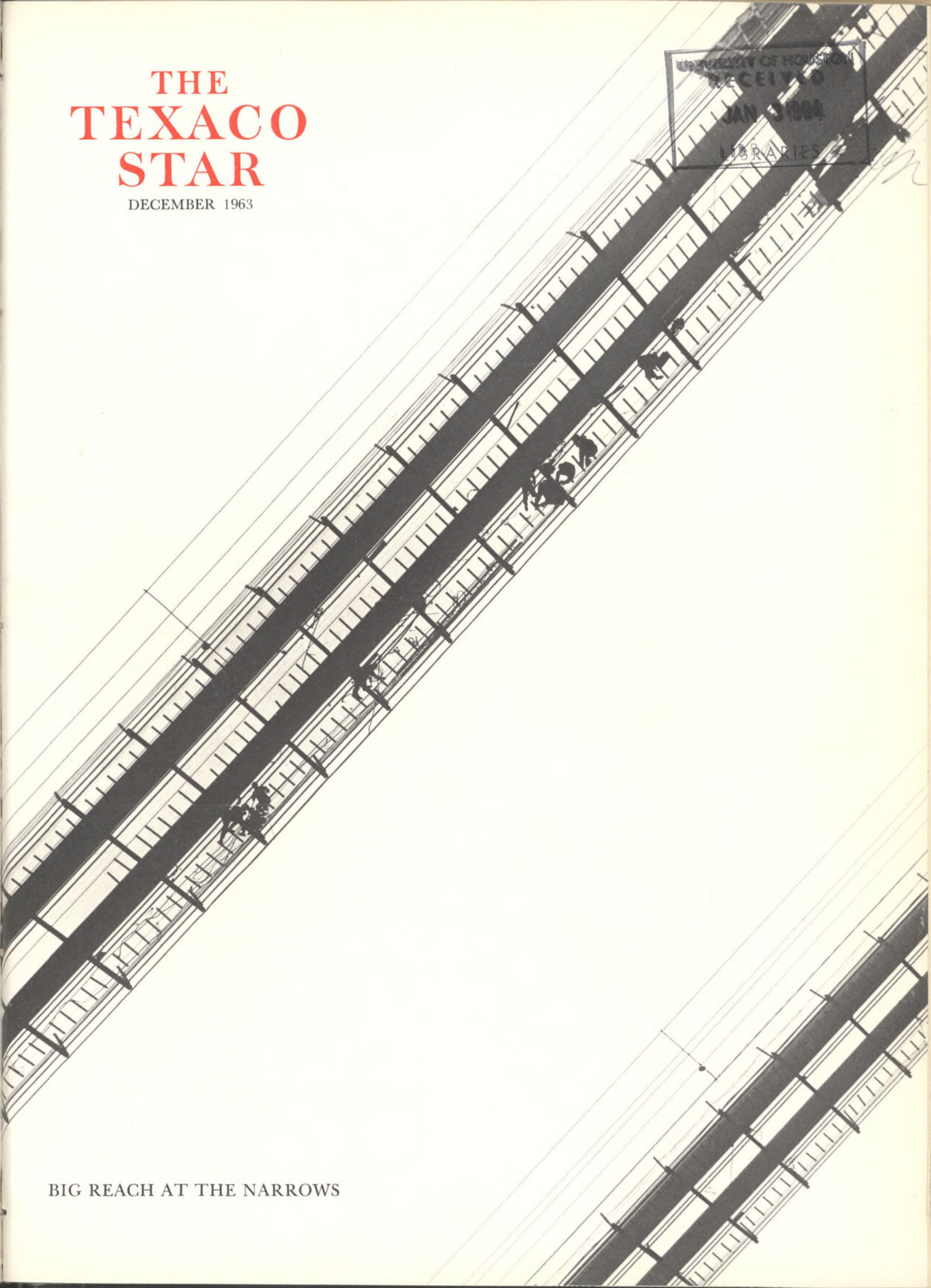
THE TEXACO STAR

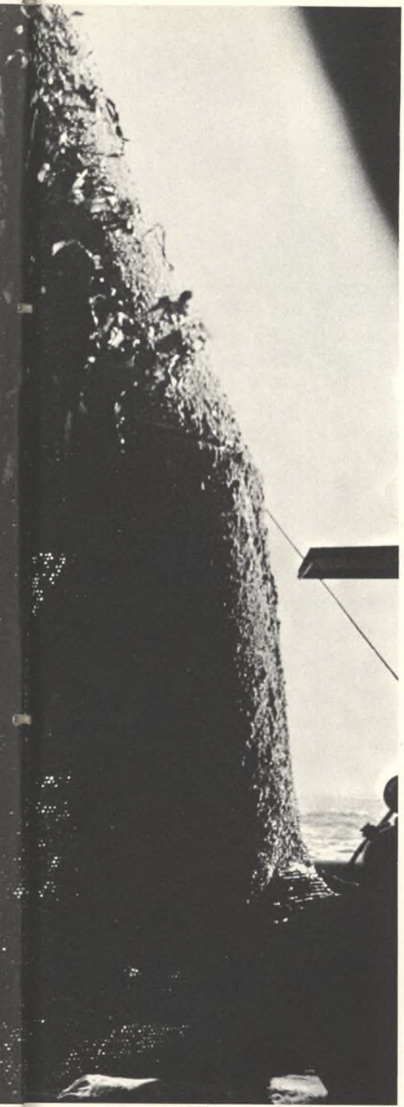
DECEMBER 1963



BIG REACH AT THE NARROWS

CHANGING OF THE GUARD

TEXACO'S PRODUCING PEOPLE are willing to go to extraordinary lengths, or depths, if making the trip means improved operation. The dome-shaped structure looming in the foreground of this photo has just been hoisted about 100 feet up from the ocean floor. It is a wellhead housing, and is to be replaced by the new, better model in the background. A small improvement in Texaco's big overall producing picture, but a telling example of the Company's continuing concern for operating efficiency wherever it works. That concern, along with an insistence that Texaco miss no bets on land or sea in its development



of domestic petroleum reserves, has given the Company an enviable production record. "Working on Wells Underwater," on Page 18 of this issue, describes the unusual California offshore producing operation in which undersea wellhead guards—like the ones shown here—are being used. •

THE TEXACO STAR

CONTENTS OF VOLUME L · NUMBER 3 · DECEMBER 1963

THE COVER: Hundreds of feet in the air over the entrance of New York Harbor, workmen blithely go about the business of building the Verrazano-Narrows bridge. Texaco's part in this huge construction job (the bridge will have the longest single span of any yet built) is described in "Longest at the Narrows," beginning on Page 4.

THE TEXACO STAR

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TEXACO INC.

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DEMAND FROM TOMORROW

Prospects of growing populations and

rapidly advancing technologies promise a profitably

busy future for the oil industry

LAST YEAR, MORE THAN FOUR MILLION new petroleum users arrived in this country. All of them are bound to become bigger users as time goes on.

The new customers were this nation's contribution to the worldwide population explosion. They were America's newborn. Since baby oil is mostly highly refined crude oil, it is a safe bet that nearly all of them began benefiting from a petroleum product very early in life.

But the United States statistics are only a small part of the world picture. Over the free world today, the population is increasing by about 40 million persons a year. That is an increase roughly comparable to the combined populations of New England, New York, and Pennsylvania.

The petroleum industry must provide huge numbers of these people with the energy to meet their needs, along with the raw material for countless products ranging from pesticides to paints to plastics. At the same time it must keep pace with the rising per capita demand imposed by mechanization and the development of new products. And this task will not be a short-term one. Oil and gas now supply about 75 percent of this nation's energy needs, and a recent study indicates that these fuels will still be supplying about that percentage all the way to the year 2000.

It has been estimated that free world demand for petroleum products will rise to about 30 million barrels a day by 1968, compared with a demand of about 21.6 million barrels a day in 1962.

Texaco intends to keep on growing as a supplier to this expanding market. In 1956, the Company established a new record by producing a daily gross average of approximately one million barrels of crude oil and natural gas liquids, including equity in affiliates. Last year it raised that average to 1,570,818 barrels a day for a gain of over 57 percent.

This increase in Texaco's production greatly exceeds the 36 percent increase in free world production over the same six-year period. Texaco, in other words, has been expanding about one and one-half times as rapidly as the free world petroleum industry generally.

