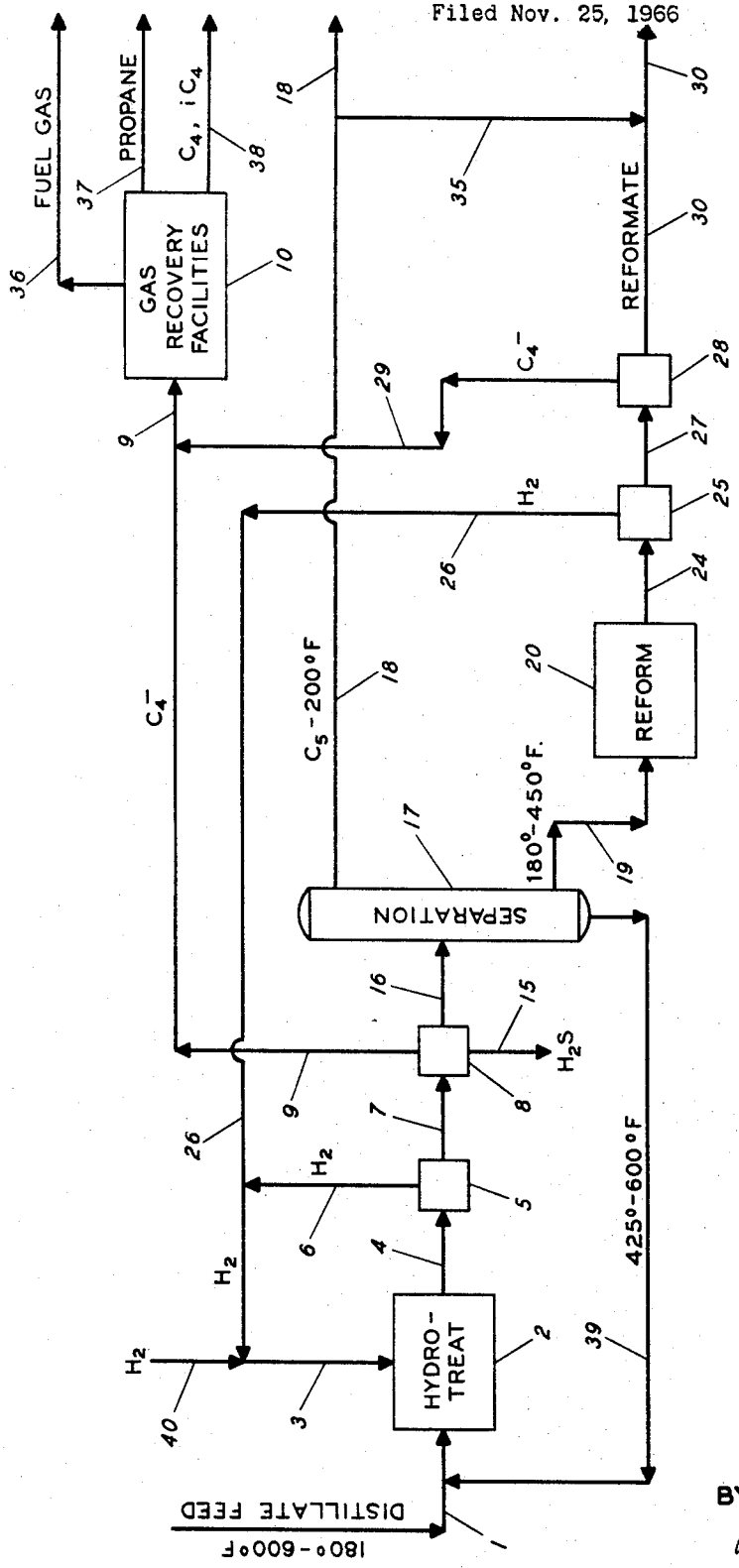
Nov. 5, 1968 N. J. PATERSON 3,409,539

COMBINATION HYDROTREATING AND REFORMING PROCESS FOR CONVERTING LOW BOILING NORMALLY LIQUID HYDROCARBON MATERIALS TO A VARIETY OF NORMALLY LIQUID AND NORMALLY GASEOUS FUEL PRODUCTS

