CLAIMS

1. A method for processing a feedstock hydrocarbon, the method comprising:

separating the feedstock hydrocarbon into a lesser boiling point hydrocarbon fraction and a greater boiling point hydrocarbon fraction;

cracking the greater boiling point hydrocarbon fraction in a high-severity fluid catalytic cracking reactor unit to form a catalytically cracked effluent, wherein the high-severity fluid catalytic cracking reactor operates at a temperature of at least 500°C;

cracking the lesser boiling point hydrocarbon fraction in a steam cracker unit to form a steam cracked effluent; and

separating one or both of the catalytically cracked effluent or the steam cracked effluent to form two or more petrochemical products.

2. The method of claim 1, where the feedstock hydrocarbon comprises crude oil.

3. The method of claim 1, where one of the petrochemical products comprise one or more of methane, ethene, propene, butene, or butadiene.

4. The method of claim 1, further comprising hydroprocessing the greater boiling point hydrocarbon fraction prior to the heavy crude fraction being cracked in the high-severity fluid catalytic cracking reactor unit, where the hydroprocessing comprises reducing the content of one or more of sulfur, metals, aromatics, and nitrogen in the greater boiling point hydrocarbon fraction.

5. The method of claim 4, further comprising combining the greater boiling point hydrocarbon fraction with hydrogen prior to being introduced to the high-severity fluid catalytic cracking reactor unit.

6. The method of claim 5, where at least a portion of hydrogen that is combined with the greater boiling point hydrocarbon fraction is a petrochemical product such that it is recycled.

7. The method of claim 1, where feedstock hydrocarbon is separated into the lesser boiling point hydrocarbon fraction and the greater boiling point hydrocarbon fraction by flashing.

8. The method of claim 1, where contents of the lesser boiling point hydrocarbon fraction have a boiling point of less than or equal to 400°C and the contents of the greater boiling point hydrocarbon fraction have a boiling point of at least 180°C, and the boiling point of the contents of the greater boiling point hydrocarbon fraction is greater than the boiling point of the contents of the lesser boiling point hydrocarbon fraction.

9. The method of claim 1, where the greater boiling point hydrocarbon fraction that is cracked comprises one or more of:

at least 17 parts per million by weight of metals;

at least 135 parts per million by weight of sulfur; and

at least 50 parts per million by weight of nitrogen.

10. The method of claim 1, further comprising combining the catalytically cracked effluent and the steam cracked effluent.

11. The method of claim 1, further comprising:

separating naphtha from the catalytically cracked effluent with a first separator; and

combining the naphtha with the steam cracked effluent.

12. A method for processing a feedstock hydrocarbon, the method comprising:

introducing a feedstock hydrocarbon stream to a feedstock hydrocarbon separator that separates the feedstock hydrocarbon into a lesser boiling point hydrocarbon fraction stream and a greater boiling point hydrocarbon fraction stream;

passing the greater boiling point hydrocarbon fraction stream to a high-severity fluid catalytic cracking reactor unit that cracks the greater boiling point hydrocarbon fraction stream to form a catalytically cracked effluent stream, wherein the high-severity fluid catalytic cracking reactor operates at a temperature of at least 500°C;

passing the lesser boiling point hydrocarbon fraction stream to a steam cracker unit that cracks the lesser boiling point hydrocarbon fraction stream to form a steam cracked effluent stream; and

separating one or both of the catalytically cracked effluent stream or the steam cracked effluent stream to form two or more petrochemical product streams.

13. The method of claim 12, where the feedstock hydrocarbon stream comprises crude oil.

14. The method of claim 12, where one of the petrochemical product streams comprises butene.

15. The method of claim 12, further comprising passing the greater boiling point hydrocarbon fraction to a hydroprocessing unit positioned upstream of the fluid catalytic cracking reactor unit, where one or more of sulfur content, metals content, aromatics, or nitrogen content are reduced in the heavy crude fraction in the hydroprocessing unit prior to the greater boiling point hydrocarbon fraction being introduced to the fluid catalytic cracking reactor unit.

16. The method of claim 15, further comprising combining the greater boiling point hydrocarbon fraction stream with a hydrogen stream prior to being introduced to a hydroprocessing unit positioned upstream of the high-severity fluid catalytic cracking reactor unit.

17. The method of claim 16, where at least a portion of hydrogen in the hydrogen stream that is combined with the greater boiling point hydrocarbon fraction stream is from a petrochemical product stream such that it is recycled.

18. The method of claim 12, where the feedstock hydrocarbon stream is separated into the lesser boiling point hydrocarbon fraction stream and the greater boiling point hydrocarbon fraction stream by flashing.

19. The method of claim 12, where contents of the lesser boiling point hydrocarbon fraction stream have a boiling point of less than or equal to 400°C and the contents of the greater boiling point hydrocarbon fraction stream have a boiling point of at least 280°C, and the boiling point of the contents of the greater boiling point hydrocarbon fraction stream is greater than the boiling point of the contents of the lesser boiling point hydrocarbon fraction stream.

20. The method of claim 12, where the greater boiling point hydrocarbon fraction stream that is cracked comprises one or more of:

at least 17 parts per million by weight of metals;

at least 135 parts per million by weight of sulfur; and

at least 50 parts per million by weight of nitrogen.

21. The method of claim 12, further comprising combining the catalytically cracked effluent stream and the steam cracked effluent stream.

22. The method of claim 12, further comprising:

separating naphtha from the catalytically cracked effluent with a first separator to form a naphtha stream; and

combining the naphtha stream with the steam cracked effluent stream.