Just to keep pace with the industry, the Company must keep finding more and more crude oil reserves, produce them, transport the crude oil to refineries, turn it into constantly growing volumes of products, and market those products to millions of customers.

TEXACO IS PRESSING aggressively ahead with its exploration and drilling programs, with refinery construction and improvement, with the expansion of its pipe line, tanker, and other transportation facilities. The result is that by continually augmenting and upgrading these phases of its operations, the Company each year provides its Sales Department with additional millions of barrels of products for the peoples of the free world.

It would be pointless, of course, to make all this product available unless it could be marketed; and the fact that the world's population is multiplying or that its per capita demand for petroleum is rising is no assurance, by itself, that Texaco's sales will grow accordingly. The Company is, after all, only one of hundreds of international oil companies and one out of thousands of oil companies in this country. Competition is brisk at the very least.

The job of expanding Texaco's share of the market takes work, initiative, imagination, perseverance, and capital. It also takes canny forward planning.

Take the case of jet fuels. Today, at New York's Idlewild International Airport, more than 1.1 million gallons of aviation fuels—both jet fuels and aviation gasoline—are delivered aboard commercial planes every day. As recently as 10 years ago, jet fuels accounted for less than one percent of this total. Today they account for 90 percent. Fortunately, the Company saw this trend shaping long ago. It is credited with pioneer research work that did a lot to establish the character of jet fuels. As long ago as 1946, it was making large-scale jet engine and jet fuel tests. The Company's Aviation Sales Department began seeking jet customers before most people had even heard of jet airliners. The result is that even with the displacement of conventional aviation gasoline by jet fuels, Texaco's total sales of all aviation fuels for commercial purposes have increased by more than 60 percent in the past five years.

Another example of profitable anticipation was the establishment of an LPG (liquefied petroleum gas) Sales Division, a few years ago, at a time when many oil people saw only a limited market potential for this product. Texaco sales management saw a great future for LPG as multiple-purpose fuel, set up offices in nine key cities to promote sales of this petroleum specialty. Last year the Company sold a record volume of the product.

Reaching out for new markets and new applications for its petroleum products is one way Texaco helps to insure its future growth. "Ammonia: Growth Product," beginning on Page 15, shows how the Company has put one of its refinery by-products—hydrogen—to good use in the huge agricultural market. And this fall, a whole new line of Texaco specialty products was introduced, designed to supply motorists with just about every car-care item they are likely to need. It's called The Quality Line; it includes more than a dozen items whose performance and value have earned them the right to the Texaco trademark.

AT BASE, Texaco is a gasoline marketer; and in the gasoline field the Company builds its future on the solid curiosity of its Research and Technical Department, whose work was largely responsible for the introduction, last year, of New Sky Chief gasoline. The Company called this new product "the nearest thing yet to perfect gasoline." It was not being flamboyant: as far as can be determined, the new gasoline *is* the nearest thing to perfection in its field.

Texaco researchers are at work in many fields besides fuels and lubricants. They formulate and develop new techniques for producing, refining, transporting, and marketing petroleum and petroleum products. They are constantly looking for new uses for petroleum, for new products that can be made from it. As a result of their work and of the work done by other scientists and technicians in the industry, crude oil today yields some 2,500 different products. These cover a remarkable range: detergents and gasoline, synthetic rubber and heating oil, synthetic fibers and lubricants, plastics and asphalt. The list grows almost daily.

As a major energy supplier, Texaco has a big job ahead of it in the years to come. It is in the business of supplying petroleum and petroleum products to a good part of a population that is growing by 40 million people a year. That is an assignment certain to keep the Company profitably busy for a long, long time. •

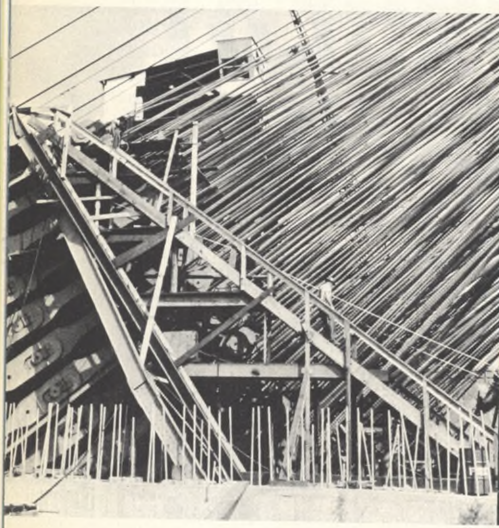
Photographed for THE TEXACO STAR *by O. Winston Link*

LONGEST AT THE NARROWS

BY ALMOST ANY MEASURE, the bridge shown here under construction will be the greatest in the world when it is finished in 1964.

It is the Verrazano-Narrows Bridge, being built by United States Steel's American Bridge Division for the Triborough Bridge and Tunnel Authority at the entrance of New York Harbor. When it is opened for traffic (the first of two road levels should go into service next year) it will become the first bridge between Staten Island and Long Island.

The Narrows Bridge will be the key structure in an expressway system that will permit motorists driving north or south along the Atlantic Seaboard to avoid the tangle of New York City traffic. One immediate benefit will be the speeding of visitors from the South and West to the New York World's Fair. A more important, long-range benefit will be the elimination of a picturesque but time-consuming ferry trip from Long Island to Staten Island. The Narrows Bridge will bring relatively undeveloped Staten Island within commuting distance of New York's other boroughs,



More than 38,000 tons of steel wire went into the Narrows bridge cables, and another 46,000 tons of

After years of discussion, the huge suspension bridge takes the shape of reality

creating a lot of living space that is sorely needed. Staten Island, until now hinterland to most Manhattanites, could become a very desirable bedroom community only half an hour or so from New York City.

One outstanding feature of the Narrows undertaking is the length of the bridge's main span. It is 4,260 feet long. This is 60 feet longer than the main span of the Golden Gate Bridge, and it sets a new world's record.

Another, upstanding, feature is the height of the two towers supporting the bridge's main cables. They are 690 feet high. That's roughly 60 stories, which would make quite an impressive skyscraper.

United States Steel's Trenton, New Jersey, mill worked for nearly three years making the wire for the cables that will support the tremendous weight and stresses of the world's longest suspended span. This wire, slightly thinner than a pencil, is spun into four cables nearly three feet in diameter.

The spinning shown on these pages is a highly specialized job. Some 600 men must carry out their individual assignments nimbly and safely. They have to get used to working at great heights—but not so accustomed they become careless. They must be able to shrug off high winds. (Last winter, gusts up to 110 mph were recorded on top of the towers. The "high work" men are, of course, called down long before winds reach dangerous velocities.)

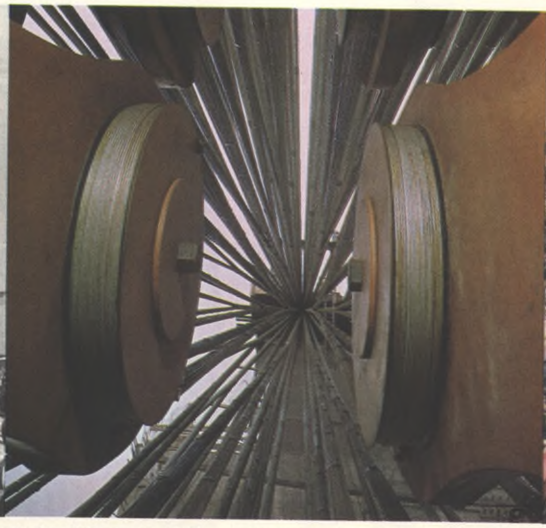
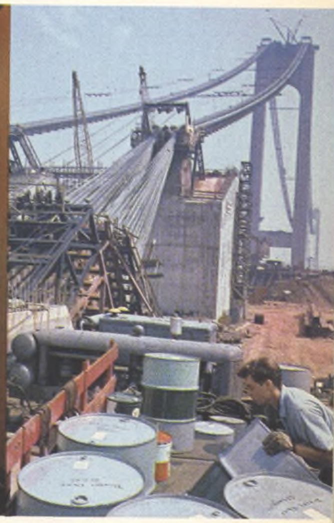
To reach the tower tops 690 feet above the Narrows, workmen ride in elevators traveling outside of the tower legs. Equipped with more safety devices than the average commercial lift, these elevators are powered on both the ascent and descent—with Texaco products fueling the massive hoisting engines that do the lifting and lowering.

