Seventy Six

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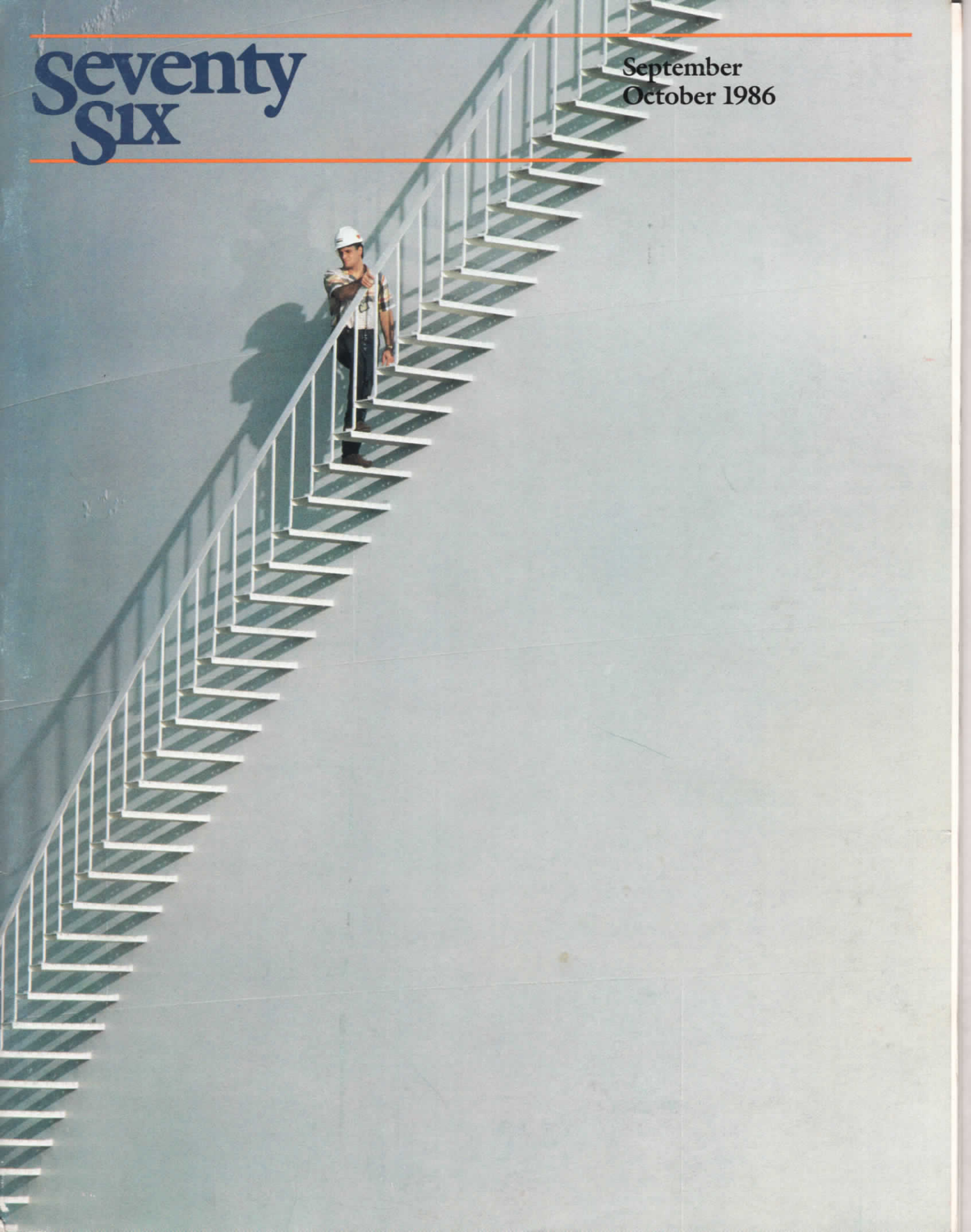


Spotlight on Refining

At Unocal, refining and marketing—the "downstream" end of the oil business—have always been a vital segment of the company's operations. Recently restructured as the Refining & Marketing Division under new president Roger Beach, the two are closely-linked components of a wide-ranging system that extends from the supply of raw materials through the selling of petroleum products.

Unocal's five refineries are a critical element of this system, for without them there would be no products to sell. Together they transform a variety of crude oils into a full spectrum of petroleum products designed to meet the ever-changing needs of the company's customers. Gasoline, diesel, jet fuel, heating and fuel oils, petroleum coke, greases, lube oils and petrochemical feedstocks are just some of the products that come out of Unocal refineries.

Located in Los Angeles, San Francisco and Santa Maria, California; Chicago, Illinois, and Beaumont, Texas, the five facilities have a total combined refining capacity of 497,000 barrels of crude oil a day. The crude they process comes from all over the world, ranging in type from the heavy, sulfur-laden crudes of California to the light, sweeter oils characteristic of East Texas.

Each of the company's refineries has its own unique processing capabilities. These differences, along with marketing strategies and logistics, help define the role of each refinery within the overall R&M system.

Unocal's west coast refineries work closely together in producing a slate of products for marketing in the west. Each refinery's role is fine-tuned to complement the others'. The Santa Maria facility, for example, is designed primarily to convert heavy California crude oils into semi-refined feedstocks for the San Francisco refinery. The San Francisco and Los Angeles facilities also exchange intermediate products for specialized processing. A complex network of pipelines and marine terminals link the three facilities.

The company's two eastern refineries operate more autonomously. Each has a well-defined processing niche relative to the eastern markets it serves. Beaumont is entirely a sweet-crude refinery, while Chicago can run all crude oil types. Both facilities yield a wide range of transportation products, as well as a variety of products for sale by the company's Chemicals Division.

To shed a brighter light on how our refining system fits into the company's overall strategy, *Seventy Six* recently spoke with two of Unocal's top refining hands: Don Hanley, vice president of refining; and Dan Waldorf, general manager of refining operations. The discussion also touched on several current issues facing the refining industry during these turbulent times.

The interview is accompanied by capsule profiles of Unocal's five refineries, a short glossary of refining terms, and a photo essay taken this fall at the Los Angeles refinery.

How has the reorganization of Unocal's Refining & Marketing Division affected the division's refining arm?

Hanley: Prior to the reorganization, we had two vice presidents of refining: one for the Eastern Region in Schaumburg, and one for Western Region in Los Angeles. They reported to a Refining & Marketing Division senior vice president based at each location.

The reorganization has consolidated that structure. We now have only one vice president of refining, and the R&M senior vice president positions have been eliminated. So structurally, we in refining are now a consolidated organization under one umbrella. Management is streamlined, and the overall system is more efficient and responsive. For example, supply of crude oils and raw materials is now handled by a single group, and that gives us broader flexibility.

Has the restructuring affected operations at the individual refineries?

Hanley: Not really. I think all our refinery staffs will have better communications under the new organization. But refineries do not lend themselves to a lot of changes so far as operations are concerned. The system still retains an east/west distinction. Our three west coast refineries have always been closely linked together, and that hasn't changed. In the west we operate almost as though we're running a 450-mile-long refinery.

Chicago and Beaumont are more autonomous, although we do move some products between them. We do not move product between our eastern and western refineries, however. The Rocky Mountains are a real barrier in terms of tying the product distribution system together. And the reorganization can't change that.

Don Hanley (top), Dan Waldorf

Is forecasting such variables as product demand and oil price swings important to the refining end of our business?

Hanley: Very much so, because these things greatly affect our planning. Forecasting is an inexact science, however. For example, late last year, crude prices were hovering around $28 a barrel, and gasoline demand was flat. No one foresaw that OPEC would abandon its production quotas and throw the world oil market into chaos. The flood of OPEC oil drove the price below $10 a barrel in some cases, and now it's hovering around $14.

Certainly we try to anticipate changes in the marketplace. Our marketing arm and our Corporate Economics Department are continually looking at oil prices and product demand. You can't survive in this business without planning of some sort—but you can't always see what's coming.

What happens from a refining standpoint when the realities deviate from the forecasts?

Hanley: You have to be flexible enough to respond. If gasoline is in short supply, for example, we will want to maximize gasoline production and perhaps back off on diesel or heating oil.

But there are limits to flexibility. No refinery can produce only gasoline or only diesel. And every refinery has its own unique processing capabilities. Our Beaumont refinery, for example, processes sweet, low-sulfur crude oils exclusively.

I might add that over the years, Unocal's marketing and corporate economics people have done a fantastic job of forecasting product demand. And that's one of the keys to the success of our refining operation, because the refineries exist to meet a marketing demand.

As far as planning goes, are the refineries basically independent?

Hanley: Yes and no. Each refinery has its own operations planning group, but they relate very closely with an overall refining planning organization. This group, in turn, links up with our marketing planning group, so that you get supply and demand together.

One thing we're never short of in this business are plans. We have monthly plans, three-month plans, a six-month forecast, and an annual operating plan. We also have three-year and five-year strategic plans. The rule of thumb is: if you want to be right, forecast often.

Waldorf: Our short-term operating plans are very important, because they're updated each month to reflect current conditions. The short-term plans also coordinate the input of refining, marketing, crude oil supply, and transportation. So it's not a stand-alone system for refining.

How do swings in product demand affect refining operations?

Waldorf: Swings in demand are basically seasonal. They impact all our refineries, but they affect the east and west differently. In the west there is a seasonal surge in gasoline demand—more is consumed in the summer. Back east there is a seasonal heating oil demand, which goes up in winter. So we adjust our refinery runs accordingly.

The seasonal swings are within the capacities of our refineries so product demands are met. System-wide, we're running at around 85 percent of rated capacity. We like to keep the level up as high as possible, because the closer to capacity you can run, the better the economics are for a refinery.

How has the crude oil price drop of recent months impacted Unocal's refining operations?

Hanley: The oil price collapse is having an enormous impact on all of Unocal, including the company's refining operations.

As I said earlier, crude oil prices plunged from about $28 to $10 per barrel from last December to April. That's a 60-percent drop in just four months. Prices have now recovered to about the $14-per-barrel level, but company revenues are still significantly below those of last year.

Because the company's cash flow has been sharply reduced, there's more pressure than ever on the refining side to increase efficiency and profitability, and we've made a lot of progress in recent months. Moreover, the steep decline in crude prices has temporarily improved our profit margins—the difference between the price we pay for crude and the price we receive for products—because product prices have not fallen as steeply as crude prices. However, this is not the boon it may seem.

Unocal's refining arm does not stand alone; we are part of an integrated earth-resources company. Improved performance on the refining side cannot make up for the lost revenues incurred by our exploration and production operations—the "upstream" segment of the company charged with finding, developing and producing oil and gas.

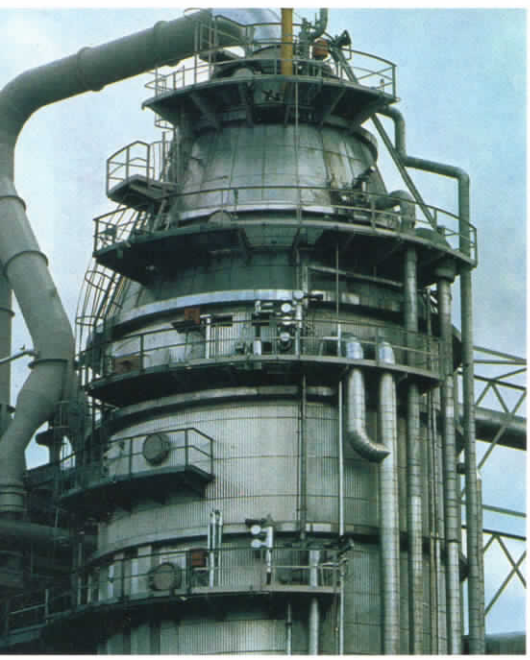
Furthermore, with today's low prices, many new exploration and development projects cannot be economically justified. As a result, the company's capital and exploration budget has been cut, new drilling and development projects have been put on the shelf, and some producing wells have been shut in.

What's happening to Unocal isn't unique. Virtually every other oil company in America has taken the same steps. Without new discoveries, America is rapidly depleting its available petroleum reserves. The longer this situation continues, the more dependent we'll become on imported oil. And that could spell serious trouble for this country in the years ahead.

Clockwise from left: Alkylation unit at the Beaumont refinery; the Chicago refinery's Unisar, which removes aromatics from jet fuels and solvents; Beaumont's lube oil extraction unit.

What other factors affect refining margins besides crude oil prices?

Waldorf: Efficiency of operations is certainly a factor. And crude oil selection is also a big part of the equation. We run a variety of crudes in our refining system—everything from very heavy oils to extremely light ones. Each type has varying qualities and characteristics, and each is priced differently. So we have to continually reevaluate the best mix of crudes to buy for each refinery in order to optimize margins.



FCC unit, Chicago refinery.

In the mid to late '70s, a lot of small refineries were built in this country. Then the '80s ushered in a period of shutdowns. Why did this up-and-down situation come about?

Hanley: The expansion came about largely because of the government's so-called "Entitlements Program," begun in 1975. The idea was to "equalize" crude oil prices to all refiners, large and small alike, and by so doing, encourage uniform petroleum product prices. At that time, prior to decontrol in 1981, domestic oil was under federal price controls, so it cost less than market-priced imported oil.

But the program ended up creating a very complex web of payments transferred among refiners in the attempt to give everyone the same so-called "average national crude oil price." Oil companies with large domestic supplies, like Unocal, paid entitlements to others. Small refiners, on the other hand, were subsidized. They received entitlements because they were small, so a lot of "entrepreneurs" built small refineries strictly to capitalize on this incentive.

When the Entitlements Program along with its subsidies was terminated in the early 1980s, market forces took over. The result was that these smaller, less efficient "teakettle" operations were no longer economically viable, so many of them shut down.

Today's domestic refining capacity—roughly 16 million barrels per day—is down more than two million barrels from its peak level back in 1980. But most of the facilities closed have been the very small "entitlements bias baby" refineries that lived and died with a regulatory quirk, not with the market. The survivors have been the more sophisticated, integrated refiners such as Unocal, that can take a barrel of crude oil and make a full range of products from it.

Is there still some over-capacity in the domestic refining industry, or have conditions stabilized?

Hanley: I think today we're in pretty good balance between the number of refineries operating and what the market will bear. In 1980, U.S. refineries were running at only 72 percent of capacity. Today the utilization rate is 85 percent, a much more efficient level. And the refiners who have survived are designed to satisfy the true market.

Distillation tower, Santa Maria refinery.

An important issue affecting refiners is the EPA-mandated lead phase-down for gasoline. How has this impacted our operations?

Hanley: It has varied in the east and west due to marketing differences. But overall, the lead phase-down has been a very smooth transition for us. In fact, Unocal has long been at the forefront of the effort to get the lead out of gasoline. In the early '70s, the company made a marketing decision to go exclusively with unleaded regular on the west coast. An additional reforming unit was built at our Los Angeles refinery at that time to accommodate unleaded gasoline production.

