CLAIMS

1. A process for preparing a low sulfur liquid hydrocarbon product comprising:

i) heat soaking a tar stream to obtain a first process stream comprising reduced reactivity tar;

ii) blending the first process stream with a utility fluid to reduce the viscosity of the first process stream and obtain a second process stream comprising reduced reactivity, lower viscosity tar;

iii) removing solids from the second process stream to provide a third process stream comprising a reduced reactivity, lower viscosity tar that is substantially free of solids of size larger than 25 μm;

iv) passing the third process stream through a guard reactor that further removes reactive olefins and residual solids to produce an upgraded third process stream, and then pretreating the upgraded third process stream to further lower the reactivity of the tar and obtain a fourth process stream having a Bromine Number (BN) lower than 12;

v) hydrogenating and desulfurizing the fourth process stream and recovering a total liquids product (TLP);

vi) distilling the TLP and recovering a mid-cut of the distillation products and a heavy bottoms fraction;

vii) desulfurizing the heavy bottoms fraction to obtain a low sulfur product having a sulfur content of about 0.3 wt. % or less.

2. The process of claim 1, further comprising recycling a portion of the mid-cut as at least a portion of the utility fluid used in step ii).

3. The process of claim 1, further comprising blending the low sulfur product with an aromatic gas oil.

4. The process of claim 1, further comprising producing an ECA stream that includes the low sulfur product.

5. The process of claim 1, wherein the reduced reactivity tar has a reactivity ≤ 28 BN.

6. The process of claim 1, wherein the heat soaking step is performed at a temperature in the range of from 200°C to 300°C, and for a time in the range of from 2 minutes to 30 minutes.

7. The process of claim 1, wherein the solids removal step ii) includes centrifugation.

8. The process of claim 1, wherein the hydrogenating and desulfurizing step v) adds from 1000 SCF/B to 2000 SCF/B of molecular hydrogen on a feed basis to the tar and reduces sulfur content of the tar by 80 wt. % to 95 wt. %.

9. The process of claim 1, wherein the heavy bottoms desulfurizing step vii) provides a product having a sulfur content of 0.1% or less.

10. The process of claim 1, that further comprises recycling a portion of the mid-cut as at least a portion of the utility fluid used in step ii), and wherein 70 wt. % to 85 wt. % of the recycled mid-cut is included in the utility fluid.

11. The process of claim 1, wherein the pretreatment step (iv) is performed at a temperature in the range of from 260°C to 300°C and a feed weight hourly space velocity (WHSV) in the range of from of 2 hr^{-1} to 3 hr^{-1}.

12. The process of claim 1, wherein the hydrogenating and desulfurizing step v) is performed at a temperature in the range of from 375°C to 410°C and a space velocity (WHSV, feed basis) in the range of from 0.7 hr^{-1} to 1.0 hr^{-1}.

13. The process of claim 1, wherein the desulfurizing step vii) is performed at a temperature in the range of from 375°C to 425°C and a space velocity (WHSV, feed basis) in the range of from 0.4 hr^{-1} to 0.7 hr^{-1}.

14. The process of claim 7, wherein (A) the heat soaking step is performed at a temperature in the range of from 200°C to 300°C for a time in the range of from 2 minutes to 30 minutes, (B) the second process stream comprises 20 wt. % to 50 wt. %

solids, and (C) the centrifugation is performed at a temperature in the range of from 80°C to 100°C and a force of 2000 x g to 6000 x g.

15. The process of claim 1, wherein the tar stream has a reactivity $\geq$ 30 BN.

16. The process of claim 1, wherein the heat soaking achieves a reactivity in the reduced reactivity tar that is $\leq$ 28 BN, and the second process stream comprises the utility fluid in an amount < 10 wt. % of the second process stream.

17. The process of claim 1, wherein the guard reactor is operated at a temperature in the range of from 260°C to 300°C and a space velocity (WHSV, feed basis) in the range of from 5 hr^{-1} to 7 hr^{-1}.

18. The process of claim 12, wherein the hydrogenating and desulfurizing of step v) is performed in a reactor packed with a plurality of different catalysts arranged so that each catalyst forms a bed and the beds are arranged serially.

19. The process of claim 18, wherein at least one of the catalysts of step v) contains one or more of Co, Ni, or Mo.

20. The process of claim 1, in which the guard reactor is packed with a plurality of different catalysts arranged so that each catalyst forms a bed and the beds are arranged serially.

21. The process of claim 20, wherein at least one of the catalysts in the guard reactor contains one or more of Co, Ni, or Mo.

22. The process of claim 13, wherein the desulfurizing step vii) is performed in a reactor packed with a catalyst that contains one or more of Co, Ni, or Mo.