PATENT SPECIFICATION

822,475

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COMPLETE SPECIFICATION

NO DRAWINGS

Improvements in or relating to a Process and Apparatus for the Preparation of Motor Fuels by Catalytic Reforming

We, N.V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ, a company organised under the laws of The Netherlands, of 30 Carel van Bylandtlaan, The Hague, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a process for the preparation of motor fuels or components therefor by catalytic reforming, and also to an apparatus for carrying out this process.

It is already known that the anti-knock properties of petroleum fractions boiling wholly or partly within the gasoline range may be improved by catalytic reforming, by which is meant a catalytic treatment of these fractions at an elevated temperature and under hydrogen pressure, as a result of which an increase in the octane number is attained by conversion of the hydrocarbons. Of the reforming processes those which employ a platinum-containing catalyst are now most widely used. Such a catalyst comprises a small quantity of platinum usually between 0.1 and 1% by weight, for example between 0.3 and 0.8% by weight, supported on a carrier consisting entirely or substantially entirely of alumina or alumina and silica and which in addition may contain small quantities of one or more halogens such as fluorine or chlorine. The product obtained by such processes is frequently termed platformate.

In addition to these catalysts containing platinum, a great number of other reforming catalysts have been proposed, for example molybdenum oxide supported on alumina, molybdenum oxide and cobalt oxide supported on alumina, chromium oxide supported on alumina, palladium supported on alumina, or rhodium supported on alumina.

The pressure to be applied in these reforming processes is in the range of from 10 to 100 atm., preferably of from 25 to 40 atm. The temperature is in the range of from 400° to 600°C, preferably from 460° to 520°C. During the reaction the mixture to be converted is entirely or substantially entirely in vapour form. After leaving the reaction space the product is first cooled and then conducted through a liquid-gas separator. The gas consisting at least partly of hydrogen, if desired after a purification to remove hydrogen sulphide and other undesirable components, is wholly or partly recirculated as recycle gas. The separated liquid, after the pressure has been released, is distilled to remove any undesirable low-boiling components. This process is usually known as "stabilization".

The catalyst is generally arranged in the form of a fixed bed consisting of small particles of catalyst, the use of a moving or a fluidized catalyst bed is, however, also known.

Not only petroleum fractions, but also hydrocarbon-rich fractions boiling wholly or partly within the gasoline range may be subjected in a similar way to catalytic reforming, for example fractions obtained by the hydrogenation of coal, bituminous shale, and other carbonaceous fuels, or by conversion of CO with H_2.

In view of the use of high pressures and temperatures special demands are made on the reaction equipment to be used. For technical and economic reasons reactors are generally preferred in the shape of cylinders which usually taper more or less gradually at the ends where they are provided with flanges in order that the reactor may be connected to the inlet and outlet members,

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which flanges thus enclose two reactor openings. Reactors of this type are generally used with the axis in a vertical position.

A technical scale reforming unit usually comprises more than one reactor, for example 3 or 4, since this allows interstage heating of the reaction mixture (which may have been cooled by endothermic reactions) to the desired reaction temperature.

In each reactor there is a quantity of catalyst which as a rule constitutes a single bed.

The aim should always be to ensure that the residence time of the various portions of the reaction mixture entering the reactor is as uniform as possible in the catalyst mass. If the spread of the residence time is too great the contact time for some portions of the mixture entering the reactor will be too short, the anti-knock properties will be little improved, and for other portions of the mixture the contact time will be too great, leading to excessive cracking on the catalyst during catalytic reforming and thus greatly impairing the selectivity of the process. Experiments have shown that the best results (that is the highest yield at a given octane number) are obtained where there is the smallest possible spread of the residence time.

A contact time as uniform as possible is easily attained in reactors permitting axial flow of the reactant stream through the catalyst mass, which will be hereinafter referred to as reactors of the axial type, wherein the direction of flow of the reaction mixture through the bed is parallel to the axis of the reactor, and the reaction mixture is uniformly distributed over the entire cross-section of the catalyst mass.

