CASE STUDY

A Nalco Water defoamer helped a Saudi Arabian phosphate beneficiation plant increase production by 8%, growing their revenue by $4.95M per year

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BACKGROUND

Located in Turaif, Saudi Arabia, a large company mines phosphate rock and produce phosphoric acid. The operations include a phosphate beneficiation plant and phosphoric acid plant that are supported by utility and sulfuric acid plants. The beneficiation plant is designed to supply phosphate-concentrated ore to the phosphoric acid plant, and the phosphoric acid plant produces 54% phosphoric acid.

The beneficiation plant produces approximately 625 Mt / hour of phosphate concentrate with a plant yield of ~37% and slime loss of 25-30% based on the total feed. To produce the concentrate, the rock phosphate is wet ground with ball mills, and then deslimed and screened. After this process, the slurry is fed through a flotation circuit, during which the ore is enriched with P205 content and separated from the waste materials. After the flotation process, the enriched ore is thickened before being transported to the phosphoric acid plant for manufacturing. The waste material, or tailings, are also thickened and pumped into a slime pond.

SITUATION

Nalco Water has an established partnership with the customer through other operations, delivering chemistry solutions for a separate alumina refinery since 2012. In 2016, the mining company began manufacturing phosphoric acid at the facility in Turaif. Because of our long-standing relationship, Nalco Water was asked to supply water treatment chemicals to the utility plant that supported the beneficiation operations.

After starting operations, the beneficiation plant was unable to maintain productivity at the designed capacity. When the plant attempted to operate all 5 of its ball mills at full capacity, excessive foam was generated downstream in the process, which often caused the foam to spill over onto the plant floor. Foam spills cause safety challenges and require significant water to clean, so the plant needed to restrict productions in order to avoid excessive foam. Because of the restrictions, the plant was unable to produce the amount or grade of ore required for phosphoric acid manufacturing.

ANNUAL SAVINGS

PRODUCTIVITY

Production increase of

8%

per year

WATER

Freshwater reduction of

52,500 m3

per year

HUMAN HEALTH & SAFETY

Reduced Foam

Creating safer work environment

VALUE DELIVERED

Revenue increase of

$4.59M ANNUALLY

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The plant needed a program that controlled foam while maximizing production capacity. As an existing partner for their utility water treatment program, Nalco Water was asked to help the plant overcome the production bottleneck.

SOLUTION

Nalco Water began lab testing different types of defoaming agents that would fit the production needs of the beneficiation plant. The results of the testing showed that the defoamer, 71D5PLUS, performed the best under several different process conditions.

The Nalco Water Research, Development, and Engineering (RD&E) team also confirmed that the defoamer would not cause any adverse effects in the downstream process under the specific operating conditions of this plant. After completing lab and small-scale trials in late 2017, Nalco Water completed full scale plant trials with the defoamer in early 2018.

RESULTS

During the trial, Nalco Water tested the effects of the defoamer on several downstream operations, including at the slime thickener, at the desliming cyclones, and in the flotation circuit. With the application of 71D5PLUS, Nalco Water found that no or less downstream foaming occurred when all 5 ball mills were operational, as compared to when 4 or less mills were operational without the application of 71D5PLUS.

The 71D5PLUS defoamer program enabled the beneficiation plant to increase production levels to full capacity, which helped the plant generate 120 tons of concentrate per day or 39,600 tons per year. By enabling the 8% production increase at the beneficiation plant, Nalco Water helped the customer gain an additional $4.95M of revenue per year through increased P2O5 manufacturing.

In addition, by removing the excessive foam, Nalco Water helped to eliminate foam spills, which generated significant freshwater savings and created a safer work environment. The beneficiation plant uses 175,000 m3 of freshwater per year for cleaning, and foam spills accounted for approximately 30%. By introducing the defoamer, Nalco Water helped the customer save approximately 52,500 m3 of water annually.

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