Spinning is a very complicated engineering feat (so complicated, one technical magazine recently describing the operation warned its engineer-readers that what they were about to read would be "hard to visualize").

Essentially, though, it is a matter of pulling endless loops of wire across the Narrows, using pulley-like "spinning wheels," and building the individual wires into the three-foot-diameter bundles that form the bridge's four main cables. Suspender cables will be hung from them and the bridge's two-level roadway will then be put in place section by section.

The Verrazano-Narrows project, like all large bridge construction jobs, uses many types of machinery—trucks, winches, compressors, cranes, dredges, pneumatic tools, and tugs—all of which require fuels, lubricants and engineering service to keep them operating at high efficiency.

Texaco is the major petroleum supplier on this project. It is playing an important role in one of the most ambitious construction jobs in bridge-building history. •

of

structural steel will be used on its roadways. At far right, drums of Texaco product arrive on job site.

ANSWER TO AN ACADEMIC QUESTION

In airy classroom at University of Miami, students take notes during

To a very large degree, what happens to America depends on what happens to American education, and industry in this country has paid increasing attention to the importance of sound and widespread higher education in recent years.

Fast-moving technology has made it vital to create a pool of young people trained in engineering and the sciences. Growing complexity in business organization and management has made the need for well educated young people with potential ability to take charge of business problems a very pressing need.

Where will the money come from that will make it possible for our schools to maintain excellence in plant and faculty, and for deserving but short-of-money students to keep up their education? Costs, both for schools and students, have gone up at a steady rate over the last decade. Growing enrollments put more strain on school operating budgets each year. Without generous outside help any school, these days, is likely to be in serious financial trouble.

A good part of that help is coming from industry. Last year, American corporations volunteered more than $150 million for aid to education. Texaco was one of the donors; it has had a formal aid-to-education program since 1956. (Before that, the Company had for many years awarded graduate fellowships and special grants, with the emphasis almost wholly on technical education.)

The Company's program is based on a simple premise: An investment in the education of America's youth and the continued strength of its colleges and universities is an investment in the future welfare of America's economy.

The Company's program aims at a balance between broad general support of private education and more specific help—student aid, and contributions to designated fields of study, for instance.

More than 300 undergraduate scholarships and graduate fellowships now are supported by Texaco. They are in effect at some 80 colleges and universities. Their administration is handled by the individual schools, within administrative guidelines established by the Company.

These awards carry no obligation of employment on the part of either Texaco or the students. Their purpose is to encourage study in areas of interest to the oil industry by offering financial help to deserving students who are following such courses of study.

Each school in the scholarship program sets the number and size of individual awards to be established with the money Texaco provides (the amount offered a school varies in relation to tuition and fees charged). At privately supported institutions the amount to be used for scholarship assistance is accompanied by a supplement, in recognition of the fact that tuition charges rarely, if ever, cover the total costs of education. At tax supported schools, money is provided in addition to the amount for scholarship assistance to help defray costs of administering awards.

law lecture. *Miami is one of 150 private schools receiving unrestricted grants under Texaco's aid-to-education program.*

Texaco also awards a number of fellowships each year, for graduate work. Usually, the Company designates the field of study and asks that it be told of the problem chosen for investigation.

The major part of Texaco's aid to education is provided in the form of grants to privately supported schools. Generally, these are awarded directly to the schools' administrations. And generally, the money is given with no restrictions on its use. Contributions for specific purposes are made only when the project is particularly important to Texaco. One project Texaco helps support because of its obvious interest is the continuing oceanographic survey work done by Lamont Geological Observatory at Columbia University.

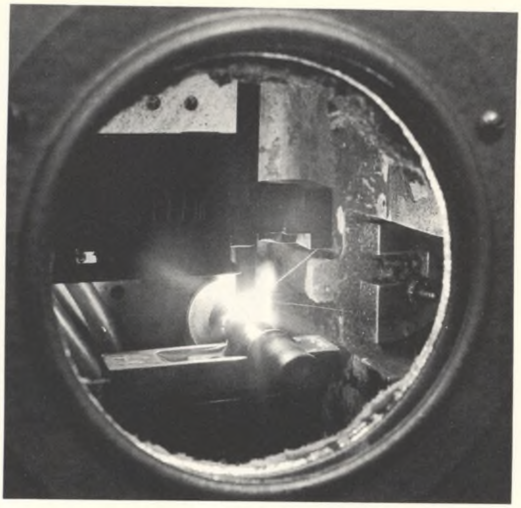
Annual unrestricted grants are made directly to 150 privately supported schools. The grants are rotated periodically, so as many qualified schools as possible may be helped. Though grants per school are not huge ($1,500), they are important to colleges whose alumni rosters cannot be expected to produce much in the way of yearly donations.

Recently, one of these grants—this one to a Midwestern college—brought with it an unexpected bonus. Texaco's district sales manager had presented the Company's check to one of the school's officials and was walking with the educator across the campus. The Texaco man noticed a row of trees, badly blighted. He remembered that a new Texaco service station was going up nearby, and that as part of construction some perfectly healthy trees were scheduled for removal. Would the college like the trees? It certainly would, said the official—and in the next few days they were delivered and planted. So that particular school got even more green stuff than it had counted on.

Finally, the Company makes special grants to institutions and associations for general support or for the support of specific projects the Company is interested in. These, Texaco feels, indirectly benefit education everywhere. Examples of recipients are the National Fund for Medical Education, the United Negro College Fund, the Council for Financial Aid to Education, the Council for the Advancement of Small Colleges.

Since it established its aid to education program seven years ago, Texaco has contributed several million dollars to a cause it firmly believes is one of this nation's most important. The Company is convinced that the money has been given wisely. •

Outside a series of test cells at Texaco Research Center, technicians at remote control panels check performances of fuels and lubricants in internal combustion engines running inside. In foreground, engine that has been put through test run is examined.



Quantometer determines amounts and kinds of metals in oils.

THE SCIENCE IN SELLING

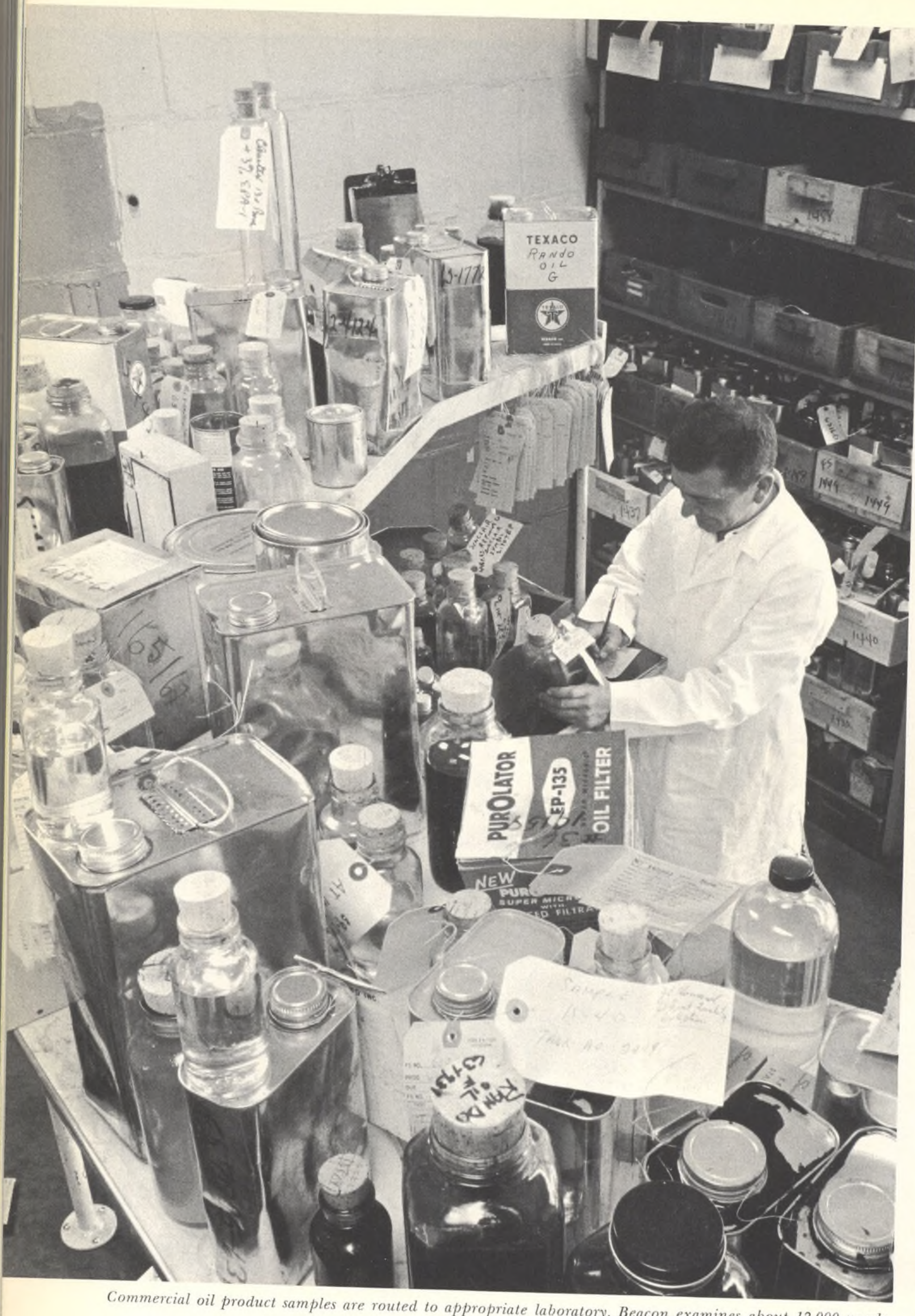
IN THE DIM LIGHT of his "office," thousands of feet above the earth, a veteran airline pilot was going through the businesslike check of his instrument panel that had become second nature in years of flying. From the thin night air outside came the level, reassuring sound of his plane's engines.

