Attachment VI

Description of the Lubricating Oil Plant, Rheinpreussen

Lurgi Gelellschaft May 31st, 1945

The Chart AS 1263 is a flow sheet of the Synthetic Lubricating Oil Plant.

The first stage of the process is the chlorination of the crude distillate, boiling between about 200 and 350°C from the Fischer-Tropsch synthesis. The operation is continuous. About one cubic meter of crude distillate is recycled for several hours by pumping it through the chlorine tower at a temperature of about 80-100°C which is maintained by a heat exchanger first by heating and later by cooling, to remove the heat of reaction. The chlorine is taken in a liquid state from a storage tank which is kept under the saturation pressure of liquid chlorine, about 10-15 atm., expanded through a throttle valve, vaporized, and introduced at the lower end of the chlorine tower. HCl gases escaping from the tower at the upper end are cooled in a cooling tower, removed from the plant and passed into a gas holder. The cooling tower is cooled indirectly with circulating naphtha (Benzin), which is kept at a low temperature in a cooler. The chlorinated intermediate product is stored in a tank and passed therefrom to the second stage.

The second stage is the actual synthesis. The chlorinated crude distillate is continuously mixed with naphtha (Benzin) and naphthalene in agitators. The quantities are measured in measuring vessels before their introduction. The measuring vessel for the crude distillate has a capacity of 600 liters, those for naphtha and naphthalene 1400 liters. Each one of the six agitators has a capacity of 3 cubic meters. To start the synthesis aluminum turnings are added and the contents of the agitator kept at about 120°C by means of a heating jacket. The reaction takes place at atmospheric pressure, the escaping HCl gases being cooled in the same cooling tower in which the HCl gases of the chlorination step are

cooled, as mentioned above. The undesirable tarry products formed in the synthesis are separated in four settling tanks. These products are again mixed in an agitator with naphtha which extracts the tar. The remaining tar residue is withdrawn. The agitator used for mixing the tar with the naphtha has a capacity of 4 cubic meters.

The intermediate product formed in the synthesis is passed from the settling tanks into two agitators connected in parallel in which the product is treated with bleaching earth and lime at a temperature of 150°C. The treatment with lime serves to neutralize the product. The used bleaching earth and lime are removed in a filter press.

The third stage of the plant is the distillation in which the intermediate products formed in the synthesis are fractionated. The low boiling mixture (naphtha and naphthalene) is first distilled off in a distillation tower. The distillation takes place at an absolute pressure of about 200-300 mm Hg. The still is heated with steam at about 100-150 atm. pressure. This water (sic) is heated in a furnace and circulates between the furnace and the still. The fractionating tower operates continuously and is designed for a maximum feed of 1800 kg/hr. and a maximum distillate of 1100 /hr. In a subsequent refrigerating plant the distillate from the fractionating tower is separated into naphthalene and naphtha. This refrigerating plant consists of two chillers which are cooled with ammonia vapor to a temperature of about -20°C and a centrifuge which separates the naphthalene.

The bottoms from the fractionating tower compose the synthetic oils. These oils are separated in a high vacuum distillation unit into four fraction: distillates I, II, III, and IV. Distillate IV is the desired lubricating oil; distillates I, II, and III have lower boiling ranges.

The last stage of the plant comprises the dewaxing and clay treatment of

distillates I, II, or III. These two units of the plant have not been used and are, therefore, inactive. The intention was to use acetone a s solvent in the dewaxing step. The mixture of distillate and acetone is cooled to a low temperature in the chillers and passed to a drum filter of about 1.5 square meter area which is able to handle a maximum of 500 kg of liquid (acetone and oil). The filtrate is removed by means of a vacuum pump. The acetone is distilled off from the dewaxed oil in a shell still by flash distillation. To prevent the risk of explosion these units are filled with inert gas. Finally, the dewaxed oil is treated with bleaching clay in an agitator having a capacity of 5 cubic meters. The spent bleaching clay is separated in a filter press.

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