These reactors have, however, the drawback that solid impurities such as soot and detached particles of corrosion products (for example iron sulphide), which form on the walls of supply lines and furnace pipes, deposit at or near the point where the reaction mixture first contacts the catalyst mass, that is at the relatively small lower or upper surface of the catalys cylinder in the reactor. This surface thereby clogs up very quickly, with a resulting fairly rapid increase in the pressure drop over the reactor, which requires extra compressor power which in practice is often no longer available, so that the reactor has to be shut down and cleaned. In addition, the distribution of the reaction mixture over the cross-section of the catalyst mass becomes irregular.

In cases where such deposits have been found to occur to a large degree, as in catalytic reforming, reactors permitting axial flow have been replaced by reactors permitting radial flow of the reactant stream through the catalyst bed, which will be hereinafter referred to as reactors of the radial type. In reactors of the radial type, the reactor holds a catalyst bed in a manner permitting radial flow of the reactant stream therethrough, which means that the direction of flow is either turned away from or towards the axis of the reactor and is moreover at right angles to the axis of the reactor. To this end a perforated inlet or outlet pipe is arranged, generally centrally, in the catalyst mass, which is surrounded by a screening jacket having a multiplicity of perforations, and made, for example, of wide-mesh metal gauze, which is not in direct contact with the inner wall of the reactor, or which is in direct contact only at comparatively few points. The space between the reactor wall and the screening jacket is generally referred to as "scallops". The catalyst bed is closed at one or both ends by unperforated cover plates of, for example, a flat or conical design. A reactor of this type is described, for example, in the U.S. patent specification No. 2,634,194.

In such reactors the perforations in the central pipe and the screening jacket are preferably small enough to prevent the passage of the particles of catalyst. Except for this reservation the perforation is made as large as possible and the aim should be to ensure the maximum possible percentage of perforated area of central pipe and screening jacket. The passage of the reaction mixture is therefore effected with the lowest possible pressure drop across the pipe and screening jacket. In view of this the screening jacket is preferably made of wide-mesh metal gauze, and the central pipe is provided with, for example, the greatest possible number of long narrow slots. With reactors of this type the pressure drop over the catalyst bed is distinctly higher than the sum of the pressure drops over the central pipe and the screening jacket. These pressure drops may either be measured directly or calculated from data on the quantity, condition and composition of the reaction mixture, and on the dimensions and shape of the apparatus, in particular on the size and number of perforations, and on the size of the catalyst particles.

The reaction mixture entering the reactor at one end spreads over the space between the reactor wall and the perforated screening jacket, then flows successively through the openings in this wall in a radial direction, through the catalyst mass to the openings in the central pipe through which it leaves the reactor at the other end. The reverse flow is also possible. With the first-mentioned arrangement the solid impurities are admittedly deposited on the catalyst bed, but since the entire screening jacket surface acts as a filter the deposit per unit of surface is much smaller than in reactors permitting axial flow of the reactant stream.

Further, with the conventional vertical reactors of this type through which the reactant mixture flows in a downward direction, deposits are chiefly formed on the upper cover plate and below in the "scallops". As a result the pressure drop increases to a much smaller extent than in reactors of the axial type. In addition, the pressure drop across the catalyst bed is low in itself since the catalyst layer to be passed through is much thinner.

It has now, however, been found that in addition to the said advantages such reactors of the radial type have certain disadvantages which limit their applicability in practice, since it has been found that the desired uniform flow through the catalyst bed necessary to ensure a uniform residence time is not realized. Even very small deposits of dirt and the like on or in the catalyst bed are sufficient to cause a great disturbance of the regular flow pattern. As a result the residence time in some parts of the bed is much longer than in other parts and, as has already been stated, this leads to poor selectivity of the reforming process in that hydro-cracking is intensified and dehydrogenation is suppressed, this being shown in a fall in the hydrogen content in the recycle gas and in a decreased yield of liquid reaction product. Moreover, in order to obtain a final product with the same octane number under otherwise similar conditions it is necessary with a reactor of the radial type to apply an inlet temperature which is appreciably higher for example by 20 degrees C than the inlet temperature necessary with a reactor of the axial type.

