CHEMISTRY

Oil, Mother of Chemicals

Better cosmetics, plastics, insecticides, and automobiles will result from advances recently made in the petroleum industry.

By MARTHA G. MORROW

➤ YOU WILL probably be able to get more mileage from your gas after the war; keep your home more nearly free of flies, mosquitoes and other pests; have a brighter, shinier car; and find your bread fresher in its waxed container because of advances recently made in the petroleum industry.

Better lipstick and face creams for the ladies, storm coats and fishing boots for the men, may also result from war-inspired developments in gasoline byproducts, as well as more effective girdles for stout beauties, hotter "canned heat" for cooking hamburgers on picnics, and more efficient explosives for clearing farm lands and for building roads.

Already the Allies are benefitting from 100-octane gasoline, which enables a plane to fly farther on a given quantity of fuel, or to carry a heavier load, or to travel faster. Oils have been developed which will flow about as freely when the plane is in the stratosphere where the surrounding temperature is 60 degrees below zero as when the plane is just taking off from the desert with its air sizzling around 110.

Special war weapons such as the new oil incendiary bomb which has been causing so much damage in Japan's chief cities, the improved flamethrower which is credited with shooting around corners, and the smoke generator which quickly hides ships and factories from the airborne enemy, all have the petroleum industry to thank for part of their newfound effectiveness.

Flaming Jellied Gasoline

The flamethrower which has been so successful in routing Japs out of pillboxes spits out jets of flaming jellied gasoline. It can be aimed effectively whereas previous flamethrowers, using a petroleum liquid fuel, had to be fired down the wind and were risky to use.

The "gel gas," which sticks to whatever it strikes, is made by adding a gray powder to ordinary motor gasoline. This thickened oil increases the range of the weapon three-fold. Since the gel is just beginning to burn when it reaches the pillbox, fire instead of just flame is really being thrown at the enemy. The fuel leaves the nozzle of the flamethrower, which weighs no more than a soldier's full pack, as a glowing rod of fire and flows much like water when the hose nozzle is set for a sharp stream.

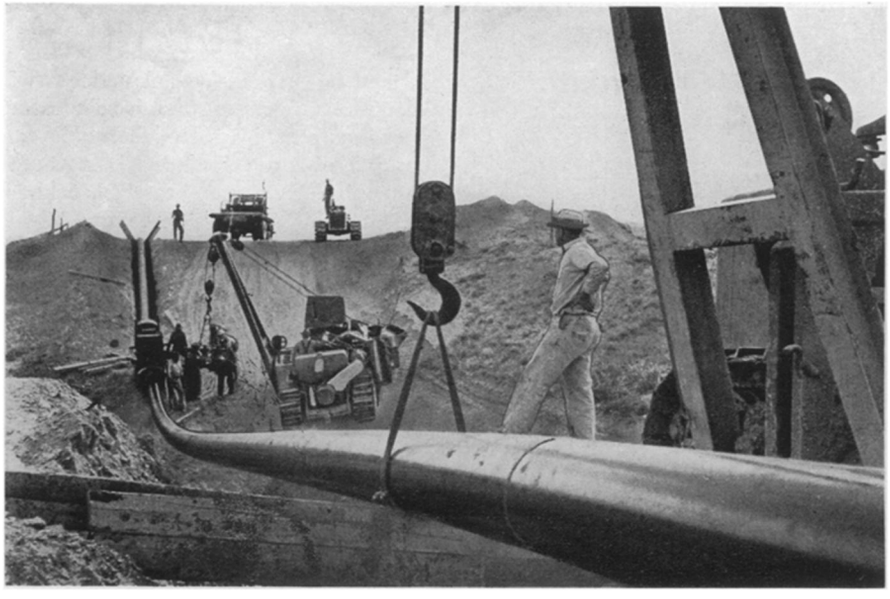
Gel gas is also used in incendiary bombs which can destroy factory buildings and the machines in them. Although the flame temperature of magnesium, used in the bombs which fell upon London early in the war, is higher than that of gasoline, it was found that gasoline has a heat content almost twice that of magnesium and is thus better for starting destructive fires.

The bombs, which look like a piece of hexagonal pipe, can be packed into clusters of as many as 60, the clusters breaking open as they fall. The bomb is equipped with a fuse which begins its deadly work only upon striking the ground. It ignites a three- to five-second powder train which allows enough time for the bomb to come to rest on its side. The powder train explodes a mixture of black powder and magnesium which hurls an ignited cheesecloth sock filled with the gel gas from the tail of the bomb; it strikes with such force that the sock is broken and flaming "goo" spread all around.

The bomb is kept right side up by a cloth tail streamer which flies out when the bomb falls free. This makes it possible to aim with greater accuracy. The streamer also slows the fall so that the bomb does not strike so hard as to keep it from exploding properly.

Smoke so concealing that enough can be quickly generated from two quarts of the liquid mixture to hide the average city block is protecting our men and positions overseas. Generated from a petroleum derivative, the oil fog comes out like steam from a locomotive safety valve and hangs over the area, hiding it completely. The smoke particles are so small that it would take tens of thousands of them, set side by side, to make a row one inch long.

