



CCR Technologies Inc.

Technical Bulletin

Formamides

N-formyl amines (formamides) are generally found in gas treating solutions that are based on primary (MEA and DGA®) and secondary (DEA) amines. Under certain conditions primary and secondary amines react with the formic acid in solution (via dehydration) to form n-formyl amines. For the rest of the discussion we will focus only on n-formyl DEA (also called DEA-F).

The data from process solutions containing formate as a Heat Stable Salt (HSS) anion shows that there is an equilibrium relationship that exists between the amount of formate HSS in solution and the amount of DEA-F in solution. See the equation below.



Since the above equation represents equilibrium, it is then possible to also hydrolyze DEA-F back into DEA and formic acid. The heat and water content both present in the stripper of the amine unit will generate a new equilibrium if the balance of the equation is disturbed by removing one of the above components. If a slipstream of the circulating solution is processed while the amine unit is on line, it is then possible to remove a portion the DEA-F from solution *indirectly* by removing the formate anion and disturbing the above equilibrium. This removal mechanism takes place when ion exchange, electro dialysis, and vacuum distillation are used. On the other hand, the vacuum distillation process is able to remove both the formate anion, **and** the DEA-F *directly* from the circulating solution.

If the DEA solution is reclaimed in a batch mode (tank to tank) rather than processing a slipstream of solution while on line, it necessary to understand what happens to the DEA-F in solution. If you use ion exchange or electro dialysis to remove the formate anion (since they both only remove ions), the DEA-F still remains in solution. The DEA-F remaining in the solution will “liberate” a formate anion to reestablish equilibrium when the solution is placed back in the circulating solution. On the other hand if you use vacuum distillation to process in a batch mode, the formate **and** the DEA-F will be removed since the process achieves complete removal on a per pass basis.

Summary

Under certain processing conditions ion exchange and electro dialysis will remove the HSS anions only, leaving you with contaminants in the system that may then accumulate in the circulating DEA solution. Vacuum distillation will not only remove all of the contaminants in the circulating DEA solution, but will also remove all of the contaminants from the system if batch processing is employed. Batch processing has been found to be the most efficient way to reclaim solutions and the vacuum distillation process allows you to select the water content of the reclaimed material for storage or transportation purposes.

For more information contact CCR Technologies Inc. in Houston at 281-988-5800, or visit us at www.reclaim.com.