These high temperatures appreciably curtail the life of the catalyst mass. In addition, such an increase of an already fairly high temperature at the pressures applied will appreciably damage in a relatively short time the material of which the reactor and the transfer lines are made.

However, a process has now been found which enables the use of reactors permitting radial flow of the reactant stream through the catalyst bed without forfeiting the advantages of this type of reactor, and also avoiding the disadvantages as compared to reactors of the axial type.

The present invention provides a process for the preparation of motor fuels or components therefor which comprises catalytically reforming a hydrocarbon mixture boiling wholly or partly within the gasoline range, i.e. in the range of 20 to 200°C, in the presence of hydrogen or a gas containing hydrogen, at elevated pressure and temperature, using at least one reactor of the radial type in which the catalyst bed is situated around a perforated pipe and inside a perforated screening jacket, through which bed the reaction mixture is passed in a radial direction, the sum of the pressure drops across the perforated pipe and the perforated screening jacket being equal to or greater than the pressure drop across the catalyst bed.

The sum of these two pressure drops is preferably 4 to 400 times as great as the pressure drop across the catalyst bed, but good results are also obtained with higher and lower values of this ratio.

The process according to the present invention consequently differs from the known processes in which reactors of the radial type are used in which the sum of the pressure drops across the pipe and the screening jacket is less than 1 and usually not greater than 0.3 times the pressure drop across the catalyst bed.

In the process according to the present invention the sum of the pressure drops across the perforated pipe and the perforated screening jacket is therefore abnormally high compared to the values occurring in the conventional reactors of the radial type. This abnormally high value is realized, for example, by a suitable choice of the number and the size of the perforations in the central pipe and the screening jacket, the percentage of perforated area being, of course, considerably reduced, at least in one of the two said members, as compared to the reactors previously used.

It has been found that in the process now proposed a very uniform flow through the catalyst mass takes place in spite of any local deposits such as iron sulphide, soot, coke, in or on the catalyst mass. This results in an increased selectivity of the process, this being shown by a high hydrogen content of the recycle gas and a higher yield of liquid reaction product, while moreover lower reactor inlet temperatures may be used to obtain a final product having the same octane number. Conversely, as compared to the prior process a product having a higher octane number is obtained at the same inlet temperature.

By suitably perforating it is possible to ensure in various ways that the sum of the pressure drops across the perforated pipe and the perforated screening jacket reaches the desired value. Thus the screening jacket may be provided with relatively few small perforations and the pipe with relatively many large perforations (for example long slots), so that the contribution of the pipe to the sum of the pressure drops across the pipe and the screening jacket is negligible and the requisite pressure drop is supplied almost entirely by the screening jacket. Conversely, the pipe may be provided with relatively few small perforations and the screening jacket with many relatively large perforations; this may be done, for example, by making this wall of wide-mesh metal

gauze. With this arrangement substantially the whole pressure drop is associated with the pipe. Embodiments in which both perforated members contribute appreciably to the said sum of pressure drops are also possible.

The condition in which the screening jacket has a multiplicity of perforations and the pipe almost completely supplies the desired value of the sum of the pressure drops across the central pipe and the screening jacket is generally preferred as in this case the most uniform flow of the reaction mixture is obtained through the catalyst mass, this being associated with the smaller distance between the perforations which is thus possible. In this case the screening jacket is preferably designed as a circular cylinder, a polygonal prism with flat lateral surfaces, or a polygonal prism of which the vertical lateral surfaces are curved inwardly as described, for example, in the U.S. patent specification No. 2,634,194.

The following considerations relate in particular to a process in which the pipe is provided with relatively few small perforations and the screening jacket has many large perforations. These considerations may also be similarly applied to other embodiments of the invention such as those referred to above.