We recently made another major marketing decision in the west: to replace our leaded premium with an unleaded product. The Chicago and Beaumont refineries continue to produce leaded as well as unleaded grades of gasoline for eastern markets. The lead content of these gasolines is greatly reduced from times past to comply with EPA regulations.

To improve our ability to manufacture unleaded product, we are building a new isomerization unit at San Francisco. Another of these is planned for the Chicago refinery. These new units, which increase the octane of gasoline blend stocks, are state-of-the-art pieces of equipment. There's considerable technological challenge involved in producing quality unleaded gasolines.

How important is the area of quality control to our refining business?

Waldorf: Extremely important. We have a set of specifications on products produced at each refinery that must be met. These specs have been derived by a technical committee made up of representatives from Refining, Marketing, and Science & Technology. The specs, which are under continuous review, set high-quality targets—and any product that doesn't meet spec isn't shipped. We're also continually striving to improve and enhance product quality.

Above, Beaumont's catalytic reformer unit. At left, a view of the Chicago refinery. "Each of our refineries has its own unique processing capabilities."

Do we have a central laboratory for testing crudes and products, or does each refinery maintain its own lab?

Hanley: Our Science & Technology people conduct crude oil assays for us, which evaluate the characteristics of the different crudes we run. S&T also monitors the overall quality of our products in the market.

The individual refineries, however, are directly responsible for their own quality control. Each facility has a lab on site where products are tested and analyzed at varying stages of manufacture.

Above, a maze of pipes cuts through the sky at the Los Angeles refinery. Below right, the San Francisco plant's coker. "We're continually striving to improve and enhance product quality."

A lot of motorists have the idea that all gasolines and automobile products are more or less the same. In fact, there are major differences in terms of additives and octane ratings. How do we arrive at what's right for us?

Waldorf: Marketing factors play a big role. For example: our unleaded regular in the west is formulated at 89 octane, which is two points higher than most unleaded regulars. That enables Unocal to offer a unique, high-quality product which gives us a marketing advantage over competing gasolines. Our recently introduced Super 76 Unleaded also has a higher octane in keeping with this strategy.

The Science & Technology Division is also highly involved in formulating our products. They have a very talented group of people who research better ways to make gasoline and other petroleum products, and look for ways to improve on the products themselves.

Over the years S&T researchers have developed dozens of product innovations. One of these is a patented detergent additive for gasoline that keeps automobile carburetors, intake systems, and port fuel injectors clean. This results in gasolines that promote better engine operation, improved fuel economy and reduced auto emissions. Another S&T-developed product is an anti-wear additive now used in 85 percent of the world's automotive engine oils.

S&T also runs periodic tests of customer satisfaction with our products. Refining then takes their recommendations and incorporates them into the products.

Environmental protection has been a key issue for refiners for many years. Is this a major area of focus for us?

Hanley: Very much so. All of us in refining are committed to safeguarding the environment in our operations. We've also been responding to environmental concerns on the product side for many years now.

Each refinery is responsible for meeting all the environmental standards—for emissions, water quality, and other areas—under which it must operate. There is also an environmental support group within our division that Mike Dougherty heads up. He in turn works closely with the company's Environmental Sciences Department.

We have studies going on all the time to find ways of improving the environmental control systems at our facilities. Unocal researchers have pioneered many advances in this field. For example, S&T has developed or shared in the development of several processes—such as Unisulf and Selectox—for removing sulfur compounds from a variety of refinery gases, natural gas and geothermal steam.

Unocal-developed refining processes such as Unicracking and Unionfining have also helped reduce auto emissions by removing sulfur and other contaminants from our products and feedstocks. Another process called Unicracking/HDS removes sulfur and metallic contaminants from heavy residual oils.

Safety is another important concern for the refining industry. Does Unocal emphasize "safety first?"

Waldorf: Absolutely. Safety is the single most important concern in all of our operations. At least 25 percent of a refinery manager's job is strictly involved with safety: making sure that employees have good work habits, that they're aware of unusual situations, and that they're trained to spot anything that is not operating properly.

Our maintenance people and other workers also have very strict procedures to follow in their work and in the event of any emergency. Safety is really the key concern of everyone's job at a refinery. It is stressed all the time.

Hanley: I might add that our focus on safety creates a synergism with good operations. If you run a safe operation, it has a positive impact in many other ways. You're also more efficient, and people take more care and pride in what they're doing.

Are any major breakthroughs on the horizon in refining technology?

Waldorf: I don't think we'll ever run out of new ways to do things. Unocal, for example, has been extremely successful in its research efforts on the use of catalysts and hydrogen for materials processing. That work continues to advance steadily.

There are even loftier things to reach for. Traditionally, refineries are in the business of boiling hydrocarbons to separate them into various components. Maybe there's some technology out there that could eliminate this phase of it. Then you'd have a brand new refining industry that could develop. If we spend enough time and thought on how to take a major step like that, I think it can be achieved. And our researchers at S&T have the mandate to pursue that sort of thing.

How do things look for the future of the U.S. refining industry—and for Unocal's in particular?

Hanley: I think the industry is very healthy overall, and Unocal is one of its strongest competitors. We have excellent refineries. We have top-notch people. And we have one of the world's finest research efforts in product development and refining technology. We'll be a good, strong participant in the downstream segment of this business for years to come. ⑯

"All of us in refining are committed to safeguarding the environment. We have studies going on all the time to find ways of improving our environmental control systems."

Unocal Materials Processing Technology

Listed below are several leading Unocal-developed technologies in the field of materials processing. Developed by researchers at Unocal's Science & Technology Division, each of these pioneering processes is employed throughout the company's refining system. They are also widely licensed for use in refineries and other facilities the world over.

Unionfining uses hydrogen and catalysts to remove sulfur, nitrogen and other contaminants from a variety of petroleum products.

Unicracking uses hydrogen and catalysts to convert heavy crude oil components into clean, high-grade fuels and petrochemical feedstocks.

Unicracking/HDS removes sulfur and metallic contaminants from heavy residual oils.

Unisar improves the quality of jet fuels and solvents by removing aromatics.

BSRP, BSR/Selectox, Unisulf and Selectox are gas treatment processes which remove sulfur compounds from a variety of refinery gases, natural gas and geothermal steam.

Refining Glossary

alkylation conversion process which chemically combines light crude oil components to produce higher-grade feedstocks. Related processes are reforming and isomerization. These processes increase the octane of hydrocarbon molecules—a key element in the manufacture of unleaded gasolines.

blending fourth and final step in the refining process, in which various refined stocks are blended into finished products.

catalyst a substance that hastens or retards a chemical reaction without undergoing a chemical change itself. Catalysts are used in a variety of advanced refining processes.

catalytic cracking conversion process in which low-grade crude oil components (the heavy components yielded by distillation) are chemically converted into lighter components through the application of heat and catalysts. The process greatly increases gasoline yield from crude oil.

coking thermal conversion process for producing light hydrocarbons from heavy residual oils. Also produces petroleum coke as a by-product.

conversion second step of the petroleum refining process, in which crude oil components are structurally altered through applications of heat, pressure and catalysts. Conversion allows crude oil to yield a higher percentage of gasoline and other desired products than it would through distillation alone.

distillation process whereby crude oils are heated, vaporized and then condensed to separate them into various hydrocarbon components. The first step in the petroleum refining process, distillation takes place in a refinery's distillation unit, also known as the crude unit or fractionation tower.

feedstocks crude oil or semi-refined crude oil components that are processed by a refinery.

fluid catalytic cracker one type of conversion unit in which catalytic cracking takes place. Also referred to as an FCC.

fractionation see distillation

gravity short for API gravity, the relative measure of the weight or density of a gallon of oil per the American Petroleum Institute's recommended system. Low gravity means the oil is heavy (more weight per gallon); high gravity means the oil is light (less weight per gallon).

heavy crude thick, low-gravity crude oils characteristic of California oil fields.

heavy crude oil components see residual oils

hydrocracking advanced conversion process which employs hydrogen and catalysts to convert mid-barrel distillates and residual oils into high-grade fuels and petrochemical feedstocks. Unicracking is a hydrocracking process.

hydrotreating catalytic refining process for removing sulfur and other contaminants from a variety of petroleum products. Unionfining is a hydrotreating process.

isomerization see alkylation

light crude fluid, high-gravity crude oils characteristic of the East Texas and Middle East oil fields.

light crude oil components see naphthas

low-grade distillates see residual oils

lube oils petroleum products made from heavy crude oil components that are used to lubricate machinery parts.

mid-barrel distillates mid-range crude components separated during distillation that are processed into diesel and jet fuel.

napthas very light crude components which condense at the top of the distillation unit. After reforming, these become the basic gasoline blending stock.

petroleum coke solid, coal-like byproduct of the coking process, marketed for use in electrodes employed by the steel and aluminum industries.

rated capacity quantity of crude oil which can be processed by a refinery's distillation unit in a 24-hour period.

refining process by which crude oils are transformed into a variety of marketable products through a four-step process of separation, conversion, treating, and blending.

reforming see alkylation

residual oils thick, high-gravity crude oil components left as residue after the distillation process. Also called "bottoms" or "heavy ends."

separation see distillation

sour crude crude oil that has a high content of sulfur and other impurities.

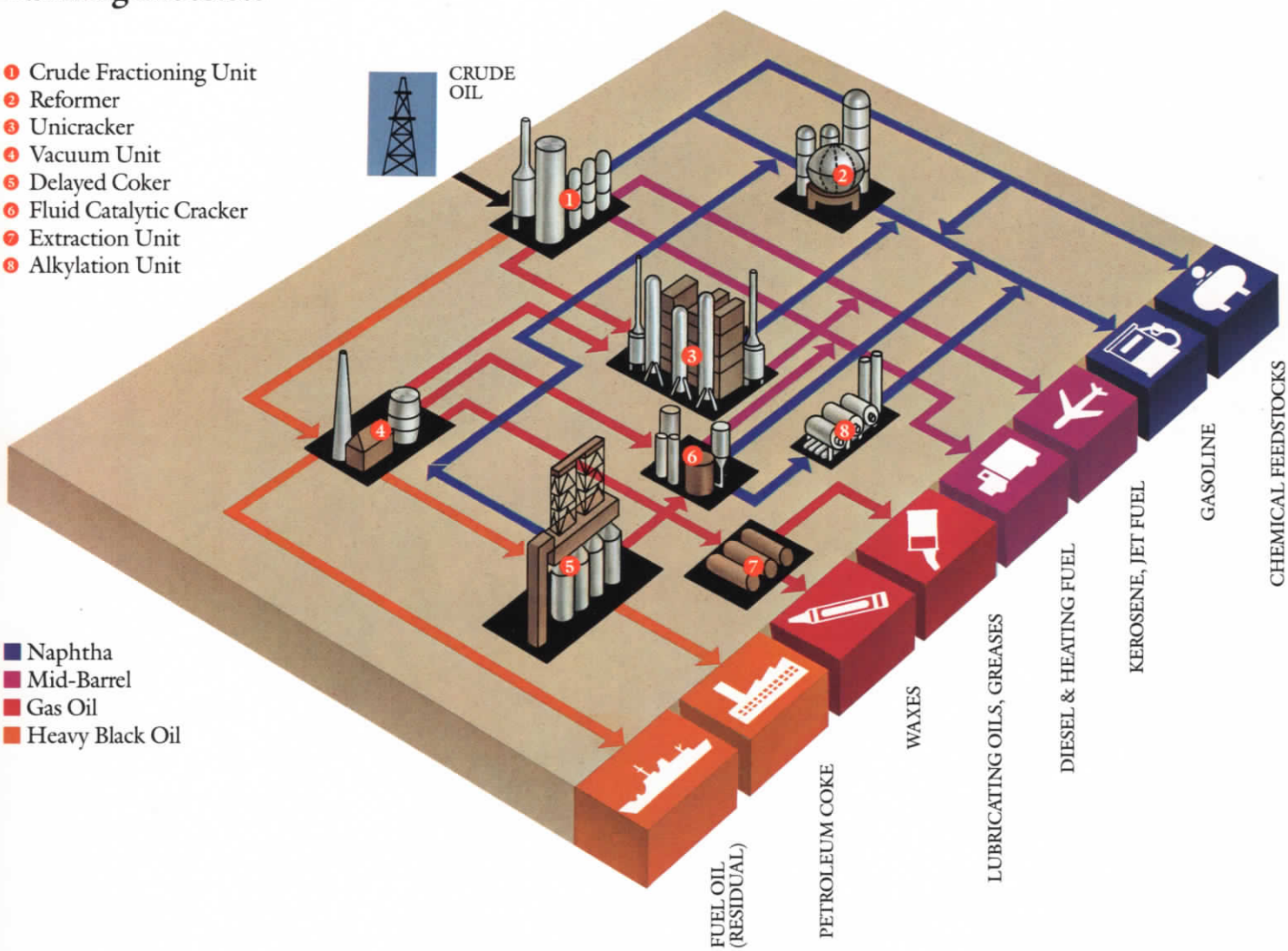
sweet crude crude oil that has a low content of sulfur and other impurities.

treating the removal of sulfur and other contaminants from crude oil components and products. Third step of the refining process.

utilization rate the amount of crude oil run through a refinery's distillation unit in a 24-hour period. Usually expressed as a percentage of rated capacity. ⑯

Refineries:	Los Angeles	Santa Maria	San Francisco	Chicago	Beaumont
Location:	Wilmington, California	Santa Maria, California	Rodeo, California	Romeoville, Illinois	Nederland, Texas
Size:	424 acres	120 acres	475 acres	500 acres	560 acres
Year opened:	1916	1955	1896	1970	1924
Rated crude oil capacity:	108,000 barrels per day	41,000 barrels per day	77,000 barrels per day	151,000 barrels per day	120,000 barrels per day
Crude types processed:	all types	heavy sour	all types	heavy sour	light sweet
Crude sources:	California, Alaska (North Slope), Indonesia, Australia, Thailand, India	California	California, Alaska (Cook Inlet)	Alaska (North Slope), Texas, Oklahoma, Gulf of Mexico, United Kingdom, Canada, Mexico	Texas, Gulf of Mexico, Algeria, Nigeria, Norway, United Kingdom, India
Products:	transportation fuels, heating and fuel oils	semi-refined products (feedstocks for San Francisco refinery), petroleum coke	transportation fuels, lube oils, waxes, greases, heating and fuel oils, petroleum coke	transportation fuels, heating and fuel oils, petroleum coke, asphalt feedstock, petrochemical feedstocks	transportation fuels, heating and fuel oils, lube oils, waxes, petrochemical feedstocks, asphalts
Market area:	west	—	west	midwest	southeast, east coast
Number of employees:	580	100	500	700	670
Manager:	Dick Miller	Art Felderman	John Dietzman	Al Eliskalns	Bob Campbell

Refining Processes



A day in the life of LAR.

