

Spent Acid from Chlorine Drying

In Chlor-Alkali plants, concentrated sulphuric acid is used to remove moisture from the chlorine gas prior to compression. This drying process creates a dilute acid stream that is saturated with chlorine. Often, this acid is disposed of as a waste stream or neutralized. Chemetics® offers an alternative, proven process for the concentration of this spent acid allowing the acid to be recycled to the drying towers.

The long term success of recycling this sulphuric acid stream depends on the careful selection of materials to handle the corrosive chemicals at elevated temperatures. Chemetics has extensive experience with materials selection for both the Chlor-Alkali industry as well as for the Sulphuric Acid industry. This makes us uniquely qualified to tackle this tricky spent acid stream.

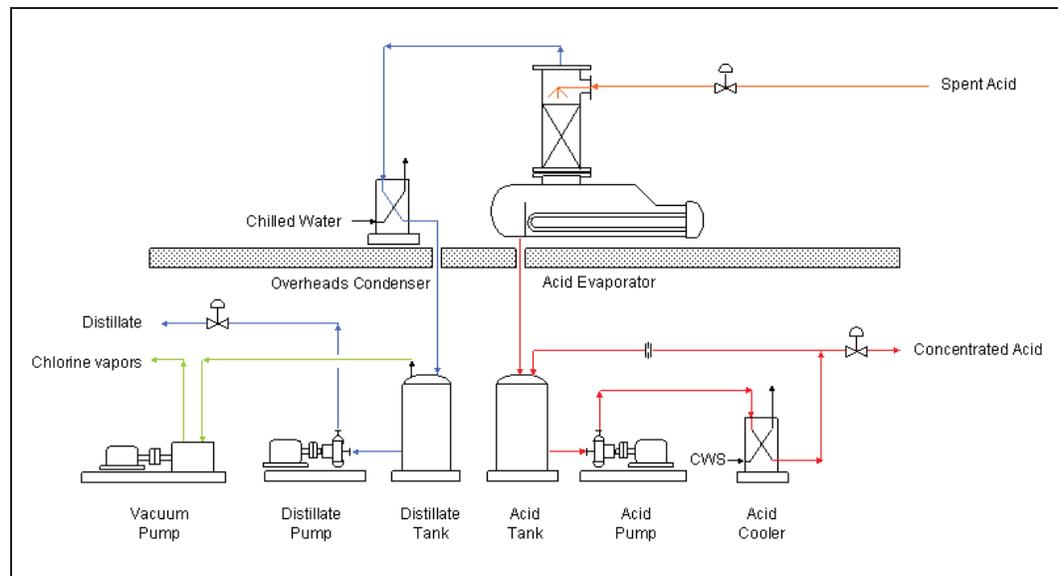
Chemetics offers two options for the concentration of chlorine drying spent acid:

High Concentration Process

This process is applicable for all chlor-alkali plants. The spent acid is concentrated to ~96wt%, which is returned to the final drying tower. Because of the high sulphuric acid concentration that has to be achieved, the vapours that are removed from the acid contain a significant amount of sulphuric acid vapour. This acid is removed in a wash column installed on the vapour exit from the evaporator unit. In the wash column the vapours are contacted with the dilute feed acid, removing essentially all the sulphuric acid from the vapour. Due to the low pressure required (approx. 20 mBara) in the acid evaporator, chilled water is required to condense the vapours. Normally, no acid purge is necessary.

The evaporator can be heated using either 20 Barg steam or electricity. Generally, cheap electricity is available which eliminates the cost for installation of steam and condensate piping.

Figure 1:
High Concentration
Process



Low Concentration Process

This process is only applicable for chlor-alkali plants that operate a drying system with two (or more) towers. For these multiple tower systems, the amount of water removed from the chlorine vapour stream decreases in every tower, while the acid concentration employed increases. Thus, returning the re-concentrated acid to the final tower requires a significant extra effort (to achieve the required acid concentration) for a small benefit (additional reduction in acid purchase/disposal cost).

A more cost effective solution is to return the re concentrated spent acid to the first drying tower. A lower concentration (approx. 86-89 wt%) from the acid concentration unit is sufficient to maintain optimal drying conditions in the tower. At this acid concentration, the overhead vapour from the evaporator contains very little sulphuric acid vapour. Furthermore, this acid concentration can be operated at a pressure of approx. 100 mBara allowing regular cooling water to be used to condense the vapours. This results in a simplified process with lower capital investment and operating cost while

maintaining the overall drying efficiency of the chlorine drying system.

This solution allows more than 90% of the acid to be recycled. A small sulphuric acid make-up stream is still required to maintain the final drying tower acid concentration. The resulting purge stream from the acid concentrator is chlorine free and can be used elsewhere in the complex (e.g. cooling water treatment, brine acidifying).

The evaporator can be heated using either 20 Barg steam or electricity. Generally, cheap electricity is available which eliminates the cost for installation of steam and condensate piping.

Chemetics Chlorine Drying Spent Acid Recovery Plant Features:

- Safe and reliable process requiring minimal operator attention
- No pumps in hot acid service for improved reliability and safety
- Minimal acid losses
- Can be skid mounted for easy site installation

Figure 2
Low Concentration
Process

