

Attachment 51

Principle of Lubricating Oil Copolymerization

(I.G. Leuna Report of January 12, 1942)

The principle of the copolymerization (Mischpolymerisation) process consists of the joint reaction of natural and synthetic lubricating oil hydrocarbons. Raw materials are, on the one hand, lubricating oil fractions of petroleum and, on the other hand, synthetic polymerizates of ethylene or cracked paraffin products. An important factor for the success of the reaction is, in the first place, a practically complete removal of asphalt, resins and paraffin from the natural lubricating oil fractions and, in the second place, the use of synthetic polymerizates in their nascent state (still containing aluminum chloride). The vacuum-distilled lubricating oil fraction from crude petroleum is normally processed as follows.

1. The crude lubricating oil fraction is de-asphalted and de-resined with liquid propane.
2. The preredefined lubricating oil fraction is dewaxed by the usual solvent processes: propane, benzol-acetone or ethylene chloride.
3. The lubricating oil fraction thus freed from asphalt, resins and paraffin is extracted with a selective solvent, such as phenol or furfural. The purpose of this treatment is to remove olefinic and aromatic hydrocarbons, but since these in turn act as solvents for naphthenic and paraffinic hydrocarbons, an extract is obtained which contains all four types of hydrocarbons. The amount of extract depends on the desired quality of the end product and on the chemical composition of the crude petroleum processed. For German paraffinic lubricating oils the extract amounts to 10-20% when automobile oils are to be produced, and 30-40% when aviation engine oils are to be obtained, based on the lubricating oil fraction pretreated in accordance with items 1 and 2.

In the copolymerization process the extraction, step 3, is omitted. If an

aviation engine oil is to be prepared, the 30-40% of extracted hydrocarbons remain in the lubricating oil fractions pretreated in accordance with items 1 and 2. This fraction is heated to about 100-120°, introduced at atmospheric pressure into an agitator together with the AlCl₃-containing crude ethylene polymerizate coming directly from the reaction autoclaves. The two products are mixed for about 3-4 hours at the aforementioned temperature.

The olefins and the aromatic hydrocarbons in the natural lubricating oil fraction then react with the ethylene polymerizate under the influence of aluminum chloride. The resulting copolymerizate is then treated in the same manner as the pure ethylene polymerizate. The weight ratio of the natural lubricating oil hydrocarbons to the ethylene polymerizate is 1:1 in the manufacture of aviation engine oils, and 2:1 to 3:1 when automobile oils are to be produced. An aviation engine oil copolymerizate compared in engines with a physical blend of equal parts of finished ethylene polymerizate SS 906 and a mineral lubricating oil refined by extraction in the conventional manner has the following advantage:

SS 906 + Lubricating oil raffinate	1:1	13 hours running time
Copolymerizate		18.5 " " "

Consequently the copolymerization process not only affords a better utilization of the natural lubricating oil base, but also yields a qualitatively better end product.

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