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METHOD OF MAKING HIGH VISCOSITY INDEX LUBRICATING OILS

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This invention relates to hydrocarbon lubricating oils which have extremely flat viscosity-temperature curves,—that is, whose "viscosity indices" (as defined, for example, by Dean and Davis in Chemical and Metallurgical Engineering, 1929, vol. 36, page 618) are extremely high. The invention also relates to processes for producing hydrocarbon lubricating oils which possess this desired property.

As is well known, lubricating oils from Pennsylvania crude oils have higher "viscosity indices" than those obtained from Mid-Continent, Gulf or California crudes, and, in fact, are superior in this respect to lubricating oils obtained from any other naturally occurring crude oils.

It is a purpose of this invention to provide hydrocarbon lubricating oils possessing considerably higher viscosity indices than those of the most superior naturally occurring oils, and to provide suitable methods of producing them. It is another purpose of the invention to provide lubricating oils of such high viscosity indices that very considerable amounts of low viscosity index oils may be blended or mixed therewith without lowering the viscosity index of the blend or mix below those of the most superior naturally occurring oils.

We have found that the viscosity index of the hydrocarbons or series of hydrocarbons in the lubricating oil range of boiling points increases as the structure of the hydrocarbon molecules approaches that of the normal straight chain paraffines, and that, in fact, the normal straight chain paraffines themselves (for example, the paraffine waxes) possess apparent viscosity indices far higher than those of the most superior "paraffine base" lubricating oils known.

It is a purpose of the invention to provide hydrocarbon lubricating oils whose molecular structure approaches that of the normal straight chain paraffines and whose viscosity indices approach those of the normal straight chain paraffines themselves, but whose fluidity is retained to relatively low temperatures and whose viscosity and boiling points may be of any desired range.

The oils of our invention are produced, generally, by dehydrogenating essentially saturated hydrocarbons of the normal straight chain series, for example, the paraffine waxes, to form olefines and diolefines, and, if desirable, polymerizing the produced olefines and diolefines, wholly or in part, to form higher average molecular weight hydrocarbons of any desired volatility or viscosity range. The dehydrogenated paraffines (olefines and diolefines) have the same molecular structure, so far as length of chain is concerned, as the saturated hydrocarbons from which they are obtained, and moreover, the product is liquid at ordinary temperatures. Upon polymerization, wholly or in part, branched chains may be introduced, but, due to the length of chain in the hydrocarbons polymerized, all such branched chains in the product are of great length, however far polymerization may be allowed to progress. The produced oils are liquid at relatively low temperatures, and possess extremely high viscosity indices, as is exemplified below.

Dehydrogenation of the saturated straight chain hydrocarbons may suitably be brought about by chlorination, followed by dechlorination and the evolution by hydrochloric acid, the latter step taking place in the presence of a dechlorination catalyst which may also be a polymerization catalyst, if products of high viscosity are desired.

Although the process as described below is exemplified by the use of paraffine waxes as saturated straight chain hydrocarbons, it will be apparent that the benefits of the invention may be obtained by the use of other hydrocarbon materials, and that the more nearly the original saturated material approaches the single, normal straight chain in molecular structure the greater will be the benefits obtained in the practice of the process.

In the practice of the process:

Paraffine wax (for example, crude scale wax, match wax, "Parawax", etc.) is chlorinated by direct contact with chlorine at temperatures of 130° to 210° F. or slightly above. Between these temperatures the rapidity and degree of chlorination of the wax increases with increasing temperature; at temperatures of 250° F. or higher, however, decomposition of part of the chlorparaffines takes place, and hence are to be avoided. Chlorination catalysts, such as traces of iodine, may be used, but are generally not necessary. Efficient contacting of gas and liquid obviously increases the rate of chlorination.

In the chlorination step, chlorination of all of the paraffine hydrocarbons in one operation is impractical, and even undesirable. Thus it has been found that as the degree of chlorination increases, the proportions of di- and tri-chlor paraffines increase, with respect to monochlorparaffines; moreover, as the proportions of di- and higher chlor derivatives increase, the viscosity of the dechlorinated product increases, probably by reason of the greater ease of polymerization of the di-, tri-, etc., olefines produced. Further than this, the viscosity index of the dechlorinated

product, whether polymerized to a high or low degree, is lower by reason of the formation of di-, tri-, etc., chlorparaffines, for, as stated above, the length of chain of the dehydrogenated hydrocarbons has been found to determine in large part the viscosity index of the oil, and it is apparent that the dechlorination of monochlorparaffines will produce hydrocarbons with the longest and most nearly normal straight chains.

