Introduction

A brewery installed a brackish water reverse osmosis unit to soften and purify the borehole water available on site to make it suitable for use as brewing liquor. The installed RO suffered rapid scaling and required frequent cleaning despite antiscalant dosing. After 6 months operation this resulted in membrane replacement. Avista Technologies were asked to review the plant's operation and to recommend one of their antiscalant products. This was undertaken and the plant has run in a stable manner for more than 12 months.

Background

The brewery had installed two 25m^3/hr capacity RO trains which were designed to operate at 82% recovery. The feedwater pre-treatment was limited to chlorination/dechlorination and cartridge filtration as the borehole supply had very low suspended solids content. A competitors antiscalant was specified to control the calcium carbonate scaling potential. Calcium carbonate scaling occurred very quickly, and the antiscalant supplier recommended acidic cleaning followed by increasing the antiscalant dose to 12ppm to rectify this. This failed to prevent further scaling and frequent cleaning was required leading to irreversible scaling within 6 months.

Component	Feedwater (mg/litre)	Brine (mg/litre)
Sodium	19.5	181.4
Potassium	4.8	29.8
Calcium	147.0	911.8
Magnesium	8.3	51.5
Chloride	40.0	247.2
Sulphate	81.7	507.3
Bicarbonate	377.0	2,325.2
Nitrate	24.5	146.1
Silica	20.0	121.7
pH	7.3	8.1

Water analysis details

Recommendation and Implementation

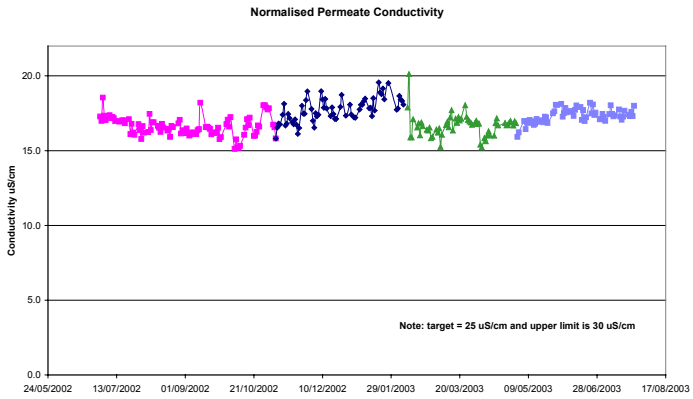
Avista Technologies were called in to review the plant to provide an effective antiscalant which would reduce cleaning frequency. A required dose rate of 3ppm Vitec 3000 was calculated to control scaling in this plant and an Avista representative attended the site to supervise the changeover of the antiscalant to Vitec 3000 ensuring the dosing pump was set to the correct flow. As the dosing pump output was quite high and the customer was uncomfortable with reducing the dose rate by such a large margin it was decided to set the dose rate at 6ppm to ensure frequent pulses of product were added to the feed stream.

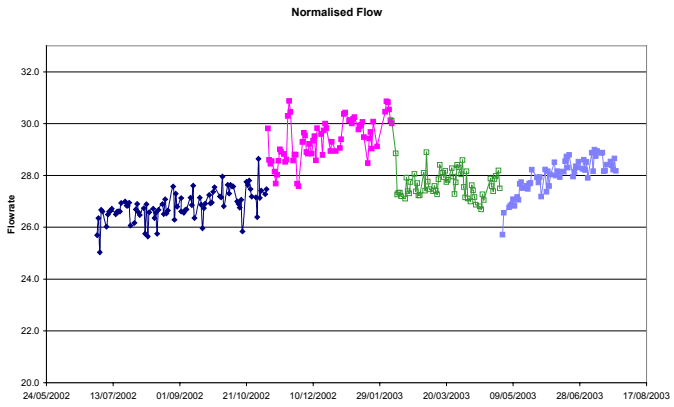
Operation of the plant at the design recovery rate of 82% was on the limit of the Vitec 3000's capability. Bearing in mind the operating history of the plant and the closeness to the product limitation Avista undertook to normalise the plant data on a weekly basis and to advise when cleaning was required.

Results

In the 12 months of plant operation since converting to Vitec 3000 the plant has operated in a stable fashion with little evidence of scaling. Charts of normalised flow and permeate quality were issued on a

weekly basis to communicate the plant performance criteria to all concerned.
(See below for summary charts for the first years operation with Vitec 3000.) Three acidic maintenance cleans were carried out during regular service visits. (These are indicated by the change in trend line colour.) The differential pressure has remained steady over each membrane array throughout the year.





From the operating data it is clear that the plant in fact operates at between 82 and 84% recovery. Under these conditions the antiscalant is working outside the normal guaranteed operating range but still performing well.

The table below summarises the calcium carbonate precipitation potential and the silica concentration at the limits of the operation.

	82% Recovery (Normal product limit)	84% Recovery
CCPP	880	1050 (120%)
Silica	108	121 (112%)

The figures in brackets indicate the percentage of the normal operating envelope of Vitec 3000.

Summary

The client is pleased with the stable operation of the plant and with the data provided. Avista Technologies is also pleased with the plant operation as it has demonstrated Vitec 3000 performing very satisfactorily at the extremes of its operating limits.

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