On the surface, a working refinery may appear silent and strangely deserted—almost as if nothing at all is going on. But in fact, a normally operating refinery teems with activity around the clock. Much of it is merely out of sight.

The work of a refinery—transforming crude oil into the fuels and products we need—is a large and complex task. It's a task that is dependent on highly advanced processing equipment, sophisticated control technology, and precisely detailed logistics. Even more important to a successful refining operation is a staff of highly skilled workers to keep things running smoothly, efficiently and safely.

Unocal's Los Angeles refinery (LAR), a mammoth operation which sprawls over 424 acres, is one such facility. A total of 108,000 barrels of crude oil per day move through LAR, which has 580 employees and an additional 120 maintenance contractor workers. Split into three shifts, they work around the clock, 365 days a year.

To capture the essence of a working refinery, *Seventy Six* enlisted the aid of photographer Bob Witkowski. His assignment was to record in pictures a typical "day in the life" of LAR. The resulting photo essay is culled from more than 600 photographs submitted by Witkowski—all taken between 6 a.m. and 6 p.m on Thursday, September 25.

1

2

A 6 a.m. sunrise ignites the sky behind LAR's alkylation unit (1). Minutes later, the dawn rays bathe a nearby storage tank (2) in soft light. It's Thursday morning, September 25, and all is well at LAR.

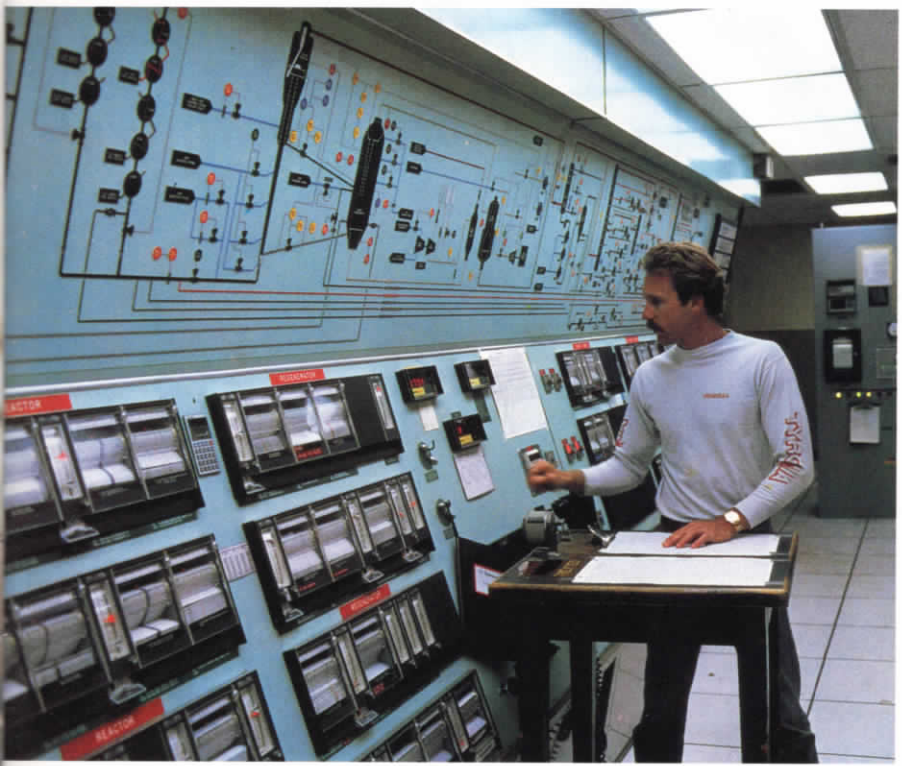
4

It's still early in the day, but maintenance tasks—which are not performed at night unless immediately necessary—are already underway at LAR. In the machine shop, foreman Gary Mignacca (4) consults with his crew, while a welder is busy fabricating a replacement pipeline (5) in the heavy metal shop.

3

5

At the fluid catalytic cracker (FCC), one of the main components of the refinery, operations are flowing smoothly at 9 o'clock. Boardman Curtis Austin (6) enters data from the unit's control board into a logbook. Readings of operating conditions at the FCC (and all other units) are taken at regular intervals during each shift.



6

7

Outside, Rhonda Parkins and Dan Prieto (7) check the operation of one of the FCC's heater circulation pumps. Another pump functions quietly on its own (3).

At 11 a.m., a group of operators extinguish a fire in a simulated emergency (8). Fire drills and other safety exercises are conducted regularly at all of Unocal's refineries. The object is to learn and practice the appropriate response to any emergency situation.

8

10

In the refinery's quality control laboratory, chemist Nina Whiddon prepares a solution for effluent testing (9). All of the refinery's combustion products are periodically checked to assure that emissions comply with air quality regulations.

9

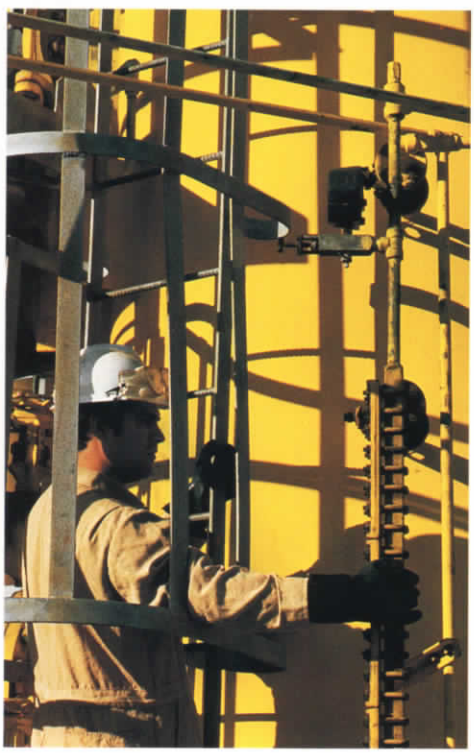
Outside, bright mid-day sunshine lights up LAR's fuel gas scrubber (10). The scrubber removes hydrogen sulfide from fuel gas before it is burned in the heaters of various refining units. Workers periodically check the liquid level in the tower (13).

The blending of gasoline stocks is a continuous operation at LAR, requiring careful monitoring. Just after 1 p.m. at the blending facility, operator John Kennard checks an additive addition pump (11).

11

In the FCC control room, head operator Joseph Sequeira consults a computer graphic display which reads out the unit's operating conditions (12). About 47,000 barrels of crude components pass through the FCC each day, yielding a variety of intermediate feedstocks.

12



13

Fuel oils are blended at the fuel oil and raw material unit, where operator Carlos Arvizu works with a maintenance man to repair a valve before product is transferred to a storage tank (14).

14

15

Mid-afternoon finds operator Tom Ragsdale busy on the "dance floor"—a steel grating sitting above a vast network of pipes and valves through which various product streams are directed (15). Products are transferred among tanks, to Unocal's terminal dock in the harbor for loading on seagoing tankers, or to other areas of the refinery.

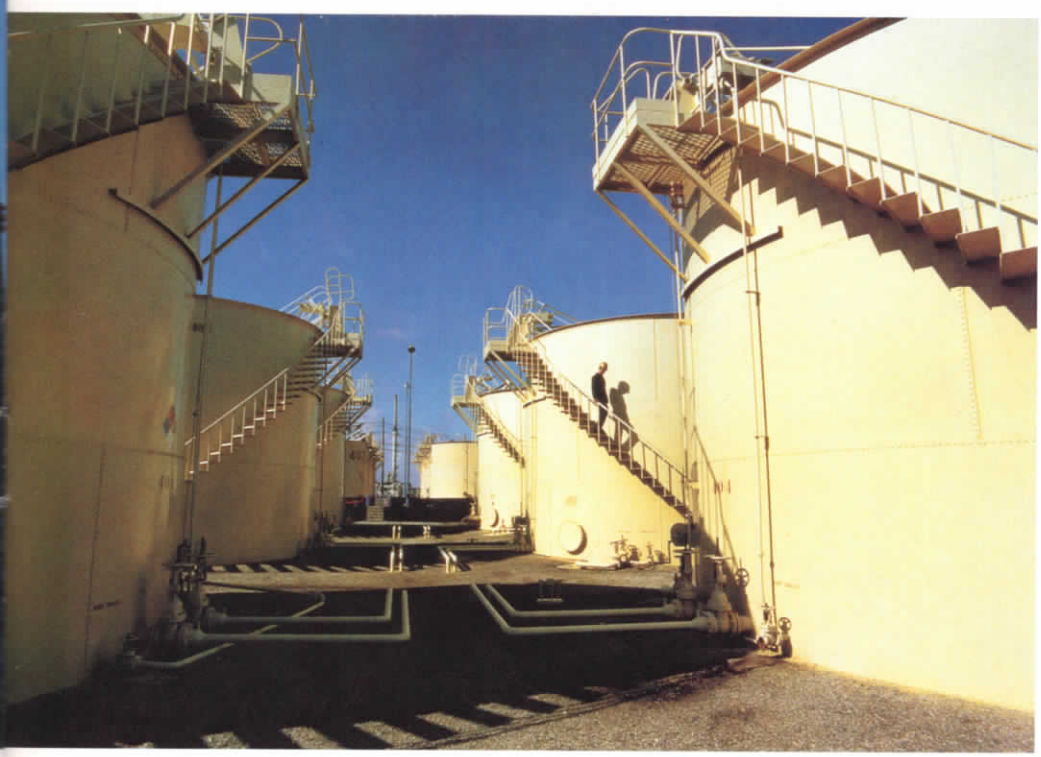
16

At 3:30 p.m., operator Charles Frazier is perched on a landing on one of the Unicracker towers, where he takes a temperature reading (16). Although all operations data—such as temperature, flow rates and pressures—are automatically and continuously transmitted to each unit's control room, readings are verified manually by refinery workers at least once during each eight-hour shift.

17

By 4 p.m., the low sun is casting long, slanting shadows through a maze of pipes at the alkylation unit, where operator John Moreno checks a valve (17). Nearby, an intermediate product "pipeway" stretches off into the distance (18).

18



As the hour nears 6 p.m. and evening approaches, a worker descends a staircase in the midst of a row of additive storage tanks (19). Another day is nearly done at LAR. But the work, as ever, goes on.

19

IT'S HERE!

Fewer and fewer cars these days require leaded fuel. In response to the changing marketplace, Unocal has introduced two new products. Super 76 Unleaded premium gasoline has replaced leaded premium at 76 stations in the west. Valve Saver,™* an additive, will serve as a lead substitute for older engines—and provide the same valve protection as the lead in gasoline. (Domestic cars and trucks manufactured before 1975 used leaded fuels.)

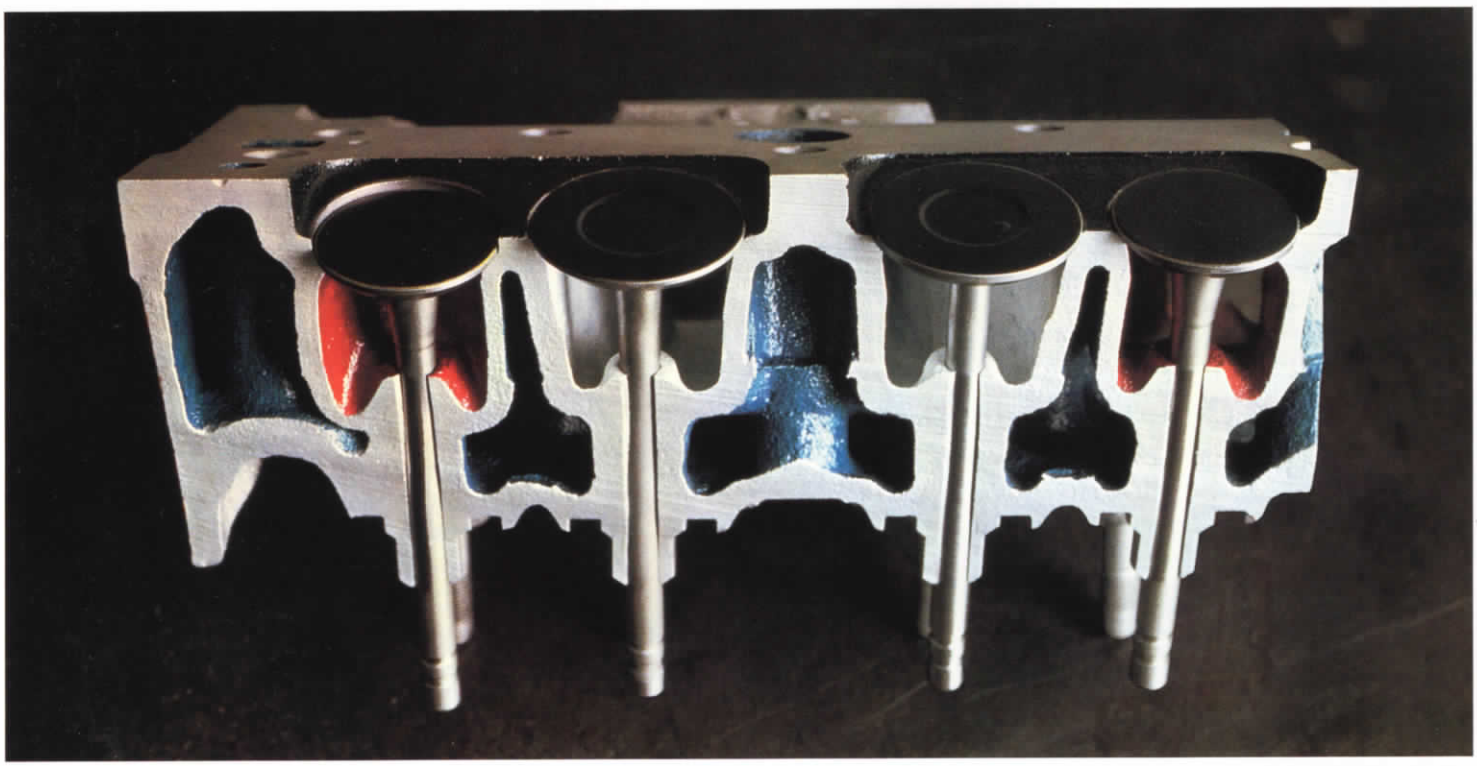
"We are the first oil company to sell unleaded gasoline exclusively in the west," says Roger Werner, manager of products and technical services for western marketing, Refining & Marketing Division.

