SYSTEM HAVING A PISTON FEEDSTOCK FEEDER SYSTEM FOR USE IN HYDROPROCESSING A SOLID FEEDSTOCK

[0001] The present disclosure generally relates to systems and methods for hydroprocessing of renewable feedstocks. More specifically, the present disclosure relates to a solid feedstock feeder system integrated into a hydroprocessing system.

BACKGROUND OF THE DISCLOSURE

[0002] The demand for energy is increasing as a result of worldwide economic growth and development. This increase in the demand for energy has contributed to an increase in the amount of greenhouse gases and the overall carbon footprint. In addition, with increasing demand for liquid transportation fuels, decreasing reserves of crude petroleum oil that may be accessed and recovered easily and increasing constraints on carbon footprints of such fuels, it may be desirable to develop routes to produce liquid transportation fuels from renewable resources in an efficient manner. Such liquid transportation fuels produced from biomass are sometimes also referred to as biofuels. Biomass offers a source of renewable carbon. Examples of suitable biomass include vegetable oils, oils obtained from algae and animal fats, deconstruction materials such as pyrolyzed recyclable materials and wood, among others. Therefore, when using fuels derived from renewable resources, it may be possible to achieve more sustainable CO_2 emissions over petroleum-derived fuels. For biofuels to replace all or at least a portion of the carbon-based fossil fuels, the biofuels should meet the required performance and emission specifications of the carbon-based fossil fuels.

[0003] Currently, solid feedstock (e.g., solid biomass) is feed into a hydroprocessing reactor by pressurizing a volume of the solid feedstock in, for example, a lock hopper system. While this approach is suitable for introducing the solid feedstock into the reactor, it requires a large vessel and consumes an undesirable amount of pressurized gas. In addition, existing lock hopper systems have a complex design. For example, the lock hopper system includes an atmospheric vessel, a sluice vessel, and a pressurized vessel along with several sets of valves. Moreover, because lock hopper systems pressurize the volume of the solid feedstock, a source of pressurized gas is required. It would be advantageous to use a solid feedstock feeding system that