

CLAIMS:

1. A process for preparing a liquid hydrocarbon product comprising:
 - providing a reduced reactivity tar;
 - 5 blending the reduced reactivity tar with a utility fluid to produce a lower viscosity, reduced reactivity tar;
 - hydroprocessing the lower viscosity, reduced reactivity tar at a temperature of greater than 350°C to produce a total liquids product (TLP) comprising the liquid hydrocarbon product and a recycle solvent;
 - 10 separating the recycle solvent from the TLP, wherein the recycle solvent has a solubility blending number (S_{BN}) of greater than 110; and
 - flowing the recycle solvent to the reduced reactivity tar for blending to produce the lower viscosity, reduced reactivity tar.
- 15 2. The process of claim 1, further comprising increasing the temperature of the lower viscosity, reduced reactivity tar during the hydroprocessing if the S_{BN} of the recycle solvent is less than 115.
3. The process of claims 1 or 2, wherein the lower viscosity, reduced reactivity tar is
20 hydroprocessed at a temperature of greater than 350°C to about 500°C.
4. The process of any of any of claims 1-3, wherein the lower viscosity, reduced reactivity tar is hydroprocessed at a temperature of about 400°C to about 450°C.
- 25 5. The process of any of claims 1-4, wherein the utility fluid comprises the recycle solvent, and wherein the S_{BN} of the recycle solvent is greater than 110 to about 160.
6. The process of any of claims 1-5, wherein the S_{BN} of the recycle solvent is greater than 120 to about 150.
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7. The process of any of claims 1-6, wherein the S_{BN} of the recycle solvent is about 130 to about 150.

8. The process of any of claims 1-7, further comprising processing the lower viscosity, reduced reactivity tar to remove solids therefrom prior to hydroprocessing.
9. The process of any of claims 1-8, further comprising centrifuging the lower viscosity, reduced reactivity tar to remove substantially all solids having a size of greater than 25 μm .
10. The process of any of claims 1-9, wherein the utility fluid comprises two-ring aromatics, three-ring aromatic, four-ring aromatics, or any combination thereof.
11. The process of any of claims 1-10, wherein the utility fluid comprises a solvent selected from the group consisting of benzene, ethylbenzene, trimethylbenzene, xylenes, toluene, naphthalenes, alkylnaphthalenes, tetralins, alkyltetralins, and any combination thereof.
12. The process of any of claims 1-11, wherein the hydroprocessing of the lower viscosity, reduced reactivity tar further comprises:
- heating the lower viscosity, reduced reactivity tar to a temperature of about 260°C to about 300°C in a pretreater containing hydrogen; then
 - heating the lower viscosity, reduced reactivity tar to a temperature of about 325°C to about 375°C in a first reactor containing hydrogen; then
 - heating the lower viscosity, reduced reactivity tar to a temperature of about 360°C to about 450°C in a second reactor containing hydrogen.
13. A process for preparing a liquid hydrocarbon product comprising:
- heat soaking a tar stream to produce a reduced reactivity tar;
 - blending the reduced reactivity tar with a utility fluid to produce a lower viscosity, reduced reactivity tar;
 - centrifuging the lower viscosity, reduced reactivity tar to remove solids therefrom; then
 - hydroprocessing the lower viscosity, reduced reactivity tar at a temperature of greater than 350°C to produce a total liquids product (TLP) comprising the liquid hydrocarbon product and a recycle solvent;
 - separating the recycle solvent from the TLP, wherein the recycle solvent has a solubility blending number (S_{BN}) of greater than 115; and
 - flowing the recycle solvent to the reduced reactivity tar for blending to produce the lower viscosity, reduced reactivity tar.

14. The process of claim 13, further comprising increasing the temperature of the lower viscosity, reduced reactivity tar during the hydroprocessing if the S_{BN} of the recycle solvent is less than 120.
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15. The process of claims 13 or 14, wherein the lower viscosity, reduced reactivity tar is hydroprocessed at a temperature of greater than 350°C to about 500°C.
16. The process of claim 15, wherein the temperature is about 400°C to about 450°C.
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17. The process of any of claims 13-16, wherein the utility fluid comprises the recycle solvent, and wherein the S_{BN} of the recycle solvent is greater than 120 to about 150.
18. The process of claim 17, wherein the S_{BN} of the recycle solvent is about 130 to about 150.
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19. The process of any of claims 13-16, wherein after centrifuging, the lower viscosity, reduced reactivity tar is substantially free of solids having a size of greater than 25 μm .
20. The process of any of claims 13-16, wherein the utility fluid comprises two-ring aromatics, three-ring aromatic, four-ring aromatics, or any combination thereof.
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21. The process of any of claims 13-16, wherein the utility fluid comprises a solvent selected from the group consisting of benzene, ethylbenzene, trimethylbenzene, xylenes, toluene, naphthalenes, alkylnaphthalenes, tetralins, alkyltetralins, and any combination thereof.
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22. A process for preparing a liquid hydrocarbon product comprising:
- heat soaking a tar stream to produce a reduced reactivity tar;
- blending the reduced reactivity tar with a utility fluid to produce a lower viscosity, reduced reactivity tar;
- 30 hydroprocessing the lower viscosity, reduced reactivity tar at a temperature of greater than 350°C to produce a total liquids product (TLP) comprising the liquid hydrocarbon product and a recycle solvent;
- separating the recycle solvent from the TLP;
- measuring a solubility blending number (S_{BN}) of the recycle solvent;

increasing the temperature of the lower viscosity, reduced reactivity tar during the hydroprocessing if the S_{BN} of the recycle solvent is less than 115; and

flowing the recycle solvent to the reduced reactivity tar for blending to produce the lower viscosity, reduced reactivity tar.

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23. The process of claim 22, wherein the temperature of the lower viscosity, reduced reactivity tar is about 400°C to about 450°C.

24. The process of claims 22 or 23, wherein the utility fluid comprises the recycle solvent, and
10 wherein the S_{BN} of the recycle solvent is about 130 to about 150.

25. A process for preparing a liquid hydrocarbon product comprising:

heat soaking a tar stream to produce a first process stream comprising a reduced reactivity tar;

15 blending the first process stream with a utility fluid to reduce viscosity of the first process stream and produce a second process stream comprising solids and a reduced reactivity, lower viscosity tar;

centrifuging the second process stream to produce a third process stream comprising the reduced reactivity, lower viscosity tar and having a concentration of solids less than the
20 second process stream;

hydroprocessing the third process stream at a temperature of greater than 350°C to about 450°C to produce a fourth stream comprising the liquid hydrocarbon product and a recycle solvent;

25 separating the recycle solvent from the fourth stream, wherein the recycle solvent has a solubility blending number (S_{BN}) of about 130 to about 150; and

flowing the recycle solvent to the first process stream for blending to produce the second process stream.

26. A process for producing a hydroprocessed tar, the process comprising:

- 30 (a) providing a process stream comprising a reduced reactivity tar;
- (b) mixing the process stream with a utility fluid having a solubility blending number (S_{BN}) < 110 to produce a tar-fluid mixture;
- (c) catalytically hydroprocessing the tar-fluid mixture produce a total liquids product (TLP) comprising the liquid hydrocarbon product and the utility fluid;

- (d) separating a recycle solvent and a hydroprocessed tar from the TLP, wherein the recycle solvent has a true boiling point range that is substantially the same as that of the utility fluid, and has a solubility blending number (S_{BN}) ≥ 110 ; and
- (e) substituting at least a portion of the recycle solvent for the utility fluid in step (b).