Application of Inherently Safer Design Principles in Biodiesel Production Process

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ABSTRACT

Petroleum oil production has increased over the year due to the greater demand. It has been predicted that fossil fuel will be depleted in the near future perhaps as short as 30 years. Increasing demanding, limited supply and associated environmental problems of this fossil fuel are urging us to find alternative energy sources.

Among many of potential energy sources explored, biofuel has been a promising alternative, both economically and environmentally. Biodiesel is typically produced by transesterification that refers to a reaction of a vegetable oil or animal fat with an alcohol in the presence of a catalyst to yield mono-alkyl esters of long chain fatty acids and glycerin. Herein mono-alkyl esters of long chain fatty acids are biodiesel and glycerin is a Co product. The transesterification reaction in biodiesel production can be alkali-catalyzed (i.e., NaOH, KOH) or acid catalyzed (i.e., H2SO4).

The production of biodiesel through the transesterification of vegetable and waste oils have been researched and commercialized. However, most of the studies in the open literature focus on the reaction, production or economic of the process. No papers have addressed the process safety of biodiesel production. Since process safety has been increasingly emphasized in the chemical and petroleum industries, we must consider process safety in the biodiesel industry as well. As Trevor Kletz pointed out (1984, 1991), inherently safer design principles should be considered at earlier stage of process development and process design. This paper reviews the hazards existing in biodiesel production processes and potential inherently safer options and the holistic impact of these options on process safety.