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Efficient Amine Reclamation with Minimal Operation Impact using Electrodialysis Tecnology

Amine unit contamination with non-regenerable salts, whether as a result of acid or inorganic salt incursion, or solvent degradation, is a common industry problem. In MEA systems this is usually redressed by the use of a "reclaimer" but this is not a practical solution for DEA, MDEA or formulated solvents. Similarly, the old approach of "purging" solvent is no longer economically or environmentally justifiable. Neutralization of amine salts with a strong base can significantly prolong the useful life of an amine solution but, eventually, some of the salt may have to be removed, especially if mechanical losses are low. Electrodialysis (ED) has recently been applied to this problem and has been found to overcome many of the disadvantages of vacuum distillation and ion exchange technologies, both of which have been used in recent years for solvent clean-up.

Since 15 years Electrodialysis is the only method to remove non-regenerable salts (HSAS) that does not have a direct impact on the operation of the amine unit. Amine is sent to the electrodialysis unit and is returned in exactly the same state, except that the level of salts has been reduced. There is no need to modify the operation of the amine unit in any manner when the electrodialysis unit is on line. Electrodialysis units are also now available as fixed units for application were the growth rate of HSAS is constant.

The use of reclamation technology such as electrodialysis is becoming a consolidated and popular method of controlling heat stable amine salts (HSAS) in refinery, natural gas plant, Carbon Capture with amine solutions. Up to now proper control of the level of heat stable salts was not considered a priority for many operators. Salt levels were often well above recommended levels. HSAS were essentially non-controlled. The concentration was controlled by the often-important losses of amines from various points in the amine system and by the resultant high quantity of make-up amine that was added to the units.
HSAS levels now play important roles in optimising the energy efficiency of amine units, are critical for the control of corrosion and are a factor in the amount of amine lost due to foaming.

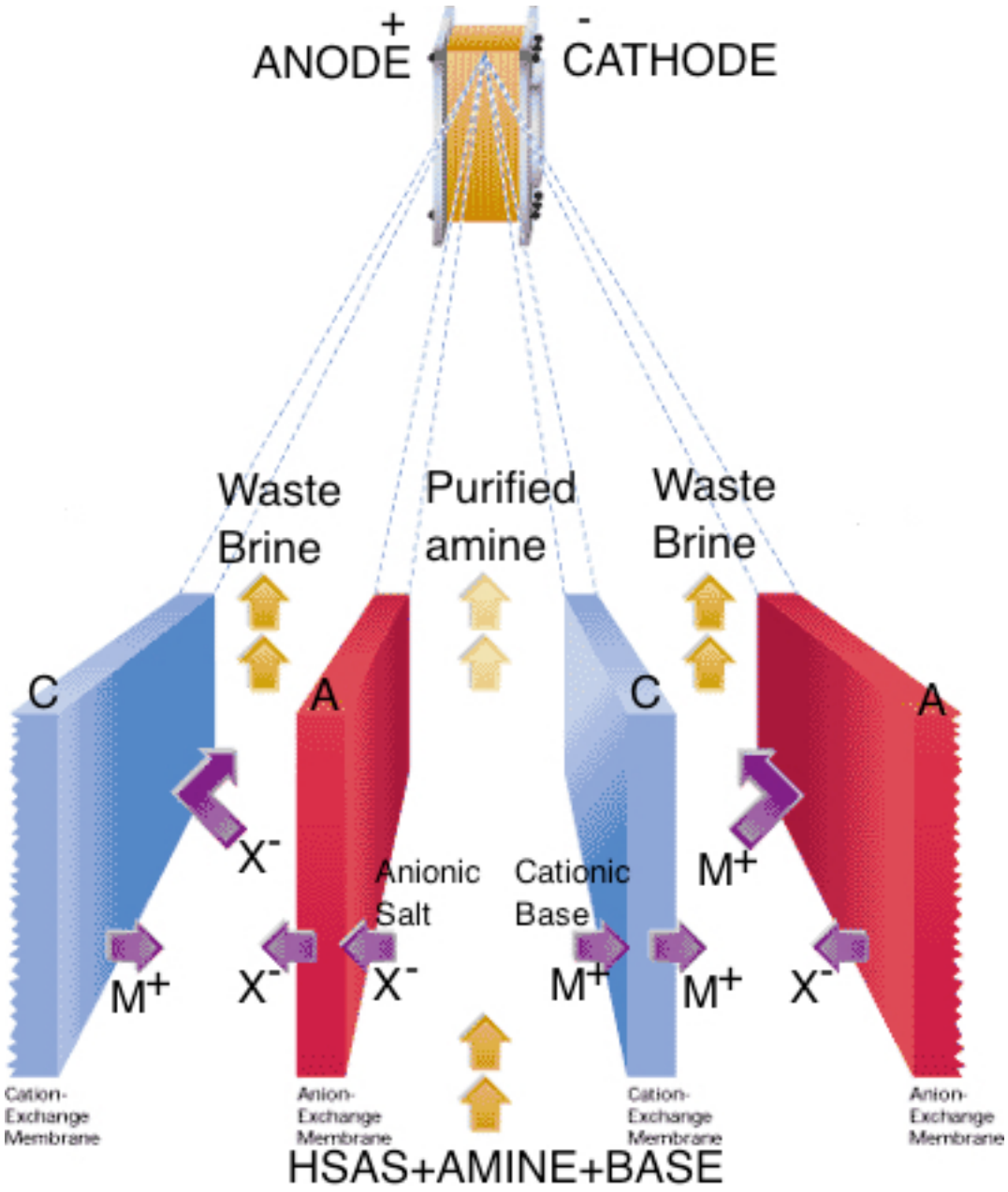

Fig. 1 - Principles of Electrodialysis Process

The salt removal rate in ED is primarily a function of the number of membrane cell pairs and the applied current. However, the membrane type, surface area, and solution conductivity all play an important role.

For the electrodialysis processes the rate of salt removal is proportional to the operating current. The electrodialysis process is continuous.

Once the unit is in operation, the process may operate for months with little to no change in operating conditions. Base consumption is almost exactly stoichiometric.

As no excess base is required volume and quantity of waste generated is minimized. The amine that has been treated and is returned to the amine system is identical to the amine feed with the exception that the concentration of heat stable salts has been reduced.

There is no effect on the operation of the amine unit. The amine unit's operation does not have to be modified in any manner when the electrodialysis unit is in operation.