The effect of increasing degree of chlorination upon the relative proportions of mono-, di- and tri-chlorparaffines is brought out in the table below.

Percent chlorine absorbed by wax (percent gain in weight upon chlorination)	Chlorinated paraffines mol., percent				Unchlorinated wax
	Mono-	Di-	Tri-	Higher	Mol. percent
3.0	23	3.5	----	1	72.5
6.0	33.5	11	2.5	0.5	52.5
10.0	36.5	19.5	7.0	2.0	34.0

From a consideration of these data it is apparent that when a product of low viscosity, or a product of high viscosity index (whether of low or high viscosity) is desired, the degree of chlorination should not be high, in any single chlorinating operation.

Low degree of chlorination may be combined with convenience and high efficiency of wax utilization by chlorinating for a brief period, say to a point when 3–6% by weight of chlorine has been absorbed, on the basis of wax treated, and cooling the partially chlorinated mixture to 70° F. or below. The chlorparaffines, whatever their degree of chlorination, are light mobile liquids at very low temperatures, whereas, as is well known, the paraffine waxes are solid below about 110° F. It has been found that the chlorinated paraffines are excellent crystallizing agents for the unchlorinated waxes, and that the waxes are essentially insoluble in them. By cooling the chlorination mixture to 70° F. or below, very good separation of chlorinated and unchlorinated hydrocarbons may be effected by the use of a bulk centrifuge without the use of a filter aid, as is invariably necessary in the removal of solid waxes from crude petroleum distillates or residue. In this manner unchlorinated wax, inert in the remaining steps in the process, is prevented from becoming an ingredient of the final oily product; moreover, by return of the wax to the chlorinating step in the process, its utilization is made substantially 100% complete.

For the several reasons advanced above, we prefer that chlorparaffines be produced containing from 13–23% chlorine, on a wax-free basis, and that unchlorinated wax be removed by simple bulk centrifugation and returned for use in a subsequent chlorinating operation. Hereinafter, the terms "chlorinated paraffines" and "chlorparaffines" are to be interpreted on a wax-free basis, that is, after removal of unchlorinated wax.

In effecting chlorination of this type of hydrocarbons, the use of iron reaction vessels, or of ferrous alloy vessels in general, has been found to produce inferior products, especially as concerns the color of the finished dechlorinated oils. Lead or porcelain lined vessels, fittings, etc., are found to have no deleterious effect of this character, and hence are preferred in the construction of the chlorinating apparatus.

The wax-free chlorparaffines are dechlorinated at elevated temperatures with the aid of a dechlorinating catalyst. Hydrochloric acid is evolved, and olefines, diolefines, etc., depending upon the degree of chlorination (as brought out above), are produced. In the absence of polymerization these hydrocarbons have the same molecular structure as that of the original wax, namely, single normal straight chains. Whether polymerization is or is not allowed to take place, the produced dechlorinated hydrocarbons are entirely of the unsaturated series,—olefines, diolefines, etc., and/or their polymers.

The dechlorination catalyst may also be a polymerization catalyst, if products of high viscosity are desired, and there are given hereinbelow examples descriptive of the use of both non-polymerizing and polymerizing dechlorination catalysts. Typical of the first class of catalyst (dechlorinating, non-polymerizing) are various of the adsorbent earths,—clays of both the fuller's earth and bentonite types,—and silica gel. Typical of the second class of catalyst (dechlorinating, polymerizing) are metallic aluminum and aluminum amalgam. Anhydrous aluminum chloride occupies a position intermediate between these two types, so far as polymerization is concerned.

When using the clay or adsorbent earth type of catalyst, the chlorparaffines and clay are heated, with agitation, to a temperature of 550° F., or thereabouts. Hydrochloric acid evolution begins at about 300° F. and increases rapidly as the temperature is raised. The reaction is continued until all evolution of HCl has ceased; the last traces of HCl may conveniently be removed by the use of steam or an inert gas. After HCl removal the mixture is allowed to cool somewhat and the clay separated by filtration. The resulting oils are very light in color and possess a green bloom or fluorescence; they are relatively low in viscosity.

