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Recovery of Hydrogen Converter Efficiency Affected by Poisoning of Catalyst with Increasing of Temperature

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Abstract : The purpose of the H2 removal system is to reduce a content of hydrogen and other combustibles in the CO2 feed owing to avoid developing a possible explosive condition in the synthesis. In order to reduce the possibility of forming an explosive gas mixture in the synthesis as much as possible, the hydrogen percent in the fresh CO2, will be removed in hydrogen converter. Therefore the partly compressed CO2/Air mixture is led through Hydrogen converter (Reactor) where the H2, present in the CO2, is reduced by catalytic combustion to values less than 50 ppm (vol). According the following exothermic chemical reaction: 2H2 + O2 → 2H2O + Heat. The catalyst in hydrogen converter consist of platinum on a aluminum oxide carrier. Low catalyst activity maybe due to catalyst poisoning. This will result in an increase of the hydrogen content in the CO2 to the synthesis. It is advised to shut down the plant when the outlet of hydrogen converter increased above 100 ppm, to prevent undesirable gas composition in the plant. Replacement of catalyst will be time exhausting and costly so as to prevent this, we increase the inlet temperature of hydrogen converter according to following Arrhenius' equation: K=K0e (-E_a/RT) K is rate constant of a chemical reaction where K0 is the pre-exponential factor, E_a is the activation energy, and R is the universal gas constant. Increment of inlet temperature of hydrogen converter caused to increase the rate constant of chemical reaction and so declining the amount of hydrogen from 125 ppm to 70 ppm.

Keywords : catalyst, converter, poisoning, temperature
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