CLAIMS

1. Process for treating a feedstock comprising a solid recovery fuel and/or plastics pyrolysis oil, comprising:

a) optionally, a selective hydrogenation step performed in a reaction section fed at least with said feedstock and a gas stream comprising hydrogen, in the presence of at least one selective hydrogenation catalyst, at a temperature of between 100 and 280°C, a partial pressure of hydrogen of between 1.0 and 20.0 MPa abs. and an hourly space velocity of between 0.3 and 10.0 h^{-1}, to obtain a hydrogenated effluent;

b) a hydroconversion step performed in a hydroconversion reaction section, using at least one ebullated-bed reactor, entrained-bed reactor or moving-bed reactor, comprising at least one hydroconversion catalyst, said hydroconversion reaction section being fed at least with said feedstock or with said hydrogenated effluent obtained on conclusion of step a) and a gas stream comprising hydrogen, said hydroconversion reaction section being operated at a temperature of between 250 and 450°C, a partial pressure of hydrogen of between 1.0 and 20.0 MPa abs. and an hourly space velocity of between 0.05 and 10.0 h^{-1}, to obtain a hydroconverted effluent;

c) a separation step, fed with the hydroconverted effluent obtained from step b) and an aqueous solution, said step c) being performed at a temperature of between 50 and 450°C, to obtain at least one gaseous effluent, an aqueous effluent and a hydrocarbon effluent;

d) a step of fractionating all or some of the hydrocarbon effluent obtained from step c), to obtain at least one gas stream, a hydrocarbon cut comprising compounds with a boiling point of less than or equal to 385°C and a hydrocarbon cut comprising compounds with a boiling point above 385°C,

e) a hydrotreatment step performed in a hydrotreatment reaction section, using at least one fixed-bed reactor containing n catalytic beds, n being an integer greater than or equal to 1, each comprising at least one hydrotreatment catalyst, said hydrotreatment reaction section being fed with at least some of said hydrocarbon cut comprising compounds with a boiling point of less than or equal to 385°C obtained from step d) and a gas stream comprising hydrogen, said hydrotreatment reaction section being operated at a temperature of between 250 and 430°C, a partial pressure of hydrogen of between 1.0 and 20.0 MPa abs. and an hourly space velocity of between 0.1 and 10.0 h^{-1}, to obtain a hydrotreated effluent;

f) a separation step, fed with the hydrotreated effluent obtained from step e) to obtain at least a gaseous effluent and a hydrotreated liquid hydrocarbon effluent.

2. Process according to the preceding claim, comprising said selective hydrogenation step a).

3. Process according to either of the preceding claims, in which the hydrocarbon cut comprising compounds with a boiling point above 385°C obtained from step d) is at least partly recycled into step b).

4. Process according to one of the preceding claims, comprising a step a0) of pretreating the feedstock, said pretreatment step being performed upstream of the optional selective hydrogenation step a) or upstream of the hydroconversion step b) and comprises a filtration step and/or a step of washing with water and/or an adsorption step.

5. Process according to one of the preceding claims, in which the hydrotreated liquid hydrocarbon effluent obtained from step f) is sent into a steam cracking step h) performed in at least one pyrolysis furnace at a temperature of between 700 and 900°C and at a pressure of between 0.05 and 0.3 MPa relative.

6. Process according to one of the preceding claims, which also comprises a recycling step g) in which a fraction of the hydrotreated liquid hydrocarbon effluent obtained from the separation step f) is sent into the optional selective hydrogenation step a) and/or the hydroconversion step b) and/or the hydrotreatment step e).

7. Process according to one of the preceding claims, in which the separation step f) comprises a fractionation making it possible to obtain, in addition to a gas stream, a naphtha cut comprising compounds with a boiling point of less than or equal to 175°C, and a diesel cut comprising compounds with a boiling point above 175°C and below 385°C.

8. Process according to the preceding claim, which also comprises a hydrocracking step e') performed in a hydrocracking reaction section, using at least one fixed bed containing n catalytic beds, n being an integer greater than or equal to 1, each comprising at least one hydrocracking catalyst, said hydrocracking reaction section being fed at least with said hydrotreated effluent obtained from step e) and/or with the diesel cut comprising compounds with a boiling point above 175°C and below 385°C obtained from step f) and a gas stream comprising hydrogen, said hydrocracking reaction section being operated at a temperature of between 250 and 450°C, a partial pressure of hydrogen of between 1.5 and 20.0 MPa abs. and an hourly space velocity of between 0.1 and 10.0 h^{-1}, to obtain a hydrocracked effluent which is sent into the separation step f).

9. Process according to one of the preceding claims, in which the separation step f) also comprises fractionation of the naphtha cut comprising compounds with a boiling point of less than or equal to 175°C into a light naphtha cut comprising compounds with a boiling point below 80°C and a heavy naphtha cut comprising compounds with a boiling point of between 80 and 175°C.

10. Process according to Claim 9, in which at least part of said heavy naphtha cut is sent to an aromatic complex including at least one naphtha reforming step and/or in which at least part of the light naphtha cut is sent into the steam cracking step h).

11. Process according to one of the preceding claims, in which said selective hydrogenation catalyst of step a) comprises a support chosen from alumina, silica, silica-aluminas, magnesia, clays and mixtures thereof and a hydro-dehydrogenating function comprising either at least one group VIII element and at least one group VIB element, or at least one group VIII element.

12. Process according to one of the preceding claims, in which, when step b) is performed in an ebullated bed or in a moving bed, said hydroconversion catalyst of step b) comprises a supported catalyst comprising a group VIII metal chosen from the group formed by Ni, Pd, Pt, Co, Rh and/or Ru, optionally a group VIB metal chosen from the group Mo and/or W, on an amorphous mineral support chosen from the group formed by alumina, silica, silica-aluminas, magnesia, clays and mixtures of at least two of these minerals, and when step b) is performed in an entrained bed, said hydroconversion catalyst of step b) comprises a dispersed catalyst containing at least one element chosen from the group formed by Mo, Fe, Ni, W, Co, V and Ru.

13. Process according to one of the preceding claims, in which said hydrotreatment catalyst of step e) comprises a support chosen from the group consisting of alumina, silica, silica-aluminas, magnesia, clays and mixtures thereof and a hydro-dehydrogenating function comprising at least one group VIII element and/or at least one group VIB element.

14. Process according to Claims 8 to 13, in which said hydrocracking catalyst of step e') comprises a support chosen from halogenated aluminas, combinations of boron and aluminium oxides, amorphous silica-aluminas and zeolites and a hydro-dehydrogenating function comprising at least one group VIB metal chosen from chromium, molybdenum and tungsten, alone or as a mixture, and/or at least one group VIII metal chosen from iron, cobalt, nickel, ruthenium, rhodium, palladium and platinum.

15. Process according to one of the preceding claims, in which the feedstock has the following properties:

- a content of aromatic compounds of between 0 and 90% by weight,
- a content of halogenated compounds of between 2 and 5000 ppm by weight,
- a content of metallic elements of between 10 and 10 000 ppm by weight,
- including a content of iron element of between 0 and 100 ppm by weight,
- a content of silicon element of between 0 and 1000 ppm by weight.