Example 1.—A yellow crude scale wax was chlorinated to a chlorine content of 18.6% by weight, on a wax-free basis, and the chlorparaffines separated from unchlorinated wax by bulk centrifuging at 35° F. The fluid chlorparaffines were mixed with 10% by weight of 30–60 mesh Florida clay, such as is used for decolorizing petroleum lubricating oils, and the mixture heated, with agitation, to 500° F. during a period of about 2 hours; the temperature of the mixture was held at 500° F. for 2 hours, by which time HCl evolution had ceased. The dechlorinated mixture was cooled and filtered free from clay. There was no oil-insoluble "sludge" formed, nor did there appear to be any loss of hydrocarbon material except that held up on the clay. A red oil with a green bloom, having the following characteristics, was obtained:

Viscosity at 100° F.	173 Secs. Saybolt Universal
Viscosity at 210° F.	48 Secs. Saybolt Universal
Viscosity Index (Dean & Davis)	137
Pour	50° F.
Solid	45° F.

Example 2.—A chlorinated paraffine, dewaxed and containing 18.6% chlorine by weight, on a wax-free basis, made by the chlorination of yellow crude scale wax, was mixed with 10% by weight of an acid-treated 200 mesh decolorizing clay of the montmorillonite type and heated to 525° F. as rapidly as HCl evolution permitted; it was held at that temperature until HCl evolution had ceased. Upon cooling somewhat it was filtered to remove clay. A pale yellow oil with a

green bloom was obtained; its characteristics were as follows:

Viscosity at 100° F.	144 Secs. Saybolt Universal
Viscosity at 210° F.	44 Secs. Saybolt Universal
Viscosity Index	122
Pour	60° F.
Solid	55° F.

This oil was dewaxed using four volumes of liquefied butane to one volume of oil, at —40° F. The dewaxed oil had the following characteristics:

Viscosity at 100° F.	151 Secs. Saybolt Universal
Viscosity at 210° F.	44 Secs. Saybolt Universal
Viscosity Index	113
Pour	0° F.
Solid	—5° F.

Example 3.—Silica gel, used in the amount and under the conditions detailed in Example 1, above, produced an oil having characteristics identical with those there tabulated.

When using a dechlorination and polymerizing type of catalyst, such as aluminum amalgam or metallic aluminum, the chlor-paraffine is mixed therewith and heated, with agitation, to temperatures between 200° and 300° F. Hydrochloric acid evolution begins at about 200° F. and increases rapidly with temperature rise. The reaction is continued until HCl evolution is complete, after which the catalyst is separated and the oil clarified, as before. By reason of the considerable increase in viscosity attending the use of this type of catalyst, an inert diluent, such as purified (inert) kerosene, may in extreme cases be desirable as a diluent to facilitate handling; the diluent may later be removed, as by ordinary or steam distillation. The resulting oils are darker in color than those prepared with the clay type dechlorinating catalysts; they are of relatively high viscosity, by reason of the polymerization taking place simultaneously with dechlorination.

Example 4.—Substantially wax-free chlorparaffines containing 21.7% chlorine by weight, made from yellow crude scale wax, was heated with 0.5% by weight of aluminum amalgam, with agitation. Evolution of HCl began at about 200° F. The temperature was raised to about 300° F. as rapidly as HCl evolution would permit, and held at 300° F. for about 3 hours, by which time dechlorination was complete. No "sludge", such as is characteristic of the use of anhydrous aluminum chloride, was formed with the use of the aluminum amalgam. The oil was filtered free from aluminum hydroxide, after steaming to remove traces of hydrochloric acid. The resulting oil had the following characteristics:

Viscosity at 100° F.	690 Secs. Saybolt Universal
Viscosity at 210° F.	88 Secs. Saybolt Universal
Viscosity Index	137
Pour	65° F.
Solid	60° F.

When dewaxed, this oil had a 0° F. pour point and viscosity index of 120.

The aluminum amalgam used above is prepared by contacting aluminum turnings with 5% sodium hydroxide in the presence of mercury; the sodium hydroxide produces a perfectly clean surface with which the mercury readily amalgamates. The amalgam contains about 10% of mercury, by weight; it is washed free of hydroxide by means of alcohol, and, because of its great reactivity, is added immediately to the chlorparaffine in the reaction vessel.

