Refining of Imported Crude Oil.

Suggestions have been made from time to time that New Zealand should import crude oil, but that the refining should be carried out in New Zealand. In the early days of the industry refining was carried out by simple distillation; afterwards methods of cracking were available which gave a higher yield, and at present the average yield of petrol from crude oil is approximately 45 per cent.

Hydrogenation of oil is now being carried out by the Standard Oil Company at New Jersey, and larger yields are likely. It will be seen, however, that under present conditions the amount of crude oil used is over twice the amount of petrol produced, so that any saving of transport due to the decreased risk with crude oil is probably more than offset by the greater bulk to be carried; moreover, some of the by-products of the cracking or distillation process would be produced in too large a quantity to be wholly consumed in New Zealand. Consequently, until the processes are more firmly standardized the present procedure of importing petrol seems the most economic.

In connection with the increased tendency towards the use of Diesel engines for lorries and motor-vehicles and the possibility of their expansion to the motor-car, it is worthy of note that the design of motor-engines should proceed alongside any alterations in the type of fuel oil which may be developed.

General Theoretical Energy Consideration.

It will be appreciated from the foregoing general considerations that it is essential that coal should be converted from a solid mass into a fluid for convenience of application in many branches of industry, and that for this purpose two processes are available, the first gasification and the second hydrogenation for oil. Although hydrogenation gives us about 30 to 35 per cent. of petrol on total coal used, including that for hydrogen and power, while gasification gives us less than 5 per cent. of petrol, there is in the latter case the fuel value of the gas, &c., and actually the waste or loss of energy by the latter process is approximately only 20 per cent. of that contained in the material treated and consumed. In hydrogenation, however, in spite of the larger yield of petrol, the actual loss of energy involved is more than 60 per cent., and the object achieved is the production of a substance which at the present time Nature itself is yielding in plethoric quantity. Whatever the merits of either processes may be, it is a matter of first interest to the coal industry that they should be watched and tested. Encouragement of research by colliery-owners and coal-merchants would be an important step in the right direction. Synthesis of products at high temperatures and pressures, now possible because of the development of steels to withstand these conditions, is only in its infancy, and it may well be that such processes applied to coals may eventually produce commodities of greater intrinsic value than oil.

PRODUCTION OF FLOW OIL OR PETROLEUM.

Petroleum is particularly widespread throughout the world, despite the general belief that there is a very limited quantity available for future generations. From the geographic standpoint, petroleum may be located in any part of the world. It has been found in the Arctic Circle, on the Equator, and in the temperate zones.

An oil-pool is primarily a geologic phenomenon. It occurs within some kind of porous reservoir rock, never as a lake of oil, and is definitely associated with some type of geologic structure. It exists because in relation to its structure the escape of crude oil in any direction is prevented by impervious rocks which seal the reservoir.

Man's earliest prospecting for oil was dependent upon the surface indications in the form of seepages, oil-flow, asphalt deposits, gas, mineral waxes, bituminous shales, saline ground waters, stunted vegetation, or a combination of these. However, the existence of oil is not limited to such places, nor is it necessarily true that deposits are located under seepages, for the oil may have migrated laterally through the lower earth-layers for some distance.

The industry has been forced, because of the tremendous cost involved in drilling a well—with chances of bringing in a dry hole—to call in every branch of known science that may throw light upon the definite finding of oil. The geologist and the engineer, the physicist, the chemist, the palæontologist, are all brought into the picture, contributing their collective knowledge as to the best location for the well.

First comes the geologist, with his special training, to survey the ground at close quarters, identifying the age and types of structure located there. He examines "outcrops" of rock which jut from the earth's surface, determining their ages, whether they are soft and porous or hard and solid, and deducting from position and arrangement the probable formation under the surface. Soft, porous rock or sand formations are more likely to contain oil than hard solid ones.

More than surface indications are necessary, however, to determine the presence of petroleum, and the geophysical prospector is called upon to investigate the properties of the sub-surface earth. He makes use of instruments, some of which have long been associated with the mineral industries, while others are only now being developed to fit present conditions. Several of these instruments simply record variations in the earth's natural forces. Others, on the contrary, take advantage of the physical properties of the substances of which the earth is made, but employ man-made disturbances in order to identify such properties. The outstanding advance of the past year has been the development of seismic reflection methods to outline or contour subsurface st ucture.

There is, of course, nothing absolutely definite in locating oil. The drill itself is the answer. During the year 1930 a total of 21,165 wells was completed in the United States of America, of which 11,577 struck oil, 2,885 found gas, and 6,703 were dry, these last representing over £32,000,000 loss for the oil industry.