With the use of a pipe with relatively small perforations and a screening wall with many large perforations the pressure drop across the screening wall is negligible. The desired pressure drop across the pipe is realized by the application of a suitable combination of the number and the size (or sizes) of perforations. A relatively large number of small perforations is preferable as this will promote a regular distribution over the catalyst bed. In principle the perforations in the pipe may be of any desired shape, but they are preferably round or slot-shaped. The perforations are preferably uniform and are generally regularly distributed over the central pipe, preferably in a spiral or diamond pattern. An irregular distribution is also possible in principle. For example, a central pipe may be used having round perforations 0.6 cm in diameter arranged in a diamond pattern with a side of 3-7 cm, but the invention is by no means limited to this embodiment.

It has moreover been found that, with the use of a screening jacket having many perforations and consequently a negligible pressure drop, the desired values of the pressure drop across the perforated pipe and of the pressure drop across the catalyst bed are generally attained when the total area of the perforations in the pipe is less than 4 and preferably below 1.2 times the cross-section of the reactor opening enclosed by the smallest reactor flange.

The reactor may in principle be used in two ways, with the central pipe either as the supply line or as the discharge line; generally it is advisable to use the pipe as the discharge line, as in this case a larger catalyst surface is available for the deposit of impurities.

The perforated pipe may also be surrounded by a jacket of metal gauze to prevent catalyst particles from blocking the perforations.

It is possible for the catalyst mass in a reactor to be further subdivided into a number of beds which are connected in parallel or in series and to each of which the present invention is applied.

A number of reactors connected in series are generally used in catalytic reforming. According to the present invention the relatively high pressure drop can now be applied in each of these reactors. It is also possible to combine a reactor operating according to the present invention with one or more conventional reactors of the axial and/or radial type, the reactor operating according to the present invention being preferably used as the first reactor.

The above process may be carried out in a reactor of the radial type, in which the screening jacket has a multiplicity of relatively large perforations and the pipe a small number of relatively small perforations, the total area of the perforations in the pipe being less than 4, and preferably less than 1.2 times the cross-section of the reactor opening enclosed by the smallest reactor flange.

The closing flange into which the perforated pipe issues will generally be the smallest reactor flange. The screening jacket will preferably consist entirely or substantially of wide-mesh metal gauze.

For the rest, all structural details already known for similar apparatus, such as special linings can be used in such reactors, special reference being made to the U.S. patent specification No. 2,634,194.

These reactors may not only be used for the catalytic reforming of hydrocarbons with the use of catalysts described in the preamble, but also for many other catalytic reactions. Thus they are suitable for carrying out cracking reactions, hydrogenation and dehydrogenation reactions, isomerization reactions, or polymerization reactions.

In view of the above, it is also observed that the French patent specification No. 822,420 describes a special reactor of the axial type, in which the catalyst is arranged in a plurality of parallel pipes provided at one end with one narrow opening. With this arrangement, however, it is not certain that there will be a regular flow through the catalyst mass within the separate pipes, while, in addition, the disadvantages of

axial type reactors of conventional design are not avoided. Moreover, such a reactor is very expensive to construct and operate, one reason being that filling the parallel pipes with catalyst and afterwards emptying them is a very time-consuming operation.

The performance of radial flow reactors and axial flow reactors was compared as described below.

The starting material used was a straight-run gasoline having an initial boiling point of 53°C, an end boiling point of 200°C and an F-1 octane number of 40.

This gasoline was catalytically reformed in three vertical reactors connected in series, charged with catalyst pellets comprising 0.37% by weight of platina, 0.2% by weight of chlorine, and 0.5% by weight of flourine on an alumina support. The catalyst beds in the three reactors were substantially cylindrical. Each catalyst bed had an external diameter of 67.5 cm and a height of 305 cm.