In California, Hawaii and southern Nevada, Super 76 Unleaded has a 92-octane rating—the highest octane level available in the west. In Arizona, Washington and Oregon, 76 stations offer a 91-octane Super 76 Unleaded. The premium gasoline helps prevent engine knock (see sidebar) in vehicles with high octane requirements, especially those with high-performance or turbocharged engines. And the special detergents in Super 76 Unleaded help keep engines clean.

"We switched to an unleaded premium gasoline because of the rapidly declining market for leaded premium fuel," explains Clay Warnock, western marketing vice president, Refining & Marketing Division.

Statistics indicate that U.S. demand for leaded gasoline has plunged some 80 percent since the early 1970s. Of the 155 million cars and light trucks on U.S. roads today, about 119 million—or three-fourths—are designed to run on unleaded fuel.

Unocal, however, was concerned about motorists who owned vehicles requiring leaded fuel. Many customers had relied on 76 leaded premium for



Cutaway of a leaded-fuel engine shows how exhaust valve seats can recede (far left) if a vehicle is driven on unleaded gasoline under severe conditions. When added to gasoline, 76 Valve Saver prevents this damage, keeping the valve seat intact (far right).

years, especially since it was the only leaded premium still offered by a major oil company in the west.

"That is the very reason we really developed Valve Saver," says Warnock. "We wanted to accommodate all of our longstanding leaded-premium gasoline customers."

Valve Saver protects the valve seats of engines designed for leaded fuel when the vehicle operates under severe driving conditions. (Towing heavy loads like boats and trailers while traveling long distances at high speeds is an example.)

An engine's valves open and close thousands of times per minute to allow fuel and air into the cylinder and exhaust gases to channel out. As the valves move up and down, they come into continuous contact with the valve seats.

In engines designed for leaded fuel, these seats are not as durable as those in unleaded-fuel engines. A different, softer metal for the seat was used because the gasoline's lead supplied the necessary protection. Without lead, however, the seats are more likely to erode and recess into the valve opening.

When Valve Saver is added to gasoline and burned in the engine's combustion chamber, it produces a semi-metallic ash that coats valve seats. "The additive gives valve seats in older engines the special lubrication protection they need," says Werner.

Valve Saver's introduction last August was planned to coincide with the arrival of Super 76 Unleaded at Unocal stations. "We wanted to make the additive available when we eliminated leaded fuel, so we could still meet the needs of former leaded premium users," Werner explains.

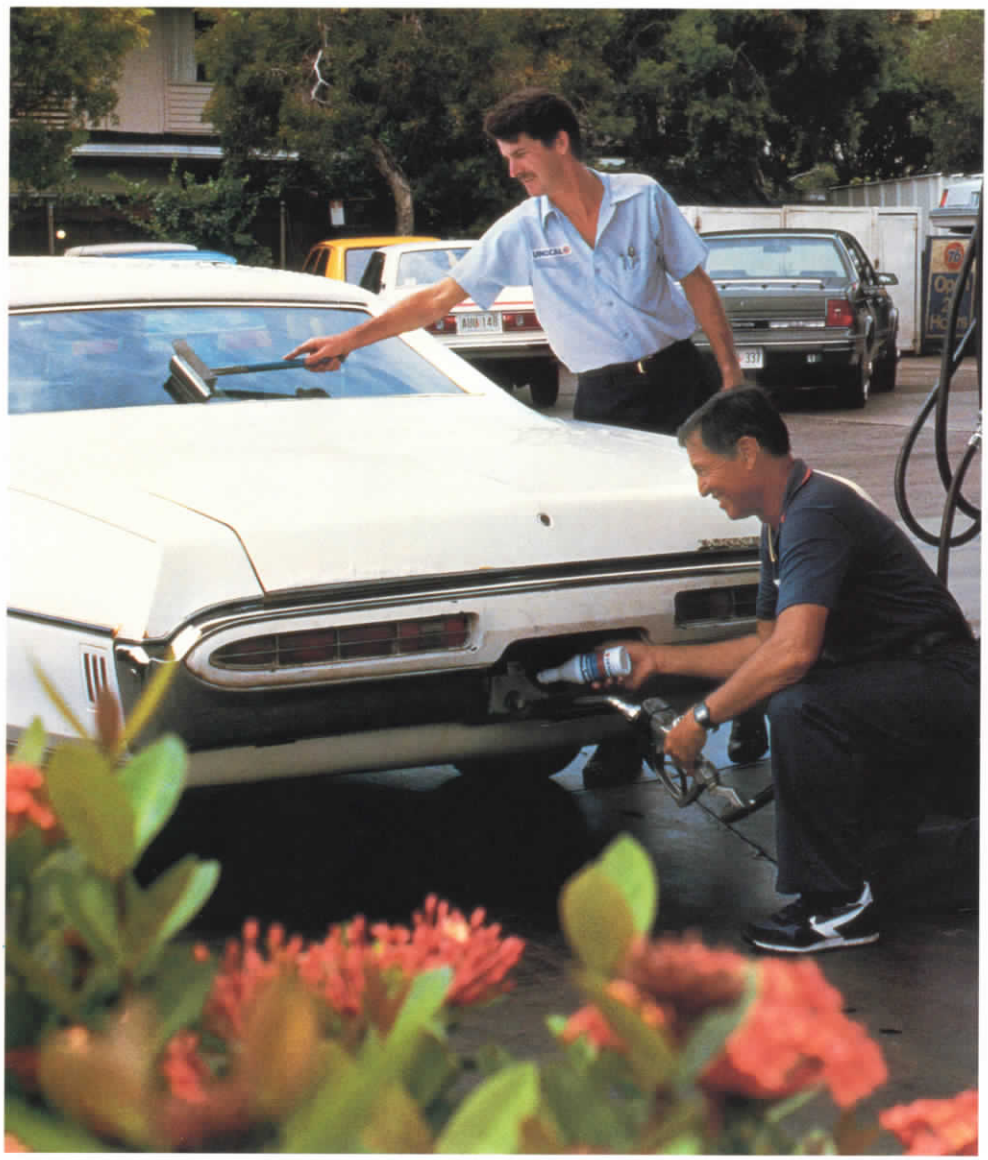
Researchers had to develop Valve Saver within certain time constraints, according to Dr. Michael Croudace of Unocal's Science & Technology Division in Brea, California. But timeliness was not the only concern.

"We wanted to come out with a quality lead substitute. So we had to make sure the product was reliable, relatively safe to handle, and worked well with unleaded gasolines," he explains.

S&T's Tim Wusz, an engineering associate for products evaluation, developed a rigorous engine test for potential lead substitutes. Wusz tested each product in a conventional automobile engine that was set up to simulate driving with heavy loads at high speeds.

"We tested many compounds," says Croudace, "but found problems because most of them seemed to adversely affect the car's engine and fuel. The only additive we found that

**Valve Saver is prohibited for use in vehicles designed to run only on unleaded fuel.*



Super 76 Unleaded premium gasoline was recently introduced in the west to replace 76 leaded premium fuel. Barry Hudson, owner and manager of a Unocal station in Honolulu, Hawaii, fills a car designed for leaded gasoline with Super 76 Unleaded and Valve Saver, a lead-substitute additive.

prevented valve seat wear without side effects was Valve Saver.

"Our product is simply more effective than other lead substitutes on the market," he continues. "Not only does Valve Saver protect valve seats, it also cleans the carburetor. That allows the engine to perform better."

Roger Werner expects Super 76 Unleaded and Valve Saver to meet the high standards of western motorists. So far, that prediction has proven true: sales of Valve Saver have already well exceeded original projections.

"By going to a totally unleaded product, we can meet the demands of a larger portion of the public," Werner says. "We now offer motorists one of the highest octane unleaded gasolines available with Super 76. And with Valve Saver, we still serve customers who drive vehicles made for leaded fuel. The combination enables us to satisfy all of our customers." ⑦⑥

UNLEADING AMERICA.

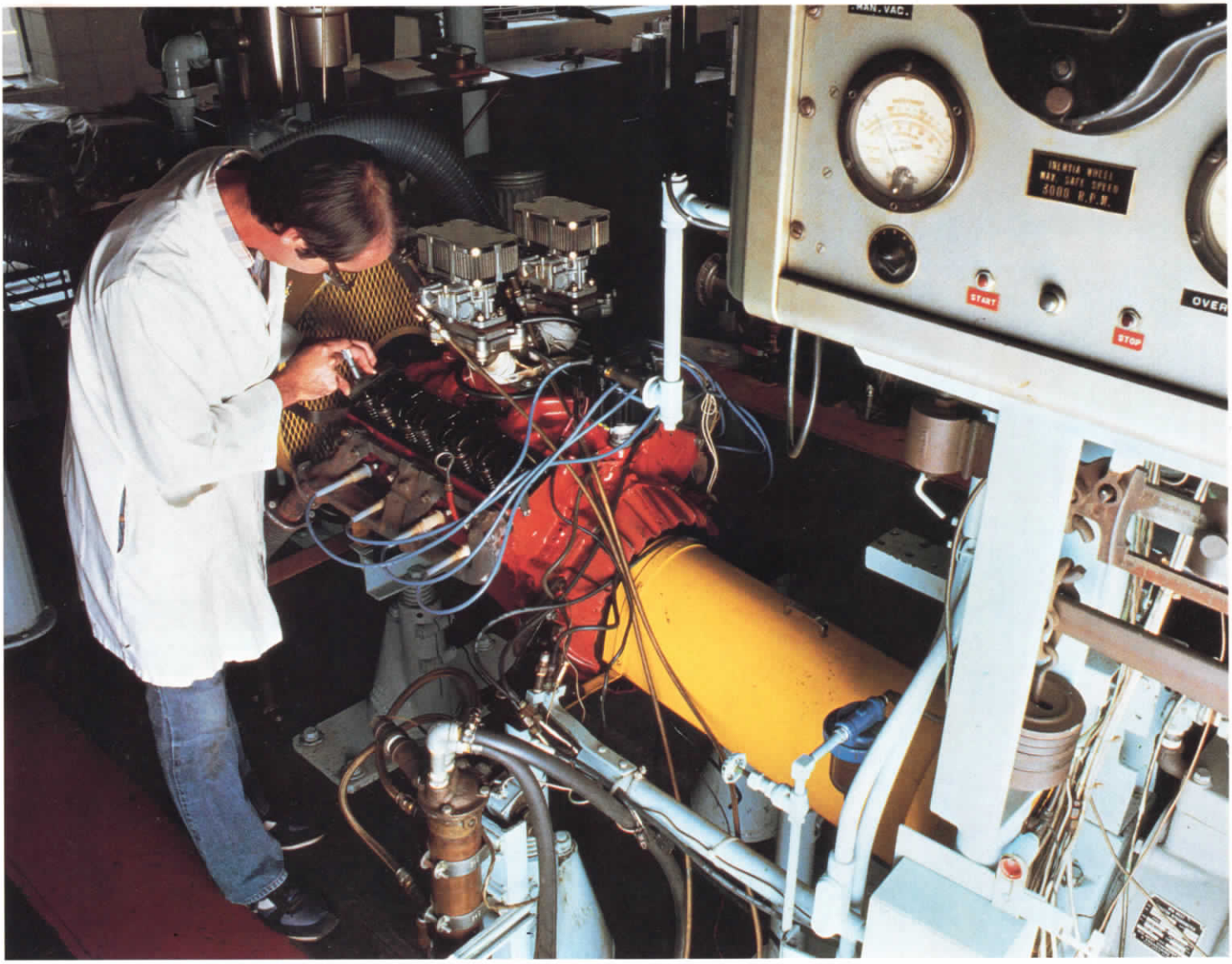
The ancient Egyptians used lead in coins, jewelry, pottery glaze, and even cosmetics. During the Middle Ages, builders made lead gutters and pipes for churches and castles. Today we use the heavy, durable metal for everything from batteries to ammunition.

But one important use for lead is disappearing. Since 1926, lead has been used as an additive in gasoline to boost the octane of fuels for internal combustion engines. Lead helps eliminate what is known as engine "knock"—the sharp, pinging noise caused when gasoline burns unevenly in engine cylinders. If prolonged, this knocking can lead to severe engine damage.

Researchers discovered in the early '20s that some chemical additives improved gasoline performance by suppressing engine knock. Dr. Thomas Midgley, Jr. found that tetraethyl lead, a lead compound, worked especially well. In 1923, Midgley received a scientific award for his discovery. Another important advancement came in 1926, when Graham Edgar of the Ethyl Corporation developed the octane scale—recognized now as the world standard for measuring the antiknock quality of gasoline.

Over the years, researchers tested many antiknock formulas but found lead the most cost-effective. Use of lead in gasoline eventually became the industry standard. For more than four decades, most cars and trucks operated on either diesel or leaded regular fuel.

During the 1960s, however, public concern focused sharply on environmental pollution. Many people felt particularly troubled by studies that



revealed potential harm from high levels of lead in the human body. The Environmental Protection Agency (EPA) began to look closely at several sources of atmospheric lead, including truck and auto exhausts.

In heeding the public's call to end pollution, Unocal Chairman Fred L. Hartley submitted a proposal in 1970 to the Secretary of Health, Education and Welfare on the use of a low-lead, high-octane fuel. Shortly thereafter, Unocal introduced its low-lead regular 76 gasoline in the west.

In 1972, the EPA proposed making unleaded gasoline available for 1974 model cars. (Auto manufacturers, however, would not be able to produce cars that could operate solely on unleaded fuel until 1975.)

The EPA took more forceful action in 1973, setting forth a specific plan to reduce the amount of lead in the air. Effective the following year, new rules required gasoline marketers to make unleaded gasoline available at 60 percent of their service stations. The EPA plan further proposed regulations to gradually decrease the amount of lead allowed in leaded fuel.

In response to these directives, Unocal introduced unleaded regular gasoline in July 1974, just before the 1975-model cars and trucks arrived. The vehicles were manufactured with catalytic converters, which convert engine-exhaust pollutants into chemical compounds acceptable under EPA standards. But the cars and trucks could use only unleaded gasoline, since lead destroys the catalytic operation.

Despite the introduction of unleaded gasoline, a substantial number of motorists continued to fill up with leaded fuel. They owned pre-1975 vehicles, motor homes, trailers and motorcycles—all of which had been designed to operate on leaded gasoline.

In 1985, the EPA issued a definitive mandate that refiners reduce the amount of lead in leaded fuel. The program required refiners to lower lead content by 91 percent, from 1.1 grams per gallon to 0.1 by January 1, 1986. (The EPA is considering a ban on all lead usage in gasoline in the future.)

Governmental actions such as these, in addition to broader environmental concerns, have substantially reduced the market for leaded fuel. The vast majority of cars and trucks are now manufactured with catalytic converters and use only unleaded gasoline. But premium unleaded fuels like Unocal's high-octane Super 76 Unleaded provide the same quality antiknock protection as leaded gasolines. And the owner of a '69 Mustang, for example, can protect his leaded-fuel engine from valve damage when he drives under severe conditions by using Unocal's 76 Valve Saver, a lead-substitute additive. *A.B.*

Technician Don Stafford of Unocal's Science & Technology Division (opposite) measures the effectiveness of potential lead substitutes under a variety of engine conditions. Dr. Michael Croudace (left) and Tim Wusz analyze results from the extensive testing of lead-substitute products.

