

Nalco Water's ScaleGuard Treatment and SCRAMO Realtime Scaling Rate Measurement in Settlers and Washers

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Abstract

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Red mud clarification has always been an area of high scaling potential, particularly in Settlers and 1st Washers, and as refineries have strived for higher supersaturation to push rates of alumina production. Nalco Water has developed a chemical treatment program, known as ScaleGuard™, which can significantly reduce the rate of scaling in this area of the refinery and allow for extended vessel life even under high supersaturation conditions.

Along with the ScaleGuard™ chemical treatment program, Nalco Water has also developed scale rate monitoring equipment, known as SCRAMO, which enables the real time determination of scaling rate online in vessels. In refineries that have been using ScaleGuard™ chemical treatment program, SCRAMO has proved to be beneficial with maximising the effective control of ScaleGuard™ dosage and performance. The SCRAMO scale rate monitoring equipment is now also providing refinery operations with real time insight into how changes to liquor chemistry and process conditions is also impacting ongoing operation in clarification.

Trials of ScaleGuard™ chemical program when dosed from the start of a settler campaign were able to reduce scaling rates from a baseline of 142 to 27 g/d (grams per day) as measured by the SCRAMO instrument. The SCRAMO unit was also able to demonstrate a reduction in scaling through a switch to RRA (Reduced Reagent Addition) from powder floc in the lead washer from 66 to 29 g/d and the beneficial use of caustic to control supersaturation, reducing scaling from 264 to 233 g/d.

Keywords: Scaling, Clarification, ScaleGuard™, SCRAMO, Supersaturation.

1. Introduction

Clarification vessel life has always been a major issue with refinery operations especially in the settlers and front-end washers where high rates of scaling occur and vessel life is the shortest [1–3].

For many years now Nalco Water has been providing chemical solutions in the form of ScaleGuard™ to refinery operations which slows down the scaling rate, lowers alumina reversion (loss) and subsequently extends the vessel life. Extending the life of these vessels allows for fewer unplanned outages, maintenance of production rates, lower alumina loss and increased caustic recovery.

In conjunction with the ScaleGuard™ chemistry approach Nalco Water has developed online real-time scale measuring technology “SCRAMO” which supports the efficient application of the

ScaleGuard™ chemistry and is now also being recognised as a valuable tool for day-to-day monitoring of clarification operations.

In this paper we will provide some examples of how the SCRAMO technology is assisting clarification operations.

2. Background

The ScaleGuard™ chemistry for reducing scaling rates in clarification has been in use for over ten years with its initial use in the refineries of Australia with particular use 1st Washers where it was used to extend the vessel life, minimise alumina loss and increase caustic recovery [4, 5].

Subsequent use of ScaleGuard™ materialised in some of the refineries of India and again with its use focussed on the 1st Washer.

With the use of ScaleGuard™ it is recommended that the scaling rate in the 1st Washer be measured to ensure efficient use of the chemistry. Scale coupons were used to measure the scaling rate and involved immersing a mild steel coupon into the liquor in the washer and weighing the amount of scale growth over time. This process of re-weighing the coupon every few days and the inherent risks involved with performing this task made Nalco Water look for an alternative method to measure scaling rate. From this review a prototype scale rate measurement device was developed and after some minor alterations the SCRAMO instrument has now been produced and is readily available for industry wide use.



Figure 1. Installed SCRAMO unit on operating washer.

The SCRAMO unit utilises load cell technology to continuously monitor the scaling rate in real-time, whilst using modern telecommunication systems, Nalco 3DTraser and Ecolab3D data management systems, to present the scaling rate data back to refinery operations. The scaling weight is determined every hour, instead of whenever the scale coupon was physically removed and weighed, providing real-time information that can be directly related to liquor chemistry,

In one refinery the addition of ScaleGuard™ to a Settler has realised an improvement in liquor filtration through Security Filtration which can be taken advantage of via increased flow and/or increased blow off ratio.

Online and real time measurement of scaling rates using the “SCRAMO” scale rate monitor unit has allowed the optimisation of ScaleGuard™ and alleviated the traditional labour intensive and infrequent method of daily measurement of scale coupon weight and scaling rate determination.

The “SCRAMO” unit has also become a handy device to measure changes in scaling rate that can be triggered by other events that can occur from the day-to-day operation of a clarification circuit.

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