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MERICHEM COMPANY



LO-CAT[®] II PROCESS OPTIMIZATION OF A SULFUR RECOVERY UNIT

Prior to Suncor's purchase of the Spirit River facility, little attention was given to the LO-CAT[®] unit. In general, over injecting chemicals into a LO-CAT unit will not result in operating problems, just higher than required operating costs. Consequently, in remote gas plants such as Spirit River, it is sometimes difficult to convince operators to change operating conditions if the unit is not presenting any operating problems. However, this is not Suncor's operating philosophy.

Upon taking ownership of the facility, Suncor contacted Merichem and stated that the operating costs associated with the LO-CAT unit were not cost effective and something had to be done about chemical consumption, power consumption and the disposal cost of blowdown liquid or the unit would be shutdown.

At this point, Suncor and Merichem started working closely together to optimize the system.

The Suncor LO-CAT unit is operating at close to the design conditions of 123.4 Nm³/Hr of acid gas containing 57.5% H₂S (2.19 MT/day of sulfur). As suspected, an initial examination of the unit and a review of historical operating data show that the chemical addition rates were much higher than the original design rates, and that the operators were maintaining a lower solution specific gravity than required by maintaining a higher than normal blowdown rate. For example, the iron concentration was being maintained at more than twice the design level while the chelate concentration was more than three times the design level. In addition, the

LO-CAT[®] II PROCESS

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TABLE 1: Summary of Results

	Before Changes	After Changes
Natural Gas to Plant, MMCFD	20	20
H ₂ S Removal Efficiency, Vol. %	99.99%	99.99%
Sulfur Removed, MTPD	2.2	2.2
Number of Operators	6	3
Number of Blowers Operating	2	1
LO-CAT Chemicals, \$/MT Sx	~\$300/Ton	~\$150/Ton
Power, KW	139.7	74.7

system was designed to operate with one air blower in operation; however, the unit was being operated with both air blowers in operation. These conditions resulted in a very positive, solution which promoted the formation of sulfate over thiosulfate resulting in a high chelate oxidation rate. Consequently, this highly oxidized solution state resulted in high salt formation and thus a high blowdown rate to maintain solution specific gravity. The high blowdown rate resulted in an increased iron replacement rate and higher than required solution disposal costs. The unit also experienced symptoms such as occasional sparger plugging, indicating the solution was close to saturation.

The obvious remedy to Suncor's problems was to get the solution chemistry back to a normal state. This was accomplished by discontinuing the chemical addition of the makeup chelate and iron. In addition, one air blower was shutoff, immediately reducing power consumption by 50%. During this period, Merichem monitored the solution chemistry biweekly. Over a short period of time, the iron, chelate, and stabilizer concentrations and the solution specific gravity were brought into line. The chemical addition and blowdown rates were then re-established at rates corresponding to actual processing conditions of the unit. When the unit was operating at design conditions, power consumption, chemical costs and disposal costs were reduced by approximately 50%, thus achieving operating costs, which were in line with Suncor's requirements. In addition, sparger plugging was greatly reduced. These reductions were achieved while maintaining an H₂S removal efficiency of greater than 99.99+%. Table 1 summarizes the before and after operating costs.

It is important to note that these cost savings were obtained by optimizing the system. No daily detailed chemical analyzes were required, just simple redox potential, pH and specific gravity readings. Although it took years to get the LO-CAT solution in a state of near saturation, the situation was remedied in a matter of weeks.

Although dramatic reductions in chemical costs were achieved at the Suncor facility, even more chemical savings can be realized in modern LO-CAT units due to the ability to more accurately control thiosulfate concentration.

CONCLUSIONS

A determined commitment to teamwork by Suncor and Merichem has resulted in a significant reduction in plant operating costs in the LO-CAT unit while maintaining H₂S removal efficiency and ease of operation. As summarized by the plant operation staff—"Chemical consumption and cost savings are important to Suncor. The ultimate is to remain emission free while running as economical as possible. This process can run emission free which will in turn guarantee the safety of the plant operators and our environment."