AUTOS AND OIL PARTNERS FOR 100 YEARS

The first gasoline-powered automobile was fired up in Germany 100 years ago. What started as a novelty soon became a major industry. As parts were standardized and production methods improved, the price of owning and operating an automobile dropped to within the common man's range. The world would never be the same.

People have yearned for easy mobility for centuries. What was probably the first self-propelled car, a wind-up version run on a giant clock-spring, was built in 1649 by German clockmaker John Hautzsch. In 1655, a French Jesuit priest in China, Father Ferdinand Verbiest, built a small steam-powered vehicle for indoor use.

In 1769, French Captain Nicholas Cugnot constructed the first road vehicle, a three-wheeled, steam-powered tractor designed to haul a cannon. It was too slow and cumbersome to ever be used in battle, but it started something. By 1838, steam carriages were carrying passengers over English roads at speeds up to 25 miles per hour. Progress slowed when heavy tolls were imposed on these loud and frightening vehicles, with the support of the competing railroad and stage companies.

But inventors continued to tinker—and the future would soon belong to a spryer sort of vehicle. In 1859, the age of the gasoline auto became a possibility when Edwin Drake presided over the drilling of the first oil well. The well was located in Pennsylvania's Venango Valley, where petroleum oozed into pits and was used as a medicinal cure-all. A Pittsburgh druggist bottled and sold it, and learned to refine it for lamp fuel on a small scale.

Connecticut businessman George Bissell grasped the broad potential of oil. Along with partner J.G. Eveluth, he organized the country's first petroleum company. Professor Benjamin Silliman of Yale analyzed Bissell's oil and concluded that it would yield kerosene—an illuminating oil that could compete with coal and whale oils—as well as several other useful products. So, in 1859, Bissell and Eveluth dispatched Edwin Drake to the Venango Valley to drill for more oil. After all, the local salt manufacturers were highly successful in drilling for brine.

One year after Drake's success, a Frenchman, Etienne Lenoir, built the first internal combustion engine. It was powered by illuminating gas. Other inventors improved on the design and began to use liquid fuels. In 1866, a German, Nikilaus August Otto, developed an internal combustion engine that ran on gasoline—considered at that time as a dangerously volatile, worthless by-product of kerosene refining.

But Otto's engine was the forerunner of a fabulous industry that changed the way people lived and changed the way oilmen thought about gasoline. By the turn of the century, oilmen would step up production of gasoline and other products made from crude oil, such as asphalt and lubricating oils—products that would literally pave the way and grease the wheels for the coming automobile age.

Within 50 years from Drake's well and Otto's engine, Henry Ford was flooding the world's growing highway system with Model T's, and gasoline surpassed kerosene as the oil refiners' principal product. By 1910, there were almost half a million cars registered in the United States. In 1985, there were more than 115 million on the nation's highways. Worldwide, there are now more than 364 million passenger cars registered, plus 108 million trucks and buses—or one vehicle for every 10 people.

What follows is a capsulized history of the auto and oil industries, with the emphasis on Unocal's participation in the growth of the automotive age.

Pennsylvania Historical and Museum Commission

Replica of Drake's well

1886 ▪ In Germany, Karl Benz's three-wheeled car attains a speed of nine miles per hour during its first public run. Gottleib Daimler unveils his first four-wheeled road vehicle, a converted carriage. The fledging Hardison & Stewart Oil Company, founded in 1883 by former Pennsylvania oil hunters Lyman Stewart and Wallace Hardison, produces 35,000 barrels of California crude oil. The company lays the first pipeline to tidewater to ship by sea, which is much less costly than rail.

The first Benz, built in 1885

National Automotive History Collection, Detroit Public Library

1887 ▪ Kerosene is the main product of the new Hardison & Stewart refinery in Santa Paula. Oil is displacing coal as boiler fuel in the oil fields (and later in other industries), thanks to Stewart's development of the oil burner.

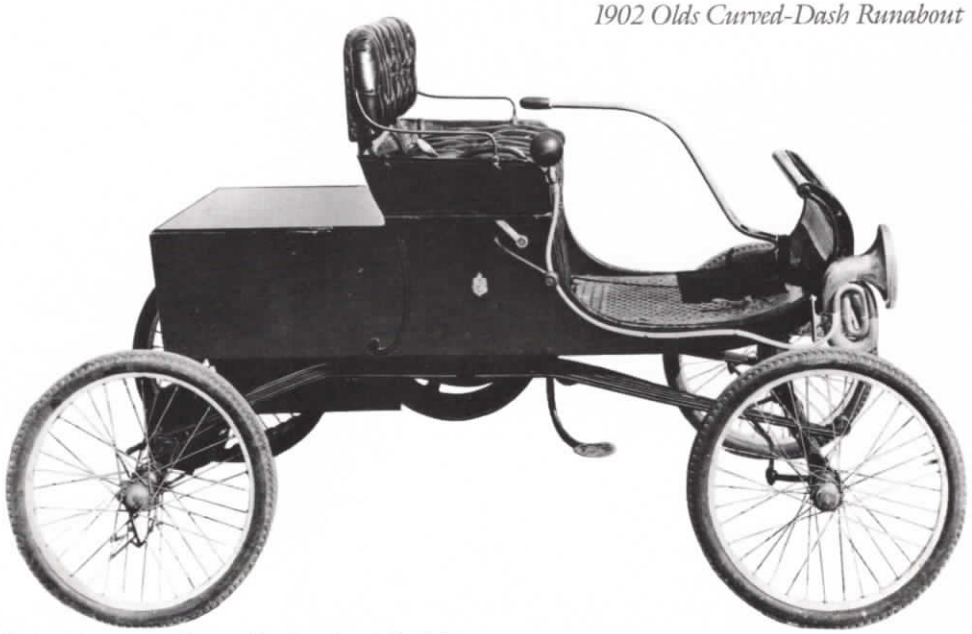
1888 ▪ Hardison & Stewart's pioneering application of structural geology principles to the oil search pays off with the state's first gusher, flowing initially at 800 to 900 barrels a day. Company production for the year is 162,000 barrels of crude oil.

1890 ▪ Stewart and Hardison merge three companies they control to form Union Oil Company of California.

1891 ▪ Union opens the west's first petroleum research laboratory in order to develop a clear, non-smoking kerosene from California's heavy crudes.
1892 ▪ German engineer Rudolf Diesel patents an internal combustion engine designed to use compression rather than a spark for ignition. Petroleum proves a more satisfactory fuel than coal dust.
1893 ▪ In Massachusetts, J. Frank Duryea builds America's first gasoline-engine motor car using the designs of his brother Charles. Two years later, the Duryeas establish the first American company to produce gasoline-engine cars. The first brick surface on a rural road in the U.S. is laid near Cleveland.
1894 ▪ Auto racing, destined to be one of the world's most popular spectator sports, gets its start with the Paris-to-Rouen reliability test of 21 motorcars.
1895 ▪ Winner of the first U.S. auto race averages 6.7 miles per hour.
1896 ▪ The first motor truck, built by Daimler, has a four-horsepower engine. Union opens the west's largest refinery at Oleum on the San Francisco Bay. It can process up to 50,000 barrels of crude oil per month.
1898 ▪ There are now more than 50 U.S. auto makers, but no agreement as to what to call their product. Names include motorcar, motorfly, autometon, motorig, autobaine—and a new French word, ***automobile***.

Mules hauled fuel oil in San Francisco in the early 1900s. They would soon step aside for "horsepower."

1902 Olds Curved-Dash Runabout



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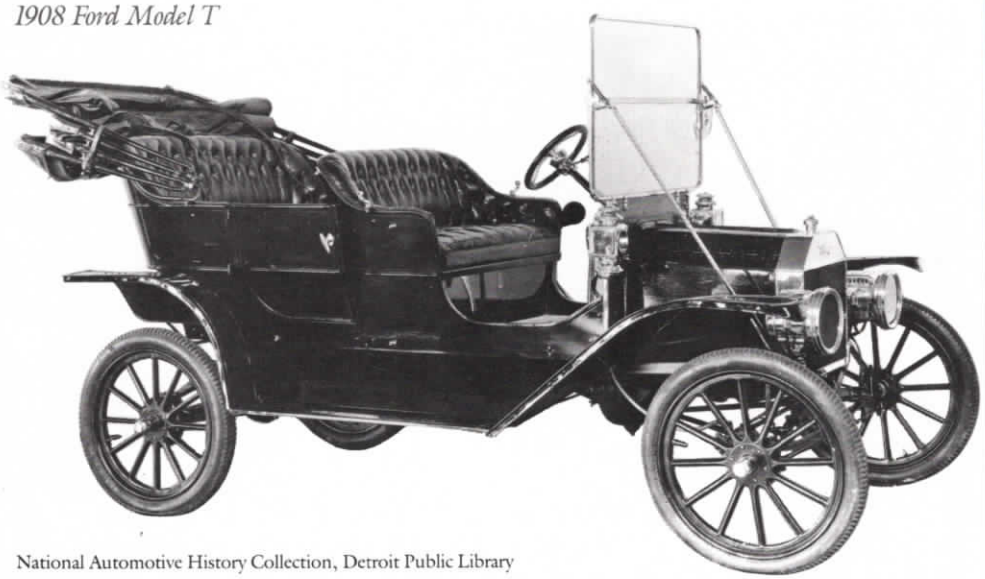
1900 ▪ Of the 8,000 autos on America's streets and roadways, most are battery-powered. For the first time, a gasoline-engine car defeats electric and steam-powered models in a Chicago race. Union creates the industry's first geology department to find more oil. Annual company production totals 240,000 barrels.
1901 ▪ The Spindletop gusher in Texas pushes crude oil prices to below 5¢ a barrel, assuring the eventual supremacy of gasoline over electricity and steam as an economical auto fuel. In Detroit, mass production gets its start with the Olds curved-dash runabout: each car is mounted on a wagon and pushed around to workers.

1903 ▪ The Ford Motor Company is formed, beginning an eight-year court battle. Ford is victorious over the holders of the "Selden patent," who were demanding royalties from all car makers and hampering the industry's growth. Despite the lack of highways, the first three U.S. transcontinental auto trips are completed. A Packard makes the best time—53 days.
1904 ▪ A shipping company's test run demonstrates that motorized trucks can make more deliveries faster and farther than horse-drawn wagons—and they are easier to park. There are 200,000 miles of surfaced roads in the U.S.
1905 ▪ Motorists ride now and pay later—cars are sold on the "installment plan."

1908 Ford Model T



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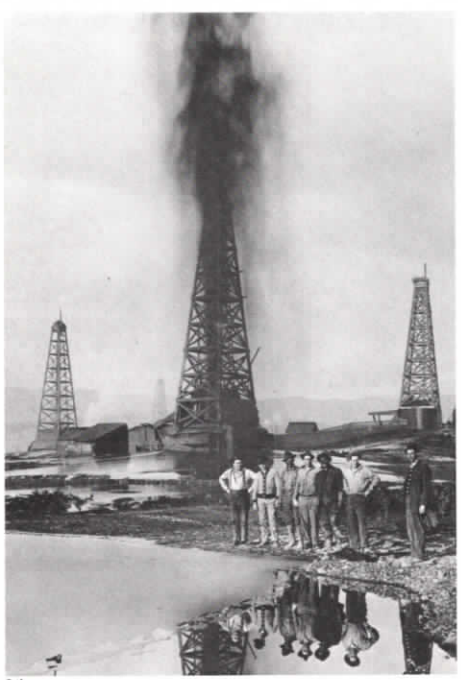
1906 ▪ Walter C. White organizes a caravan of White trucks to carry help and supplies to the victims of the great San Francisco earthquake and fire.
1907 ▪ In Glencoe, Illinois, the first "speed bumps" dampen motorists' enthusiasm. Rolls-Royce introduces the Silver Ghost, so-called for its exceptionally quiet running.
1908 ▪ Ford introduces the Model T for $850 a copy. William C. Durant forms a combine of Buick, Oldsmobile and several other auto companies—and calls it General Motors. The 60-horsepower Thomas Flyer wins the New York-to-Paris Race in 170 days, including 88 days of driving a total of 13,341 miles. Union Oil acquires its first automobile. Company production tops five million barrels for the year.

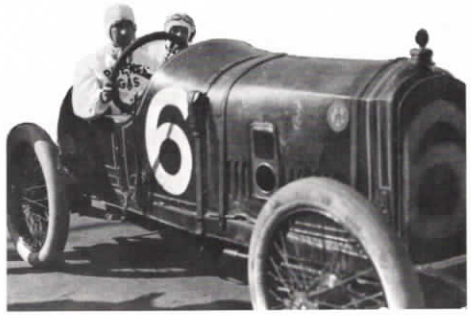


1909 ▪ Famed racer Louis Chevrolet begins work on a six-cylinder engine design in his Detroit shop. Outside of the city, the first rural mile of concrete pavement is laid.
1910 ▪ There are 290 different makes of U.S. autos produced in 145 cities, led by Detroit and Chicago. Four-wheel drive autos, developed in 1908, roll out of the new Four Wheel Drive Auto Company factory in Wisconsin. Gasoline surpasses kerosene as the primary product extracted from crude oil. Union drillers bring in the "world's greatest gusher," the Lakeview #1 well near Bakersfield, helping California become the nation's number one oil-producing state. Union puts its first motorized tank truck into service.
Left, the "world's greatest gusher"

1911 ▪ Ray Harroun wins the first Indy 500 in a Marmon Wasp, averaging 74.59 miles per hour and completing the course in under seven hours. In Michigan, Edward N. Hines has a nifty idea—painted center lines on roadways.
1912 ▪ Cadillac introduces an electrical self-starter, eliminating the necessity of hand cranking to start the engine.
1913 ▪ Ford's moving assembly line produces 1,000 Model T's a day. The price drops to $550. (It will reach a low of $290 in 1924.) Union Oil opens one of the west's first service stations on the corner of Sixth and Mateo streets in Los Angeles.
1914 ▪ Ford introduces the eight-hour day and the minimum wage of $5.

Union began selling fuel oil to customers in Hawaii in 1901, and automotive products soon followed. By 1930, the company operated eight service stations in the islands.