Example 5.—Wax-free chlorparaffines containing 18.6% chlorine were heated with 0.5% by weight of clean aluminum turnings. As the temperature rose, dry HCl gas was bubbled in small amount through the liquid. At about 200° F. dechlorination commenced, and the introduction of dry HCl was thereupon discontinued. The temperature was increased to 300° F. and held at that point for about 2 hours, by which time dechlorination was complete. As was noted above, with the use of aluminum amalgam, no "sludge" was formed with the use of metallic aluminum as catalyst. The resulting oil, after separation from the aluminum catalyst and steaming, etc., to remove traces of HCl, had the following properties:

Viscosity at 100° F.	445 Secs. Saybolt Universal
Viscosity at 210° F.	68 Secs. Saybolt Universal
Viscosity Index	122
Pour	65° F.
Solid	60° F.

Example 6.—Metallic aluminum may be used as dechlorinating and polymerizing catalyst without the introduction of HCl to initiate the reaction, as was exemplified above (Example 5). In this event, however, higher temperatures must be used and a longer time of heating is required to give equivalent results. Thus, the dechlorination reaction does not begin below about 300° F., and, if the dechlorination is to be completed within 4–5 hours, the reaction temperature should be brought to 400° to 450° F. At these higher temperatures, however, excellent results are obtained, and the following oil, obtained in this manner from a wax-free chlorparaffine containing 15.2% chlorine with the use of 1% of aluminum by weight, is typical:

Viscosity at 100° F.	918 Secs. Saybolt Universal
Viscosity at 130° F.	432 Secs. Saybolt Universal
Viscosity at 210° F.	109 Secs. Saybolt Universal
Viscosity index	126
Pour	65° F.
Solid	60° F.

Anhydrous aluminum chloride is in wide use as a dechlorinating agent, and also as a polymerization catalyst. It functions in the present dechlorination-polymerization reaction to produce satisfactory high viscosity index oils, but we have found it less desirable than aluminum amalgam or metallic aluminum, whether or not the dechlorination reaction is initiated, in the latter case, with anhydrous HCl. As is well known, anhydrous aluminum chloride invariably forms an oil-insoluble "sludge" which contains a very considerable amount of hydrocarbon material held in rather loose chemical combination. The formation of this sludge decreases considerably the yield of oil that may be obtained in a reaction such as that here discussed, for, as is well recognized, the hydrocarbons which may be obtained from the sludge itself, for example, by decomposition with water, are of inferior quality and represent an utter loss except for use as a fuel or the like purpose.

In addition to loss in yield of high quality oil through the formation of the typical aluminum chloride sludge, this catalyst is less desirable than aluminum or aluminum amalgam by reason of its cost and because of the relatively large quantity required. Thus for dechlorination alone (in the absence of polymerization), as much as 5% by weight of anhydrous aluminum chloride is

required. For example: Wax-free chlorparaffine containing 13.7% chlorine was heated with 5% by weight of anhydrous aluminum chloride for a total time of 5 hours, the latter 4 of which were at 325° F. After sludge removal, steaming, etc., and filtration, the produced oil had the following characteristics:

Viscosity at 100° F	97 Secs. Saybolt Universal
Viscosity at 130° F	65 Secs. Saybolt Universal
Viscosity at 210° F	39 Secs. Saybolt Universal
Viscosity index	87
Pour	55° F.
Solid	50° F.

It will be noted that there has been in this instance no appreciable polymerization; to obtain appreciable polymerization, aluminum chloride approaching 10% in amount must be employed, with consequent increase in amount of sludge formed. In the above example, the yield of oil from original wax was 65 per cent by weight; in the preceding examples (Examples 1–6) the yields in each case were above 90%. From the above it will be clear that although anhydrous aluminum chloride may be used as dechlorination and polymerization catalyst (especially the former), the use of aluminum amalgam or of metallic aluminum, the latter either with or without the introduction of HCl to initiate the reaction, is much preferred.

The simultaneous use of both polymerizing (aluminum) and non-polymerizing (clay) type catalysts has been found of advantage, for in this manner the viscosity of the finished oil may be controlled. In the use of the two types of catalysts, aluminum or polymerizing type is allowed to function at relatively low temperatures, for example, 300° F. or thereabouts, until the reaction has proceeded sufficiently to produce oil of the desired viscosity; thereafter, the temperature is raised to a higher point, for example 500° F. or thereabouts, and the non-polymerizing type catalyst allowed to function until dechlorination is complete. The following is an example of this method of operation.

