



Oil & Gas

## AMINE MANAGEMENT<sup>SM</sup> PROGRAM FROM DOW HELPS GS-CALTEX OPTIMIZE ITS REFINERY UPGRADES

### The Challenge: Maximizing Upgrader Performance and Profits.

GS-Caltex is headquartered in Seoul, South Korea, and is the country's second largest refiner. To upgrade their facility and begin processing lower quality oil feedstocks, such as heavy and sour crudes from Venezuela, Canada or the Middle East, into high-quality oils and lubricants for export, they added a heavy oil upgrader unit to help provide the marketplace with more valuable and useful feedstocks and end products – and boost GS-Caltex's profitability. To fully optimize the profit potential of these crudes – and minimize both operating expenses and environmental impact – the safe and efficient removal of sulfur-containing species, including H<sub>2</sub>S and mercaptans, would be critical. Methyl diethanolamine (MDEA) was initially recommended as the treatment solvent. However, based on processing experience with previous upgrader systems, GS-Caltex specifically requested the UCARSOL<sup>TM</sup> line of specialty amines, as well as the service and technology provided by Dow Oil & Gas.

GS-Caltex's Yeosu Refinery is now designed to process 113,000 barrels/day of Bunker C oil (a low-quality feedstock used to make asphalt, for example) into higher quality oils for export into the international market.

The entire system consists of:

- Vacuum distillation unit
- Hydrocracker
- Lubricant oil production unit
- Sulfur recovery unit

The heavy oil upgrade was GS-Caltex's third such project in the refinery. At a price tag of US\$2.8 billion, it also represented the largest single investment in the country's refining industry.



**Dow's Solution: AMINE MANAGEMENT™ Program.** Over 250 amine units in Asia Pacific and more than 1,000 units worldwide utilize Dow solvents for effective acid gas removal. The UCARSOL™ solvents are specially formulated MDEA-based solvent packages that have been used to efficiently remove acid gases. After reviewing the needs of the refinery and performing thorough simulations, Dow's technical expertise was utilized to select the best UCARSOL package for GS-Caltex.

Based on the successes in treating two previous upgrader units, coupled with a thorough analysis of the expected treatment criteria for crude feedstocks in the new unit, Dow chose UCARSOL HS 101 Solvent. Possessing a high capability to selectively remove H<sub>2</sub>S from acid gas mixtures, UCARSOL HS 101 Solvent provides several important advantages:

- Improved treatment selectivity compared to conventional chemistries, such as monoethanolamine, diethanolamine, triethanolamine or diisopropylamine
- Reduced energy demands in processing compared to other chemistries
- Increased processing capacity of existing equipment
- A high degree of chemical stability, thus reducing the need for solvent reclaiming



## **COMPREHENSIVE SERVICES, CUSTOMIZED FOR GS-CALTEX**

As part of the AMINE MANAGEMENT<sup>SM</sup> Program, Dow was able to help ensure timely and efficient delivery of the UCARSOL<sup>TM</sup> HS 101 solution for the GS-Caltex refinery using:

- **Computer simulations of the proposed oil upgrading system.** Dow conducted a series of amine system simulations for the upgrader units. This, coupled with a review of the design specifications for the standard unit, allowed Dow to offer design changes that boosted the performance of the units, while lowering capital expenditures. Based on the overall experience in the refinery, Dow was able to help optimize the integrated system, which was composed of all three units.
- **Local technical support from readily available experts.** Dow provides subject matter expertise in the areas of chemistry, simulation, design and process engineering, which is available in the region and can be quickly deployed when needed. This local resource proved valuable in resolving a foaming problem in upgrader unit #2 in 2008. Within a few hours of being notified of the problem, Dow experts arrived at the refinery and worked in tandem with GS-Caltex to identify the source of the foaming. Troubleshooting identified the root cause as a faulty activated carbon filter, which was quickly replaced to get the unit back online.
- **Insightful, comprehensive and ongoing analysis of system parameters.** Dow collects samples from GS-Caltex's amine unit on a routine basis and analyzes them to ensure that the quality of solvent is maintained throughout the treatment cycle. Dow then reports these findings back in a matter of weeks, helping GS-Caltex make any necessary changes to their unit to avoid amine consumption, contaminant build-up or corrosion.
- **Nimble supply chain with a global reach.** Dow has a robust supply chain that is designed to keep GS-Caltex stocked with the product they need, when they need it. When the refiner needed 800 MT of UCARSOL solvent delivered in one shipment, Dow was able to carefully and successfully coordinate the scheduling, manufacturing and supply chain logistics to deliver 40 pressurized tank containers at one time, a task other regional suppliers were not able to accomplish.

GS-Caltex's third upgrader unit started in October 2010 and has been running smoothly from the outset. Dow's technical service representatives have provided ongoing support that consistently exceeded expectations and has ensured that the UCARSOL<sup>TM</sup> HS 101 Solvent is delivered on time and on specification.

**TO LEARN MORE...**

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