SiYPro™ Case Study

Ethylene Plant Caustic Tower

EVONIK INDUSTRIES

Athlon Solutions

The chemistry of results™

Situation

An ethylene producer in northeast China was experiencing poor quality spent caustic in the acid gas removal section of the plant. The caustic was heavily emulsified and had a thick orange oil layer on top of the milky bulk liquid. The caustic tower was treated with a red-oil inhibitor from a domestic supplier.

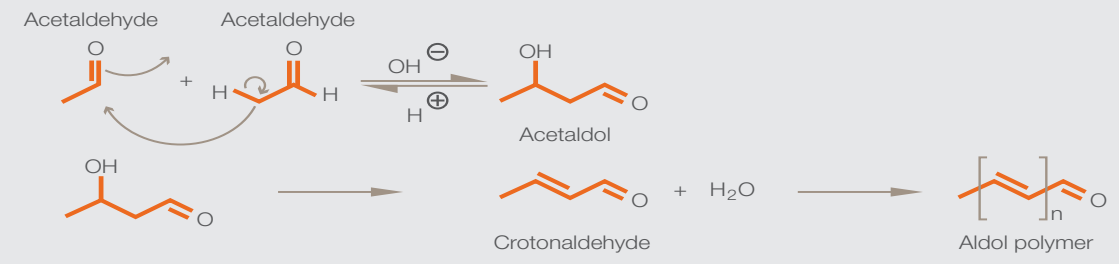
Approach

Problems of this nature are typically caused by the presence of aldehydes in the cracked gas feed to the tower. Acetaldehyde is the main contributor. This molecule is generated in the cracking furnaces and cannot be easily prevented. Furthermore, in plants that recycle streams from polyethylene plants using vinyl acetate as co-monomer, acetaldehyde is also generated when the recycled vinyl acetate makes contact with caustic. In the high pH environment of the caustic tower, acetaldehyde rapidly reacts with itself through an aldol reaction and then dehydrates to form crotonaldehyde. This molecule is also highly reactive in caustic and reacts with further aldehyde molecules to form oligomers and polymers. These molecules have very poor solubility in caustic and tend to form a separate layer on top of the caustic. At higher molecular weight they start to solidify and create fouling in the tower or the spent caustic system.

Liquid hydrocarbons such as aromatics that have condensed from the process stream in the tower can help to keep the aldol polymers mobile, as can a deliberate wash oil injection. However, this generates a waste stream, which needs to be further processed. Many commercially available solutions exist to manage the problem, including dispersants to keep the aldol-containing oil layer emulsified in the bulk caustic. It, however, is generally preferential to eliminate the oil by use of an inhibitor. Of the available inhibitors, there is a range of performances depending on the mode of action and efficacy. SiYPro™ E242 has been found to show particularly fast and effective scavenging of aldehydes. The scavenged aldehyde-inhibitor adduct leaves the tower dissolved in the spent caustic.

Results

Evonik started to apply SiYPro™ E242 into the strong and weak caustic loops inside the tower. Within a few days, the orange hydrocarbon layer started to become thinner and within three months the oil layer had almost disappeared.



Athlon Solutions Corporate Headquarters
5500 N. Sam Houston Pkwy W., Suite 800
Houston, Texas, USA 77086
+1 713 457 2400
athlonsolutions.com or info@athlonsolutions.com