Filed Nov. 25, 1966



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United States Patent Office

3,409,539
Patented Nov. 5, 1968

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COMBINATION HYDROTREATING AND REFORMING PROCESS FOR CONVERTING LOW BOILING NORMALLY LIQUID HYDROCARBON MATERIALS TO A VARIETY OF NORMALLY LIQUID AND NORMALLY GASEOUS FUEL PRODUCTS

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Filed Nov. 25, 1966, Ser. No. 597,116
4 Claims. (Cl. 208—60)

ABSTRACT OF THE DISCLOSURE

A two-stage process for producing valuable products including LPG and gasoline from a hydrocarbon feedstock boiling in the range 180°–600° F., containing 10–1000 parts per million sulfur and less than 300 parts per million nitrogen, comprising a hydrocracking stage followed by a reforming stage, the hydrocracking stage containing a solid, acidic, siliceous, highly active hydrocracking catalyst, operating at a per-pass conversion of at least 15%, said hydrocracking stage producing valuable products including LPG and also producing a superior feedstock for said reforming stage.

This invention relates to a catalytic conversion process for converting hydrocarbon distillates to valuable fuel products including light gases. More particularly, the invention relates to a catalytic hydrotreating process for converting certain low boiling hydrocarbon distillates into valuable products including catalytic reformates, unreformed gasoline blending stocks and liquefied petroleum gases (known as LPG and consisting of C_3 and C_4 hydrocarbons).

Objects

Many refineries periodically have excess low octane hydrocarbon distillates boiling within the range of about 180° to 450° F. Because of their low octane numbers these distillates, particularly those having octane numbers below about 70 F–1 Clear, and more particularly those having octane numbers below about 60 F–1 Clear, have little utility either as gasoline blending stocks or reformer feedstocks. It is an object of the present invention to provide a process for converting hydrocarbon feedstocks boiling in the range 180° to 600° F., including the aforesaid excess low octane 180° to 450° F. distillates, into various valuable fuel products, including high octane catalytic reformates, unreformed high octane gasoline blending stocks and propane and butanes. The process is attractive in view of the large demand not only for high octane gasolines but also for propane and butanes for LPG, town gas or chemical plant feedstocks. Butanes are in particularly high demand because of their multiple uses, for example gasoline blending and alkylate manufacture.

Drawings

This invention will be more clearly understod and further objects and advantages thereof will be apparent from the following description when read in connection with the accompanying drawing in which the figure there shown is a diagrammatic illustration of an arrangement of process units and flow paths suitable for carrying out one embodiment of the process of the invention.

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Statements of invention

In accordance with one embodiment of the present invention there is provided a catalytic hydrotreating process which comprises hydrocracking a previously unhydrofined hydrocarbon distillate feedstock boiling in the range 180° to 600° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., 10 to 1000 parts per million sulfur and less than 300 parts per million nitrogen in a hydrocracking zone in the presence of hydrogen and a substantially halogen-free, solid, acidic hydrocracking catalyst having a high cracking activity comprising a siliceous cracking component and a hydrogenating-dehydrogenating component selected from the group consisting of Group VIII metals, the oxides of Group VIII metals and the sulfides of Group VIII metals, said hydrocracking being accomplished at a temperature in the range 500° to 850° F., preferably 500° to 800° F., a pressure in the range 300 to 3000 p.s.i.g., preferably 300 to 2000 p.s.i.g., a liquid hourly space velocity in the range 0.2 to 10, and at a per-pass conversion of said feedstock of at least 15% to hydrocarbons boiling below the initial boiling point of said feedstock, including normally gaseous hydrocarbons, whereby valuable lower boiling hydrocarbons are produced, whereby at least a substantial portion of the sulfur in said feedstock in a form other than H_2S is converted to H_2S, separating from the effluent from said hydrocracking zone at least one normally gaseous hydrocarbon fraction, a hydrocarbon fraction boiling in the range C_5 to 200° F. and a hydrocarbon fraction boiling in the range 180° F. to 450° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., and containing less than 10 parts per million, preferably less than 5 parts per million, sulfur, and reforming said fraction boilingg in the range 180° F. to 450° F. to produce a high octane reformate.

Other embodiments of the present invention, for example wherein more specifically defined feedstocks are used, will be apparent from the following portions of this specification.

