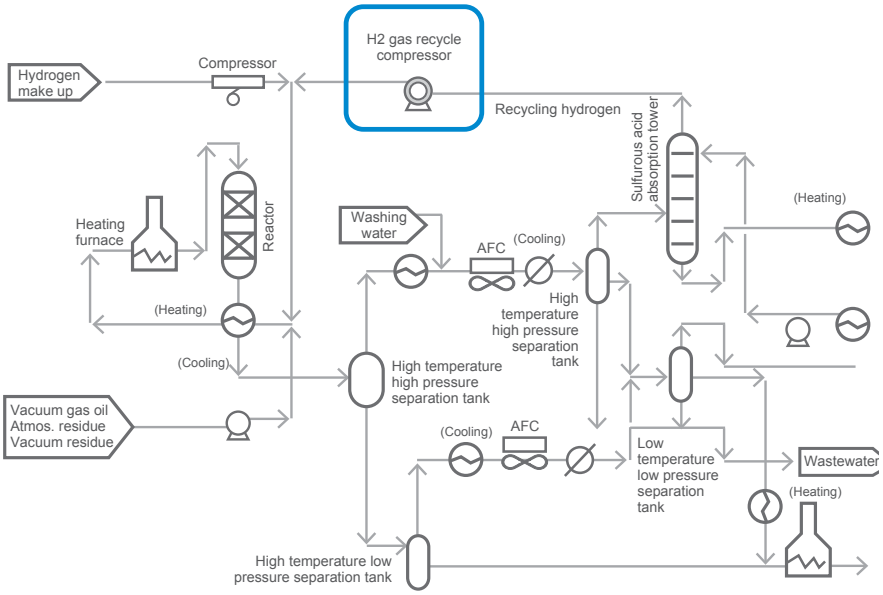
REFINERY IMPROVES COMPRESSOR OUTPUT BY 16% WITH KURITA DROPWISE CONDENSATION TECHNOLOGY

>15% Improved compressor output	Stable operation	Steam reduction

BACKGROUND

In the residue hydrotreating process, the hydrogen recycle compressor is driven by a condensing steam turbine. At this location, the turbine surface condenser is cooling with seawater. In the summer, the water temperature increases, the result being insufficient cooling. This, in turn, restricts the hydrogen output from the compressor.



Compressor to which this technology is applied.

The residue hydrotreating process removes the sulfur compounds in residue oil coming from a crude distillation unit. In this process, having adequate hydrogen available to react with the sulfur is critical for optimal operations.

The plant had surplus hydrogen, which needed to be recovered in the recycle compressor. If this recovery rate decreases, then the necessary mixing ratio of oil and hydrogen cannot be maintained, causing problems such as deterioration of the catalyst.

SOLUTION

Kurita worked with the customer to find an innovative solution for their challenges, which included Kurita Dropwise Condensation Technology. Kurita Dropwise is dose continuously into the steam line in front of the target heat exchanger. It creates a water-repellent film on the heat transfer surfaces, which can improve the heat transfer coefficient on the steam side of the exchanger. The improved heat transfer can increase productivity, improve reliability, and reduce energy use.

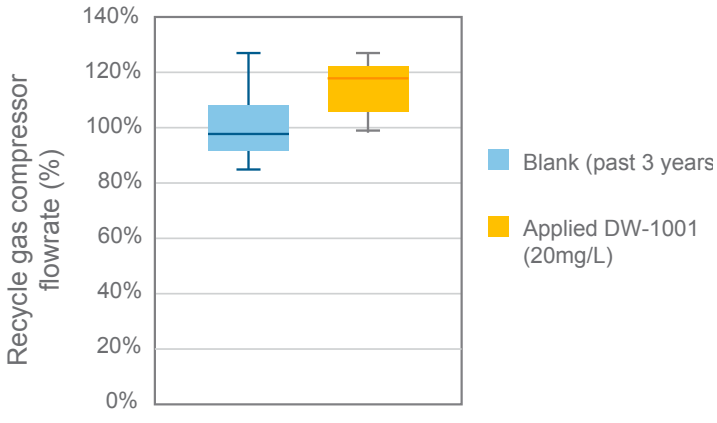
At this location, Kurita Dropwise was continuously injected into the steam line downstream of the steam turbine of the hydrogen recycle at a rate of 20 milligrams per liter (mg/L) to steam. Kurita used past operation data as a baseline for comparison to after the application of this technology. The result was an increase of hydrogen output from the centrifugal compressor and reduced steam consumption relative to degree of vacuum.

RESULTS

Injecting Kurita Dropwise provided the plant with positive results. As shown in the figure below, after the application, the flow rate of the compressor increased by about sixteen percent on average, and the problem was solved. The output of the hydrogen recycle compressor was significantly improved. It optimized the mixing ratio of hydrogen and residue feed, which helped maintain stable operations.

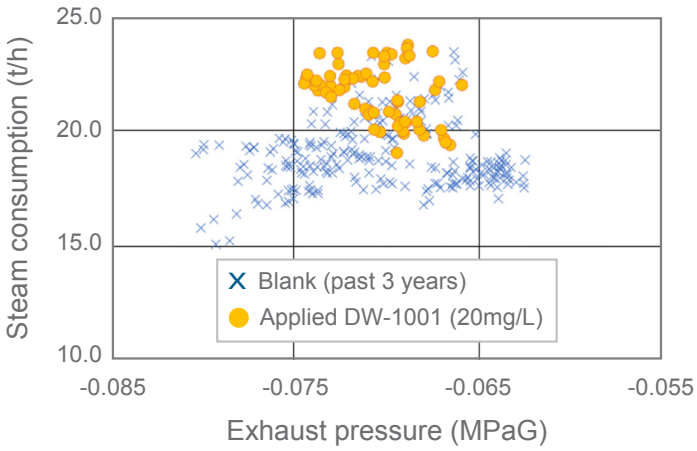
Additionally, the application of this technology suppressed the deterioration of the degree of vacuum, introduced more steam into the turbine, and — as a result — improved the output of the compressor.

Kurita Dropwise also helps customers reduce energy consumption and costs. When the plant load is low, the effect of steam reduction can be obtained. It is an important initiative for realizing a sustainable society.



Result of application of this technology (Increase in compressor flowrate)

** Data are compared with seawater temperature over 22 deg.C.*



Relationship degree of vacuum and steam consumption

** Data are compared with seawater temperature over 22 deg.C.*