ABSTRACT

Failure Analysis of Reformer Catalyst Tubes in a Methanol Plant

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The Caribbean Methanol Company (CMC) has had a significant problem with premature creep failure of its Reformer Furnace catalyst tubes. In this thesis, several investigations have been undertaken in order to identify the problems and their causes, as well as recommendations for improvements to the system to alleviate the situation, and improve radiant catalyst tube life.

The analysis is based on a historical review of the tube failures incurred by the unit coupled with calcium carbonate testing and a statistical analysis of tube wall temperatures. Results revealed abnormal firebox conditions, manifested as pronounced burner flame bending, tube seal air leakage into the firebox and elevated catalyst tube wall temperatures.

Major recommendations, emanating from this study, include replacing the outer burners and tiles with an improved design, replacing the catalyst tubes with an upgraded material and reducing/eliminating fugitive air ingress into the furnace. With the implementation of these modifications, it is anticipated that practical catalyst tube life can be maximized.

Keywords: Creep; Reformer Furnace Catalyst Tubes; Calcium Carbonate Testing; Burner Flame Bending; Tube Seal Air Leakage; Tube Wall Temperatures.