DEYLAMAN
Filtration | Separation

NAPTA Services

Understanding the Effect of **Heat Stable Amine Salts**

Heat Stable Amine Salts (HSAS) are formed when the amine solvent reacts with acidic components stronger than H_2S and CO_2. Typical acidic components (but not limited to) include acids that form salts of chloride, sulphate, formate, acetate, oxalate, cyanide, thiocyanate and thiosulphates. Heat Stable Salts (HSS) are slightly different from HSAS because they do not need to include an amine molecule in the salt. HSS in amine solvents can also be formed when the acids react with a strong base like NaOH, Na_2CO_3, KOH or K_2CO_3. Heat Stable Salts (HSS) are therefore a more general term than Heat Stable Amine Salts (HSAS).

Problems can occur when the salt stability decreases to the point where some disassociation takes place in a site-specific location in the unit. Corrosion occurs when the disassociation creates a corrosion cell with metals in the system.

Problems can also occur when the weakest bound salts dissociate in the reboiler and the acidic part of the salt evaporates. This can lead to the condensation of acidic vapours in colder parts of the reboiler and regenerator. As the amine solvent has a much lower volatility than for instance formic and acetic acid, no base is present in the vapour to neutralize the acid after condensation. The vapours condensing in cold part of the reboiler, the piping to the regenerator and the regenerator itself can therefore have a very low pH. The low pH of condensing vapours in relatively cold places in the reboiler and regenerator will significantly increase the corrosion and erosion rates. Besides increased corrosion, HSAS can increase the foaming tendency because particularly organic acids are surfactants.

The presence of strong acid anions in the amine solution can also influence in a positive way the regeneration of the solvent. In the regenerator strong acids will help to strip the solvent to very low levels of H_2S and CO_2. Details of the limitations, disadvantages and advantages can be provided and simulated by NAPTA in a more detailed study.

How to deal with Heat Stable Amine Salts in amine systems?

There are five different methods to control the level of HSAS and corrosion in amine systems:

1. Bleed or purge amine to control the level of HSAS in the amine solvent. High OPEX.
2. Neutralise the HSAS with a strong base like inorganic base like KOH. If the ingress of HSAS is very high some bleed or purging of the amine solvent may be required. Very cost effective with no CAPEX and low OPEX.
3. Removal of HSAS by Ion Exchange. Medium CAPEX and medium OPEX.
4. Removal of HSAS by Electrodialysis. Requires less CAPEX than Ion Exchange and roughly the same medium OPEX.
5. Vacuum distillation. Highest CAPEX option and similar OPEX. The most important advantage is that it is the only way to remove non-ionic amine degradation products.

NAPTA will help you to evaluate the most cost-effective HSAS control technology based on the characteristics of your plant conditions.

Drawing on the NAPTA Corporation's know-how heritage, NAPTA's technology is designed to operate safely, reliably and efficiently, and to help maximise the return on investment during the entire life cycle of a unit.

In addition, we also offer after-service and operational support delivered by experienced personnel. NAPTA can provide assistance during design, installation, operation and troubleshooting units. In the project phase, NAPTA can support its customers by providing professional services such as P&ID, HAZOP review meetings, etc. NAPTA experts can conduct a site visit for better understanding of site-specific issues and training of local operational and technical staff.

For more information, please contact with NAPTA's technology SME Mr Egbert van Hoorn via herein below contact details.

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