532g Solid/Liquid Separation Processes in Gas-to-Liquid Systems

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Central to most Gas-to-Liquid technology is the Fischer Tropsch (FT) process, where synthetic gas, a mixture of hydrogen and carbon monoxide, undergoes catalyzed chemical transformation to form a mixture of long chain hydrocarbons. Solid/liquid separation (SLS) processes are employed to recover produced hydrocarbon from reactor effluent slurry- a mixture of FT catalyst and liquid hydrocarbon product. The prominence and nature of the gas-to-liquid SLS systems are determined, to a large extent, by the type of the Fischer Tropsch reactor(s) used. In gas-to-liquid processes employing fixed bed reactors for the Fischer Tropsch synthesis, the SLS process essentially involve purification/polishing of the wax products to meet the specifications of the product upgrader located downstream of the FT units. Typically, catalyst fines, ranging from submicron to a few tens of microns in size, in low to medium concentration, are removed from the produced wax. However, many GTL processes use mobile slurry phase reactors such as the slurry bubble column, the fluidized bed reactors, and their numerous variations, to conduct the conversion of synthetic gas into a mixture of high molecular weight hydrocarbon fluids. Whilst these mobile slurry reactors feature excellent heat and mass transfer characteristics, the solid liquid separation prevalent in these systems are inherently more challenging than those in the GTL systems with fixed bed FT reactors. Challenges, opportunities and advances in design and operation of solid/liquid separation systems for GTL systems are presented.