As his eyes flicked from one dial to the next, everything checked out as it should. As he had expected it would. Then his eyes came to rest on the oil pressure indicator for the cabin supercharger and for long seconds he did not turn away. When he did, it was to give his copilot some worrisome news. The cabin supercharger oil pressure had dropped.

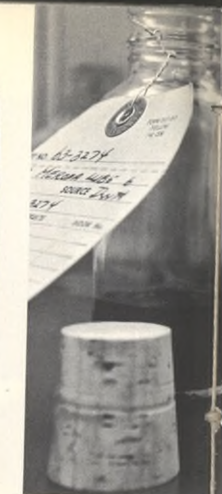
All through the flight the pilot and copilot continuously monitored the cabin supercharger oil pressure. Failure of this unit would call for an immediate reduction in altitude.

The flight was completed without mishap but it was necessary to remove and replace the malfunctioning cabin supercharger; and this resulted in costly flight cancellation and rescheduling of aircraft. When the cabin supercharger was taken apart at the overhaul shop, it showed gear and bearing damage resulting from what appeared to be improper lubrication.

Texaco was asked to investigate this failure even though the cabin supercharger was lubricated with a competitor's product. What had happened, it was discovered, was this: Under the severe conditions of service, the lubricant in the cabin supercharger had foamed excessively. This excessive foaming had caused the oil pressure to drop and the resultant lack of lubrication severely damaged the gears and bearings.

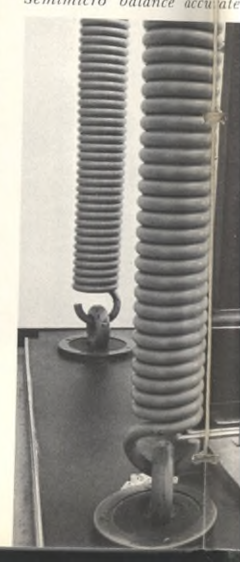


Commercial oil product samples are routed to appropriate laboratory. Beacon examines about 12,000 yearly.



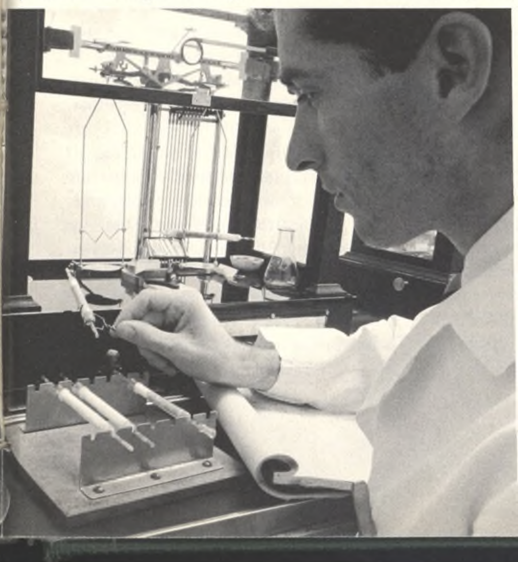
New test techniques require c

Some samples are reduced to ca
Semimicro balance accurately



equ only tiny samples, make handling of test materials easy and fast.

ced to carbon ash before inspection, and are examined in powder form.
ccurately detects changes in weight down to 1/100,000 of a gram.



A test rig was set up at the Company's Beacon, New York, Research Laboratories that demonstrated very vividly the poor foam resistance qualities of the lubricant used. This same test rig was also used to demonstrate the superior foam resistance of Texaco Texamatic Fluid, which was recommended because of its excellent performance in severe automotive automatic transmission service.

As a result of this laboratory investigation, Texaco's lubricant was placed in service and eliminated the difficulties. This same product is now widely used in similar units by many airlines.

Helping sell, and often resell, Texaco products is an important function of the Technical Services unit of the Company's Research and Technical Department.

"Helping sell" should not be confused with "selling," of course. The Company's marketing organization does the actual selling job. Technical Services helps by providing technical assistance, technical information, technical evaluations, and technical consultations whenever necessary.

Under those four categories are 10 specific assignments. Technical Services monitors and surveys product quality, provides technical help and guidance in the handling of complaints about product performance, obtains product acceptances and approvals, makes product recommendations, develops requirements for new products, supervises field testing of experimental products. It keeps informed of the latest equipment designs and developments related to fuels and lubricants. It keeps abreast of competitive activities. It prepares technical publications (*Lubrication*, for instance, a technical journal for industrial and technical people, with a monthly circulation of more than 100,000). It maintains close relations with equipment manufacturers to find out what new lubricants might be required that could be profitably turned out by Texaco.

To carry out all that work, Technical Services draws on a broad and deep experience of the application and use of petroleum products in all kinds of equipment. And while the basic objective is to help sell Texaco products, the knowledge accumulated often is used to improve internal Company operations.

Technical Services has, for instance, provided invaluable help with problems of pipe line and tanker corrosion, and with the automation of refinery processes. What is more, Technical Services activities often dovetail with some of those carried on by Texaco affiliates and subsidiaries. Many of its important activities are performed for other departments and divisions of the Company. Predictably, most are directly related to the objectives and operations of the sales forces.

Among the unit's most strenuous assignments is the road testing of Texaco fuels and lubricants in new model autos. At Steamboat Springs, Colorado, and in Texas a new batch of cars is put through paces that include stop-and-go and long-distance driving, mountain driving, cold weather starts, and a lot more to make sure the Company's automotive products will do their jobs in Detroit's latest creations. A great deal of testing is carried out off the road, too, at Beacon, New York. There are test stands for auto engines, jet airplane engines, diesel locomotive power plants. And there are thousands of small-scale laboratory tests made every year.

As the value of scientific inquiry has become established, the volume of inquiries has multiplied. To handle a rapidly growing volume, Technical Services some time ago began using what scientists call the "dry process" of investigation.

In the dry technique, equipment like spectrographs and other electronic devices replace test tubes, sizable chemical mixtures, and intricate procedures. Tests can be completed much faster, and only tiny samples of the substance to be analyzed are needed. As a result, handling is much simpler.

As a random example of the difference between "wet" and "dry" investigation, suppose an industrial lubricant is being examined to find out what its constituents are and in what percentages they occur. In the old days, technicians would have made chemical tests, breaking the oil down for analysis by creating identifiable reactions. The job might have taken a week, say. Today the same job is done in minutes or possibly hours using spectrometry, electron microscopy, or one of several other electronically aided methods. More inquiries can be made, less material must be handled, more precision is possible.

Most of the work Technical Services does is done within the Company. A certain amount, though, takes its personnel outside Texaco.

