 hours, and corrective measures would have been taken to prevent the second-wave of fouling at 1,000 hours, saving a lot of valuable time and maintenance, not to mention loss of productivity and plant availability.

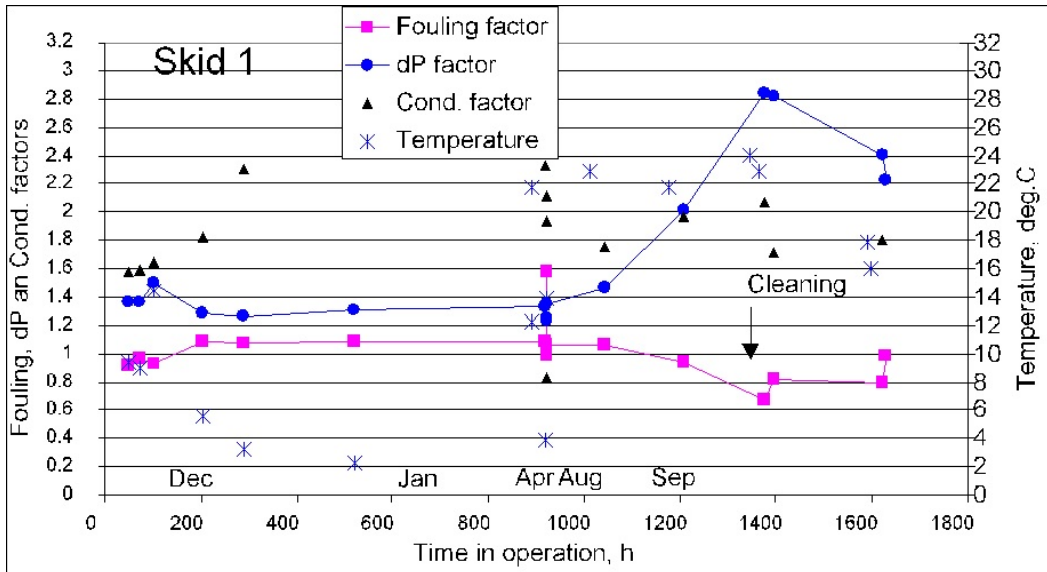


Fig. 1 – NF Plant Performance Monitoring Diagram

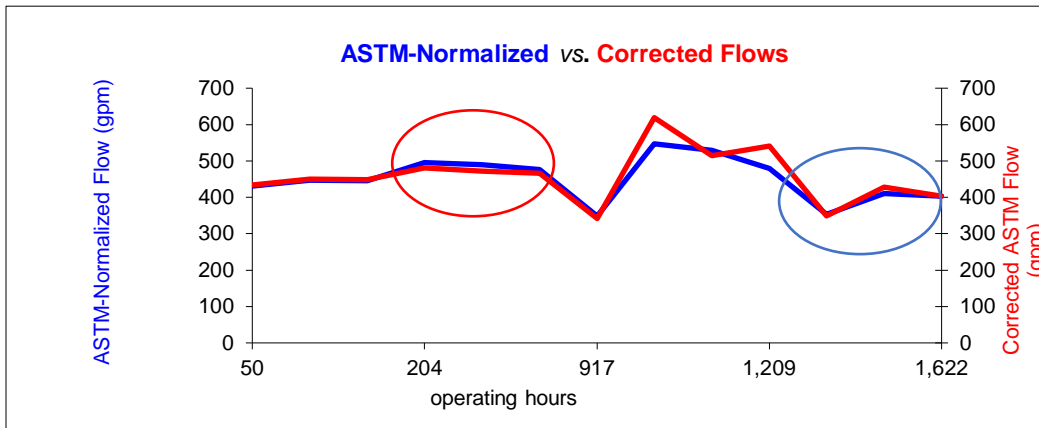


Fig. 2 – SilentAlarm™'s comparative flux decline curves

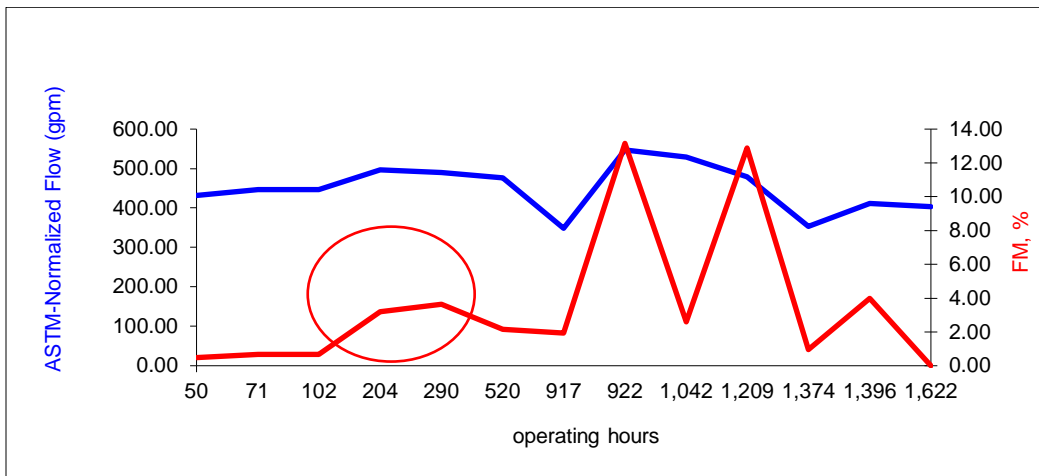


Fig. 3 – SilentAlarm™ FM vs. ASTM-Normalized Flows