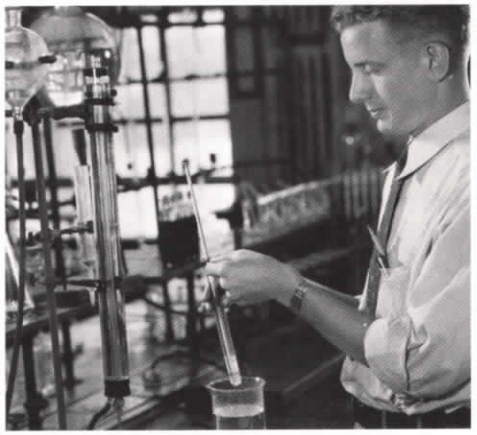
1917 ▪ Union acquires the Pinal-Dome Oil Company along with its chain of 20 service stations. The company begins a station-building boom and, in the next year, holds a contest for architects to design an attractive and functional service station suitable for any neighborhood.
Union helped fuel the 1915 San Diego Expo Race.



1918 ▪ World War I rages. In the U.S., "gasless Sundays" are instituted to restrict the use of cars in the face of fuel shortages. Auto makers mass-produce aircraft engines to support the boys "over there." Diesel engines provide reliable power for submarines.
1919 ▪ Almost half of the world's automobiles are Fords. Detroit gets the world's first three-color stoplight.
1920 ▪ California's half-million motor cars trigger a gasoline shortage, so Union ships in two million gallons from Texas. The company steps up exploration efforts to help meet the booming demand for gasoline and asphalt. By 1923, Union's annual crude oil production will double—from 8.7 million barrels to 18.7 million.
1921 ▪ Dr. Thomas Midgeley Jr. and associates prove the effectiveness of tetraethyl lead as an antiknocking agent in gasoline.
1922 ▪ Union Oil sells its last 65 horses. Its motor vehicle fleet now consists of 752 trucks and 607 automobiles. The company operates or leases 236 service stations. Auto insurers revise their policies to cover the actual value of the insured car rather than the purchase price. Houston gets the first electrically interlocked traffic signal system.
1925 ▪ The *Union Oil Bulletin* reports: "The motor car no longer is a luxury, but a necessity. The horse has practically disappeared from our streets and even from the farms. Motor-driven trucks have almost entirely superseded the railroad for short hauls....The motor car and the petroleum industry are today dependent one upon the other." The company issues its first gasoline credit cards. Walter P. Chrysler establishes the Chrysler Corporation.
1926 ▪ Union Ethyl, containing tetraethyl lead, is introduced as "the new super fuel." The company installs thermal cracking units at its refineries to produce more of the high-test gasoline. Graham Edgar devises the "octane scale" to measure the antiknock quality of motor fuels. The companies started by the first gasoline-auto makers, Benz and Daimler, are combined to form Mercedes-Benz.

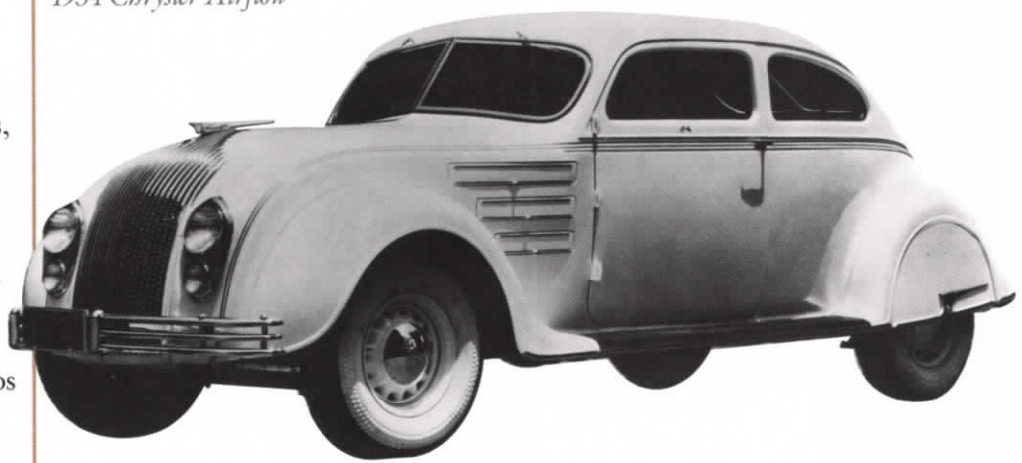
Top, the bright red Union truck of the '20s. Right, ads for the "super motor fuel" promised more power on hills, less vibration and quicker pick-up.

In 1932 a Canadian station was decked out to introduce Union 76 gasoline. Below, a Union chemist tests aromatic solvents, used in resin auto finishes (1937).



1927 ▪ After more than 15 million Model T's have rolled out of the factory, Ford stops production to make way for the new Model A. Packard Motor Car Company introduces hypoid gears for final drive differentials, resulting in quieter operation.
1928 ▪ Higher compression ratios and better fuel are raising the automobile's horsepower average.
1929 ▪ The Big Three—Ford, Chrysler and General Motors—dominate the U.S. car market, producing three-quarters of the cars that are sold. Radios are offered as options on many autos. In October, the stock market crash heralds world economic crisis.
1930 ▪ There are 26.5 million registered motor vehicles in the U.S., including 3.5 million trucks and 40,500 buses. Union service stations number 760.
1931 ▪ Oil production exceeds demand as the Depression discourages new car buyers. When gasoline price wars break out, Union Oil forms a subsidiary to take over operations from service station dealers caught in the squeeze.

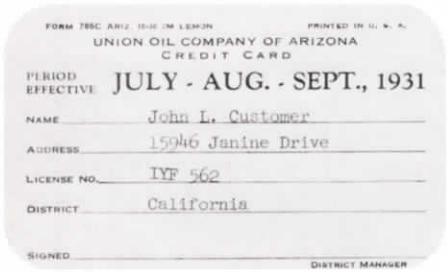
1934 Chrysler Airflow



National Automotive History Collection, Detroit Public Library

1932 ▪ Union introduces the "finest antiknock gasoline ever offered" and gives it a catchy name—76. Annual U.S. car production has dropped to one million, from five million in 1929.
1933 ▪ A drive-in movie theater opens in Camden, New Jersey.
1934 ▪ Chrysler's Airflow Eight employs aerodynamic design principles, but its "unclassic" styling proves unpopular. Union introduces Triton Motor Oil. This 100-percent paraffin-base lubricating oil with very low carbon-forming qualities meets the demands of the ever more powerful engines. The Nissan Motor Company is founded in Yokohama, Japan.
1935 ▪ The Toyota Works, a flourishing Japanese textile firm, produces its first motor car.
Left, Union added 35 combination stake-and-tank trucks to its fleet in 1933. Right, a 1930s tank truck.

1936 ▪ More than 50 percent of U.S. families own automobiles. Union's continuing research results in boosting the octane of 76 gasoline to 80-plus.
1938 ▪ In Germany, Ferdinand Porsche unveils the Volkswagen 38, the "people's car"—but World War II breaks out before production can begin.



UNION OIL COMPANY OF ARIZONA
CREDIT CARD

PERIOD EFFECTIVE JULY - AUG. - SEPT., 1931

NAME John L. Customer

ADDRESS 15946 Janine Drive

LICENSE NO. IYF 562

DISTRICT California

SIGNED

DISTRICT MANAGER

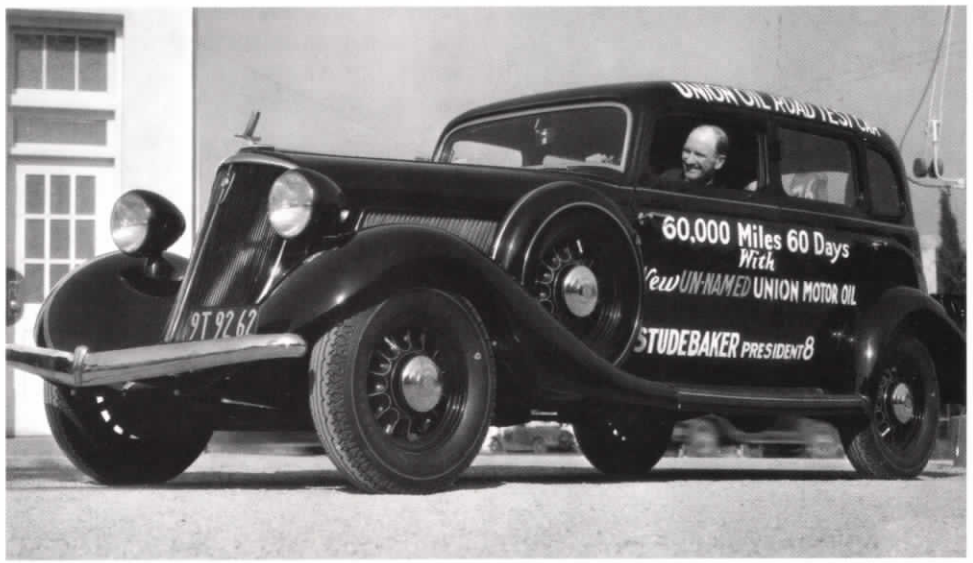
Union Oil Company credit card, 1931

1939 ▪ The 75-millionth car is produced in the U.S. Some new models sport metallic paints and two-tone color schemes. As part of an ambitious expansion program, Union improves its refining facilities and increases its recovery ratio of gasoline from crude oil.

1940 ▪ The Lincoln Continental, styled by Edsel Ford for his personal use, is introduced. The car will be cited by New York's Museum of Modern Art "for excellence as a work of art" in the next year, and will be produced for sale in limited quantities.

1941 ▪ The U.S. enters World War II and auto companies produce tanks, weapons and aircraft engines. Willys starts delivery of a reconnaissance vehicle—the "Jeep." Union steps up production to assist the war effort. The *Montebello,* a Union tanker, is sunk off California by an enemy submarine.

1942 ▪ Civilian car and truck production is halted. Gasoline is rationed. The U.S. speed limit is cut to 35 miles per hour to save gas.



A brand new 1934 Studebaker was driven 60,000 miles in 60 days from San Diego to Seattle to demonstrate the excellence of Triton motor oil in keeping engine wear to a minimum.

1940 Lincoln Continental

National Automotive History Collection, Detroit Public Library

Union supplied much of the gasoline for Pacific Coast maneuvers as the army prepared for combat in 1941. The company, like many, many others, geared up for wartime production—and took security measures to guard against sabotage and spies. Left, in 1937 the service station at the corner of Gayley and Lindbrook in Westwood, California was "strikingly modern."

1943 ▪ Union Oil is awarded its first patent for Unifining (later called "Unionfining"). The process, perfected and licensed to many other refiners by the mid-50s, removes sulfur and nitrogen from oil products, thus improving the quality of gasoline and other valuable fuels yielded by sour crude oil.

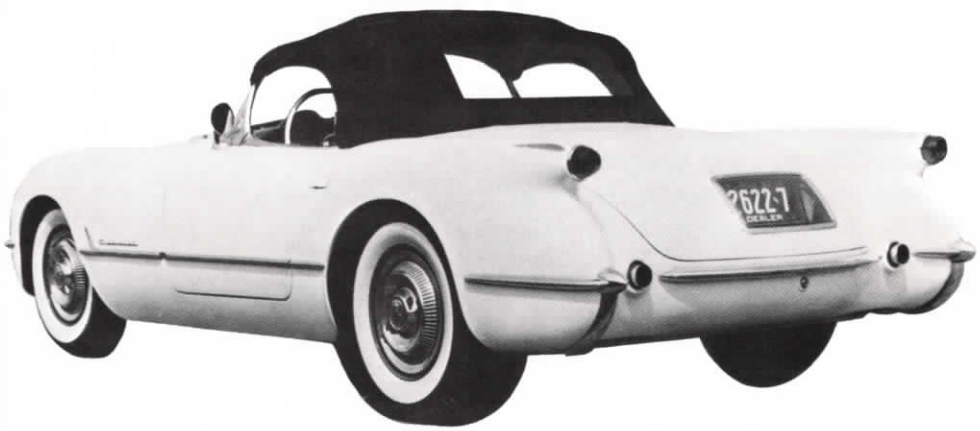
Union researchers achieved major breakthroughs in refining technology with the Unionfiner, top, and Unicracker.

1944 ▪ Union's first catalytic cracking plant goes on stream at the company's Los Angeles refinery, substantially increasing the output of urgently needed aviation gasoline.

1945 ▪ The war ends. Diesel engines, having gained respect as the prevalent power source for armed forces equipment on land and sea, will become the conventional power source for heavy duty vehicles, including trucks and buses. Almost half of the cars on U.S roads are more than seven years old.

1948 ▪ The U.S. becomes a net importer of crude oil as the country's thirst for liquid fuels outpaces domestic production. Imports of crude oil and products will increase steadily, reaching a peak of 46 percent in 1977. Tail fins appear on the Cadillac fastback coupe. Union researchers develop a new family of oil additives—zinc dialkyl dithiophosphates (ZDDP). These patented compounds form the basis for all subsequent anti-wear, anti-oxidant crankcase oil additives.

1953 Chevrolet Corvette



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Union Oil Research Center, 1951

1953 ▪ Chevrolet begins producing the Corvette, a fiberglass-body sports car. Studebaker's new models forecast the sleek long-hood, short-deck body styles that gain popularity in the '60s.

1954 ▪ Ford introduces the two-seater Thunderbird sports car. GM has 51 percent of the U.S. market, Ford 31 percent and Chrysler 13 percent. Hudson and Nash merge to form American Motors.

1957 ▪ Ford introduces the Edsel to compete in the medium-priced car market, which has shrunk dramatically in a slumping economy. Meanwhile, American Motors sells 100,000 of its new economy model—the Rambler. New-model features include fuel injection and torsion-bar suspension.

1953 Studebaker Champion Starliner

National Automotive History Collection, Detroit Public Library

1959 Cadillac

National Automotive History Collection, Detroit Public Library

1958 ▪ Foreign car imports, including Volkswagens and the first Toyotas, total half a million. Union introduces one of the industry's first detergent gasoline additives to keep carburetors clean. The so-called "price label law" requires auto makers to provide price, option and other information on every car.

1965 ▪ When Union merges with Pure Oil Company, a combined total of 18,000 retail outlets market their products in 37 states. The U.S. produces 9.3 million autos, 1.4 million over the previous peak in 1955. Oldsmobile's '66 Toronado is the first front-wheel drive car built in the U.S. since 1937.

1964 Mustang

National Automotive History Collection, Detroit Public Library

1960 ▪ Five new compact models are offered by different manufacturers, bringing the total of American compact styles to 10. A new law authorizes the surgeon general to study and report on discharges from auto exhausts. Union sells 7.3 million gallons of gasoline a day and markets it products through 4,500 retail outlets.

1961 ▪ Cars manufactured for sale in California feature a device to reduce smog-forming hydrocarbon exhaust emissions. Union researchers work to eliminate lead from automotive gear oils, thus improving high-temperature performance.

