

# SINCLAIR REFINING COMPANY

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## Processing of Fischer-Tropsch synthesis Products to Alcohols, Fatty Acids and Sulfonates

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By oxidizing and hydrogenating the 50-150° fraction of Fischer-Tropsch synthesis benzene prepared by the foam process, C<sub>6</sub>-C<sub>11</sub> alcohols can be manufactured with a 65% yield. About 20% of higher alcohols of a molecular size of about 200 are obtained at the same time, but we have not yet found a way of using them.

About 40% of the (200-350°) middle oil can be converted into sulfonates by sulfonation, an increase in weight of about 50% is attained by the addition of H<sub>2</sub>SO<sub>4</sub>. The residual middle oil left over after the sulfonation process may be worked up to phenyl-nonyl-sulfonates by means of sulfochlorination after being hydrogenated with benzol. At the present time, middle oil can also be processed according to the Reppe-process, yielding 40% of fatty acids.

The paraffin obtained may be oxidized, a part of it directly after being hydrogenated, another part only after being subsequently subjected to a gentle cracking. However, it may also be converted to middle oil by cracking (yield: 70%) and then it may be used for the same purposes as the original middle oil.

The table that follows records the distribution of the products and the outputs obtained in processing them.

In the table we have assumed the liquid and solid yields to be 100%. We must add:

Gasol 10 parts  
 Alcohols (C<sub>2</sub>, C<sub>3</sub>, C<sub>6</sub>) in the product water 6 parts

<u>Benzene up to</u>	<u>Yields</u>	<u>Final Products</u>	<u>Benzene</u>
50°	2	-	-
50-100°	22	14 alcohols C <sub>6</sub> , C <sub>7</sub>	5) alcohols
100-150°	16	10 " C <sub>8</sub> , C <sub>11</sub>	5) of about C <sub>20</sub>
150-200°	10	-	-
<u>Middle Oil</u>	-	-	-
200-350°	30	(12 olefin gives olefin sulfonate (18 residual olefin gives 12 phenyl nonyl sulfonate	2 3 5 10
<u>Paraffin</u>	-	-	-
350°	20	hydrogenated (rest illegible)	-

} 17 with loss

That means that 21% (on basis of the liquid and solid outputs) of C6-C11 alcohols are available for esters, or 16% of only the C6-C8 alcohols are to be taken into consideration.

A foam reactor of 1.5 m<sup>3</sup> capacity has been in operation for ten weeks without any disturbance; 500 kg. of various products per day have been obtained therewith at a synthesis temperature of 250°. The operation was discontinued in order to carry out minor improvements. We did not encounter any fundamental difficulties.

The operational data are:

CO:H <sub>2</sub>	-	55:45
20 atm.	-	250-270° operational temperature
Gasification	-	ca. 5%

10,000 ton/year are one technical unit; 8,000 m<sup>3</sup>/hr. of gas are required for this purpose. They can be generated by one water-gas generator. For this purpose, 4 reactors of 1.80 m. diameter and 10 m. high or three reactors of 2.50 m. diameter and 10 m. high would be necessary.

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