CLAIMS:

1. A system for manufacturing a base stock from a light hydrocarbon stream, comprising:

a steam cracker configured to form a raw product stream from the light hydrocarbon stream;

one or more separators configured to remove water from the raw product stream to form an oligomerization feed stream comprising 35 % to 55 % olefin, 30 % to 60 % hydrogen, 0.5 % to 3 % alkyne, 5 % to 30 % paraffin, and 500 to 2,000 wt. ppm of carbon monoxide;

an oligomerization reactor configured to increase a molecular weight of the oligomerization feed stream forming a raw oligomer stream;

a distillation column configured to separate a heavy olefinic stream from the raw oligomer stream;

a hydro-processing reactor configured to hydro-process the heavy olefinic stream to form a hydro-processed stream; and

a product distillation column configured to separate the hydro-processed stream to form the base stock.

2. The system of claim 1, wherein the light hydrocarbon stream includes ethane, butane, propane, or naphtha, or any combinations thereof.

3. The system of either of claims 1 or 2, wherein the cracker includes a steam cracking reactor.

4. The system of any of claims 1 to 3, wherein the separator includes a quench fractionator.

5. The system of any of claims 1 to 4, including a primary fractionator configured to remove tar and steam cracking gas oil (SCGO) from the raw product stream, a caustic tower configured to remove hydrogen sulfide from the raw product stream, and a dryer configured to remove the water from the raw product stream.

6. The system of any of claims 1 to 5, wherein the oligomerization reactor is configured to use a heterogeneous catalyst.

7. The system of claim 6, wherein the heterogeneous catalyst includes a zeolite bound to a metal oxide.

8. The system of any of claims 1 to 7, wherein the hydro-processing reactor includes a hydrocracking unit.

9. The system of any of claims 1 to 8, wherein the hydro-processing reactor includes a hydroisomerization unit.

10. The system of any of claims 1 to 9, wherein the product distillation column is configured to separate from the hydro-processed stream a distillate stream including naphtha, diesel fuel, and gasoline.

11. The system of any of claims 1 to 10, wherein the product distillation column is configured to separate from the hydro-processed stream a heavy neutral stream, a medium neutral stream, and a light neutral stream.

12. A method for manufacturing a base stock from a light hydrocarbon stream, comprising:

cracking the light hydrocarbon stream in a steam cracker to form a raw product stream;

removing water from the raw product stream to form an oligomerization feed stream, wherein the oligomerization feed stream includes 35% to 55% olefin, 30% to 60% hydrogen, 0.5% to 3% alkyne, 5% to 30% paraffin, and 50 to 2000 wt. ppm of carbon monoxide; oligomerizing the oligomerization feed stream to form an intermediate stream;

distilling a heavy olefinic stream from the intermediate stream; hydro-processing the heavy olefinic stream to form a hydro-processed stream; and distilling the hydro-processed stream to form the base stock.

13. The method of claim 12, including separating naphtha, steam cracking gas oil (SCGO), or tar, or any combinations thereof, from the raw product stream.

14. The method of either of claims 12 or 13, including separating hydrogen sulfide from the raw product stream.

15. The method of any of claims 12 to 14, including separating carbon dioxide from the raw product stream.

16. The method of any of claims 12 to 15, wherein oligomerizing the oligomerization feed stream includes contacting the oligomerization feed stream with a heterogeneous catalyst including a zeolite bound with a metal oxide.

17. The method of claim 16, including controlling a composition of the intermediate stream by changing a ratio of the zeolite to a metal oxide binder.

18. The method of any of claims 12 to 17, including distilling a light linear alpha olefin stream from the intermediate stream.

19. The method of any of claims 12 to 18, including distilling a heavy linear alpha olefin stream from the intermediate stream.

20. The method of any of claims 12 to 19, wherein hydro-processing the heavy olefinic stream includes hydrocracking the heavy olefinic stream.

21. The method of any of claims 12 to 20, wherein hydro-processing the heavy olefinic stream includes hydroisomerizing the heavy olefinic stream.

22. The method of any of claims 12 to 21, wherein distilling the hydro-processed stream includes separating a distillate stream, a naphtha stream, or both from the hydro-processed stream.

23. The method of any of claims 12 to 22, wherein distilling the hydro-processed stream includes forming a heavy neutral oil stock stream, a medium neutral oil stock stream, or a light neutral oil stock stream, or any combinations thereof.

24. A system for manufacturing a base oil stock from a light hydrocarbon stream, comprising:

a steam cracker to form a raw product stream from the light hydrocarbon stream;

one or more separators configured to remove naphtha, water, steam cracker gas oil (SCGO), and tar from the raw product stream to form an oligomerization feed stream comprising 35 % to 55 % olefin, 30 % to 60 % hydrogen, 0.5 % to 3 % alkyne, 5 % to 30 % paraffin, and 500 to 2,000 wt. ppm of carbon monoxide;

an oligomerization reactor configured to convert the oligomerization feed stream to a higher molecular weight stream by contacting the oligomerization feed stream with a heterogeneous catalyst;

a distillation column configured to separate a heavy olefinic stream from the higher molecular weight stream, wherein the distillation column is configured to recover a light alpha-olefin stream from the higher molecular weight stream;

a hydro-processing reactor is configured to demetallate the heavy olefinic stream, to crack the heavy olefinic stream, to form isomers in the heavy olefinic stream, or to hydrogenate olefinic bonds in the heavy olefinic stream, or any combinations thereof;

a product distillation column is configured to separate the isomers in the heavy olefinic stream to form a number of base stock streams.

25. The system of claim 24, wherein the light hydrocarbon stream includes ethane.

26. The system of either of claims 24 or 25, wherein the heterogeneous catalyst includes a zeolite bound with alumina.