



Nalco Water ScaleGuard™ Improves Mud Washing Efficiency by Extending Washer Life



BACKGROUND

A critical component of the alumina refinery process is the recovery of the caustic soda used to allow dissolution and extraction of the alumina from the bauxite ore. Caustic soda is a high-cost raw material for any alumina refining operation, and maximizing its recovery is critical to the sustainability of the refinery. Also critical to productivity is the minimization of alumina loss throughout the refining process.

The caustic is recovered using counter-current decantation technology, more commonly known in the alumina industry as red mud washing. The process of washing the caustic from the red mud requires numerous washing stages, typically 6, where relatively clean wash water picks up the caustic as it moves from a low-caustic, low-temperature environment to a high-caustic, high-temperature environment. The mud slurry, in contrast, liberates the caustic as it moves from a high-caustic, high-temperature environment to a low-caustic, low-temperature environment.

One of the inherent liabilities with this method of caustic recovery is that instability of the process liquor can be triggered, particularly in the high-caustic, high-temperature washers, which heightens the potential for auto-precipitation, subsequent loss of the valuable alumina and the promotion of scale forming on the internal walls, rakes and associated pipes of the washer tanks. The formation of this scale shortens the washer tank life, restricts

CUSTOMER IMPACT	eROI SM	ECONOMIC RESULTS
Recovered more caustic Extended operational life from 180 to 200 days.	  PRODUCTIVITY COSTS	\$110,000
Reduced tank de-scale turnaround time from 65 to 45 days leading onto further recovered caustic.		\$110,000
Reduced alumina loss via reversion minimization.		\$32,000
Reduced flocculant usage via improved tank hydraulics - lower volume of scale.	 COSTS	\$45,000

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.

overall washer performance and requires excessive descale time, all of which leads to reduced caustic recovery and increased flocculant usage from the reduced volumetric capacity of the washer tank.

Extending the washer tank life by reducing the growth rate and formation of the scale reduces tank turnaround time and limits lost alumina.

SITUATION

An alumina refinery in India wanted to extend the operational life of the 1st washer. The following were key specific goals of the extended washer life:

1. Extend 1st washer operational life to greater than 200 days; current 1st washer life was typically 180 days.
2. Run for longer than 100 days without a “scale event”; a “scale event” occurs when scale which has already formed on the washer walls and/or rake begins to shed which would result in blocked underflow lines and pumps and extensive scale trap maintenance. In extreme scale event cases, alternative means of removing compacted mud were sourced whilst the scale was removed from scale traps over time.
3. Achieve final wall scale thickness of 300mm or less after 200 days; current 1st washer scale thickness was growing at a rate which meant a final scale thickness of greater than 500mm after 180 days.
4. Reduce washer descale time; current washer descale time was around 65 days.

SOLUTION

Nalco Water proposed to the alumina refinery technical staff that our ScaleGuard™ technology be applied to the 1st Washer for a campaign period, and scale coupons be used to measure the performance of the ScaleGuard™ program. The ScaleGuard™ was provided to the refinery on a shared-risk basis. This was agreed to by technical and operations personnel and a trial of ScaleGuard™ commenced when the 1st washer returned to service after de-scale.

The ScaleGuard™ chemical was diluted with readily available process water and the diluted ScaleGuard™ was added to the clear liquor zone of the washer. Scale coupons were placed inside the clear zone, near the overflow outlet of the washer and the rate of scale growth was determined by the weight of the scale deposited on the coupon over time.

During this time, the washer was run as per normal operation, and the usual performance parameters were monitored. Nalco Water personnel maintained the dosing of the ScaleGuard™ to the washer and routinely checked the coupon scale build up and reported back to the refinery technical and operations personnel.

RESULTS

The addition of Nalco Water ScaleGuard™ to the 1st washer enabled the washer to operate uninterrupted, without a scale event, for the entire life of the tank, which was 200 days.

The final thickness of the scale after the 200 days was roughly 50% of that normally seen after 180 days of operation.

The scale growth rate as determined by coupon weight analysis was greatly reduced when ScaleGuard™ was applied as described in Figure 1.

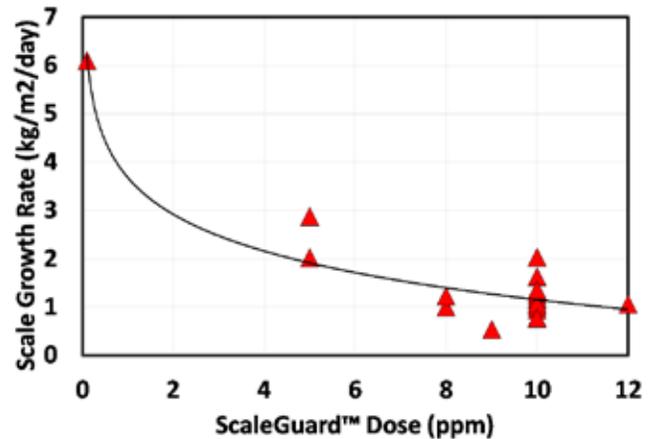


Figure 1. Scale Deposition Rate versus ScaleGuard™ Dose.

The time taken for the 1st washer to be descaled and brought back into operation was reduced to 45 days, a 30% reduction in descale and out-of-service time.

CONCLUSION

Major benefits from the introduction of Nalco Water ScaleGuard™ technology were realized, going beyond the parameters originally set:

1. Extended washer life giving improved caustic recovery, estimated to be \$110,000.
2. Cessation of "scale events" which cause large process upsets and inefficiencies.
3. Tank scale growth wall thickness measured 250mm - a 50% reduction in scale deposited.
4. Less scale was deposited, leading to a reduced time to descale and return the washer to service, an estimated saving of \$110,000.
5. Reduced flocculant usage to the value of \$45,000.
6. Reduced alumina loss estimated to be \$32,000.

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