Hydrotreating zone catalysts

The hydrotreating zone catalyst may be any conventional hydrotreating catalyst that under the conditions in the hydrotreating zone: (a) will reduce the sulfur content of a feedstock containing 10 to 1000 parts per million sulfur by an amount sufficient to obtain from the hydrotreating zone effluent a fraction boiling in the range 185° to 450° F. that contains less than 10 parts per million, preferably less than 5 parts per million, sulfur; (b) will result in a yield of LPG ($C_3+nC_4+iC_4$), based on fresh feed to the hydrotreating zone, of at least 10%, when that zone is operated at a conversion of 25% to products boiling below the initial boiling point of the feed to that zone, and to at least 20% when that zone is operated at a conversion of 40% to 50% to products boiling below the initial boiling point of the feed to that zone.

Suitable hydrogenating components may be selected from the group consisting of a Group VIII metal alone, a compound of a Group VIII metal alone, a Group VIII metal in combination with a Group VI metal, a Group VIII metal compound in combination with a Group VI metal, and a Group VIII metal compound in combination with a Group VI metal compound. Suitable Group VIII metals and compounds thereof include nickel, co-

balt, platinum, palladium, and compounds thereof, with palladium being especially useful when the cracking component is a molecular sieve. Suitable Group VI metals and compounds thereof include molybdenum, tungsten, chromium, and compounds thereof.

The cracking component preferably is a solid, acidic component having high cracking activity, such as silica-alumina. Suitable cracking components include silica-alumina, silica-alumina-zirconia, silica-alumina-titania, acid-treated clays and molecular sieves, with molecular sieves being especially suitable, particularly when used in conjunction with a hydrogenating component comprising palladium or a compound thereof. The catalyst may be prepared by impregnation, cogellation, or a combination of these procedures.

Suitable feedstocks; source, octane number, sulfur content and nitrogen content

The fresh hydrocarbon feed for the hydrotreating zone may be any previously unhydrofined hydrocarbon distillate boiling within the range 180° to 600° F., preferably 180° to 450° F., more preferably 180° to 425° F., containing at least 40 volume percent, preferably at least 50 volume percent, of materials boiling in the range 180° to 320° F., and containing 10 to 1000 parts per million sulfur and 0 to 300 parts per million nitrogen in the form of organic nitrogen compounds. Suitable available feedstocks frequently will contain more than 300 parts per million, for example 500 parts per million sulfur.

When the hydrotreating catalyst does not comprise at least a substantial amount of a molecular sieve cracking component, the previously unhydrofined feedstock should contain less than 50 parts per million nitrogen, more preferably less than 10 parts per million nitrogen, and still more preferably less than 5 parts per million nitrogen. When the hydrotreating catalyst comprises at least a substantial amount of a molecular sieve cracking component, the nitrogen content of the hydrocarbon feed to the hydrotreating zone may range up to 300 parts per million, although preferably it will be below 50 parts per million and still more preferably below 10 parts per million. Generally the nitrogen content, in the form of organic nitrogen compounds, of available, previously unhydrofined, fresh feedstocks meeting the boiling range requirements for the present process will be well below 10 parts per million.

The 180° F. lower limit of the hydrocarbon feed boiling range is chosen primarily to exclude C_6 components from the feed in other than minor amounts. The hydrocarbon feed should contain less than 5 volume percent C_6 components, and preferably less than 3 volume percent of these components, because they are substantially nonreactive in the hydrotreating zone and the normal C_6 components in particular adversely affect the octane number of the C_5 to 200° F. gasoline blending stock recovered from the effluent from the hydrotreating zone. That gasoline blending stock contains a desirably high percentage of C_5 components, particularly the highest octane iC_5 components, when C_6 components are substantially excluded from the feed to the hydrotreating zone.

The upper limit of the boiling range of the hydrocarbon feedstock preferably is the upper limit of the permissible boiling range of the feed to the catalytic reforming zone, i.e., not more than 450° F., and more preferably not more than 425° F. where it is desired to operate the hydrotreating zone on a once-through basis. In this case it is possible to pass to the catalytic reformer substantially all of the nonsynthetic product from the hydrotreating zone, that is, that product boiling within the boiling range of the feed to the hydrotreating zone. However, where recycle operation of the hydrotreating zone is desired, the hydrocarbon feed thereto may boil within a range that extends to 600° F. or higher, with those portions of the effluent from the hydrotreating zone boiling above an acceptable upper limit for the feed to the reforming zone being returned to the hydrotreating zone.

