

CHAPTER I

INTRODUCTION

“Yellow oil” is a complex mixture of polymers formed in a caustic tower of ethylene plant. The yellow polymer is insoluble in spent caustic solution causing a caustic tower fouling. The caustic tower is used to remove the acid gases from the cracked gas in the ethylene plant. The yellow oil is believed to be produced principally from carbonyl compounds, like acetaldehyde, undergoing the classic aldol condensation. The yellow oil can deposit onto the tower internals. The deposit also leads to a high pressure drop and a reduction of acid gas removal capability. This reduces the plant production rate and, possibly, requires an unscheduled shutdown to clean the tower. Moreover, equipment such as oil separators, storage vessels, and benzene strippers, may experience fouling due to the formation of yellow oil in the caustic tower.

Chemical treatment has been selected as a method to stop the aldol condensation. And the treatment is accomplished by adding chemicals called “antipolymerant”. Many antipolymerants have been studied for the reduction of the fouling in the caustic tower but their ability to completely stop the aldol condensation in a commercial plant has never been successful, in part, because of the lack of total understanding of the reaction inside the caustic tower. Another important reason is all the published work did not have a good indicator to follow the reaction. The only thing that has been used has been the observers’ eyes.

The objective of this work is to study effects of temperature, concentration of acetaldehyde and antipolymerants to the aldol condensation, with a more consistent method. The other objective of this work is to

characterize the spent caustic from the National Petrochemical Public Co.,
Ltd.