Example 7.—Chlorinated paraffine containing 15.6% chlorine by weight, on a wax-free basis, was heated with 10% by weight of the acid-treated clay of the montmorillonite type and 0.5% by weight of aluminum, for 1½ hours at 300° F. The temperature was then raised to 500° F. and held there for about 30 minutes, by which time dechlorination was complete. The reaction mixture was cooled and filtered free of clay and of aluminum. A light yellow oil with a green bloom was obtained; it had the following characteristics:

Viscosity at 100° F	423 Secs. Saybolt Universal
Viscosity at 210° F	70 Secs. Saybolt Universal
Viscosity index	130
Pour	60° F.
Solid	55° F.

This oil was dewaxed with liquefied propane as dewaxing diluent, at −40° F., and an oil was produced with a cold test of 0° F., a viscosity of 75 at 210° F. and a viscosity index of 115.

If desired, this use of both polymerizing and non-polymerizing type catalysts may be in partial sequence, rather than simultaneous throughout. Thus, in a modification of the sequence of the steps of Example 7, above, we heat the chlorparaffins with aluminum or aluminum amalgam alone, until the reaction has proceeded sufficiently to produce an oil of the desired viscosity; without removing any of the reaction products produced by the aluminum or aluminum amalgam reaction, other than the produced hydrogen chloride, we then add a non-polymerizing (clay) type catalyst, continuing the heating until dechlorination is complete. The results obtained in using such a sequence of steps are similar to those of Example 7, above, with the advantage that control of the character of the desired end product is in many cases facilitated.

We have found, in general, that the viscosity of the finished oil can be controlled by the correct selection of the chlorine content of the chlorinated paraffin, the time of reaction and the temperature of reaction. The following tabulation will make clear how the practice of our invention may be varied to produce oils, varying viscosity and varying viscosity index:

Reaction time in hours	3	4	5	3	4	5
Temperature, degrees F	250	250	250	300	300	300
Chlorine content 12.9%:						
Viscosity at 210° F	60	58	65	60	61	63
Viscosity index	134	139	137	136	134	122
Chlorine content 18.6%:						
Viscosity at 210° F	83	91	115	115	107	80
Viscosity index	131	127	128	125	124	125
Chlorine content 24.1%:						
Viscosity at 210° F	------	------	------	382	440	354
Viscosity index	------	------	------	113	112	113

In these experiments, aluminum amalgam was used as dechlorinating catalyst.

From the results above tabulated it appears that:

1. The viscosity and viscosity index of the synthetic oil are almost wholly dependent on the chlorine content of the chlorinated paraffine. The higher the chlorine content, the higher the viscosity and the lower the viscosity index.

2. The reaction time and reaction temperature, within the limits shown above, have relatively little effect on the viscosity of the synthetic oils. These two factors control the degree of removal of the chlorine. The temperature must be at least 250° F. for complete dechlorination in a reasonable time. Also the higher the chlorine content, the longer the reaction time must be for the reaction to go to completion.

In blending the high viscosity index oils herein described with oils of low viscosity index,—for example, to improve in this respect the naphthenic or mixed-base naturally occurring oils,—it is to be pointed out that the viscosity index (as defined by Dean and Davis, supra) is not the arithmetic mean of the viscosity indices of the blended oils, but is in all cases considerably higher. For example, the oil whose preparation was described above in Example 4 was blended with an equal volume of a naphthenic-type lubricating oil whose viscosity index was 25, by the Dean and Davis method of calculation. The characteristics of the oils and of this 50–50 blend follow:

	Synthetic oil	Naphthenic oil	50–50 blend
Viscosity at 100° F	690	687	643
Viscosity at 130° F	324	259	274
Viscosity at 210° F	88	60	70
Viscosity index	124	25	94

It will be observed that the pour points of several of the oils whose production is described above are higher than is desirable for some lu-

bricating purposes. The pour points of these oils may be lowered by a dewaxing process, as mentioned above in connection with Examples 2 and 4, or, if preferable, by adding small amounts of a specially prepared pour point lowering compound, such as is described, for example in U. S. Patent 1,815,022, issued July 14, 1931 to Garland H. B. Davis. Representative of the results obtained with the use of the Davis compound, identified in the trade as "Paraflow", are the following:

	Pour	Solid
Synthetic oil (Example 4, above)	65° F.	60° F.
Same, plus 2.0 % "Paraflow"	15° F.	10° F.

While we have described in detail the character of our invention and given numerous illustrative examples of the preparation of synthetic hydrocarbon oils of high viscosity index, we have done so by way of illustration and with the intention that no limitation should be imposed upon the invention thereby.