ALONG WITH maintaining solid relationships with equipment manufacturers, members of the Technical Services unit keep active in technical societies and trade associations, maintain contact with Government agencies, contact customers when that is desirable, and from time to time hold technical conferences for different industry groups.

These outside activities help the groups with which Texaco people are working, and they also help sell Texaco products. They help convince technical people outside the Company that Texaco knows its business. Often, that conviction leads to sales.

One important, and very tangible, way Technical Services helps the marketing organization lies in its assistance with industry's lubrication problems.

As machinery, materials, and processes have become more complex, problems of lubrication have become harder and harder to solve in the plant. Industry has learned to depend increasingly on the petroleum laboratory to find and evaluate minute clues, to trace causal factors, and to recommend correctives. Being a master mechanic, these days, often is not enough to figure out what went wrong with a piece of machinery. More and more, that has become the job of the petroleum research center.

At Beacon, Texaco has one of the finest research facilities in the nation—and at Beacon, daily, Technical Services applies its skills and equipment to the solutions of lubrication problems that have been posed by the Company's customers and prospects. A few examples show what it is capable of.

A household refrigerator manufacturer complained that oil-induced deposits were plugging his refrigerator cooling system capillary tubes. These fine tubes are used to expand the refrigerant to a lower pressure, thus bringing about a cooling effect.

The laboratories found that in brazing a fitting to this tubing the internal bore was constricted and served to filter out minute particles left in the system in manufacturing. The manufacturer readily adopted recommendations for better methods of cleaning the units after assembly and a method of brazing the tubing without constricting the fine capillary bore. Thus the oil was completely exonerated and the customer was appreciative.

In another case a manufacturer of small, engine-powered yard equipment complained of severe carburetor gumming and valve problems during the factory run-in and early service life of certain equipment.

Laboratory chemists at Beacon found by analyzing samples of the gasoline taken from the tanks just off the assembly line that the fuel contained zinc chloride, a common ingredient in soldering flux and also a powerful catalyst in forming gasoline gum. The gum trouble stopped when the manufacturer started washing the flux residues from his tanks more thoroughly. Texaco kept the plant business.

Beacon's investigations are not always concerned with machinery. Sometimes they involve humans. Take the case of the girls in an armament plant suffering from dermatitis.

These girls had the job of drilling tiny holes in fuse heads, and they complained their hands were being reddened by the soluble cutting oil used in drilling. The oil was Texaco's, and the plant asked the Company to look into the problem.

Investigation at the start showed that the girls had to hold the fuse heads during the drilling operation, which put them in close and nearly constant contact with the fuses. More investigation showed that in the preceding manufacturing step the fuse heads had been washed in a special solvent, that they were still wet as they were delivered to the girls and, finally, that the solvent was causing the dermatitis—not the oil. Changing the solvent solved the problem for the customer and saved the account for Texaco.

One other assignment for Technical Services in which humans were involved and, in fact, were the culprits, came from a manufacturer of circular saws.

The manufacturer complained that his saw blades were developing blotchy patches after finishing that ruined their sales appeal. He thought the patches might be some kind of stain, or they might be rust. The Texaco salesman who called on him suggested that a couple of the blades be sent to Beacon for analysis.

In the laboratories, researchers first determined that the patches were rust, then acted on suspicion based on a lot of experience. They put a blade in a special humidity cabinet to rust it more. Doing this, they made visible the fingerprints which had been invisible.

This problem was solved by supplying a unique rust-preventive oil that contained special additives capable of removing and neutralizing the sodium chloride, water, and organic acids contained in perspiration and fingerprints. As a further safeguard, the workmen began wearing gloves during manufacture and final packaging.

In every one of these cases, and thousands more like them, Texaco provided an important service. And in every case, science, applied by Technical Services, became a real selling aid. •

With applicators that shoot ammonia fertilizers into the earth, farmers vastly improve crop outputs.

AMMONIA: GROWTH PRODUCT

WHEN THE AMERICAN INDIAN buried a fish in each hill of corn he planted, he had the right idea about crop fertilization even though he had no scientific information on the subject. All soils need nitrogen supplement for top production, and the fish supplied a rich nitrogen boost.

But you are not likely to find any of today's American farmers putting fish in their corn hills. With the science of agronomy (the theory and practice of field crop production and soil management) to help them, they plan the fertilization of their fields with the precision of a mother measuring out her infant's formula. The farmer's formula, these days, is almost certain to include nitrogen in some form—either by itself or in careful combination with other nutritive elements. The nitrogen, most likely, comes from a petrochemical plant like Texaco's ammonia unit at the Company's Lockport, Illinois, refinery.

Lockport Plant makes 220 tons of ammonia (which, by weight, is over 80 percent nitrogen) every day, and about 80 percent of that production goes into agriculture as fertilizer. The ammonia may be added directly to the soil, or used by other manufacturers in their commercial fertilizers.

Commercial fertilizer production using petrochemicals has become increasingly important in recent years because it is the most practical solution for a perpetual farming problem: soil depletion.

Good farmers know that in addition to sunlight and water, healthy productive crops need large quantities of chemicals containing nitrogen, phosphorus, and potassium, with "trace" amounts of other elements. They know, for example, that 100 bushels of corn take 160 pounds of nitrogen from the soil. Unless that nitrogen is amply replaced, the soil weakens and future crops will be runted and puny.

There is plenty of nitrogen in the air. Above every acre of the earth's surface there are about 35,000 tons of gaseous nitrogen. But only legumes like clover, alfalfa, and soybeans can use it in gaseous form. Other plants need "fixed" nitrogen—nitrogen contained in a chemical like ammonia.

Farm manure contains some fixed nitrogen, but both the proportion of nitrogen and the quantities of manure now available are inadequate. Growing and plowing under legumes partly answers the nitrogen shortage, but it also cuts productive acreage at least in half. So the use of commercial fertilizer has become the only practical and profitable answer to the nitrogen shortage. Using it, American farmers restore more than 2.8 million tons of fixed nitrogen to our soil every year, and their demand for petrochemical fertilizer grows by about 10 percent a year.

FARMERS in some parts of the United States are now using eight times as much commercially produced fertilizer as they did a little more than a decade ago. It was to meet this growing demand that Texaco opened the Lockport ammonia facility in 1958.

At Lockport, ammonia is produced in a very straightforward way. Ammonia contains one volume of nitrogen to three volumes of hydrogen, and the Lockport unit simply combines the two elements directly.

Hydrogen from petroleum is available from the gasoline refining section of Lockport Plant. It is one of the side products of modern refining methods, and it can be drawn, in a state of high purity, from the catalytic reforming units used to produce high-performance fuels.

Nitrogen, the other element needed to make ammonia, comes from the atmosphere—which is almost four-fifths nitrogen. To separate nitrogen from oxygen and other atmospheric gases, refiners use low-temperature fractionation, which is a system of boiling one liquid off another. At low temperatures, under reasonable pressures, air can be liquefied and distilled selectively. The most abundant product of this process is nitrogen. One section of the ammonia plant produces nitrogen that way and pipes it to the synthesis section where the ammonia is produced.

Combining hydrogen and nitrogen to make ammonia involves heat, pressure, and a catalyst. The operation is carried out at about 9,000 pounds per square inch pressure, and the temperature is maintained carefully near 900F. Ammonia comes out of this reaction as a compressed gas, and the gas is cooled and stored as a liquid.

Lockport makes an ideal site for an ammonia plant because it is near the large, efficient farms of the Midwest at the same time it is near big industrial centers (ammonia that does not go into agriculture goes into explosives, refrigerators, dyestuffs, synthetic fibers, plastics, and a raft of other industrial chemical applications).

Currently, about half of Texaco's ammonia production is converted into nitrogen solutions that are sold primarily to the solid mix fertilizer industry. These solutions are used in the formulation of mixed fertilizer. The other half is sold as anhydrous (waterless) and aqua (water-diluted) products that find their way into both fertilizer and industrial chemical markets.

The farms of the Midwest often cover thousands of acres, so big their owners and top hands need cars with two-way radio to keep in touch with each other as they drive from one crop area to the next. On a farm like this, a crop of onions might be planted in a 300-acre section.

Fertilizing 300 acres is no small job, and the larger farms have found that one very efficient way to go about it is the use of a tank truck filled with ammonia. The truck drives across fields dispensing the ammonia through knife-like prongs that cut into the soil. In the tank the ammonia is liquid under pressure, but as it shoots into the earth it turns into a gas that seeps through the soil spreading nitrogen.

