CLAIMS

1. A process for upgrading refinery heavy hydrocarbons to petrochemicals, comprising the following steps of:

(a) feeding a hydrocarbon feedstock to a ring opening reaction area, wherein the process conditions prevailing in said reaction area for ring opening are a temperature from 100 °C to 500 °C and a pressure from 2 to 10 MPa together with from 50 to 300 kg of hydrogen per 1,000 kg of feedstock over an aromatic hydrogenation catalyst and passing the resulting stream to a ring cleavage unit at a temperature from 200 °C to 600 °C and a pressure from 1 to 12 MPa together with from 50 to 200 kg of hydrogen per 1000 kg of said resulting stream over a ring cleavage catalyst;

(b) feeding the effluent from (a) to a separation unit for producing a gaseous stream comprising light boiling hydrocarbons, a liquid stream comprising naphtha boiling range hydrocarbons and a liquid stream comprising diesel boiling range hydrocarbons;

(c) feeding said liquid stream comprising naphtha boiling range hydrocarbons to a hydrocracking unit, wherein the process conditions prevailing in said hydrocracking unit are a reaction temperature of 300-580 °C, a pressure of 0.3-5 MPa gauge, and a Weight Hourly Space Velocity (WHSV) of 0.1-10 h-1;

(d) separating reaction products of said hydrocracking unit of step (c) into an overhead gas stream, comprising light boiling hydrocarbons, and a BTX (a mixture of benzene, toluene and xylenes) comprising bottom stream,

(e) feeding the overhead gas stream from the hydrocracking unit of step (d) and the gaseous stream from the separation unit of step (b) to a steam cracking unit and at least one or more units chosen from the group of propane dehydrogenation unit, butane dehydrogenation and combined propane-butane dehydrogenation unit, preferably after separating a hydrogen containing stream from said gas streams.

2. The process as set forth in claim 1, further comprising feeding the overhead gas stream from the hydrocracking unit of step (d) and the gaseous stream from the separation unit of step (b) to another separation unit and feeding the thus separated streams to said steam cracking unit and said dehydrogenation unit(s).

3. The process as set forth in any one of claims 1-2, wherein said dehydrogenation process is a catalytic process and said steam cracking process is a thermal cracking process.

4. The process according to any one or more of the preceding claims, further comprising pretreating said hydrocarbon feedstock in an aromatics extraction unit, from which aromatics extraction unit its aromatics rich stream is fed into said reaction area for ringopening, especially wherein said aromatics extraction unit is chosen from the group of the type of a distillation unit, the molecular sieve type and the type of a solvent extraction unit, especially

further comprising pretreating said hydrocarbon feedstock in a splitter unit, from which splitter unit the naphtha boiling range hydrocarbons fraction is fed directly into said hydrocracking unit and its heavier fraction is fed into said ring opening reaction area, especially

further comprising pretreating said hydrocarbon feedstock in a pre-hydrocracking unit, from which pre-hydrocracking unit a heavy hydrocarbons fraction is fed to said ring opening reaction area, a stream comprising naphtha boiling range hydrocarbons is fed directly to said hydrocracking unit and a gaseous stream comprising LPG is fed to a steam cracking unit and one or more units chosen from the group of propane dehydrogenation unit, butane dehydrogenation unit and combined propane-butane dehydrogenation unit, especially

further comprising pretreating said hydrocarbon feedstock in a hydrodealkylation/reforming type unit, from which hydrodealkylation/reforming type unit a BTXE type stream is obtained, a heavy hydrocarbons fraction is fed to said ring opening reaction area and a gaseous stream comprising LPG is fed to a steam cracking unit and one or more units chosen from the group of, propane dehydrogenation unit, butane dehydrogenation unit and combined propane-butane dehydrogenation unit.

5. The process according to any one or more of the preceding claims, further comprising feeding at least one of said gaseous stream from said separation unit of step (b), said gaseous stream from said hydrodealkylation/reforming type unit and said gaseous stream from said pre-hydrocracking unit to said hydrocracking unit.

6. The process according to any one or more of the claims 2-5, further comprising feeding said bottom stream from said hydrocracking unit to a transalkylation unit.

7. The process according to any one or more of the preceding claims, further comprising feeding said liquid stream comprising diesel boiling range hydrocarbons from said separation unit to an aromatics saturation unit.

8. The process according to any one or more of the preceding claims, further comprising separating the overhead gas stream from said hydrocracking unit, the gaseous stream from said separation unit of step (b), and possibly the gaseous streams from said pre-hydrocracking unit and said hydrodealkylation/reforming type unit, into individual streams, each stream predominantly comprising C2 paraffins, C3 paraffins and C4 paraffins, respectively, and feeding each individual stream to a specific furnace section of said steam cracker unit, wherein a hydrogen containing stream is sent to one or more hydrogen consuming process units, such as said (pre)-hydrocracking unit and said reaction area for ring opening,

further comprising feeding only the C3-C4 fraction to at least one of said dehydrogenation units, especially as separate C3 and C4 streams, more preferably as a combined C3 + C4 stream.

9. The process as set forth in any one of claims 1-8, wherein the process conditions prevailing in said separation unit are a temperature from 149[deg.] C to 288[deg.] C and a pressure from 1 MPa to 17.3 Mpa.

10. The process as set forth in any one of claims 1-9, wherein the process conditions prevailing in said hydrocracking unit are a reaction temperature of 450-580 °C, preferable of 470-550 °C, a pressure of 0.6-3 MPa gauge, preferable at a pressure of 1000-2000 kPa gauge, most preferable at a pressure of 1-2 MPa gauge, even most preferable at a pressure of 1.2-1.6 MPa gauge, a Weight Hourly Space Velocity (WHSV) of 0.2-6 h-1, preferable of 0.4-2 h-1.

11. The process as set forth in any one of claims 1-10, wherein the process conditions prevailing in said steam cracking unit are a reaction temperature around 750-900 °C, residence times of 50-1000 milliseconds and a pressure selected of atmospheric up to 175 kPa gauge.

12. The process as set forth in any one of claims 1-11, wherein the hydrocarbon feedstock of step (a) is chosen from the group of shale oil, crude oil, kerosene, diesel, atmospheric gas oil (AGO), gas condensates, waxes, crude contaminated naphtha, vacuum gas oil (VGO), vacuum residue, atmospheric residue, naphtha and pretreated naphtha, light cycle oil/heavy cycle oil (LCO/HCO), coker

naphtha and diesel, FCC naphtha and diesel, and slurry oil, or a combination thereof.

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