



# SCALE-GUARD™

## Increases Production at a Phosphoric Acid Plant

**NALCO** Water  
An Ecolab Company

CASE STUDY - CHEMICALS  
CH-2073



### BACKGROUND

Throughout the world, calcium sulfate scale in phosphoric acid plants is a daily cost of doing business. This cost is especially felt in the evaporators, where the acid is concentrated up to 54%. This scale results in:

- Lost evaporator efficiency during the entire production campaign
- Lost production because of cleanings
- Increased expense because of cleaning
- Cleaning operations which can injure employees and damage equipment

Industry leaders have long desired a solution which would transform gypsum scale from a hard and tenacious crystalline structure, to a softer compound which would transfer heat more efficiently and be much easier to clean.

### SITUATION

In a U.S. phosphoric acid plant, the evaporator production campaign lasted 3 weeks, on average. At the end of each campaign, the plant would spend a little over 1.5 days to clean the evaporator for the next production run. Each campaign would produce approximately 370 metric tons (MT) of 54% phosphoric acid per day.

This was their normal operation for many years. Then, their Nalco Water Mining sales rep approached them with a different way.

#### CUSTOMER IMPACT

- Increased daily production by 10 MT
- Extended production campaigns by 100%
- Recovered 13.9 production days

Reduced maintenance cost by decreasing cleaning frequency from 16 times per year to 8.3.

eROI™

#### ECONOMIC RESULTS



PRODUCTIVITY

Increased annual 54% annual acid produced \$4,891,666



COSTS

\$95,000 per year

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

The SCALE-GUARD™ program, consisting of several products formulated to inhibit evaporator scale, was introduced with the goals of:

- Increasing the length of the production campaign
- Decreasing cleaning time
- Decreasing cleaning intensity

Scale samples from the evaporator's heat exchanger were taken and sent to Nalco Water's analytical laboratories, where the elements of the compounds, as well as the make-up of the crystalline structure, were identified. With this information, Nalco Water's chemists were able to identify the correct SCALE-GUARD™ product and dosing regimen. EP310 was chosen. A plant trial was recommended.

## SOLUTION

SCALE-GUARD EP310 was applied at the recommended dose and dosing points. The production campaign lasted 6 weeks, a 100% improvement over their historical operation. Not only did the campaign last longer, it produced more acid. With EP310, the average daily production of 54% acid increased by 10 MT to 380 M

Figure 1 Average of 380 MT per day of 54% phosphoric acid during EP310 trial

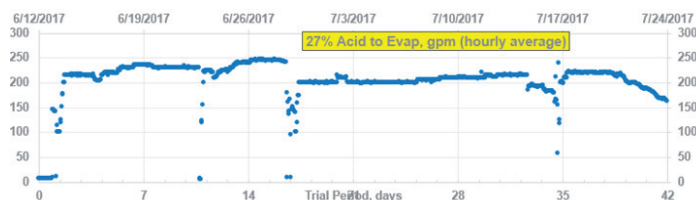


Figure 2 Customer goal of 200 to 240 gallons per minute of feed acid achieved during the course of the trial. Acid feed interrupted on days 9, 16 and 35 because of operational necessities unrelated to the trial. Feed acid tapered as scheduled shut down neared.

SCALE-GUARD EP310 was not allowed to operate beyond 6 weeks because, citing a competitor's trial, the customer was fearful the evaporator would have been too difficult to clean, and therefore erase any gains the increased production cycle would have generated. With the SCALE-GUARD™ program, the opposite was observed.

### Nalco Water, an Ecolab Company

**North America:** 1601 West Diehl Road • Naperville, Illinois 60563 • USA

**Europe:** Richtistrasse 7 • 8304 Wallisellen • Switzerland

**Asia Pacific:** 2 International Business Park • #02-20 The Strategy Tower 2 • Singapore 609930

**Greater China:** 18G • Lane 168 • Da Du He Road • Shanghai China • 200062

**Latin America:** Av. Francisco Matarazzo • n° 1350 • Sao Paulo – SP Brazil • CEP: 05001-100

ecolab.com/nalco-water

SCALE-GUARD, Ecolab, Nalco Water and the logos are Trademarks of Ecolab USA Inc.  
©2018 Ecolab USA Inc. All Rights Reserved 03/18 CH-2073

The usual pressure washing practice cleaned a third of the tube bundle in 12 hours, at 6000 psi (400 bar). With EP310, an equal number of tubes was cleaned in 4 hours, and the water pressure reduced to 4000 psi (266 bar).

Also, the operators stated that normally, if cleaning is effective, the steam pressure at the start of the following production campaign will commence at 12 psi (0.8 bar). However, with EP310, the heat exchanger's steam bundle pressure at the start of the next campaign was at 4 psi (0.27 bar).

This is realized because of the nature of the SCALE-GUARD™ inhibition program. EP310 transforms the scale from being hard, tenacious and difficult to clean, to a softer deposit which transfers heat more efficiently during operation, and allows the heat exchanger to be cleaned more easily.

Figure 3



Evaporator scale without an inhibitor program.

Deposit with the Scale Guard™ program.

## CONCLUSION

By implementing SCALE-GUARD EP310, Nalco Water was able to extend the production campaign of the evaporator from 3 weeks to six weeks, resulting in 13.9 additional days of production per year. This netted the plant an additional annual production 8152 MT of 54% phosphoric acid. Nalco Water's SCALE-GUARD EP310 also decreased wash time by 66% and wash intensity by 33%, reducing cleaning and labor costs while increasing productivity.

The most valuable aspect of the program, according to the customer, was that daily production was increased by 10 MT. The total potential revenue gained from this new program was \$4,891,666 per year.

**NALCO** Water  
An Ecolab Company