Smaller farms often call on custom applicators, who operate much the same way the custom combiners described in "For Hire for Harvest," in the September STAR, do. These men go from farm to farm, with their own applicators, fertilizing the soil on a contract basis.

Many farmers use dry, mixed fertilizers—like the kinds you are likely to find in your hardware store—and these also contain synthetic ammonia of the kind produced at Lockport. The dry mixtures come in sacks of 50 and 80 pounds apiece, and are applied to the soil from hoppers pulled by the farm tractor.

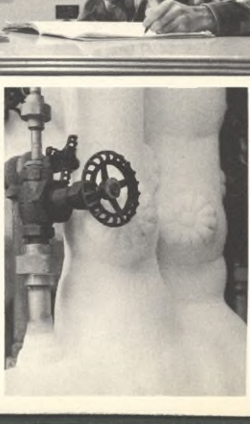
What the modern American farmer is doing with these nitrogen-rich products is feeding the soil better in order to feed the nation better, and he is doing a superb job.

Most of the world's people spend approximately half of their disposable incomes on food—and some spend an even larger proportion. People in the United States, however, spend only about one-fifth. It was 20 percent in 1960, the most recent year in which agricultural economists have complete data for their calculations.

The American farmer has made this possible by handling greater acreages and producing larger crops. In both efforts he is helped by petroleum: efficient fuels and lubricants allow him to mechanize and cover more territory with less hands, and efficient commercial fertilizers help him bring in richer harvests.

In its five years of operation, the Lockport plant has supplied thousands of tons of ammonia to agriculture and industry. Doing this, it has made available a product that can, literally, be called a growth product. •

Through central instrumentation, above, *refinery men control both quantity and quality of ammonia "runs." Ammonia's well-known refrigerating qualities are demonstrated even in its production, by frosted refinery piping,* shown at right.



Ammonia unit at Texaco's Lockport refinery can produce 220 tons of product daily.

Working on wells

AT A TEXACO PRODUCING SITE near Santa Barbara, California, recently, George (Woody) Treen was doing some routine contract maintenance work on a wellhead housing when he noticed a good-sized fish lying comfortably on a nearby manifold. Woody didn't raise an eyebrow. He went on with his work.

Treen wasn't surprised, because he was working 100 feet underwater off the California coast. He is a diver, and he is used to seeing fish snugged to the manifolds. They seem to cuddle instinctively to things on the ocean floor—like wrecked ships, and, these days, underwater piping.

The Santa Barbara installation plainly is not an ordinary one. It is not even an ordinary offshore installation. It differs from most others because here the wellheads are on the ocean floor instead of the deck of a platform.

Hydraulic valves on the wellheads, remotely controlled from a Texaco storage terminal onshore, are used to control the flow of oil from the underwater wells. The ocean-floor completions have made possible the development of substantial production on the Santa Barbara lease. Such completions are suitable for deepwater areas, and can help reduce the high operating costs of offshore production.

They do create some unusual maintenance work, though. The photograph on the inside front cover of this issue shows diver Treen just after he had been below to attach a cable to the top of the wellhead housing. He then unbolted the housing and it was lifted to the barge on the surface. Then it was replaced by a newly designed housing whose open structure collects less marine growth and also allows the fast-running (about four knots) current to flow through. The pressure of the currents had broken the old housing.

During peak drilling seasons, as many as five divers work underwater at the Santa Barbara site. They have to work fast—at 100 feet a diver can take only about 95 minutes every 24 hours. To keep reasonably warm they wear four very heavy sets of woolens, and the warm surface air is pumped through their diving suits.

Dewaxing the flow lines that run from the wellheads to shore is a weekly maintenance chore that also takes divers. This cleaning job (oilmen call it "pigging") is done with a pipe line scraper slightly smaller in diameter than the line (*see photograph, Page 19*). Pressure of the oil going through the line pushes the scraper, and it removes wax from the inside wall of the line as it moves along. Someone has to put the scraper in the line at the wellhead, and that is a diver's job. He takes it below with him and inserts it in a special trap at a central underwater manifold.

Most people in the petroleum business are enthusiastic about their work, but not many of them literally dive into it. Woody Treen and his Santa Barbara crew do—as a matter of routine. •

Asleep in the deep, a fish stretches out on an oil-field manifold 100 feet beneath surface offshore California.

s underwater

Before going below to put cleaning tool in a flow line, diver checks with Texaco's producing foreman on the job.

Before Texaco puts a new pin in its 50-state service station map, Company market experts ponder a wide range of economic and social factors to make sure the proposed unit is truly

SITED FOR SERVICE

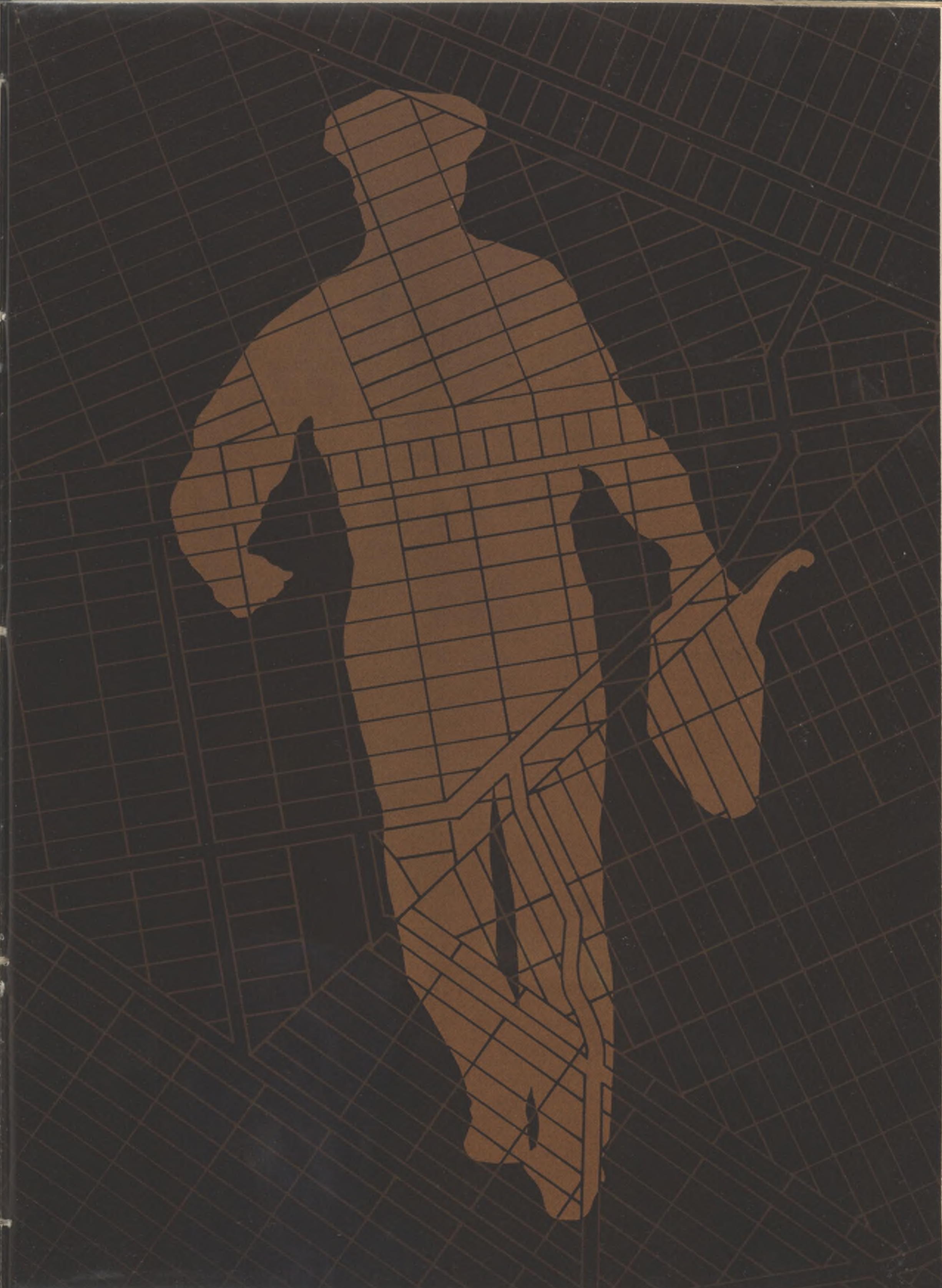
THE MORE GOOD Texaco service stations there are in an area, the more each Texaco dealer will prosper. That formula amounts to prosperity by association, and it helps explain why, sometimes, a motorist will notice several Texaco stations in one neighborhood.