1964 ▪ Ford's new Mustang will sell more than half a million in each of the next two years, capturing 78 percent of the small-sporty market segment in 1966, 6 percent of the total new car market. The first Unicracker, representing a major breakthrough in refining technology, goes on stream at Union's Los Angeles refinery. Unicracking converts base fuel oil into gasoline and other high-grade fuels, yielding 124 barrels of product from only 100 barrels of feedstock.

1966 ▪ The Motor Vehicle Air Pollution Control Act establishes auto emissions standards to be met by each state and by auto makers.

1968 ▪ Union research helps set industry standards for the volatility of gasoline to suit different climates. This improves automobile "drive-ability."

Union is lifted from regional to national status with the Pure merger.

1970 ▪ The president of General Motors meets with oil industry executives to explain that cars will have to be equipped with catalytic converters to meet emissions standards—and that they will require unleaded gasoline. Union introduces Low-Lead Regular 76 gasoline. The company dedicates its new Chicago refinery, which can process up to 151,000 barrels of crude oil per day. U.S. motor vehicle registration tops 100 million. The Clean Air Act of 1963 is amended to require more stringent antipollution controls on auto manufacturers. The newly created Environmental Protection Agency (EPA) will administer the new regulations.

1969 Volkswagen Sedan

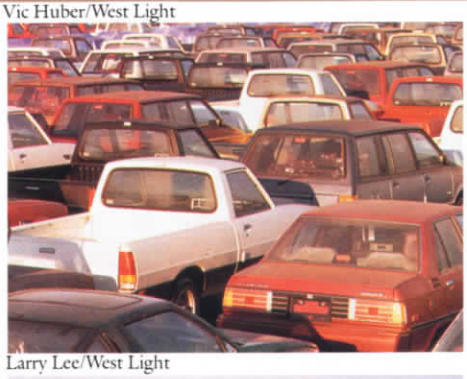
Volkswagen of America

Ron Watts/West Light

1972 ▪ The Volkswagen "Beetle" breaks the Model T's record total production of 15 million cars of a single model.
1973 ▪ The Arab oil embargo against the U.S. triggers long lines at service stations and rising prices. OPEC quadruples its crude oil prices in three months. Fuel-efficient European and Japanese imports get a boost in popularity, increasing their U.S. market share from 15 to 18 percent in the next two years.
1974 ▪ The Emergency Highway Energy Conservation Act lowers the national speed limit from 65 to 55 miles per hour to save gasoline. Domestic auto makers promise a 40-percent improvement in fuel efficiency by 1980. Cars for the model year 1975 have catalytic converters. Union introduces 76 Unleaded Regular gasoline. The Union 76 Fuel Economy tests held at Daytona International Speedway provide important gas-mileage data on more than 80 domestic and imported autos.
1975 ▪ Small cars represent 53 percent of all sales, compared to 43 percent just two years earlier. The federal Energy Policy and Conservation Act mandates fuel-efficiency standards for autos.
1976 ▪ EPA regulations call for a gradual decrease of the allowable amount of lead in gasolines over a period of several years. Some 14,000 retail outlets market Union products in 45 states.

Some cars never run out of gas. Right, a 1935 Rolls Royce tools along in a 1984 rally for cars of pre-1937 vintage.

Vic Huber/West Light

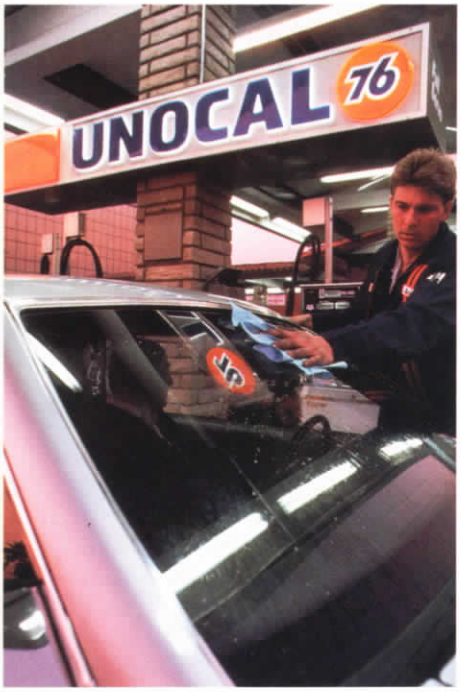


Larry Lee/West Light

Clockwise, from top left: Unocal 76 Auto/Truckstops are welcome destinations for long-distance drivers. Japanese imports are a major factor in the U.S. car market. Disruptions of crude oil supplies from the Middle East forced drivers to wait in long lines to fill up in 1973 and '79. Endless freeways and the gasoline-driven auto have shaped our cities. Henry Ford created the moving assembly line in 1908; by the '80s, it's all done by robots (GM plant).

Larry Lee/West Light

1979 ▪ The Iranian revolution causes another supply disruption. This time, the price of crude oil more than doubles. In the U.S., the 105 million cars in operation account for one-third of total oil consumption. Union introduces Long Distance Purple Motor Oil for better performance and increased mileage. The company also offers new products for the country's 1.4 million diesel trucks and buses: a line of multigrade diesel engine oils that increase engine life between major overhauls. Union completes research sponsored by the Department of Energy to establish standards for methanol and ethanol as fuels and gasoline blending agents.
1980 ▪ Toyota usurps Chevrolet as world's biggest maker of private cars. Of the 8.9 million cars sold in the U.S., 27 percent are imports. Japanese cars total 79 percent of import sales.



1981 ▪ The new decade brings increasing use of micro-computers to monitor and control various engine functions for improved mileage and combustion efficiency. More models are equipped with turbochargers to boost the power of smaller engines. Union builds its first "super facility" service station, with more pump islands and service bays than a traditional station. The company will soon lead the industry in developing this new high-volume, full-service marketing concept. Production of VW Beetles has ceased in the U.S. and Germany, but continues in Mexico, Brazil and Nigeria; Mexico turns out the 20-millionth always-reliable "Bug."

1982 ▪ For the first time, U.S. refiners turn out more unleaded than leaded gasoline. Union sells 8.9 million gallons of gasoline a day, of which 60 percent is unleaded.

1983 ▪ Shareholders approve a reorganization that makes Union Oil Company of California a subsidiary of Unocal Corporation, incorporated in Delaware. The Union 76 Auto/Truckstop system celebrates its 30th anniversary. The network includes 150 auto/truckstops on interstate highways and more than 450 smaller units on other routes. Of the 161 million vehicles registered in the U.S., 35 million are trucks.

Top, the Unocal 76 logo has replaced Union 76. Above right, the super station in Tustin, California in 1984. By 1986, Unocal operated 43 super stations.

1984 ▪ The U.S. has 3.5 million miles of surfaced streets and roads, compared to 200,000 in 1904. Thanks to conservation, U.S. petroleum consumption has dropped 17 percent since 1977. Crude oil and product imports have also dropped, from 1977's high of 46 percent of consumption to 30 percent.

1985 ▪ Japan leads the world in motor vehicle production with 12.3 million for the year. The U.S. follows with 11.6 million, but the U.S. produces more passenger cars—8.2 million to 7.6 million. Unocal sells 10.2 million gallons of gasoline per day. The company's daily crude oil production of 251,300 barrels is higher than its annual total for each of the first 11 years of its existence. OPEC abandons production quotas, and crude oil prices plunge; West Texas Intermediate drops 62 percent from December '85 to August '86.

1986 ▪ New U.S. cars average 26.5 miles per gallon, compared to 17 in 1976. The EPA's accelerated lead-phasedown, which lowers the allowable amount of lead per gallon of gasoline by 91 percent, from 1.1 grams to 0.1, takes effect. Unocal introduces Super 76 Unleaded premium gasoline in several western markets, replacing leaded premium. Unocal's Valve Saver,™ a lead-substitute gasoline additive, is introduced for use in pre-1975 cars designed to run on leaded fuels. Domestic auto makers offer very low interest rates in order to boost sales of their '86 models. The oil industry cuts back exploration and other operations to await an upturn in the price of oil. *B.P.* ⑦⑥

Editor's note: Our thanks to Lavinia Constable Spivey, a student intern on Seventy Six *during the winter/spring term of 1986, for research assistance.*

1987 Jaguar

National Automotive History Collection, Detroit Public Library

Unocal Sets First TTP.

Unocal has installed the world's first tripod tower offshore oil producing platform in the North Sea's Helder field. The platform provides an innovative, cost-effective and timely method for development of marginal oil reserves which could not be produced effectively from the field's primary platform.

The unmanned tripod tower platform (TTP) is located 30 miles offshore the Netherlands. A satellite to Unocal's Helder A platform, the TTP Helder B stands in about 90 feet of water and accommodates two wellheads, an emergency shelter and a control room. The 187-foot-tall structure consists of a production deck and helideck atop a central steel column which is supported by three steel legs connected to a tripod base on the ocean floor.

After installing the Helder A platform in 1982, Unocal's production team had considered various ways of producing an isolated well that had been drilled to a depth of 5,346 feet in 1980 and temporarily suspended. The TTP proved to be an ideal solution.

The Helder B platform is a scaled-down version of a tripod concept developed by Heerema Engineering Service B.V. of the Netherlands for potential use in very deep waters (800 or more feet) offshore Norway. TTP research, which began in 1978, has received financial support from the Dutch Ministry of Economic Affairs and the European Economic Community. Heerema welcomed the opportunity to see its design applied for the first time in the Helder field.

"We signed the contract for design and construction of the tripod tower platform in November 1985, before the recent, dramatic drop in the price of oil," says Brian Marcotte, operations manager of Unocal Netherlands, Inc. "But the cost of fabrication and installation of Helder B was low enough to preserve the attractive economics of the project despite the lower oil prices. We estimate that the TTP cost us 25 to 30 percent less than a conventional platform."

The TTP's light weight afforded much of the savings. The key is structural simplicity, which reduces the amount of steel required for fabrication by some 40 percent. Further weight reduction was achieved by installing an aluminum helideck, a feature Unocal has pioneered in its Netherlands fields. Because aluminum is a very lightweight metal, designers could scale down the weight-bearing deck supports, making the entire platform considerably lighter.

In addition, Helder B's open and simple design allows for easier inspection and maintenance. And, the platform is "recyclable," according to David Duncan, Unocal project manager. "We can relocate it at some later date," he says. "We have no plans now, but the water depth is pretty constant in the Dutch sector, about 90 feet, so reusing the TTP is a realistic possibility."

Fabrication of Helder B began in January of this year, and the platform was set July 14. Production started August 19 with an initial rate of 1,500 barrels of oil per day. The oil is piped about a mile to processing facilities on Helder A. Combined production from both platforms is then pumped through Unocal Transportation B.V.'s 55-mile pipeline to an onshore terminal near Amsterdam.

A submarine cable between the two Helder platforms provides power to operate Helder B's downhole pump and utilities. The cable also contains the world's first fiber-optic link used in offshore oil operations. This link carries light signals from Helder A to control operations on Helder B. (Fiber optics is a relatively new technology which involves beaming lasers through glass fibers no thicker than a human hair.)

Unocal maintains operations in three fields in the Q1 block of the North Sea's Dutch sector: Helder, Helm and Hoorn. Unocal's interest in the block is 80 percent, with the balance held by the company's Dutch partner, Nedlloyd Energy B.V. of Rotterdam.

Unocal began an active exploration program offshore the Netherlands in 1968. The Helm field was discovered in 1979, followed by the Helder and Hoorn fields in 1980. The Helm and Helder A platforms were installed in the summer of 1982 and began production that September. Hoorn came on stream in July 1983.

Unocal was the first company to find and develop commercial quantities of oil offshore the Netherlands. Since the Helm and Helder A platforms were set in 1982, the total number of oil platforms in Dutch waters has risen to eight, including the four that Unocal operates.

Unocal holds interests in various other blocks offshore the Netherlands, as well as in some onshore areas. Recently, the company began natural gas production from a platform on the L/11b block, located about 40 miles north of the Helder platforms. The first gas well is currently producing 25 million cubic feet of natural gas per day. A second well is planned, which will bring the platform up to its capacity production of 42 million cubic feet per day. Unocal owns a 48-percent interest in this new gas field. Nedlloyd owns 12 percent, and D.S.M. Aardgas B.V., a Dutch state-owned company, holds 40 percent. ⑯

The world's first tripod tower platform was set in July in the Unocal-operated Helder field offshore the Netherlands. The platform's unique design allows cost-effective production from an isolated well.


HEEREMA

Kids learn to be on the ball.

"All right, let's stretch!" yells Richard Wilson. "Out to your right. Now left. All the way over! Come on, hustle! Stretch those muscles!"

The youngsters, spread out in five even rows across the court, faithfully follow Wilson's directions. They jump agilely from side to side, making circles with their arms, until he calls out a new warm-up exercise. A passerby watching this rigorous regime might think the kids were in an aerobics class—or a junior boot camp. But they are actually gearing up to learn a new sport: tennis.

Wilson is one of almost 200 tennis instructors participating in the National Junior Tennis League, a special summer program. The NJTL, like nearly a dozen other junior development programs conducted by the Southern California Tennis Association (SCTA), is sponsored by Unocal.

The program focuses on young people from low-income areas in Southern California who might not ordinarily get a chance to play tennis. They range in age from eight to eighteen and pay a nominal fee to participate. (The fee is waived if they cannot afford it.)The children receive 18 hours of instruction, T-shirts, tennis rackets and tennis shoes if needed, and a chance to compete in two tournaments.

The NJTL is designed to promote competition, teamwork and fun. "The kids have a lot of energy and enthusiasm for the game now," says Wilson proudly. "In six weeks they've gone from knowing nothing about tennis to playing sets."

He teaches four classes at Queen Anne Park in Los Angeles, one of 58 sites where tennis instruction is held. Each class has a maximum of 25 members, grouped by school grade and age for more balanced competition.

"Okay," Wilson calls to the group, "let's do some backhand drills." The youngsters dash to pick up tennis balls which are scattered like marbles around the court. Then, grabbing their rackets, they form a single, orderly line behind the net.

"These kids are pretty well behaved," notes Wilson, who has taught tennis for eight years. Although he maintains an easy rapport with the youngsters, he will not tolerate horseplay.

"With this many young people, you have to keep their attention and stay in control of the class," he explains. "Otherwise there won't be a learning environment."

Wilson serves the ball and the youngsters take turns trying to return it across the net. Several hit the ball, showing form that could one day make them professional contenders.

"I see lots of potential in these kids," Wilson notes. "We've got some natural athletes here."

But the program's objective is not to make the youngsters tennis pros. Amy Gibbons, who directs the Southern California NJTL chapter, says the program nurtures more than athletic abilities. "Tennis helps children grow in a number of ways," she says. "They learn to handle pressure and work as part of a team while maintaining good sportsmanship. We like to stress the importance of having a good attitude."