At first a conventional central cylindrical discharge pipe with an outside diameter of 14 cm and an inside diameter of 13 cm, was arranged in each of these three beds. In the part surrounded by the catalyst bed one of the discharge pipes was provided with 90 substantially rectangular slots having the long side parallel to the cylinder axis. The slots measured 0.97 x 15 cm and were regularly distributed over the pipe in a tri-angular pattern, i.e. in a succession of rings, with the slots of each ring staggered evenly between those of the adjoining rings.

The catalyst beds were surrounded by wide-mesh metal gauze, leaving empty spaces ("scallops") between bed and reactor wall. The mixture to be converted thus flowed through all three catalyst beds in a radial direction.

The pressure drop across a discharge pipe of this type was approximately 0.00035 kg/sq.cm and that across the catalyst bed approximately 0.0012 kg/sq.cm.

Behind the three reactors were a cooling device and a gas-liquid separator. The vaporous product from the separator was partially recirculated. The liquid product was stabilized by means of distillation to a Reid vapour pressure of 10 lbs. at 100°F.

With this arrangement a first test was made under conditions and with results as shown in Table I, column A.

Subsequently the central discharge pipes and the screening walls were removed from the second and the third reactor, and the inlet and outlet so modified that in these reactors the mixture to be converted could flow through the catalyst beds in an axial direction only. The first reactor remained unmodified. A second test (B) was made with this arrangement under conditions and with results as shown in Table I, column B.

TABLE I

Test	*A*	*B*
Pressure in kg/sq.cm ...	32	32
Mean reactor inlet temperature °C	515	495
Liquid hourly space velocity litres oil/litre catalyst per hour	1.9	1.9
H_2/oil mol. ratio	7.3	9.2
Hydrogen content of the recycle gas in % by volume	73	78
Stabilized reaction product (Reid vapour pressure 10 lbs. at 100°F)		
Initial boiling point, °C ...	32	32
Final boiling point, °C ...	220	220
F-1 Octane number (straight-run gasoline) ...	90.5	90.5
F-1 Octane number (with 3 cc Tel/Cam gallon)	98	98
Average pressure drop per reactor in kg/sq.cm ...	0.35	0.92

It can be seen from this table that where reactors permitting axial flow through the catalyst bed (B) are used the same product could be obtained as with the use of reactors permitting exclusively radial flow (A), although in case B it was found that distinctly less drastic conditions were necessary. The average reactor inlet temperature could in fact be lowered by no less than 20°C.

The increase in the hydrogen content of the recycle gas indicates that in test B less hydrocracking and more dehydrogenation occurred than in test A, which shows that the process has increased in selectivity.

It is therefore obvious that the conventional reactors permitting radial flow through the catalyst bed are inferior as regards process selectivity and operating conditions to the prior reactors permitting axial flow through the catalyst mass.

Without forfeiting the advantages of the first-mentioned type of reactor, the disadvantages referred to above can be wholly or largely avoided by providing the central discharge pipe with perforations in accordance with the present invention, as is illustrated by the following Example.

EXAMPLE

The starting material used was a straight-run gasoline having a boiling range of 48-200°C and an F-1 octane number of 42. This gasoline was catalytically reformed using the catalyst described in Example I, arranged in three vertical reactors connected in series. The catalyst beds of the three reactors were substantially cylindrical and the dimensions of the beds were the same in all three reactors; the external diameter was 67½ cm and the height 490 cm.

A first test (C) was carried out with reactors of the conventional radial type, each

having a central discharge pipe, outside diameter 12.7 cm and inside diameter 11 cm. In each discharge pipe 150 slots were provided in a triangular pattern, i.e. in a succession of rings, with the slots of each ring staggered evenly between those of the adjoining rings; these slots were 0.97 cm wide and 15.2 cm long, their long sides being parallel to the pipe axis. The pressure drop across the slots was 0.0004 kg/sq.cm., that across the bed 0.0086 kg/sq.cm. The operating conditions and results of this test are given in Table II, column C.

