Control Amine Losses and Boost Capacity in Refinery LPG Units with UCARSOL™ Specialty Solvents

Customized Solutions for Treating Liquefied Petroleum Gases
A Unique Solution for a Common Challenge

Refineries around the world share a common processing challenge with liquefied petroleum gases (LPGs) – those lighter C2-C5 components of the hydrocarbon stream that separate out, at different temperatures, at the top of the distillation tower. While these LPGs are valuable feedstreams for applications from motor and cooking fuels to heating and refrigeration, acid gases such as hydrogen sulfide (H₂S), carbonyl sulfide (COS) and carbon dioxide (CO₂), can cause processing problems in the form of high corrosion rates and sulfur emissions.

Dow Oil & Gas has an extensive portfolio of specialty amines for treating this challenge, including our full line of UCARSOL™ solvents – specifically formulated to meet the unique removal targets of each refinery, thereby helping to reduce amine losses, reduce corrosion, treat contaminants and increase capacity. If the product you are currently using does not meet the treatment needs of your amine system and LPG absorber, we will work with you to develop a suitable solution. It’s all part of our AMINE MANAGEMENT™ Program, a unique Dow service offering that optimizes performance in gas treating systems with input from our expert technical team.
**Lower Solubility Reduces Losses**

**Challenge: Expensive Amine Losses.** Unlike other amine treating systems, LPG treaters require the contact of two liquid streams – the solvent and the LPG – to remove impurities. As much as 80 percent of amine losses in a refinery amine system occurs in the LPG absorbers, because amine is soluble in LPG. Conversely, LPG is soluble in the amine and has to be managed appropriately to optimize the amine system.

**Dow’s Solution:** UCARSOL™ products have lower solubility (see Figure 1), which can minimize the need for a downstream LPG water wash system used to recover the amine from the LPG. **This can reduce amine losses by up to 60 percent.** In addition to reducing solvent losses (see Figure 2), UCARSOL solvents can add treating capacity to the amine system, which has the potential to reduce treatment load to a downstream Merox* unit.

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**Figure 1: UCARSOL™ Solvents Have Lower Solubilities in LPG Compared to MDEA**

![Solubility of Refinery Solvents in Cracked LPG](image)

**Figure 2: Conversion Leads to Significant Improvements**

![Refinery Example – Amine Losses](image)

*Merox is a trademark of UOP LLC.*
**More Effective Removal Increases Capacity**

**Challenge: Treating Contaminants.** The presence of CO₂ and many sulfur species in the LPG stream, if not adequately removed, may not be treated in the amine unit and will pass to the downstream units, causing them to be sized larger than necessary and increasing capital expenditures for the refinery. This loading is particularly problematic for COS, which is slower to react with the amine than H₂S. Much of the amine absorption capacity is used in the H₂S reaction, leaving COS to carry over at concentrations well above the 1-2 ppm specification required for fuels, raising downstream processing costs.

**Dow’s Solution:** Many UCARSOL™ technologies can help remove COS and CO₂ to their desired specifications (see Table 1), while also minimizing amine carryover and reducing the need for, and cost of, downstream treating.

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Expected % COS/CO₂ Removal¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCARSOL™ HS-101</td>
<td>20-40</td>
</tr>
<tr>
<td>UCARSOL HS-115</td>
<td>20-40</td>
</tr>
<tr>
<td>UCARSOL LE-713</td>
<td>70-95+</td>
</tr>
<tr>
<td>UCARSOL LE-777</td>
<td>80-99</td>
</tr>
<tr>
<td>UCARSOL LE-801</td>
<td>80-99</td>
</tr>
</tbody>
</table>

¹Highly dependent on process conditions

Dow’s Technical Service personnel select the right UCARSOL solvent based on a balance of the desired removal of COS and CO₂. The solvent’s solubility in the LPG stream is also taken into account to minimize solvent losses and further optimize the system. All parameters are modeled, and the product best suited for the refinery’s particular criteria is selected.

**Fewer Impurities Reduces Corrosion**

**Challenge: Corrosion Rededication.** Acid gases such as H₂S, COS and CO₂ found in the LPG system must be removed to prevent corrosion and produce a final, clean product.

**Dow’s Solution:** UCARSOL™ solvents (as formulated MDEA solutions) enable greater contaminant removal compared to primary and secondary amines like MEA, DGA, DEA and DIPA, thus lowering corrosion rates of the LPG.
AMINE MANAGEMENT℠ Program – Cutting-Edge Technology Coupled with Expert Technical Service

A unique and comprehensive service offering from Dow Oil & Gas, the AMINE MANAGEMENT℠ Program targets gas treating amine systems to achieve environmental compliance while improving reliability, reducing energy costs and preserving the integrity of assets. A Dow Oil & Gas professional will provide a complimentary amine unit evaluation, detailing the site’s specific gas treating needs and recommending a customized solution to improve gas treating performance. Using our advanced simulation capabilities and leveraging our wide selection of specialty solvent blends, we can help maximize capacity, increase energy efficiency and lower operating costs. Periodic follow-up evaluations are also provided to help maintain these efficiencies.

Experience You Can Trust

Dow has been helping customers meet their gas treating needs for more than 65 years. Backed by more than 1,000 global references in gas treating, we work to maximize value for our customers through extensive industry knowledge, advanced innovation and chemistry expertise.

A Note About Product Safety

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