[0020] Further, this configuration is operated essentially as a full conversion zone. This means the bottom or residuum fractions are all converted in the hydrocracking units. This requires more catalyst which, in turn, requires larger reactors to be built and placed into service, adding substantial cost to the construction and operation of the hydrocracking train, both 1st and 2nd stage. In addition, more hydrogen is required to operate these larger hydrocracking units, in view of the higher severity operations, adding to the operating costs for the refiner.

[0021] Finally, because this configuration is operated as a full conversion zone, the 1st stage hydrocracking unit must be operated at high severity in order to reduce the nitrogen, sulfur and PNA to concentrations low enough for the 2nd stage to hydroprocess without deactivation. This results in shorter catalyst lifetimes and unit fouling.

[0022] Accordingly, there is a current need for a two-stage hydrocracking process capable of producing middle distillates that have reduced nitrogen, sulfur content, while simultaneously producing a 900°F$^+$ (482°C$^+$) HVGO stream useful as a feedstock to fluidized catalytic cracking unit.

[0023] There is also a current need for a two-stage hydrocracking process which utilizes less hydrogen than a conventional two-stage hydrocracking process, and which can be operated under less severe conditions than a standard two-stage hydrocracking process, thereby reducing the amount of hydrocracking catalyst and hydrogen needed to achieve the target product specifications.

SUMMARY OF THE INVENTION

[0024] The present invention is directed to a refining process for producing hydroprocessed distillates and a heavy vacuum gas oil (HVGO). The process produces middle distillates that have reduced nitrogen and sulfur content, while simultaneously producing a 900F$^+$ (482°C$^+$) HVGO stream useful as a fluidized catalytic cracking (FCC) unit feedstock.

[0024a] In one aspect, the present invention provides a process for making at least one middle distillate and a heavy vacuum gas fluidized catalytic cracking feedstock, comprising: hydrocracking a hydrocarbonaceous feedstock to produce a first stage hydrocracked effluent; distilling the hydrocracked feedstock by atmospheric distillation to form at least one middle distillate fraction and an atmospheric bottoms fraction; further distilling the atmospheric bottoms fraction by vacuum distillation to form a side-cut vacuum gas oil fraction and a

heavy vacuum gas oil FCC feedstock; hydrocracking the side-cut vacuum gas oil fraction to form a second stage hydrocracked effluent; and combining the second stage hydrocracked effluent with the first stage hydrocracked effluent.

BRIEF DESCRIPTION OF THE DRAWING

[0025] Figure 1 is a block flow diagram of a conventional two-stage hydrocracking process.

[0026] Figure 2 is a block flow diagram of a refining process for making middle distillates and a heavy vacuum gas oil FCC feedstock, as described herein.