CLAIMS

What is claimed is:

1. A continuous process for converting waste plastic into recycle for normal alpha olefins comprising:

(a) selecting waste plastics containing polyethylene and/or polypropylene with the waste plastics containing less than 5 wt. % of polyethylene terephthalate, polyvinyl chloride and polymers of classification type 7;

(b) passing the waste plastics from (a) through a pyrolysis reactor to thermally crack at least a portion of the polyolefin waste and produce a pyrolyzed effluent;

(c) separating the pyrolyzed effluent into offgas, a naphtha/diesel fraction, a heavy fraction, and char;

(d) passing the naphtha/diesel fraction to a crude unit in a refinery with the volume flow of pyrolysis oil and wax to the crude unit comprising up to but no more than 50 volume % of the total hydrocarbon flow to the crude unit;

(e) recovering a straight run naphtha fraction (C_5-C_8) from the crude unit;

(f) passing the straight run naphtha fraction to a steam cracker for ethylene production; and

(g) passing ethylene to a normal alpha olefin synthesis unit to produce normal alpha olefins.

2. The process of claim 1, wherein the naphtha/diesel fraction of (c) is passed directly to a refinery crude unit and the contaminants are removed in a crude unit desalter.

3. The process of claim 1, wherein contaminants are removed at the pyrolysis site.

4. The process of claim 1, wherein the volume flow of naphtha/diesel fraction to the crude unit in the refinery comprises up to 50 volume % of the total hydrocarbon flow to the crude unit.

5. The process of claim 4, wherein the naphtha/diesel flow comprises up to 20 volume %.

6. A continuous process for converting waste plastic into recycle for polyethylene polymerization comprising:

(a) selecting waste plastics containing polyethylene and/or polypropylene with the waste plastics containing less than 5 wt. % of polyethylene terephthalate, polyvinyl chloride and polymers of classification type 7;

(b) passing the waste plastics from (a) through a pyrolysis reactor to thermally crack at least a portion of the polyolefin waste and produce a pyrolyzed effluent;

(c) separating the pyrolyzed effluent into offgas, a naphtha/diesel fraction, a heavy fraction, and char;

(d) passing the naphtha/diesel fraction to a crude unit in a refinery with the volume flow of pyrolysis oil and wax to the crude unit comprising up to but no more than 50 volume % of the total hydrocarbon flow to the crude unit;

(e) recovering a straight run naphtha fraction (C_5-C_8) from the crude unit;

(f) passing the straight run naphtha fraction to a steam cracker for ethylene production;

(g) passing ethylene to a normal alpha olefins synthesis unit to produce normal alpha olefins, and recovering a heavy fraction (C_{22+}) normal alpha olefin stream;

(h) combining the heavy fraction from (c) with the heavy fraction (C_{22+}) normal alpha olefin stream from (g); and

(i) passing the combined heavy fraction and heavy fraction of normal alpha olefin stream from (g) to a wax hydrogenation zone to produce wax.

7. The process of claim 6, wherein the naphtha/diesel fraction of (c) is passed directly to a refinery crude unit and the contaminants are removed in a crude unit desalter.

8. The process of claim 6, wherein contaminants are removed at the pyrolysis site.

9. The process of claim 6, wherein the heavy fraction of normal alpha olefin stream in (g) is taken from normal alpha olefins produced using ethylene produced in the steam cracker.

10. The process of claim 6, wherein ethylene produced in (f) is subsequently polymerized.

11. The process of claim 10, wherein polyethylene products are prepared from the polymerized ethylene.

12. The process of claim 6, wherein heavy naphtha/diesel/atmospheric gas oil is recovered from the crude unit and further processed in the refinery to clean gasoline, diesel, or jet fuel.

13. The process of claim 6, wherein heavy naphtha/diesel/atmospheric gas oil is recovered from the crude unit and further processed in the refinery to clean gasoline, diesel, or jet fuel.

14. The process of claim 12, wherein the amount of virgin crude oil processed by the crude unit is reduced with recycled pyrolysis oil.

15. The process of claim 4, wherein the waste plastics selected in (a) are from plastics classification group 2, 4 and/or 5.

16. The process of claim 6, wherein the volume flow of naphtha/diesel fraction to the crude unit in the refinery comprises up to 50 volume % of the total hydrocarbon flow to the crude unit.

17. The process of claim 16, wherein the naphtha/diesel flow comprises up to 20 volume %.

18. A continuous process for converting waste plastic into recycle for polyethylene polymerization comprising:

(a) selecting waste plastics containing polyethylene and/or polypropylene with the waste plastics containing less than 5 wt. % of polyethylene terephthalate, polyvinyl chloride and polymers of classification type 7;

(b) passing the waste plastics from (a) through a pyrolysis reactor to thermally crack at least a portion of the polyolefin waste and produce a pyrolyzed effluent;

(c) separating the pyrolyzed effluent into offgas, a naphtha/diesel fraction, a heavy fraction, and char;

(d) passing the naphtha/diesel fraction to a crude unit in a refinery with the volume flow of pyrolysis oil and wax to the crude unit comprising up to but no more than 50 volume % of the total hydrocarbon flow to the crude unit;

(e) recovering a portion of a propane and butane (C_3-C_4) fraction from the crude unit;

(f) passing the recovered C_3-C_4 fraction from (e) to a steam cracker for ethylene production;

(g) combining the heavy fraction from (c) with a heavy fraction (C_{22+}) of normal alpha olefin stream; and

(h) passing the combined heavy fraction and heavy fraction (C_{22+}) of normal alpha olefin stream from (g) to a wax hydrogenation zone to produce wax.

19. The process of claim 18, wherein the naphtha/diesel fraction of (c) is passed directly to a refinery crude unit and the contaminants are removed in a crude unit desalter.

20. The process of claim 18, wherein contaminants are removed at the pyrolysis site.

21. The process of claim 18, wherein the heavy fraction of normal alpha olefin stream in (g) is synthesized from ethylene produced in the steam cracker.

22. The process of claim 18, wherein ethylene produced in (f) is subsequently polymerized.

23. The process of claim 22, wherein polyethylene products are prepared from the polymerized ethylene.

24. The process of claim 18, wherein heavy naphtha/diesel/atmospheric gas oil is recovered from the crude unit and further processed in the refinery to clean gasoline, diesel, or jet fuel.

25. The process of claim 18, wherein the waste plastics selected in (a) are from plastics classification group 2, 4 and/or 5.

26. A process for converting waste plastic into chemicals useful in preparing polyethylene and wax comprising:

(a) selecting waste plastics containing polyethylene and/or polypropylene with the waste plastics containing less than 5 wt. % of polyethylene terephthalate, polyvinyl chloride and polymers of classification type 7;;

(b) pyrolyzing the waste plastics and recovering a naphtha/diesel fraction and a heavy fraction;

(c) passing the naphtha/diesel fraction to a crude unit in a refinery with the volume flow of pyrolysis oil and wax to the crude unit comprising up to but no more than 50 volume % of the total hydrocarbon flow to the crude unit; and

(d) passing the heavy fraction in (b) to a wax hydrogenation zone.