He can be sure the area has been carefully surveyed by Texaco's Domestic Sales Department to make certain the potential business there will support the stations that have been opened. Texaco probably is much more careful, choosing a service station site, than a great many people are when they look for a lot to build a house on.

The Company has to be careful. For one thing, it is concerned with station sites in all 50 states and the sum of all the site decisions it makes is a very considerable one—in terms of sales and of dealer satisfaction. The current population boom and concurrent urban and suburban sprawl have made the job bigger and more important than ever.

Some of the questions Texaco looks into when a service station site is being considered are these: Is the location the best possible in an area expected to grow? Does it have a supporting community of car owners? What is the percentage of transient traffic? Is the area already saturated with service stations? What is the general level of prosperity in the neighborhood? What are the future growth factors? Existing potential? Types of stations in the area? Price conditions? Highway plans? Particularly, these days, Interstate Highway plans. Currently they are one of the most important considerations.

Unless the answers to those questions are the right ones, the site is rejected as a station location. If they *are* the right



ones, Texaco tries to buy the land or interest the landowner in building a station and leasing it to the Company. In the latter case, the Company subleases it to the Texaco dealer who takes the station over.

One specific guide the Company uses in coming to a decision on the opening of a new station is its own Service Station Saturation Index. The SSSI expresses the number of service stations in a county or trading area—Texaco's and competition's—as a percentage of the number needed to provide adequate service. For instance, an SSSI of 200 means that, theoretically at least, there are twice as many stations in the area as can be justified by their individual business volumes.

An example of the way the SSSI system can be used comes from Company files. In 1961, as part of Texaco's District Service Station Development Program, a certain county in Georgia was surveyed. It had an SSSI rating of 148.7. On the face of it, this would indicate the county contained half again as many stations as it should have. But it was the second largest county in the state and it was growing fast. Its population had increased nearly 87 percent between 1950 and 1960. A number of major highway changes under way in the county, principally those involving Interstate Highway construction, made it important to obtain key sites quickly. This was done.

The next county surveyed, however, had all the stations it needed or would need for some time. It was growing slowly. It was not an area for new service station construction. It was dropped as an area for development.

Basic to every site study the Company makes is a concern that new sites are not established in areas where the expected sales volume would have to be obtained at the expense of other, existing Texaco stations by dilution of their volume.

This is a crucial point with the dealers, who are independent businessmen with considerable investments in their stations. They have a natural fear of too many stations being built near theirs, and nobody can blame them. But they have little to worry about.

ALTHOUGH the total number of service stations is not expected to increase on a per capita basis in the next 10 years, and in fact may decrease, the amount of new station construction will be tremendous. The reason for this is that more and more out-of-date facilities will come down or be converted for another commercial use. These new stations almost invariably are large ones that require substantial investment but have the potential for greater profitability and high volume.

In recent years, the question of community relations has become increasingly important as a consideration in station site selection.

Since the war, new communities have sprung up across the continent at a phenomenal rate. Each one needs service stations, obviously, but occasionally there is the lingering notion that a service station is an eyesore, a fire trap, or a traffic hazard. Those claims could have been accurate, in widely scattered cases, many years ago— but they have not been true for the last 20 years.

The typical Texaco station today is anything but an eyesore. It is built to Company specifications on clean architectural lines, and it is kept sparkling (the Company's Sales Department is relentless in its admonitions to the field to keep the "sparkle" in Texaco stations). Recently the Company retained Peter Muller-Munk Associates of Pittsburgh to create new Texaco station designs. This leading design organization has produced three that interest Company management. Full-scale, fully operational prototypes of these are to be built soon and tested for consumer acceptance.

In many parts of the country, shopping centers are developed on an architectural theme: all the buildings in it are, say, Colonial in style. For these special situations, the Company often has veered from its standard station designs and has specially built stations that would contribute to the architectural unity of the center. Colonial is so popular, in fact, that there is a standard Texaco Colonial station design.

To the suggestion that a service station is a potential firetrap, the Texaco representative discussing a station site with community planners has a ready answer. Fire underwriters frequently charge lower premiums for service stations than for restaurants, schools, or even churches.

And to the charge that a new service station will create new traffic hazards, his informed answer is that there are no more accidents around service stations than there are in comparable business areas. The fact is that by providing a more open view at intersections they actually reduce the chances for accidents.

Finally, the opening of a new service station means new private enterprise and employment opportunities in the area as well as new capital investment.

Although the basic criteria for judging the wisdom of opening a new Texaco station at a certain site have been laid down by the Company's Distribution Development staff in New York, aided by its Market Research staff, the actual checking out is done by local sales people.

Typically, it might work like this: A district salesman learns that a large new housing development is to be built within a few months in his territory. The development will bring 300 middle-income families into the area. Almost every family will own a car, because the development is a good way out in the country. Using the check list developed by market research, he assays the potential for a Texaco station near the project. He looks into land costs, and balances those against the potential. If the balance is favorable, and everything else he knows about the area from personal experience is good, he recommends a site. There are further checks by Company men in that sales district whose specialties are real estate and station development. If what they find is favorable, a recommendation for a site goes to the Division Sales Manager. He has the authority to proceed with construction, within certain limits, but most final decisions are made by New York headquarters. Either way, if the decision is "go ahead," another community will have Texaco products and services.

And if the community flourishes and grows, as it is expected to, a passing motorist might notice there are quite a few Texaco stations scattered through it. He can be fairly sure the dealers are prospering from their associations—with the public, with Texaco, and with each other. •


Horace H. Chandler


Edward C. Mitchell


Carl D. Hall


Walter B. Gilbert


James A. Hulme

APPOINTED TO FOREIGN SALES POST

The appointment of Horace H. Chandler as General Manager of the Foreign Sales Department (Western Hemisphere and West Africa) was announced on August 21.

Mr. Chandler joined Texaco in 1932 at the Port Arthur, Texas, refinery. He held various posts until 1954 when he was assigned to the Westville, New Jersey, refinery as Assistant Superintendent. He became Superintendent of that refinery in 1955. From 1957 to 1961, he served in London, successively as Deputy Shareholder's Representative, Manager of Texaco Iran Ltd., and Board Chairman of Trinoil (U.K.) Ltd. Since March, 1961, he has been Assistant to the President of Texaco Inc. in New York City.

Mr. Chandler succeeds Henry M. Hanbury, who becomes Assistant to the Vice President of the Department.

BECOMES ASSISTANT TO PRESIDENT

On September 24, Board Chairman Augustus C. Long announced the appointment of Edward C. Mitchell as Assistant to the President.

Mr. Mitchell had been General Manager of the Foreign Operations Department (Eastern Hemisphere) since March, 1962. He joined Texaco in 1936 and has served in Texaco's Latin American Division as Manager in Haiti, Jamaica, and Brazil; as Assistant General Sales Manager of the Company's 15-state Central Region at Chicago; as Assistant to the Vice President, Foreign Operations (Eastern Hemisphere); and as Assistant to the Senior Vice President in charge of worldwide sales.

TWO APPOINTMENTS ANNOUNCED IN DOMESTIC SALES

The appointments of two General Sales Managers in the Domestic Sales Department were announced by the Company on October 8.

Walter B. Gilbert has been given the responsibility for Texaco's Eastern Sales Regions. Formerly he was Assistant to the Vice President in charge of the Domestic Sales Department. He joined Texaco in 1937 and has held various sales positions in this country and abroad.

Carl D. Hall has been made responsible for the Company's Western Sales Regions. Formerly Texaco's Assistant General Sales Manager, he has served with Texaco since 1932 and has held various sales positions in the United States.

NAMED TO EASTERN HEMISPHERE OPERATIONS POST

James A. Hulme has succeeded Edward C. Mitchell as General Manager in the Foreign Operations Department (Eastern Hemisphere). His previous post was as Manager.

Mr. Hulme joined The Trinidad Oil Company at its Pointe-à-Pierre refinery in 1936. He was named Refinery Superintendent in 1948 and Development Manager in 1951. Texaco acquired The Trinidad Oil Company in 1956, and in 1958 Mr. Hulme was named General Manager of Texaco Trinidad, Inc. In 1960 he was transferred to Texaco's New York offices.

