Conversion to Single Dosing Flocculant from Dual Dosing of Flocculant

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Abstract

India's Belagavi Alumina refinery in Karnataka had, for many years, been using a combination of powder flocculant and hydroximate flocculant in a co-dosing arrangement on their Red Mud Conventional Decanters. The powder flocculant was used to provide the settling rate and underflow density, whilst the hydroximate flocculant was used to provide supernatant clarity – a not uncommon approach to treating Red Mud Settlers. The Belagavi Technical team created a project to look at the possibility of using one flocculant, not two flocculants, whilst achieving similar or improved Red Mud Settler performance. Nalco 9779 latex flocculant was plant trialed over a number of time periods, with differing bauxite and blends of bauxite from different sources. The results achieved were exceptional with Belagavi achieving stable operation of their Red Mud Settlers whilst using the Nalco 9779 flocculant only, which resulted in operational improvements and savings in many operational parameters. This paper outlines the work done to make this change in Red Mud Settler operation and the benefits achieved.

Keywords: Flocculant, Settling, Red Mud Settler.

1. Introduction

Hindalco's Belagavi Alumina refinery in Karnataka operated their red mud clarification area with the unique combination of a powder flocculant and a liquid hydroximate flocculant to settle and compact the red mud to provide a clear settler overflow suitable for downstream filtration.

For Belagavi, the use of two flocculant products had always been problematic, with handling issues associated with the powder flocculant and freshwater dilution required for both flocculant products to be effective.

Nalco has a history of providing single flocculant chemistries that performed well in the other Alumina refineries in India [1,2], so laboratory work was undertaken to investigate if an alternative flocculant and addition approach could be utilised at Belagavi.

A single Nalco product (Nalco 9779) was identified in this preliminary laboratory screening work as being a suitable flocculant for all occasions and warranted plant investigation. The Nalco 9779 could also be effectively activated in condensate thereby eliminating the need for freshwater dilution.

A number of plant trials were undertaken with varying bauxite sources and the results achieved were exceptional and are outlined in this paper.

2. Experimental

Numerous settling tests were conducted on site at Belagavi comparing Nalco 9779 against the two flocculant product alternatives with plant slurries. These settling tests were very encouraging and subsequent follow up settling tests were conducted by Belagavi refinery personnel, the performance was then validated by the Hindalco Innovation Centre at Belagavi and a full plant trial progressed.

Various experiments were done with differing concentrations of Primary and Secondary flocculant solutions of Nalco 9779 in the lab to determine the best overall settling performance.

During the plant trial the dosing point of flocculant also plays an important role, and the flocculant addition point was also modified to provide optimum performance [3].

3. Results and Discussion

The first full plant trial of Nalco 9779 ran for a period of 69 days and the hydroximate flocculant was replaced. Specific flocculant usage results are presented in the Table 1. below. The use of powder flocculant was also ceased, with typical usage rate of powder flocculant around a quarter of the liquid flocculant dosage rate.

Table 1. Reduction in Liquid Flocculant Usage During Plant Trial.

Month	Flocculant	Usage Rate (g/T)	Reduction (%)
April – May	Hydroximate	178	-
June - July	Nalco 9779	133	25

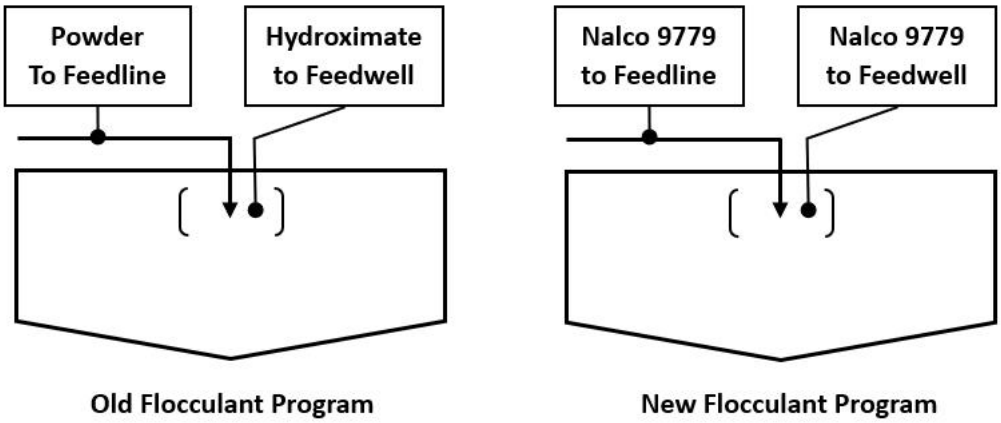

Figure 1. Schematic of Old and New Flocculant Programs.

Further reductions in Nalco 9779 use were also achieved by deploying an alternative water source to fresh water. Condensate was used in order to reduce the input of fresh water into the process. The results of changing the water source from fresh water to condensate are shown in Table 2 below.

Table 3. Comparison of Overall Performance Blended Ashapura and Dharani Bauxites.

Parameter	Powder & Hydroximate Dosing with 25 % Local Bauxite	Nalco 9779 Dosing with 26 % Local Bauxite	Benefit
Flow (m^3/h)	433	373	-
Operating Days	141	61	-
Days Bauxite Used	88	43	-
Filters Online (Ave)	18	12	Reduced Number of Online Filters
No of Flow Cut Days	21	0	Zero Flow Cuts
Settler O/F Solids (mg/L)	311	202	Lower O/F solids
Settler U/F Solids (%)	35	39	Higher U/F solids
Filtrate Solids (mg/L)	8.4	8.4	-
Flocculant Use (g/t)	171	120	Lower Flocculant Consumption

4. Conclusion

Historically, dual flocculant programs have increasingly become the common way for the operation of red mud settlers and as such refineries have had to operate and maintain multiple flocculant batching and dosing systems.

The work presented here highlights that in some instances the use of a targeted single flocculant may in fact be better for operations with many benefits that can be realized.

The other observation from this work is that simple laboratory flocculant screening test work can be effective in identifying alternative products and approaches to treating red mud settlers which can ultimately offer considerable savings in real refinery applications.

Nalco 9779 flocculant was able to provide consistently good results in the whole of Clarification whilst eliminating the need for dual flocculant program and the associated hazards from running both powder and liquid batching systems.

The good performance of Nalco 9779 was also noted when low grade local bauxite was included in the refinery bauxite feed.

5. References

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2. Nalco 9779 working well in HRD at Vedanta Alumina refinery.
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