The Regeneration of Fischer-Tropsch Catalysts: A Historical Perspective

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Catalyst deactivation is a major issue challenging the commercial implementation of the FT conversion process. The early FT literature (<1960) provides useful insight into the nature of deactivation and encompasses many unique methods for catalyst regeneration. Soon after the discovery of the process, research efforts focused on identifying methods for restoring catalyst activity. The earliest methods consisted mainly of ex-situ metals recovery and reformulation of the catalyst. Later methods employed a combination of physical and chemical techniques centered on removing hydrocarbon deposits within the catalyst structure and (re-)reducing the catalyst through hydrogen treatment. Solvent washing and thermal desorption were the two primary methods used for removing hydrocarbon deposits. Hydrogen treatment in both fixed and fluid bed reactors and at temperatures from moderate (FT reaction range) to high (metal reduction range) provided some success in restoring activity.

Over the past 80 years the FT process has been studied in several different reactor systems and employed hundreds of different catalyst formulations. However there appears to be only a limited number of both FT deactivation mechanisms and regeneration techniques applicable to the full range of reactors and catalyst. The advent of new characterization methods in the late 20th century confirmed the findings of the early FT work but does not change the fundamental findings associated with deactivation mechanisms and effective regeneration procedures.