Subsequently the three conventional central discharge pipes were replaced by discharge pipes with an outside diameter of 7.6 cm and an inside diameter of 7 cm, perforated in accordance with the present invention. In each discharge pipe 215 round openings with a diameter of 0.75 cm were made in a diamond pattern; the sides of the diamonds were 6.8 cm and the angles 60° and 120°. The screening jackets and the "scallops" were not modified. The pressure drop across the discharge pipe was 0.125 kg/sq.cm. and that across the catalyst bed 0.035 kg/sq.cm.

With this arrangement a new test (D) was made in which the operating conditions were such that a product was obtained having the same octane number as that of test C.

A third test (E) was then carried out, in which the operating conditions were kept the same as those of test C.

The results of tests D and E are given in columns D and E of Table II.

TABLE II

Test	*C*	*D*	*E*
Pressure in kg/sq.cm. ...	32	32	32
Mean reactor inlet temperature in °C ...	510	504	510
Liquid hourly space velocity litres oil/litres catalyst per hour	2.1	2.2	2.25
H_2/oil mol. ratio ...	7.1	7.4	7.2
H_2 content of recycle gas in % by volume ...	79	82	79
Stabilized reaction product (Reid vapour pressure 10 lbs. at 100°F)			
Initial boiling point, °C	32	32	32
Final boiling point, °C	200	200	200
F-1 Octane number (straight-run gasoline)	86.5	86.5	89.0
F-1 Octane number (with 3 cc Tel/Cam gallon)	96	96	97

A comparison of the operating conditions of tests C and D shows that the use of the process according to the present invention enables the preparation of gasoline of the same quality at a distinctly lower average inlet temperature. In addition, the hydrogen content of the recycle gas is higher, which shows that the process has increased in selectivity.

A comparison of the results of tests C and E shows that under the same operating conditions a marked increase in the octane number of the platformate is obtained with the use of the process according to the present invention.

WHAT WE CLAIM IS:—

1. A process for the preparation of motor fuels or components therefor which comprises catalytically reforming a hydrocarbon mixture boiling wholly or partly within the gasoline range in the presence of hydrogen or a gas containing hydrogen, at elevated pressure and temperature, using at least one reactor of the radial type in which the catalyst is situated around a perforated pipe and inside a perforated screening jacket, and through which catalyst the reaction mixture is passed in a radial direction, the sum of the pressure drops across the perforated pipe and the perforated screening jacket being equal to or greater than the pressure drop across the catalyst bed.

2. A process as claimed in claim 1, wherein the sum of the pressure drops across the perforated pipe and the perforated screening jacket is between 4 and 400 times the pressure drop across the catalyst bed.

3. A process as claimed in either claim 1 or claim 2, wherein the desired value of the sum of the pressure drops across the perforated pipe and the perforated screening jacket is realized by the combination of the number and the size or sizes of the perforations in the pipe and the screening jacket.

4. A process as claimed in claim 3, wherein use is made of a screening jacket provided with a multiplicity of relatively large perforations, and a perforated pipe provided with a small number of relatively small perforations.

5. A process as claimed in claim 4, wherein the screening jacket consists entirely or substantially of wide-mesh metal gauze.

6. A process as claimed in either of claims 4 or 5, wherein a reactor is used in which the total area of the perforations in the pipe is less than 4 times the cross-sectional area of the reactor opening enclosed by the smallest reactor flange.

7. A process as claimed in claim 6, wherein the total area of the perforations in the pipe is less than 1.2 times the cross-sectional area of the reactor opening enclosed by the smallest reactor flange.

8. A process as claimed in any one of the preceding claims, wherein the perforated pipe serves as the discharge line for the reaction mixture.

having a central discharge pipe, outside diameter 12.7 cm and inside diameter 11 cm. In each discharge pipe 150 slots were provided in a triangular pattern, i.e. in a succession of rings, with the slots of each ring staggered evenly between those of the adjoining rings; these slots were 0.97 cm wide and 15.2 cm long, their long sides being parallel to the pipe axis. The pressure drop across the slots was 0.0004 kg/sq.cm., that across the bed 0.0086 kg/sq.cm. The operating conditions and results of this test are given in Table II, column C.

