Heat Stable Salt Management

Introduction
Amine based gas treating systems can have problems with Heat Stable Amine Salts (HSAS). HSAS cause corrosion, reduced amine capacity poor unit operations, reduced solvent life and solvent disposal problems. The Dow Chemical Company has developed a program that minimizes the problems associated with HSAS, maximizes solvent life, and restores operational reliability. Dow’s Heat Stable Salt Management Program is based on a low total cost approach to treat HSAS, reduce HSAS contamination, and minimize the corrosion from HSAS. It is a part of Dow’s AMINE MANAGEMENT™ Program.

Benefits of Heat Stable Salt Management
The problems associated with unmanaged HSAS can substantially increase costs and reduce amine system equipment performance and reliability. The Heat Stable Salt Management Program allows the operator to effectively control HSAS and:

• Reduce corrosion and equipment replacement costs
• Reduce or eliminate solvent disposal and associated environmental costs
• Optimize amine system capacity for acid gases and avoid unit shutdowns
• Minimize maintenance costs due to system cleanings and frequent filter changeouts
• Avoid high energy and solvent usage

Heat Stable Salt Management Program Elements

Monitoring and Prediction
Solvent analyses determine the HSAS profile and predict when remedial action is necessary.

Control Strategies
System configuration is studied to determine if operations can be adjusted to reduce the formation of contaminants or to achieve more effective removal of contaminants upstream of the amine system.

Neutralization Technology
Dow has developed and tested in both the field and laboratory a cost-effective means of controlling HSAS via neutralization. The resulting neutralized salt is substantially less corrosive than the amine salt. Therefore, the solvent can tolerate a higher level of HSAS-forming anions, and amine solution life is extended significantly, if not indefinitely. UCARSOL™ DHM™ Neutralizer has been developed to easily and effectively neutralize HSAS. Dow’s technical representatives will assist in organizing a neutralization and monitoring program specific to your HSAS problem.
Removal
The system might eventually require some type of solvent purification, especially if solvent losses are low. Purging the solvent to remove HSAS loses valuable amine and is no longer economically or environmentally justifiable. Dow has developed a more cost-effective and cleaner method of solvent purification: the patented UCARSEP™ Amine Reclamation System for on-site and on-line salt removal. This process has been used to clean up UCARSOL, MDEA, and DEA solvents without interruption of amine system operations. For more information, call Dow at the numbers on the back cover of this brochure.

Corrosion Effects of Heat Stable Salts
Figure 1 shows how corrosion rate increases with increasing formate ion concentration in two MDEA solutions. Some other common anions have similar effects.

Figure 1 • Effect of Formate HSAS on Corrosion Rate of Field and Model MDEA Solutions

Effect of Neutralization
Heat stable amine salt management/neutralization reduces the operating and corrosion problems associated with HSAS. This control increases the capacity of the solvent for the allowable HSAS anions and greatly reduces the frequency of solvent purification, reclamation, or disposal. Figure 2 provides a dramatic illustration of the effectiveness of Dow’s Heat Stable Salt Management Program, with a reduction in solvent purification and cost while maintaining low corrosion and smooth operations.

Figure 2 • Effect of Neutralization
Performance

Plant operating conditions and efficiencies are maintained at consistent and predictable levels with the Heat Stable Salt Management Program. Actual operating parameters — heat exchanger efficiency, heat exchanger pressure drop, and absorber pressure drop — before and after neutralization are shown in Figures 3 and 4, respectively.

Figure 3 • Plant Operating Parameters vs. Time Before Neutralization

Figure 4 • Plant Operating Parameters vs. Time After Neutralization with UCARSOL DHM Neutralizer
Table 1 summarizes the reduction in actual maintenance requirements over six-month intervals before and after neutralization.

Table 1 • Maintenance Before and After Neutralization of a Refinery UCARSOL Solution with UCARSOL DHM Neutralizer

<table>
<thead>
<tr>
<th>Type of Maintenance</th>
<th>6 Months Before Neutralization</th>
<th>6 Months After Neutralization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Heat Exchanger Water Washes</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Number of Absorber Tray Water Washes</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Number of Particulate Filter Changes</td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

**AMINE MANAGEMENT Program**

The Heat Stable Salt Management Program is part of Dow’s overall AMINE MANAGEMENT Program. It is specifically designed to address HSAS problems and can be used in conjunction with amine management for total low cost amine system operation or by itself to provide operators with a focused, low-cost approach to HSAS problems.

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