The following table which sets forth approximate boiling points of various hydrocarbons will aid in understanding the significance of the selection of various boiling range limits and fractionation cut points in the present process.

TABLE I

Straight Chain Compounds	Approximate Boiling Point, ° F.	Ring Compounds
	(90)	
Pentane (C_5)	97	
2,2-dimethyl-butane (iC_6)	122	
3-methyl-pentane	147.2	
Hexane (nC_6)	156	
2,2-dimethyl-pentane (iC_7)	174	
	176	Benzene (C_6).
	177	Cyclohexane (C_6).
2-methyl-hexane (iC_7)	193	
3-methyl-hexane (iC_7)	197	
Heptane (nC_7)	209	
	211	Methyl-cyclohexane (C_7).
	230	Toluene (C_7).
	250	1,3-dimethyl-cyclohexane (C_8).
Octane (nC_8)	258	
	280	1,3,5-trimethyl-cyclohexane (C_9).
	282	p-Xylene (C_8).
	283	m-Xylene (C_8).
	290	o-Xylene (C_8).
Nonane (nC_9)	303	
	347	1-methyl-3-propyl-benzene (C_9).
Decane (nC_{10})	348	
	359	1-methyl-2-propyl-benzene (C_9).
	360	1,2-diethyl-benzene (C_{10}).
Hendecane (nC_{11})	390	
	400	1-ethyl-4-propyl-benzene (C_{11}).
	(420)	

Hydrotreating zone operating conditions

Operating temperature, pressures and space velocities for the hydrotreating zone are set forth under "Statement of Invention," above.

The hydrogen supply rate to the hydrotreating zone may be from 1000 to 12,000 s.c.f. per barrel of feed, preferably 2500 to 8000 s.c.f. per barrel.

At the operating conditions specified herein the per-pass conversion in the hydrotreating zone, to products boiling below the initial boiling point of the feed thereto, will vary from around 15% to over 60%, depending upon the hydrocarbon feedstock and the combination of conditions chosen. Preferably the hydrotreating zone will be operated at that per-pass conversion between 15% and 30%, with a given catalytic reformer and given reformer operating conditions, that will permit enough nonsynthetic reformer feedstock to be passed from the effluent from the hydrotreating zone to the catalytic reformer to enable the catalytic reformer to produce enough hydrogen to supply all of the hydrogen requirements of the hydrotreating zone and thereby to enable the system to be operated in hydrogen balance. Higher hydrotreating zone per-pass conversions may be used if additional hydrogen for the system is available from an external source, so that it is not necessary to operate in hydrogen balance with hydrogen from the reformer alone.

When a hydrotreating catalyst comprising a molecular sieve component is used, the catalyst is more nitrogen-tolerant than other conventional hydrotreating catalysts. Accordingly, a higher nitrogen content may be tolerated in the hydrocarbon feedstock to the hydrotreating zone. With such higher nitrogen content feedstocks a higher hydrotreating zone temperature than in the case of lower nitrogen content feedstocks will be found desirable. Rather than being a disadvantage, this can be advantageous in that dehydrogenation of naphthenes can be appreciable enough at the higher temperatures to significantly improve the aromaticity of the portion of the hydrotreating zone effluent that is passed to the catalytic reformer, thereby making that portion a better reformer feedstock.

Reforming zone catalyst, operating conditions and hydrocarbon feed

The reforming zone in the present process is a conventional catalytic reforming zone operating with a conventional reforming catalyst under conventional reforming conditions. Suitable catalysts include platinum-alumina catalysts, which may contain fluoride or chloride, and platinum-silica-alumna catalysts. Operating temperatures in the range 700° to 1000° F., preferably 725° to 950° F., operating pressures in the range 100 to 1000 p.s.i.g., preferably 200 to 750 p.s.i.g., and space velocities in the range 0.1 to 10, preferably 0.5 to 4 are suitable.

The feed to the reforming zone comprises a fraction boiling in the range 180° to 450° F., preferably in the range 180° to 425° F., containing at least 40 volume percent, preferably at least 80 volume percent, of materials boiling in the range 180° to 320° F., obtained from the effluent from the hydrotreating zone. It will be noted that, in contrast to the light gases and the C_5–200° F., preferably C_5–180° F. gasoline blending stock obtained from the hydrotreating zone, all of which are substantially synthetic products, the materials passed to the reforming zone from the hydrotreating zone must contain substantial quantities of nonsynthetic materials, that is, materials within the boiling range of the feed to the hydrotreating zone. Preferably, substantially all of the nonsynthetic materials from the hydrotreating zone that boil below 420° F. are passed to the reforming zone.

