HydroChem's rising star KO's biofilm

The Background:

The client operates a world-class hydrometallurgical project in remote Western Australia that requires large volumes of high-quality water.

The water treatment plant is a critical part of the process as it prepares the feed water for the plant, including the steam boilers. An installation of several reverse osmosis (RO) trains work around the clock purifying the brackish bore water that also supplies the drinking water for almost 1,000 people.

The facility sought HydroChem's assistance to improve the overall RO performance with a key outcome being to reduce the cleaning frequency. Biofouling on the membranes was necessitating an alkaline clean as often as every six weeks, in some instances.

The Challenge:

The challenge was to find a single effective NSF certified biocide that counteracted the bacteria, penetrated the biofilm and caused no damage to the membranes.

Fouling is a major operational challenge that affects the overall performance of RO plants. Through put reduces, energy consumption increases, maintenance costs rise, and the life expectancy of the membranes is drastically shortened.

The biofouling potential in a RO plant depends on feed water quality, system design and the overall operating conditions. The surface of the RO membrane where dissolved solids are most concentrated provide the ideal environment for the formation of a biofilm.

HydroChem accepted the challenge and proposed their IK110 product. It is designed to "peel off" accumulated biofilm, reduce any recurrence of biofilm buildup and maintain the improved condition of the membranes.

The effectiveness of the treatment would be measured against three main objectives set out by the client:

- Reduce the frequency of the cleanings (against historical cleaning data)
- Reduce the differential pressure
- Increase the salt rejection

The Solution:

HydroChem designed a biocide treatment with the IK110 product from its Kurita product range to run on a six-month trial. IK110 carries an NSF certification and is known for its highly effective biocide action.

The trial zeroed in on one RO train (two stages – 150m³/H). The IK110 was injected into the system ahead of the booster pump in batches of 30ppm for three hours at a time.

The aim was to unequivocally demonstrate the efficiency of the IK110 treatment program. To achieve this, the data from the treated RO train would be compared to that of an untreated one.

The Result:

Just one month into the trial period the positive signs were becoming evident with clear improvements on the differential pressure, permeate flow and salt rejection.

Prior to the treatment, the conductivity of each vessel in stage one and two were not consistent. This flagged a layer of biofouling on certain membranes. With the progression of the treatment, conductivity became more consistent on each vessel highlighting the "peel off" action of the IK110 product.

