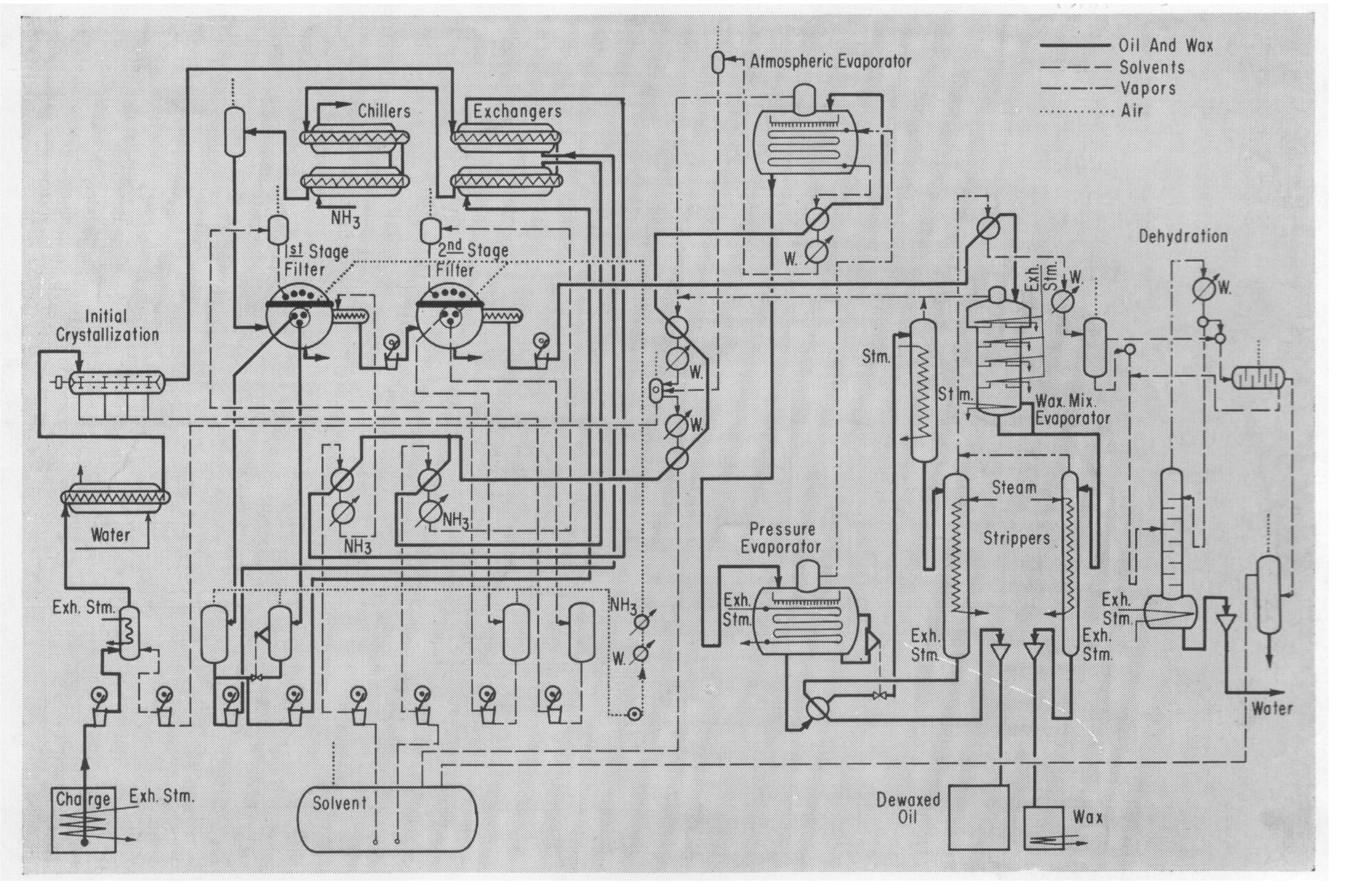

FIGURE 1—Very little instrumentation is used. Belt-driven piston pumps with adjustable stroke are used for circulation control.

They Use Benzene-Acetone to Dewax

Some of the older dewaxing solvents may be better in special cases. Here is a description of a dewaxing plant in Greece which uses benzene-acetone.

Anast S. Konstas
Elbyn Lubricating Oil Refinery, Ltd.
Athens, Greece

THE SOLVENTS used for the dewaxing lubricating oil stocks now usually are methylethylketone mixed with toluene and benzene, propane, chlorinated hydrocarbons, etc. In some cases, however, one of the first dewaxing solvents of benzene-acetone is preferable. This article describes a small dewaxing plant operating in Greece where the benzene-acetone process is used. The Technical department of the Elbyn refinery planned and constructed this dewaxing plant in their refinery at Moshaton near Athens for the following reasons:

- It is easier to obtain supplies of benzene and acetone in the country.
- Because the climate is mild, lube oils with a pour point of 10 F. are considered satisfactory for most uses and only in special cases the lube oils must have a pour point of 0 F.
- The larger part of benzene and acetone, because of their low boiling point, can be recovered with low pressure exhaust steam and the remaining part is recovered by heating with steam of 220 psig without pipe heater or vacuum.

The process is in two stages. The wax from the first filtration is mixed with fresh solvent and passed to a second filter. The filtrated solvent of the second filtration is used for the initial solution of the charge oil.