The reforming zone operates with a net production of hydrogen, which may be used to supply all or a portion of the hydrogen requirements of the hydrotreating zone.

Detailed description

A best mode for carrying out the process of the present invention may be determined by reference to the appended drawing which is a diagrammatic illustration of a group of interrelated process zones and flow paths suitable for use in practicing the process. For purposes of clarity and because their location and use will be readily apparent to those skilled in the art, various pieces of conventional equipment, such as heaters and pumps, have been omitted from the drawing.

Referring now to the drawing, a previously unhydrofined fresh hydrocarbon distillate feed boiling within the range 180° to 600° F. and preferably within the range 180° to 450° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., containing from 10 to 1000 parts per million sulfur, for example 500 parts per million sulfur, and containing from 0 to 300 parts per million nitrogen, for example 0.15 parts per million nitrogen, is passed through line **1** to hydrotreating zone **2** and contacted therein with a nickel sulfide on silica-alumina catalyst in the presence of hydrogen supplied through line **3** under conditions previously set forth, for example a temperature of 700° F., a pressure of 1180 p.s.i.g. and an LHSV of 1.35. The effluent from hydrotreating zone **2** is passed through line **4** to high pressure separation zone **5** wherein it is cooled without reduction in pressure, permitting hydrogen to be withdrawn through line **6** and the remaining portion of the effluent passed through line **7** to low pressure separation zone **8**. In low pressure separation zone **8**, the release of pressure on the materials entering that zone through line **7** permits separation from those materials of a C_4– stream, passed through line **9** to gas recovery facilities **10**, and permits separation of H_2S, which is withdrawn through line **15**. The remaining materials are passed through line **16** to separation zone **17**, which may be a distillation column.

From separation zone **17** a fraction boiling in the range C_5 to 200° F., preferably C_5 to 180° F., is withdrawn through line **18** as a high octane gasoline blending stock. From separation zone **17** a fraction boiling in the range 180° to 450° F., preferably 180° to 425° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., and containing less than 10 parts per million sulfur, is passed through line **19** to catalytic reforming zone **20**, containing a conventional reforming catalyst, for example platinum on alumina. Catalytic reforming zone **20** is operated at reforming conditions previously discussed, for example, a temperature of 900° F., a pressure of 450 p.s.i.g., an LHSV of 2.0 and a hydrogen to hydrocarbon mol ratio of 10. The effluent in line **24** from catalytic reforming zone **20** is separated in high pressure separation zone **25** into a hydrogen stream, which is passed through lines **26** and **3** to hydrotreating zone **2**, and a remaining stream which is passed through line **27** to low pressure separation zone **28**.

From low pressure separation zone **28** a C_4— stream is passed through lines **29** and **9** to gas recovery facilities **10**. From low pressure separation zone **28** a high octane reformate is withdrawn through line **30**. All or a portion of the gasoline blending stock in line **18** may be passed through line **35** to combine it with the reformate in line **30** if desired.

From gas recovery facilities **10** a fuel gas stream is withdrawn through line **36**, propane is withdrawn through line **37** and butanes are withdrawn through line **38**. The propane and butanes may be utilized for LPG purposes.

From separation zone **17** a bottoms fraction boiling in the range 425° to 600° F., where materials in this boiling range are present in the original feed in line **1**, is returned through line **39** to hydrotreating zone **2**. In cases where the hydrogen produced in reformer **20** and passed through lines **26** and **3** to hydrotreating zone **2** is not sufficient to supply the hydrogen requirements of hydrotreating zone **2**, additional hydrogen may be supplied to hydrotreating zone **2** through lines **40** and **3**.

The following specific examples will contribute to a further understanding of the process of the present invention and its advantages.