We claim:

1. A process of producing a high viscosity index lubricating oil which comprises chlorinating straight chain paraffine hydrocarbons to a chlorine content of between 10 and 25% on a hydrocarbon-free basis, removing unchlorinated hydrocarbons, dechlorinating the chlorinated hydrocarbons in the presence of a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays, at elevated temperatures, and separating the catalyst from the dechlorinated hydrocarbon oil.

2. A process of producing a high viscosity index hydrocarbon oil which comprises chlorinating straight chain paraffine hydrocarbons to a chlorine content of between 10 and 25% on a hydrocarbon-free basis, removing unchlorinated hydrocarbons, dechlorinating the chlorinated hydrocarbons in the presence of a fuller's earth at elevated temperatures, and separating the fuller's earth from the dechlorinated hydrocarbon oil.

3. A process of producing a high viscosity index hydrocarbon oil which comprises chlorinating straight chain paraffine hydrocarbons to a chlorine content of between 10% and 25% on a hydrocarbon-free basis, removing unchlorinated hydrocarbons, dechlorinating the chlorinated hydrocarbons in the presence of a montmorillonite earth at elevated temperature, and separating the montmorillonite earth from the dechlorinated hydrocarbon oil.

4. A process of producing a liquid hydrocarbon oil from paraffine wax hydrocarbons, comprising chlorinating paraffine wax hydrocarbons at a temperature not above about 250° F., to produce a mixture of mono-, di- and trichlor derivatives consisting of monochlor derivatives in major part, cooling the chlorination product to allow unchlorinated wax hydrocarbons to crystallize from produced liquid chlorparaffines, removing crystallized wax hydrocarbons, and dechlorinating the produced chlorparaffines in the presence of a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays at elevated temperatures.

5. A process of producing a liquid hydrocarbon oil from paraffine wax hydrocarbons, comprising chlorinating paraffine wax hydrocarbons to a chlorine content of not above about 25% on a hydrocarbon-free basis, at a temperature not above about 250° F., cooling the chlorination product to crystallize unchlorinated wax hydrocarbons from produced liquid chlorparaffines, removing crystallized wax hydrocarbons, and dechlorinating the produced chlorparaffines in the presence of a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays at temperatures between about 300° and about 550° F.

6. A process of producing a liquid hydrocarbon oil of high viscosity index from paraffine wax hydrocarbons, comprising passing chlorine gas into a paraffine wax containing hydrocarbon mixture at a temperature between about 110° F. and about 250° F. to produce chlorparaffines containing not above about 25% chlorine, on a hydrocarbon-free basis, cooling the mixture containing unchlorinated wax hydrocarbons and produced chlorparaffines to a temperature below the crystallizing temperature of the unchlorinated paraffine wax hydrocarbons, separating unchlorinated wax hydrocarbons from the liquid chlorparaffines, heating the produced chlorparaffines with a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays to a temperature above about 300° F. to dechlorinate the chlorparaffines without substantial polymerization of the dechlorinated hydrocarbons, and separating the dechlorination catalyst from the produced dechlorinated liquid hydrocarbon oil.

7. A process of producing synthetic hydrocarbon oils of high viscosity index which comprises chlorinating straight chain paraffin hydrocarbons to a chlorine content not above about 25% on a hydrocarbon-free basis, to produce a mixture of mono-, di- and trichlor derivatives which consist in major part of monochlor derivatives and dechlorinating the produced chlor derivatives with the aid of a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays to produce olefinic hydrocarbons consisting of monoolefines in major part.

8. A process of producing synthetic hydrocarbon oils of high viscosity index which comprises chlorinating straight chain paraffin hydrocarbons to a chlorine content of between about 3% and about 6% by weight, on the basis of the whole hydrocarbon-chlorhydrocarbon reaction mixture, and dechlorinating the produced chlorhydrocarbons with a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays.

9. A process of producing a high viscosity index lubricating oil which comprises chlorinating straight chain paraffin hydrocarbons to a chlorine content of between 13 and 23 percent, on a hydrocarbon-free basis, removing unchlorinated hydrocarbons, dechlorinating the chlorinated hydrocarbons in the presence of a dechlorinating catalyst selected from the group consisting of fuller's earths and the montmorillonite clays, at elevated temperatures, and separating the catalyst from the dechlorinated hydrocarbon oil.

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