The charge oil is heated and mixed with about 50 percent by volume of hot solvent, pumped from a small surge tank before the final cooling of the distilled solvent. The mixture is heated to 120-130 F. so that a clear solution is obtained. Then the mixture is cooled with water in a heat exchanger fitted with stirring paddles. In a following horizontal agitator, fitted with specially designed stirrers, in order to obtain a continually increasing stirring, is stepwise injected the main proportion of

Reprinted from Petroleum Refiner September, 1957

solvent at 35 F. till the final solution is obtained. The proportions of this final dilution is 1:3 to 1:4 (depending upon the charge stock) and the final temperature is 60-70 F.

The first crystals are formed during this cooling and mixing. The rate of cooling is very important because it influences the final crystallization of the wax in the following chillers. The mixture in finally cooled in heat exchangers and by direct expansion of ammonia in chillers fitted with rotating scrapers. There the final low temperature is reached which influences the pour point desired of the oil.

The mixture is filtered in a rotating vacuum filter and the slack wax is washed with solvent precooled at the filtration temperature. The filtrate passes through heat exchangers in order to precool the oil-solvent mixture and the solvent, and to be preheated to the distillation temperature. The main quantity of the solvent is distilled in a double effect evaporator plant. The remaining solvent is recovered in a distilling tower and stripper.

The slack wax, while leaving the first filter drum, is mixed with fresh cooled solvent. This mixture is carefully repulped and then pumped to a second filter where the wax is thoroughly washed. The solvent from the second filter is used again to dilute the charge oil and to wash the slack wax in the first filter. Both filters are washed from time to time with hot solvent—the time depending upon the quality of the oils.

The equipment for the plant is represented by the flow diagram in Figure 1. Belt driven piston pumps with adjustable stroke are used to circulate the oil, the solvents, and the solutions and mixtures. Many years of experience have proved that this type of pump gives satisfactory service.

Two pumps are used to carry the solvent from the storage tank, thus forming two separate approximately equal solvent streams. One of these streams is used for repulping the slack wax, while the other is used for the final washing of the wax. The main filtrate of the first stage, after precooling the oil-solvent mixture, precools the pure solvent of the second solvent stream. On the other side the wash-filtrate of the first stage precools the first solvent stream and the two filtrates join together and precool the distilled solvent returning to the solvent storage tank. The filters are of the usual type of drum vacuum filter. The automatic valve is built in the shell. This arrangement facilitates the construction and avoids losses of solvent and of refrigeration.

A sliding vane rotary blower produces the vacuum (20 inches Hg) and compresses the air to 10 psig. for the removement of the wax cake from the filter drums. The compressed air is cooled by water and ammonia.

The solution entering in the first evaporator consists of about 1 part of oil and 6 to 8 parts of solvent. The mixture leaving the second evaporator is composed of about 1 part of oil and 1 part of solvent. The following distilling tower operates under atmospheric pressure and is fitted with Raschig rings and heated by steam of 220 psig. The oil leaves the tower with about 5 percent solvent and is finally steam stripped.

The wax solvent mixture, consisting of about 1 part wax and 10 parts of solvent is first evaporated in a vertical evaporator with five compartments. The four higher compartments are heated by exhaust steam while the lower compartment by 220 psig steam and the wax is finally steam stripped.

In order to prevent the possibility of changes in the composition of the distilled solvent because of the different conditions existing in the several stages, all liquefied solvents are mixed, during the cooling operations and return in one stream to the storage tank.

The solvent vapors are cooled by preheating the oil-solvent mixture and by water coolers in a manner to obtain the maximum saving in steam and refrigeration. The vapors from the strippers are treated separately in a system of separators and fractionator in order to drive out the water. The dehydrated solvent, before entering in the solvent storage tank, passes through a final separator to leave the last drops of water. The air leaving the plant, although its amount is very small, is ammonia cooled and passes a three-stage absorbing tower filled with oil which is renewed from time to time.

The plant was constructed seven years ago and is running now about 350 days annually. It has an average capacity of 200 barrels per day. The oils treated are usually all kinds of distillates ranging from spindle to cylinder oils produced in the Elbyn refinery from reduced crudes of Middle East origin. Distillates from crudes of other origins such as Venezuela, Russia, Rumania, etc. have also been treated without difficulties.

The simplicity of the plant is evident from the fact that only two men are needed for its supervision. With the exception of the instruments controlling the flow of ammonia and a few level controllers, there are no other instruments necessary to control pressure or temperature.

The pour point of the dewaxed oil is the same as the temperature of filtration. Waxes produced are practically free of oil. Refined paraffin waxes from spindle oil and light oil have a melting point of 125-130 F. Ceresin waxes obtained from heavier oils have melting points up to 150 F. Average loss of the solvent is less than 0.4 percent on the charge oil.

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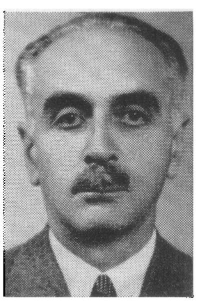
About the Author



ANAST. S. KONSTAS received his Ph.D. degree in chemistry from Athens University in Greece. He started his career in the oil and fat industry and entered in the lubricating oil industry at the Elbyn refinery 20 years ago. He has spent 38 years in research, development, design, construction and operation of various plants in his country. Dr. Konstas is a member of the American Chemical Society and fellow of the English Institute of Petroleum.