EXAMPLE 1

A hydrotreating zone containing a nickel sulfide on silica-alumina catalyst is operated on a once-through basis with a previously unhydrofined Kuwait hydrocarbon distillate feed boiling from 180° to 350° F., containing 520 parts per million sulfur, 0.15 part per million nitrogen, less than 2 volume percent of C_6 components, and having an octane number of 32.5 F–1 Clear and 57.0 F–1+3 ml. TEL (tetraethyl lead) per gallon. The feed is supplied to said zone at the rate of 10,000 b.p.s.d. (barrels per stream day), and is contacted in said zone with said catalyst and with 4.6 million standard cubic feet of hydrogen per Stream Day, supplied entirely from the catalytic reforming zone discussed below. The hydrotreating zone is operated at an average temperature of 750° F., an average pressure of 850 p.s.i.g., and a liquid hourly space velocity of 2.0, to provide a per-pass conversion of said feed of approximately 25 volume percent to products boiling below the initial boiling point of said feed.

The effluent from said hydrotreating zone is fractionated into a C_4— fraction, a fraction boiling in the range C_5 to 180° F., and a fraction boiling above 180° F.

The fraction boiling in the range C_5 to 180° F. is a high octane gasoline blending stock, produced at the rate of 1575 b.p.s.d., having an octane number of 86.5 F–1 Clear, 98.5 F–1+3 ml. TEL per gallon, and 100.5 F–2+3 ml. TEL per gallon.

The fraction boiling above 180° F. is a catalytic reformer feedstock, containing less than 1 part per million sulfur and negligible nitrogen, produced at the rate of 7500 b.p.s.d. It is passed at that rate to a catalytic reforming zone and therein contacted with a platinum on alumina reforming catalyst at a temperature of 900° F. a reactor outlet pressure of 450 p.s.i.g. and a liquid hourly space velocity of 2.0, in the presence of 10 mols of hydrogen per mol of hydrocarbon, resulting in conversion of said feedstock to C_4— products and a C_5+ cata-

lytic reformate, with a net production of hydrogen of 4.6 million s.c.f. per Stream aDy. The hydrogen produced is passed to the hydrotreating zone as previously indicated. The C_5+ catalytic reformate is produced at the rate of 5575 barrels per stream day, and has an octane number of 96.0 F–1 Clear, 101.4 F–1+3 ml. TEL per gallon, and 92.3 F–2+3 ml. TEL per gallon.

The C_4– products from both the hydrotreating zone and the catalytic reforming zone are passed to conventional gas recovery facilities, from which are recovered 710 b.p.s.d. of C_1–C_2 fuel gas, 925 b.p.s.d. of propane, and 1855 b.p.s.d. of mixed butanes, consisting of 65% isobutane.

It will be noted that the hydrotreating zone served to: (a) substantially desulfurize the hydrocarbon distillate feed; (b) produce a 180° F.+feedstock having a sufficiently low sulfur content for the catalytic reformer with its sulfur sensitive catalyst; (c) produce a high octane gasoline blending stock; and (d) produce LPG components.

EXAMPLE 2

A hydrotreating zone containing a nickel sulfide on silica-alumina catalyst is operated on a once-through basis with a previously unhydrofined hydrocarbon distillate feed boiling from 212° to 364° F., containing 534 parts per million sulfur, 0.017 part per million nitrogen, less than 2 volume percent of C_6 components and having an octane number of 32.0 F–1 Clear and 55.0 F–1+3 ml. TEL per gallon. The feed is contacted in said zone with said catalyst at a hydrogen gas rate of 4300 s.c.f. per barrel of said feed, the hydrogen being supplied partly from the catalytic reforming zone discussed below and partly from an external source. The hydrotreating zone is operated at an average temperature of 700° F., an average pressure of 1180 p.s.i.g. and an LHSV of 1.35 to provide a per-pass conversion of said feed of approximately 41 volume percent to products boiling below the initial boiling point of said feed. The effluent from said hydrotreating zone is fractionated into a C_4– fraction, a fraction boiling in the range of C_5 to 180° F. and a fraction boiling above 180° F.

The fraction boiling in the range of C_5 to 180° F. is a high octane gasoline blending stock having an octane number of 85.3 F–1 Clear and 98.5 F–1+3 ml. TEL per gallon.

The fraction boiling above 180° F. is a catalytic reformer feedstock containing less than 1 part per million surfur and negligible nitrogen is passed to a catalytic reforming zone and therein contacted with a platinum on alumina reforming catalyst at a temperature of 900° F., a reactor outlet pressure of 450 p.s.i.g. and an LHSV of 2.0 in the presence of 10 mols of hydrogen per mol of hydrocarbon resulting in conversion of said feedstock to C_4– products and a C_5+ catalytic reformate, with a net production of hydrogen. The hydrogen produced is passed to the hydrotreating zone, together with additional quantities of hydrogen from another source, as previously indicated. The C_5+ catalytic reformate has an octane number of 96.0 F–1 Clear and 101.4 F–1+3 ml. of TEL per gallon.

