Buckman

WATER TECHNOLOGIES

CASE HISTORY

Improved scale control in a Mechanical Vapor Recompression (MVR) evaporator at a steel plant in South Africa

Background

The plant uses a Mechanical Vapor Recompression (MVR) evaporator. However, the unit was not operating to design specifications due to scale buildup. The competitor's program employed an antiscalant that did not perform well, and seeding of scale occurred in the MVR. This resulted in severe calcium sulphate formation in the condenser tubes and the evaporator.

Action

Buckman initiated an ongoing program to monitor the efficiency, recovery levels and availability of the MVR evaporator, as well as regular inspections to verify for the quantity and texture of the gypsum as part of the chemical conditioning of the evaporator. Part of the monitoring also involved documenting:

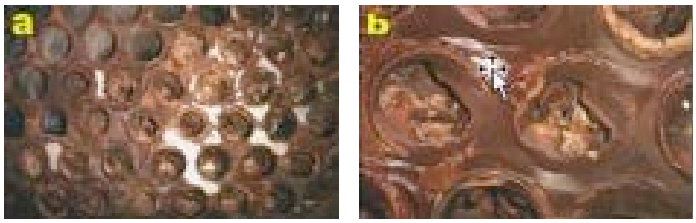
a. the frequency of forced shutdowns
b. ΔT over first leg condenser
c. specific gas consumptions

Results

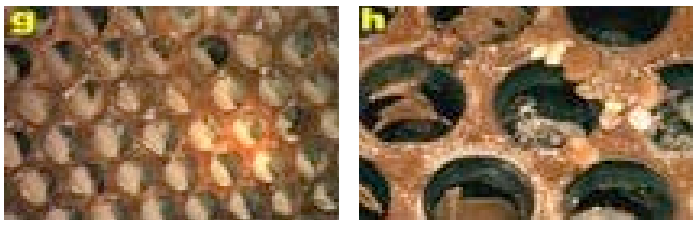
After the implementation of the Buckman treatment and monitoring programs based on a crystal modifier scale inhibitor, the hard true scale morphology was not only reduced in volume, but the residual scale consistency became soft and easy to remove. Some blocked tubes and accumulation of scale in the low flow areas was due to old scale fragments. Initially, frequent shutdowns were inevitable due to the amount of deposits recirculating in the system. However, as the old scale pieces were removed, new scale formation dramatically subsided. After eleven months of cleaning, shutdown frequency was extended from 3 months to 9 months.

Pictures a and b are photographs taken of the first leg condenser in the evaporator just before the cleaning and application of the Buckman program in 2001, whereas pictures g and h were taken in 2002 after continued use of the Buckman program.

Images below show the first leg condenser of the evaporator.



16 Oct. 2001(before cleaning)



17 July 2002 (before cleaning) *30 Sept. 2002 (before cleaning)*

Benefits

The plant significantly benefited from changing to Buckman. With the change to a crystal modifier scale inhibitor, major improvement was seen with the Mechanical Vapor Recompression (MVR) evaporator through improved evaporator efficiency, recovery and availability with reduced scale formation. As well, a significant reduction in the frequency of physical cleaning was achieved (based on records on the shutdown frequency).

Additional benefits are reduced boiler gas consumption due to more steam and condensate produced by the evaporator (see graph of specific gas consumption on

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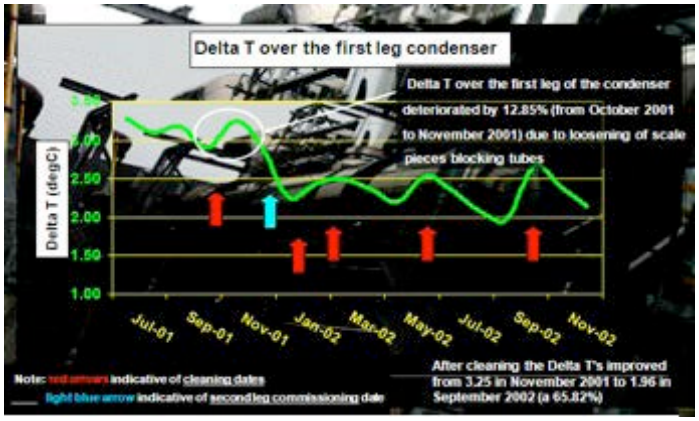

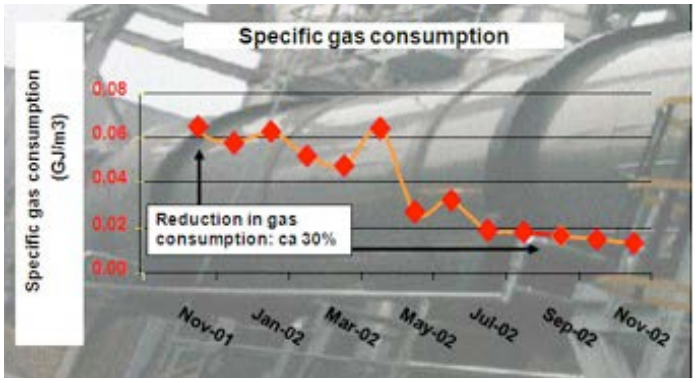

page 2) and improved Delta T's over the condensers (see graph of ΔT over first leg condenser).

ROI/E:

Water and energy savings resulted from minimizing the need for shutdown and cleaning.

- High pressure cleaning costs were reduced from US$ 0.07/m³ to US$ 0.01/m³ (75% saving)
- Based on 2 Ml/day this equates to an annual saving of US$ 43,800.

Energy was also saved as a result of reduced scale formation.

- Boiler natural gas costs were reduced from US$ 0.22/m³ to US$ 0.16/m³ (30% savings).
- Based on 2 Ml/day this equates to an annual saving of US$ 43,800.
- The return on investment (assuming a constant chemical and production expenditure) equals 22.62% on product produced for the period of the evaluation.
- Based on an average efficiency of 90% for the design feed of 92 T/h the amount of effluent treated is 82.8 t/h, equal to 2 Ml/day. Laboratory investigations and the plant trial provided a world-class solution for an intensive calcium sulphate scaling problem.