1962 ANNUAL REPORT WINS RECOGNITION

For the second year in a row, the magazine *Financial World* has named Texaco for an award in the publication's Annual Report Survey.

Participating in a field of about 5,000 entries, the Company won a third-place certificate in the petroleum (assets over $100 million) category for its 1962 Annual Report.

Reports are judged for their editorial and statistical content, format, and typography.

NEW TOUR CENTER OPENS IN NEW YORK

On October 28, in New York City, Texaco opened its newest and largest Touring Center.

Located in the Company's Chrysler Building headquarters at one of the city's busiest intersections, the new street-level bureau will offer Texaco Touring Service and general information on Texaco's worldwide operations.

The Center's uniformed travel consultants will give free travel counsel, maps, and travel booklets to visitors. They will handle the average across-the-counter routing request in less than 10 minutes.

Since Texaco's Touring Service was established in 1930, the Company has opened Touring Centers in Chicago, Houston, New Orleans, and Los Angeles, as well as in New York. Through the Touring Service it has distributed maps of the United States, Canada, and various Central and South American countries totaling about 330 million.

Associated with Texaco in planning the design of the new center was the Peter Muller-Munk firm. The bureau will replace the Texaco Touring Center located on Park Avenue.

TEXACO MARINAS NOW IN ALL 50 STATES

With the opening of a Texaco marina on Lake Mohave, Nevada, recently, the Company achieved representation of its products for pleasure boating in all 50 states. For years, Texaco has been the only marketer of automotive products to offer nationwide service to motorists.

It is estimated that more than 35 million Americans now own pleasure boats, and that they use more than 547 million gallons of gasoline and about 25 million gallons of lubricating oil for boating yearly. With an eye on this flourishing market, the Company two years ago formed a Small Craft Sales group in its Marine Sales Division.

DISCOVERY REPORTED IN COLOMBIA

Texaco's wholly owned subsidiary, Texas Petroleum Company, has made a new field discovery in the Putumayo District of Colombia at a depth of 6,200 feet, it was announced on October 3. No extended tests have been made but a confirmation well is now drilling at 6,600 feet.

This area is in the southern part of Colombia east of the Andes in the upper regions of the Greater Amazon Basin. The prospect is located within some 2,500,000 acres controlled jointly with Gulf Oil Corporation.

OPERA BROADCASTS BEGIN 24TH SEASON

This December, Texaco will again sponsor the Saturday Metropolitan Opera broadcast series that has become a radio classic. The 1963-64 season will be the 24th in which the Company has taken Saturday performances into homes all over the United States and Canada.

Through the years, the Texaco-sponsored broadcasts have received many honors for their value as a public service, and have become an eagerly anticipated source of pleasure for music lovers. The pleasure was heightened when, in 1960, the Company established its own nationwide network for the opera programs to allow listeners to hear them "live" in a number of localities that had been receiving rebroadcast performances.

METROPOLITAN OPERA BROADCASTS

Schedule for 1963-1964 Season

December 7, 1963	Aida
December 14, 1963	Die Gotterdammerung
December 21, 1963	Manon
December 28, 1963	Don Giovanni
January 4, 1964	Faust
January 11, 1964	La Sonnambula
January 18, 1964	Il Trovatore
January 25, 1964	The Magic Flute
February 1, 1964	Lohengrin
February 8, 1964	The Last Savage
February 15, 1964	Otello
February 22, 1964	Rigoletto
February 29, 1964	Eugene Onegin
March 7, 1964	Don Carlos
March 14, 1964	La Boheme
March 21, 1964	Falstaff
March 28, 1964	Requiem (Verdi)
April 4, 1964	Macbeth
April 11, 1964	Cavalleria Rusticana and Pagliacci
April 18, 1964	Tosca

Schedule subject to change

DIRECTORS INSPECT REFINERY CONSTRUCTION IN WALES

THIS FALL, the Board of Directors of Texaco inspected facilities of subsidiary and affiliated companies in the United Kingdom, Ireland, Holland, Belgium, West Germany, and Denmark. A particularly significant stop on their itinerary was in southwestern Wales where they saw at first hand the construction going forward on Regent Oil Company Limited's new 100,000 barrel-a-day Pembrokeshire Refinery.

Ground was broken for the refinery on the south shore of Milford Haven this past February. When it goes on stream next summer, the Regent Oil facility will process crude coming principally from Saudi Arabia and North Africa.

Regent, a Texaco subsidiary, currently imports refined products from Trinidad and Bahrain. Beginning in 1964, it will supply the growing demand for Regent products in the United Kingdom market mainly from Pembrokeshire Refinery. •

Against rapidly growing Pembrokeshire Refinery skyline, above, *inspection party groups for a portrait. From left to right are: Gilbert W. Humphrey, Director; Stanley T. Crossland, Vice President; Harvey Cash, Director and Executive Vice President; James H. Pipkin, Executive Vice President; Dwight P. Robinson, Jr., Director; Robert J. Derby, General Counsel; William H. Mitchell, Director; George Parker, Jr., Director; Ronald D. Nelson, Managing Director, Texaco U.K. Limited; James W. Foley, President of Texaco Inc.; John B. Christian, Managing Director, Regent Refining Company Limited; Augustus C. Long, Chairman of the Board and Chief Executive Officer of Texaco Inc.; Charles C. Dunn, Managing Director, Regent Oil Company Limited; P. L. Betzner, Resident Site Manager, Regent Refining; R. Chambers, Superintendent, Industrial and Public Relations, Regent Refining; Charles L. McCune, Director; E. A. Pryer, Manager, Western Branch, Regent Oil; Henry U. Harris, Director; E. W. A. Jeffries, Manager, Advertising and Sales Promotion, Regent Oil; Oscar John Dorwin, Director; Sir Edward Beetham, Chairman of the Board, Texaco U.K. Limited; Admiral Arleigh Burke, Director; Kerryn King, Vice President; William S. Gray, Director.* Below, *party views shoreline of Milford Haven from refinery site.*

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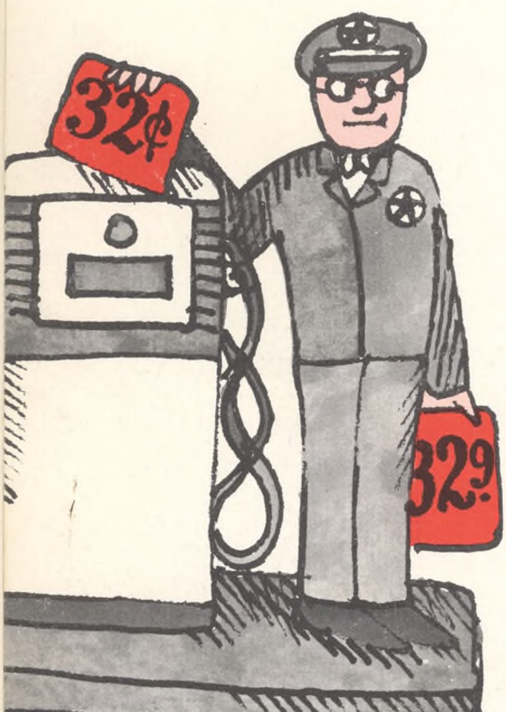

PRICING GOES LIKE THIS

Texaco's service station dealers are independent businessmen. Like all businessmen, they set their prices to make a reasonable profit. This is the way a typical dealer arrives at the price he'll charge for gasoline:

First, he knows what the Company charges him (what Texaco does charge him is competitive with other suppliers in his area and includes the cost of producing and refining crude oil, then delivering the finished product to him).

Working from there, he considers what his competition charges. He has to meet that competition. If he sets too low a price he won't make much profit. If he posts too high a price, motorists will stay away. In any case, his competition is watching him as closely as he watches them.

No one is better qualified to set the price of gasoline at the pump than the man at the pump—the individual, independent dealer. That's how pricing goes—each dealer making his own decision in the face of competition.

Incidentally, the retail price of regular-grade gasoline (excluding taxes) is <u>less</u> now than it was a decade ago, on a national average. At the same time, the consumer gets <u>more</u> quality in the fuel. Seems like free, competitive pricing works to the motorist's advantage, doesn't it?