The treated RO train began to run smoothly and produce more, and better quality permeate. The client was able to extend the period between cleans from six weeks to five months, realising a significant saving on cleaning products, labour and downtime.
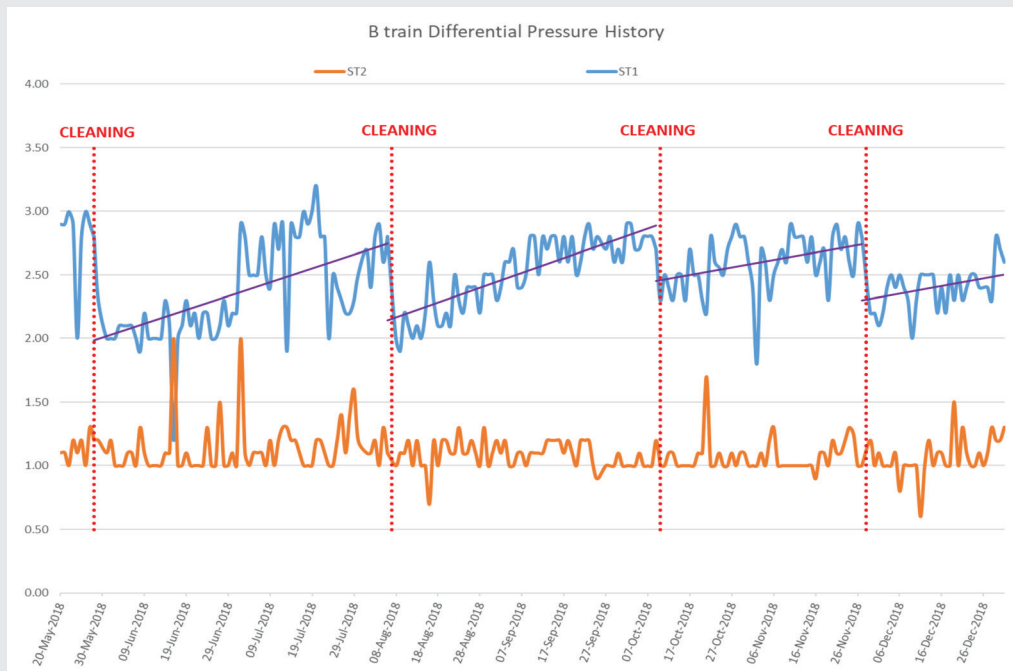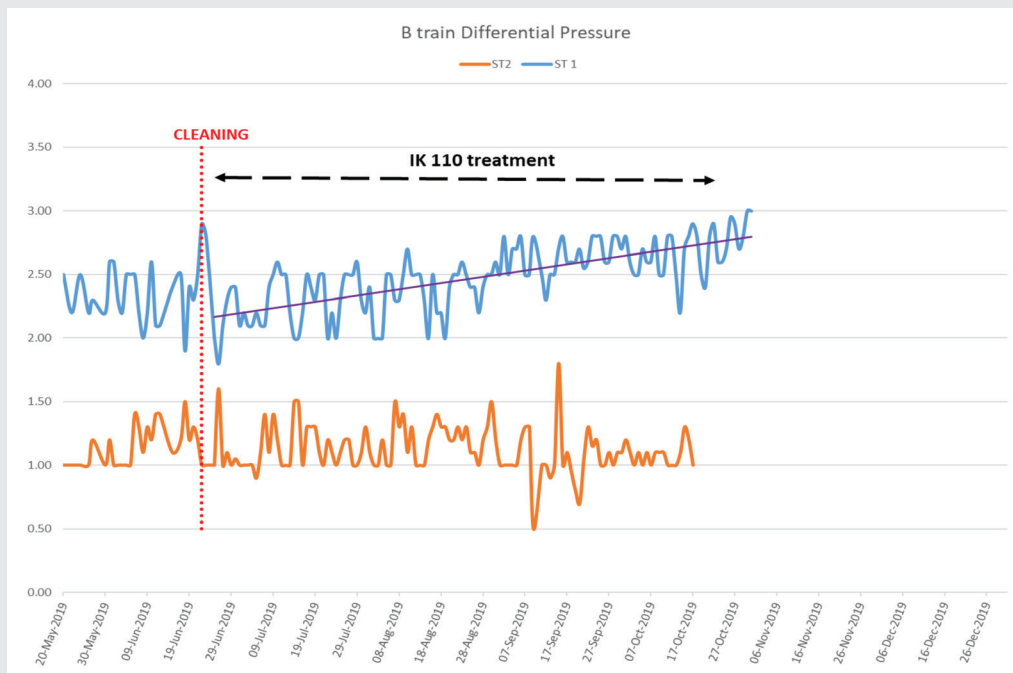
FIG. 1

FIG. 2

In Fig. 1 we can clearly see the unstable permeate flow on the untreated train, and the regular cleaning requirement. This compares unfavorably with the treated train in Fig. 2, highlighted by a stable permeate flow rate and a lengthening period between cleans. The reduced number of cleanings has also extended the membrane's lifespan – less cleaning means less risk of damage to the membrane.

IK110's chemistry is highly effective at preventing the regrowth of biofouling. This ensures significantly less physical stress is placed on the membranes during normal operation.

By the end of the six-month trial, the IK110 treatment program on the RO train had reduced the cleaning schedule by half. The client noted that this savings alone covered the cost of the IK110 treatment.