The new smoke-making mixture, which has a petroleum base, is inexpensive to produce, plentiful to supply and entirely harmless to those whom it conceals. Men can breathe it, walk through it with their eyes wide open, and even smoke in it.



TO REFINING PLANT—A 12-inch pipe line is being laid to carry the "rock oil" from field to refining plant. Photographs from the new photographic library of the Standard Oil Co.

OIL SEARCH—Field geologists in their search for petroleum deposits are shown taking measurements in the Big Horns, Wyo.

Although these new petroleum-users were developed solely to help win the war, they find peacetime applications. Some believe that the smoke-generator may help protect crops by keeping orchards and fields from freezing when a cold wave suddenly begins to nip young buds. If you are "roughing it" for several days and run out of fuel for your stove, that postwar steak can still be done to a turn. Just make some "canned heat" similar to the gel gas by adding a little of the special powder to your motor gasoline.

Lower-cost cars for a given performance and increased mileage are expected to result from 100-octane gasoline. As much as 35 to 40 miles to the gallon will be possible—say three or four years after the war—when engines are built to get the most out of the new gas. With a slight modification of the engine head, existing cars could take reasonable advantage of gasoline approaching 100 octane, say petroleum officials.

Owners of new cars after the war may not appreciate improvements which have been made in high quality oils, but those who buy used cars will find that the engine runs more smoothly and lasts longer. Oils which resist oxidation, and are not as likely to cause piston rings to stick or to let varnish deposits form, have been obtained by adding as little as one to 2% of a metallic derivative of phenolic structure.

Lubricants have been developed from petroleum which more effectively keep moisture out of delicate engine parts, thus protecting against deterioration billions of dollars worth of material shipped to all parts of the world. Some types of greases, which look as black and sticky as asphalt, not only prevent rust but tend to displace slight bits of moisture.

About 95% of the toluol, the second "T" in TNT, came during the last war as a coke byproduct. The first tank car of synthetic nitration-grade toluol was made in America just 16 months before the war broke upon us. Today most of the toluol used in our shells, bombs and torpedoes is made synthetically from petroleum. Toluol will probably be greatly used as a solvent for paints and dyes in the plastics industry after the war.

Raincoats which drape nicely about the figure and storm suits which keep out the cold and wet will probably be made after the war of synthetic rubber. Large quantities of synthetic rubber are now being made from butadiene (from petroleum) and styrene (from coal tar) to keep our tanks and jeeps rubber-shod. When peace returns this research may lead to more attractive shower curtains, and washable, long-wearing rubber sheets for baby cribs.

Petroleum Products

The various substances found in petroleum have different boiling points so that the various components may be separated by fractional distillation, or heating. Products from petroleum range from gases, for illumination, heat and synthetic rubber; light oil, which is used for gasoline and kerosene; medium oil, from which metallurgical and Diesel fuels are made; heavy oil, from which come insecticide sprays, paraffin wax and lubricating oils; to residues, which give us wood preservatives, tar for paving streets and airports, coke and emulsifiers.

Newer distillation units pass the petroleum vapors into a "bubble tower," divided into a number of sections. Substances such as heavy oils with higher boiling points condense in the lower sections and flow down through the tower. The hot gases from the furnace bubble through these liquid products, and the gasoline fraction passes out at the top of the column and is condensed separately. Other fractions are withdrawn at different levels. A variety of products may be made by separating and purifying these various fractions.

Catalytic cracking is often used to break down petroleum molecules and rearrange them chemically so as to produce more of certain desirable constituents. Cat cracker" chemicals come in three sizes: lumps, granules and a powder fine enough to be handled as a fluid.

The "cat crackers" do not turn out 100-octane gasoline as a finished product, but produce the base stock for aviation fuel. When 100-octane gas is taken out, however, less remains for the numerous byproducts made from petroleum.

A number of these "cat crackers" have been built during the war. The production of 100-octane gas is now ten times as great as in 1942.

The octane number of gasoline is measured by the tendency of the fuel not to knock in use. One of the pure hydrocarbon components of petroleum, iso-octane, was discovered earlier to be free of knocks in the highest compression motor it was then possible to build. Another component, normal heptane, was found to knock under almost any circumstances. A fuel-rating scale was thus made with heptane as zero and pure iso-octane representing 100. Gasoline falling between these extremes is rated as if it had a certain percentage of iso-octane, the rest being the knock-creating heptane.

Much of the 100-octane gas today is made by taking iso-octane mixed with tetraethyl lead (which incidentally has an octane number greater than a hundred) and blending it with gas which is rated below 100.

Geologists agree that there are still huge quantities of undiscovered oil beneath our land. We will even end the war with more known oil reserves than before Pearl Harbor because new fields have been found. Engineers have already demonstrated that we can derive synthetic crude oil at reasonable cost from the great reserves of natural gas and the tremendous deposits of oil shale, of tar sands, and of coal and lignite. Oil which can be derived from these sources is believed by many to be enough to supply our needs at the present rate of consumption for more than a thousand years to come.

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DENTISTRY

More Than 200,000,000 Teeth Need Pulling

➤ AMERICANS over age three need 238,500,000 teeth pulled and 632,000,000 fillings made in their teeth, the subcommittee on health of the Senate Committee on Education and Labor has been informed. (*turn page*)