The C_4– products from both the hydrotreating zone and the catalytic reforming zone are passed to conventional gas recovery facilities from which are recovered fuel gas, propane and mixed butanes.

As in Example 1, it will be noted that the hydrotreating zone served to: (a) substantially desulfurize the hydrocarbon distillate feed; (b) produce a 180° F.+feedstock having a sufficiently low sulfur content for the catalytic reformer with its sulfur sensitive catalysts; (c) produce a high octane gasoline blending stock; and (d) produce LPG components.

The following table sets forth on a comparative basis the composition of the effluents from the hydrotreating zones in Examples 1 and 2, in each case in volume percent of the hydrocarbon feed to the zone in question.

TABLE II.—COMPOSITION OF HYDROTREATING ZONE EFFLUENT, IN VOLUME PERCENT OF HYDROCARBON FEED

	Example 1 (25 volume percent conversion, hydrotreating zone in hydrogen balance with catalytic reformer)	Example 2 (41 volume percent conversion, hydrotreating zone not in hydrogen balance with catalytic reformer)
C_3	4.13	5.4
iC_4	9.58	15.8
nC_4	2.70	5.2
C_5	7.60	12.0
C_6	8.14	13.9
C_7+	75.00	58.8

From the foregoing it may be seen that the advantages of the process of the present invention include: (a) use of a single hydrotreating zone to substantially desulfurize a hydrocarbon distillate feed, produce a 180° F.+low sulfur reformer feedstock, produce a high octane blending stock, and produce LPG components; (b) inherent flexibility in varying the ratio of LPG to gasoline production over a wide range in response to demand changes; increasing the per-pass conversion in the hydrotreating zone increases the ratio of LPG to total gasoline produced.

Numerous variations could be made in the process of the present invention as disclosed herein, without departing from the spirit or scope of the invention. All such variations are intended to be included within the scope of the following claims.

What is claimed is:

1. A catalytic hydrotreating process which comprises hydrocracking a previously unhydrofined hydrocarbon distillate feedstock boiling in the range 180° to 600° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., 10 to 1000 parts per million sulfur and less than 300 parts per million nitrogen in a hydrocracking zone in the presence of hydrogen and a substantially halogen-free, solid, acidic, hydrocracking catalyst having a high cracking activity comprising a siliceous cracking component and a hydrogenating-dehydrogenating component selected from the group consisting of Group VII metals, the oxides of Group VIII metals and the sulfides of Group VIII metals, said hydrocracking being accomplished at a temperature in the range 500° to 850° F., a pressure in the range 300 to 3000 p.s.i.g., a liquid hourly space velocity in the range 0.2 to 10, and at a per-pass conversion of said feedstock of at least 15% to hydrocarbons boiling below the initial boiling point of said feedstock, including normally gaseous hydrocarbons, whereby valuable lower boiling hydrocarbons are produced, and whereby at least a substantial portion of the sulfur in said feedstock in a form other than H_2S is converted to H_2S, separating from the effluent from said hydrocracking zone at least one normally gaseous hydrocarbon fraction, a hydrocarbon fraction boiling in the range C_5 to 200° F. and a hydrocarbon fraction boiling in the range 180° F. to 450° F., containing at least 40 volume percent of materials boiling in the range 180° to 320° F., and containing less than 10 parts per million sulfur, and reforming said fraction boiling in the range 180° F. to 450° F. to produce a high octane reformate.

2. A process as in claim **1**, wherein said hydrotreating catalyst is selected from the group consisting of catalysts comprising nickel or a compound thereof and a conventional silica-alumina cracking component, catalysts comprising palladium or a compound thereof and a molecular sieve cracking component, and catalysts comprising platinum or a compound thereof and a molecular sieve cracking component.

3. A process as in claim **1**, wherein said hydrocarbon distillate feedstock boils in the range 180° F. to 425° F. and contains less than 5 volume percent of C_6 components.

4. A process as in claim **1**, wherein said hydrotreating catalyst comprises nickel or a compound thereof, and

wherein said hydrocarbon distillate feedstock contains less than 10 parts per million nitrogen.

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