CLAIMS

1. A method of co-processing fluid catalytic cracking feeds, comprising:

introducing a hydrocarbon feed to a fluid catalytic cracking reactor, wherein the hydrocarbon feed comprises hydrocarbons;

introducing a biomass feed to the fluid catalytic cracking reactor wherein the biomass feed comprises a biomass-derived pyrolysis oil;

introducing a waste feed to the fluid catalytic cracking reactor, wherein the waste feed comprises a lubricant; and

reacting at least the hydrocarbon feed, the biomass feed, and the waste feed in the presence of one or more fluid catalytic cracking catalysts in the fluid catalytic cracking reactor to produce cracked products.

2. The method of claim 1, wherein hydrocarbon feed comprises a petroleum crude, an atmospheric residue, a vacuum residue, propane deasphalted residue, fluid catalytic tower bottoms, an atmospheric gas oil, a vacuum gas oil, a coker gasoil, a distillate, a hydrocrackate, a hydrotreated oil, a dewaxed oil, a slack wax, a Fischer-Tropsch wax, a raffinate, or combinations thereof.

3. The method of claim 1, wherein the bio-mass derived pyrolysis oil is derived from a lignocellulosic biomass, a cellulose, a hemicellulose, a polysaccharide, a pectin, a lignin, a chitin, a protein, algae, or combination thereof.

4. The method of claim 1, wherein the waste feed comprises the plastic-derived pyrolysis oil.

5. The method of claim 1, wherein the waste feed comprises the plastic.

6. The method of claim 1, wherein the waste feed has a hydrogen-to-carbon ratio of 1.9 or more.

7. The method of claim 1, wherein the hydrocarbon feed comprises vacuum gas oil that comprises the hydrocarbons, wherein the bio-mass derived pyrolysis oil is derived from a wood biomass.

8. The method of claim 7, wherein the fluid catalytic cracking catalyst comprise a zeolitic component.

9. The method of claim 7, wherein the lubricant comprises a polyalphaolefin base stock.

10. The method of claim 1, wherein the hydrocarbon feed, the biomass feed, and the waste feed are separately introduced to a riser of the fluid catalytic cracking reactor.

11. The method of claim 1, wherein the biomass feed is introduced to a riser downstream of the hydrocarbon feed.

12. The method of claim 1, wherein the hydrocarbon feed is introduced into a riser the fluid catalytic cracking reactor through separate injection nozzles from the biomass feed and the waste feed.

13. The method of claim 1, further comprising flowing a spent fluid catalytic cracking catalyst to a catalyst regnerator for coke removal, wherein regenerated catalyst is flowed back to the fluid catalytic cracking reactor.

14. The method of claim 1, wherein product conversion in the fluid catalytic cracking reactor is increased by about 1% to about 20% on a hydrocarbon basis when feeding the hydrocarbon feed, the biomass feed, and the waste feed as compared to feeding the hydrocarbon feed alone to the fluid catalytic cracking reactor at the same reactor severity.

15. A system for cracking hydrocarbons, comprising:

a first source of a hydrocarbon feed comprising hydrocarbons;

a second source of a biomass feed comprising a biomass-derived pyrolysis oil;

a third source of a waste feed comprising a lubricant; and

a fluid catalytic cracking system comprising a fluid catalytic cracking reactor and a catalyst regenerator,

wherein the fluid catalytic cracking reactor is fluidically coupled to the catalyst regenerator such the fluid catalytic cracking reactor receives regenerated one or more fluid catalytic cracking catalysts from the catalyst regenerator,

wherein the fluid catalytic cracking reactor is fluidically coupled to the first source of the hydrocarbon feed;

wherein the fluid catalytic cracking reactor is fluidically coupled to the second source of the biomass feed; and

wherein the fluid catalytic cracking reactor is configured to receive co-feeds of the hydrocarbon feed, the biomass feed, and the waste feed, and to react the hydrocarbon feed, the biomass feed, and the waste feed in the presence of one or more fluid catalytic cracking catalysts to produce cracked products.

16. The system of claim 15, wherein hydrocarbon feed comprises a petroleum crude, an atmospheric residue, a vacuum residue, propane deasphalted residue, fluid catalytic tower bottoms, an atmospheric gas oil, a vacuum gas oil, a coker gasoil, a distillate, a hydrocrackate, a hydrotreated oil, a dewaxed oil, a slack wax, a Fischer-Tropsch wax, a raffinate, or combinations thereof.

17. The system of claim 15, wherein the first feed comprises vacuum gas oil that comprises the hydrocarbons, wherein the bio-mass derived pyrolysis oil is derived from a wood biomass, and wherein the third feed comprises the lubricant.

18. The system of claim 15, wherein the second source is fluidically coupled to the fluid catalytic cracking reactor downstream from the first source.

19. The system of claim 15, wherein the reactor comprises a fluid catalytic cracking catalyst comprising a zeolitic component.