Subsequently the three conventional central discharge pipes were replaced by discharge pipes with an outside diameter of 7.6 cm and an inside diameter of 7 cm, perforated in accordance with the present invention. In each discharge pipe 215 round openings with a diameter of 0.75 cm were made in a diamond pattern; the sides of the diamonds were 6.8 cm and the angles 60° and 120°. The screening jackets and the "scallops" were not modified. The pressure drop across the discharge pipe was 0.125 kg/sq.cm. and that across the catalyst bed 0.035 kg/sq.cm.

With this arrangement a new test (D) was made in which the operating conditions were such that a product was obtained having the same octane number as that of test C.

A third test (E) was then carried out, in which the operating conditions were kept the same as those of test C.

The results of tests D and E are given in columns D and E of Table II.

TABLE II

Test	*C*	*D*	*E*
Pressure in kg/sq.cm. ...	32	32	32
Mean reactor inlet temperature in °C ...	510	504	510
Liquid hourly space velocity litres oil/litres catalyst per hour	2.1	2.2	2.25
H_2/oil mol. ratio ...	7.1	7.4	7.2
H_2 content of recycle gas in % by volume ...	79	82	79
Stabilized reaction product (Reid vapour pressure 10 lbs. at 100°F)			
Initial boiling point, °C	32	32	32
Final boiling point, °C	200	200	200
F-1 Octane number (straight-run gasoline)	86.5	86.5	89.0
F-1 Octane number (with 3 cc Tel/Cam gallon)	96	96	97

A comparison of the operating conditions of tests C and D shows that the use of the process according to the present invention enables the preparation of gasoline of the same quality at a distinctly lower average inlet temperature. In addition, the hydrogen content of the recycle gas is higher, which shows that the process has increased in selectivity.

A comparison of the results of tests C and E shows that under the same operating conditions a marked increase in the octane number of the platformate is obtained with the use of the process according to the present invention.

WHAT WE CLAIM IS:—

1. A process for the preparation of motor fuels or components therefor which comprises catalytically reforming a hydrocarbon mixture boiling wholly or partly within the gasoline range in the presence of hydrogen or a gas containing hydrogen, at elevated pressure and temperature, using at least one reactor of the radial type in which the catalyst is situated around a perforated pipe and inside a perforated screening jacket, and through which catalyst the reaction mixture is passed in a radial direction, the sum of the pressure drops across the perforated pipe and the perforated screening jacket being equal to or greater than the pressure drop across the catalyst bed.

2. A process as claimed in claim 1, wherein the sum of the pressure drops across the perforated pipe and the perforated screening jacket is between 4 and 400 times the pressure drop across the catalyst bed.

3. A process as claimed in either claim 1 or claim 2, wherein the desired value of the sum of the pressure drops across the perforated pipe and the perforated screening jacket is realized by the combination of the number and the size or sizes of the perforations in the pipe and the screening jacket.

4. A process as claimed in claim 3, wherein use is made of a screening jacket provided with a multiplicity of relatively large perforations, and a perforated pipe provided with a small number of relatively small perforations.

5. A process as claimed in claim 4, wherein the screening jacket consists entirely or substantially of wide-mesh metal gauze.

6. A process as claimed in either of claims 4 or 5, wherein a reactor is used in which the total area of the perforations in the pipe is less than 4 times the cross-sectional area of the reactor opening enclosed by the smallest reactor flange.

7. A process as claimed in claim 6, wherein the total area of the perforations in the pipe is less than 1.2 times the cross-sectional area of the reactor opening enclosed by the smallest reactor flange.

8. A process as claimed in any one of the preceding claims, wherein the perforated pipe serves as the discharge line for the reaction mixture.

* C L M S *

9. A process for the preparation of motor fuels or components therefor substantially as hereinbefore described with particular reference to tests D and E of the Example.

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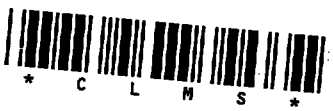
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