CLAIMS:

What is claimed is:

1. A method for processing a feedstock including at least a portion of a pyrolysis tar, comprising:

separating a solids rejection fraction and a clarified feed fraction from a feedstock comprising a pyrolysis tar portion and a utility fluid, the feedstock comprising particles having a particle size of 50 µm or more, the solids rejection fraction comprising 60 wt. % or more of the particles having a particle size of 50 µm or more from the feedstock;

exposing at least a portion of the solids rejection fraction to a physical particle size reduction process to form a reduced particle-size solids-containing fraction, wherein the physical particle size reduction process includes converting a portion of the particles having a particle size of 50 µm or more to particles having a particle size of less than 50 µm;

combining at least a recycle portion of the reduced particle-size solids-containing fraction with a) the feedstock prior to separating the solids rejection fraction and the clarified feed fraction from the feedstock, b) the solids rejection fraction prior to exposing the solids rejection fraction to the physical particle size reduction process, or c) a combination thereof; and

hydroprocessing at least a portion of the clarified feed fraction under solvent-assisted hydroprocessing conditions to form a hydroprocessed effluent, the clarified feed fraction comprising 10 wppm to 10000 wppm of particles having a particle size of 0.1 µm to 50 µm, as measured by ASTM D4464.

2. The method of claim 1, wherein the clarified feed fraction comprises

i) 10 wppm to 150 wppm of particles having a particle size of 0.1 µm to 50 µm;

ii) 50 wppm to 500 wppm of particles having a particle size of 0.1 µm to 50 µm; or

iii) 100 wppm to 1000 wppm of particles having a particle size of 0.1 µm to 50 µm.

3. The method of claims 1 or 2, wherein the clarified feed fraction comprises

i) 10 wppm to 150 wppm of particles having a particle size of 0.1 µm to 25 µm;

ii) 50 wppm to 500 wppm of particles having a particle size of 0.1 µm to 25 µm;

iii) 100 wppm to 1000 wppm of particles having a particle size of 0.1 µm to 25 µm; or

iv) 10 wppm to 10000 wppm of particles having a particle size of 0.1 µm to 25 µm.

4. The method of and of claims 1-3, wherein the hydroprocessed effluent comprises 50 wppm or less of particles having a particle size of 0.1 µm to 50 µm.

5. The method of any of claims 1-4, wherein the hydroprocessed effluent comprises 10 wppm to 100 wppm of particles having a particle size of 0.1 µm to 50 µm.

6. The method of any of claims 1-5, wherein the hydroprocessed effluent comprises 75 wt. % or less of particles having a particle size of 0.1 µm to 50 µm relative to the weight of particles in the reduced particle-size solids-containing fraction.

7. The method of any of claims 1-6, further comprising adding a solvent to the at least a portion of the solids rejection fraction prior to the exposing.

8. The method of claim 7, wherein the solvent comprises the utility fluid.

9. The method of any of claims 1-6, wherein the feedstock comprises 20 wt. % to 90 wt. % of the utility fluid.

10. The method of any of claims 1-6, wherein the solids rejection fraction comprises 1 wt. % to 25 wt. % of particles having a particle size of 50 µm to 1000 µm.

11. The method of any of claims 1-6, wherein the physical particle size reduction process comprises grinding, ablation, milling, or a combination thereof.

12. The method of any of claims 1-6, wherein the separating comprises centrifugation, settling, filtering, or a combination thereof.

13. The method of any of claims 1-6, wherein the hydroprocessing comprises fixed bed hydroprocessing, fluidized hydroprocessing, or a combination thereof.

14. The method of any of claims 1-6, wherein combining at least a recycle portion of the reduced particle-size solids-containing fraction with the solids rejection fraction prior to exposing the solids rejection fraction to the physical particle size reduction process comprises:

separating the recycle portion of the reduced particle-size solids containing fraction and a second portion of the reduced particle-size solids containing fraction from a remaining portion of the reduced particle-size solids containing fraction; and

combining the second portion of the reduced particle-size solids containing fraction with at least one of the feedstock, the clarified feed fraction, and the at least a portion of the clarified feed fraction.

15. A method for processing a feedstock including at least a portion of a pyrolysis tar, comprising:

exposing a feedstock comprising a pyrolysis tar portion and a utility fluid, the feedstock comprising a first weight of particles having a particle size of 50 µm or more, to a physical particle reduction process to form a reduced particle size feedstock having a second weight of particles having a particle size of 50 µm or more, the second weight being 85% or less of the first weight;

separating a solids rejection fraction and a clarified feed fraction from the reduced particle-size feedstock, the solids rejection fraction comprising 60 wt. % or more of the particles having a particle size of 50 µm or more from the feedstock; and

hydroprocessing at least a portion of the clarified feed fraction under solvent-assisted hydroprocessing conditions to form a hydroprocessed effluent, the clarified feed fraction comprising 10 wppm to 10000 wppm of particles having a particle size of 0.1 µm to 50 µm as measured by ASTM D4464.

16. The method of claim 15, wherein the clarified feed fraction comprises

i) 10 wppm to 150 wppm of particles having a particle size of 0.1 µm to 50 µm;

ii) 50 wppm to 500 wppm of particles having a particle size of 0.1 µm to 25 µm;

iii) 100 wppm to 1000 wppm of particles having a particle size of 0.1 µm to 50 µm; or

iv) 10 wppm to 10000 wppm of particles having a particle size of 0.1 µm to 25 µm.

17. The method of claims 15 or 16, wherein the hydroprocessed effluent comprises 50 wppm or less of particles having a particle size of 0.5 µm to 50 µm; or wherein the hydroprocessed effluent comprises 75 wt. % or less of particles having a particle size of 0.1 µm to 50 µm relative to the weight of particles in the reduced particle-size solids-containing fraction.

18. The method of any of claims 15-17, wherein the feedstock comprises 20 wt. % to 90 wt. % of the utility fluid.

19. The method of any of claims 15-18, wherein the solids rejection fraction comprises 1 wt. % to 25 wt. % of particles having a particle size of 50 µm to 1000 µm.

20. The method of any of claims 15-19, wherein the physical particle size reduction process comprises grinding, ablation, milling, or a combination thereof.

21. The method of any of claims 15-20, wherein the separating comprises centrifugation, settling, filtering, or a combination thereof.

22. A system for processing a feedstock including at least a portion of pyrolysis tar, comprising:

a particle size reducer selected from a particle grinder, a ball mill, and an ablation drum, the particle size reducer comprising a particle size reducer inlet and a particle size reducer outlet;

a particle separation stage comprising a separation stage inlet in fluid communication with the particle size reducer outlet, a separation stage outlet, and a rejected solids outlet; and

a hydroprocessing reactor comprising a reactor inlet in fluid communication with the separation stage outlet and a reactor outlet.

23. The system of claim 22, wherein the rejected solids outlet is in fluid communication with the particle size reducer inlet.

24. The system of claims 22 or 23, wherein the separation stage inlet is in fluid communication with a feedstock source, or wherein the particle size reducer inlet is in fluid communication with a feedstock source, or a combination thereof.

25. The system of any of claims 22-24, wherein the particle separation stage comprises one or more of a centrifuge, a settling tank, and a filter.