Participants at Sportsmanship Day (one of two final NJTL tournaments), for example, get selected because of outstanding behavior—not abilities.

This summer, more than 3,200 youngsters participated in the NJTL program—nearly twice as many as last year. However, there are more boys and girls interested in the program than space allows. Some parks and clubs filled up quickly, leaving many children on waiting lists the entire summer.

"We'd like to obtain more instruction sites, but it's expensive," says Gibbons. "That's why continued grants and sponsorship from corporations like Unocal are so vital. The funding allows us to expand the program and involve more children."

For several years Unocal has been a sponsor of the Pacific Southwest Tennis Tournament (renamed Volvo Tennis/ Los Angeles in 1985). That led to sponsorship of the NJTL and other SCTA junior development programs.

"Unocal developed an interest in young players through involvement with the Pacific Southwest tournament," says Clay Warnock, vice president of western marketing, Refining & Marketing Division. "We realized how valuable the tennis experience is and wanted to make it available to a broader range of youngsters. We considered the NJTL the best instructional program, and decided to lend our support to it."

Not all NJTL support comes in dollars and cents, however. Many people—from tennis pros to city officials—donate their time to make the program work. For example, a Los Angeles County supervisor sponsored an opening day gala at one of the park sites. An exhibition match between former tennis pros and an autograph session with youngsters highlighted the affair.

Virginia Glass, who coordinated NJTL programs at four sites in San Diego this summer, says tennis stars act as role models who help build children's confidence. She invites speakers to address her classes and shows filmstrips on tennis greats like Arthur Ashe, who helped found the NJTL.

Says Glass: "Tennis encourages social interaction and teaches self-control. That's why learning the game is so important."

She plans to offer private lessons to interested youngsters after the summer program ends. "Continued guidance can pay off. One young man who was a part of the NJTL program went on to earn a tennis scholarship at the University of California, Riverside," she recalls.

One way to provide continuous reinforcement for tennis is through the United States Tennis Association's Schools Program. Unocal supports the program, which is administered in Southern California by the SCTA.

Practice makes champions: Richard Wilson teaches kids the basics of tennis (bottom left), including good sportsmanship. Middle, former tennis pro Jack Kramer awards trophies to two National Junior Tennis League finalists.

The program introduces tennis into various elementary and junior high schools across the country that do not have tennis courses or courts. It enables some of the youngsters who participate in the NJTL during the summer to practice their tennis skills during the school year.

"We've received an overwhelming response to the Schools Program," says director Jean Dillingham. "Physical education teachers are really enthusiastic about being able to teach their students a sport like tennis."

"Most of the kids would never have a chance to learn how to play tennis," notes Amy Gibbons. "It's still a very expensive sport—a private lesson typically costs $35 an hour."

Another Unocal-sponsored youth tennis program, Junior Team Tennis, gives youngsters with minimal experience or skills a chance to participate in low-key competition. Various parks throughout Southern California host the program, which Gibbons says will also help maintain a year-round tennis schedule.

Ten-year-old Marvel Lacey plans to join the NJTL again next summer. "I'll definitely be here," he says, taking a breather from Wilson's workout. "I'm learning a lot of self-control. You have to be calm when you play tennis. Also, playing sports like this might help me get a scholarship when I grow up and go to college."

LaTrese Roseby, 11, had never played tennis before signing up this summer. Now she admits, "I thought it would be harder to learn. But Mr. Wilson's a good teacher—he really works us hard."

Although six weeks isn't long enough to turn youngsters into world-class tennis champs, Wilson wants every boy and girl to leave with a basic understanding of the game, and more than a touch of enthusiasm. Apparently, his techniques are working.

Quips Wilson: "One parent came up to me and said, 'What are you doing to my kid? All he wants to do now is play tennis.'" *A.B.*

"Youngsters really appreciate the fact that a large corporation like Unocal is supporting them," says Southern California NJTL director Amy Gibbons.

Service Awards

UNOCAL 76

CORPORATE

September 1986

40 YEARS **Rosetta Russell,** Unocal Center

20 YEARS **Carolyn Bayes,** Unocal Center
Norma J. Broussard, Unocal Center
James A. McCullough, Unocal Center
Jack K. Russell, Unocal Center

15 YEARS **Robert S. Strobel,** Unocal Center

10 YEARS **James H. Bray,** Schaumburg, Il.

5 YEARS **William G. Baker,** Los Angeles, Ca.
John K. Collier, Bremer, Ca.
Nancy E. Poloske, Unocal Center
Patty C. Romero, Unocal Center
James V. Weese, Kenai, Ak.

October 1986

20 YEARS **Edward H. Everett,** Unocal Center
Arnold E. Gamson, Unocal Center

15 YEARS **Betty I. Ballard,** Schaumburg, Il.

10 YEARS **Estela D. Barrientos,** San Francisco, Ca.
Shirley S. Kodani, Unocal Center
Allan S. McGregor, Taft, Ca.

5 YEARS **Hershel D. Graves,** Unocal Center
Homer M. Harrison Jr., San Francisco, Ca.
Cheryl Y. Hatter, Unocal Center
Leslie M. Piper, Unocal Center
Robert W. Walker, Orcutt, Ca.

ENERGY MINING

September 1986

10 YEARS **Timothy L. Carlson,** Parachute, Co.

5 YEARS **George L. Baloo,** Parachute, Co.
Constance J. Peckler, Parachute, Co.

October 1986

10 YEARS **Douglas S. Hackley,** Parachute, Co.

REAL ESTATE

10 YEARS **Steven J. Preston,** Unocal Center

SCIENCE & TECHNOLOGY

September 1986

30 YEARS **James M. Fraser,** Brea, Ca.

25 YEARS **Richard D. Tait,** Brea, Ca.

15 YEARS **John F. Miranda,** Brea, Ca.
Leland S. Nylander, Brea, Ca.
Howard D. Simpson, Brea, Ca.
Frank Z. Trejo, Brea, Ca.

10 YEARS **Sean M. Carey,** Brea, Ca.
Judith C. Ware, Brea, Ca.

5 YEARS **Nobuyoshi Baba,** Brea, Ca.
Bruce W. Bromley, Brea, Ca.
Richard P. Bustamante, Brea, Ca.
Gilbert O. Chavez, Brea, Ca.
Barry A. Duffin, Brea, Ca.
David Hopgood, Brea, Ca.
Eugene C. Lin, Brea, Ca.
G. Todd Ririe, Brea, Ca.
Irene C. Romo, Brea, Ca.
Vernon T. Taniguchi, Brea, Ca.

October 1986

20 YEARS **Cortez W. Hoskins,** Brea, Ca.
William R. Mallett, Brea, Ca.

15 YEARS **James E. Lawton,** Brea, Ca.
Dennis P. McArthur, Brea, Ca.

10 YEARS **Michael R. Winward,** Brea, Ca.

5 YEARS **James T. Allen,** Brea, Ca.
Michael C. Croudace, Brea, Ca.
Joseph A. Curiale, Brea, Ca.
Evelyn Garcia, Brea, Ca.
Ross Y. Iwamoto, Brea, Ca.
Richard G. Jerskey, Brea, Ca.
Byron L. O'Steen, Brea, Ca.
Paul O. Saynes, Brea, Ca.
John J. Swalec Jr., Brea, Ca.
Joseph Vu, Brea, Ca.
Roger J. Witmer, Brea, Ca.

ENERGY RESOURCES

OIL & GAS

September 1986

30 YEARS **Gail Lowe Burke,** Houston, Tx.
Langford W. Henshaw Jr., Houston, Tx.

25 YEARS **Emmett P. Horn,** Jackson, Ms.
Calvin R. Owens, Bakersfield, Ca.

20 YEARS **William U. Edwards,** Santa Fe Springs, Ca.
Don B. Hayden, Santa Fe Springs, Ca.
Afif E. Kaddoura, Pasadena, Ca.
Wilbert P. Rhodes, Houma, La.
Johnnie J. Summerford, Santa Paula, Ca.

15 YEARS **Randy W. Barnhill,** Houma, La.
Virgil R. Cochran, Houston, Tx.
Dennis L. Groboske, Olney, Il.
Ollie L. Johnson III, Lafayette, La.
Billy R. Thompson, Andrews, Tx.

10 YEARS **Richard L. Briggs,** Gillette, Wy.
Ramon B. Cerda, Odessa, Tx.
John P. Chance, Snyder, Tx.
David B. Collier, Taft, Ca.
Grady E. Fowler, Van, Tx.
Linda E. Guy, Andrews, Tx.
Sandy E. Jones, Lovington, N.M.
Robert S. Taylor Jr., Kenai, Ak.
Linda F. Williams, Midland, Tx.

5 YEARS **Tom H. Allen,** Healdton, Ok.
Donald D. Beier, Midland, Tx.
David M. Buckley, Coalinga, Ca.
David G. Candey Jr., Casper, Wy.
David L. Chaffin, Ventura, Ca.
Christopher J. Cihal, Houston, Tx.
Paul E. Clifton, Mobile, Al.
Mitchell G. Elkins, Midland, Tx.
Robert G. Fay, Grayling, Mi.
Michael A. Glassey, Compton, Ca.
Tommy E. Goodman, Mobile, Al.
Susan A. Lewis, Carpenteria, Ca.
Thomas Young Mathis, Houston, Tx.
John P. McKee, Houma, La.
Nick A. Newland, Midland, Tx.
Roger M. Saxton, Grayling, Mi.
Jack B. Schneider, Unocal Center
Christopher D. Whitney, Houma, La.
Brett A. Wilmot, Anchorage, Ak.
Rosemary M. Wyman, Unocal Center

October 1986

35 YEARS **Hugh C. Albertson,** Andrews, Tx.
Robert P. Henderson, Piru, Ca.

30 YEARS **Charles F. Lanning Jr.,** Santa Fe Springs, Ca.

25 YEARS **Ellis A. Castner,** Orcutt, Ca.

20 YEARS **Charles B. Beauchamp,** Orcutt, Ca.
Tomasita E. Bojorquez, Pasadena, Ca.
Salvador Chabolla Jr., Huntington Beach, Ca.
James C. Coon, Houston, Tx.
Kenneth P. Howle, Houston, Tx.
Candace W. Lockwood, Anchorage, Ak.

15 YEARS **Clifford J. Bellamy,** Coalinga, Ca.
Richard B. Crouch, Pasadena, Ca.
Robert R. Gastelum, Coalinga, Ca.
Willis W. Johnson, Van, Tx.
Mark J. Naquin, Houma, La.
Steven W. Ohnimus, Houston, Tx.
Johnny K. Thomas, Van, Tx.

Service Awards

10 YEARS	**Johnnie L. Bogue,** Van, Tx. **Victor J. Meyer,** Ventura, Ca. **Gary L. Toliver,** West Liberty, Il.
5 YEARS	**Michael A. Bartholomew,** Orcutt, Ca. **Matthew F. Billgren,** Houma, La. **David B. Brunette,** Houston, Tx. **Cassandra J. Bush,** Orcutt, Ca. **Joan J. Cole,** Santa Paula, Ca. **Mark L. Colvin,** Lafayette, La. **Mark J. Corser,** Houston, Tx. **Marrion L. Daniels,** Casper, Wy. **Casey K. Davis,** Ventura, Ca. **Robert S. Doherty,** Grayling, Mi. **Jimmy L. Hood,** Taft, Ca. **Paul B. Kennedy,** Jackson, Ms. **Leonard A. Quaid,** Orcutt, Ca. **Michael L. Rainwater,** Coalinga, Ca. **David A. Richardson,** Orcutt, Ca. **David R. Sanborn,** Houston, Tx. **Gale L. Scott,** Houston, Tx. **Kevin M. Shannon,** Houma, La. **Robert C. Stiles,** Orcutt, Ca. **Donna G. Story,** Orcutt, Ca. **Robert L. Tank Jr.,** Gillette, Wy. **Barry L. Tarman,** Oklahoma City, Ok. **Jan K. Terrett,** Midland, Tx. **Wendy D. Toloudis,** Houma, La. **Donna Lowe Van Horn,** Midland, Tx. **Ross D. Woodall,** Taft, Ca. **John P. Zager,** Casper, Wy.

INTERNATIONAL OIL & GAS

September 1986

5 YEARS	**Stephen C. Davidson,** The Hague, Netherlands **Richard A. Gubitosa,** Unocal Center **Jenny Saint-Satyr,** Unocal Center **Rodney A. Skeeter,** Unocal Center

October 1986

15 YEARS	**John M. Newkirk,** Unocal Center
5 YEARS	**Linda Ballesteros,** Unocal Center **Siegfried H. Hamann,** Unocal Center **Alice R. Reed,** Unocal Center **Larry J. Smith,** London, England

Unocal Indonesia, Inc.

September 1986

15 YEARS	**Kaeran** **Wiranto** **Julien Siswojo**
10 YEARS	**Ibrahim** **Mardhani** **Sugiman** **Syamsudin** **Jusuf Misi** **Muh Sikri Halki Rahman** **Anthony Rawung** **Yohanis Tappang Sarira** **Pandjiasmara Saroetomo** **Jusuf Sarong** **M. Noor Sinaga** **Andi Herman T** **Benyamin Talebong** **Totok Trinyoto** **James Marshall Wensen**
5 YEARS	**Haryanto** **Achmad Herdany**

October 1986

15 YEARS	**R. M. Budijarto** **Chaeral Helmi Ilham**
10 YEARS	**Samidi** **Suwanto** **Edward M. Nababan** **Alex Sutiono**
5 YEARS	**H. Muchlis Chandra** **Ida Dasoeki**

Unocal Netherlands, Inc.

September 1986

5 YEARS	**Barbara Vermeulan**

Unocal Limited (Singapore)

September 1986

5 YEARS	**Peter Hong Eng Ting**

October 1986

5 YEARS	**Julie Tong Gek Choo**

Unocal Suez (Egypt)

September 1986

5 YEARS	**Desouky Khattab**

Unocal U.K.

September 1986

5 YEARS	**Neil Scott,** London, England **Mary Wilson,** Aberdeen, Scotland

UNOCAL CANADA LIMITED

September 1986

20 YEARS	**Chikara Koyanagi,** Calgary, Alta. **Russell M. Mason,** Calgary, Alta.
10 YEARS	**Howard M. Boyle,** Calgary, Alta.
5 YEARS	**Kerry W. Pitt,** Fairydell, Alta.

October 1986

15 YEARS	**George D. McKay,** Calgary, Alta.
10 YEARS	**A. Ali Magda,** Calgary, Alta.

UNOCAL THAILAND, INC.

September 1986

10 YEARS	**Chavanut Vongsayan**
5 YEARS	**Boonproong Kongyuth** **Tara Tiradnakorn**

October 1986

15 YEARS	**Rachanee Na-Nakorn** **Pirom Suetrong**
5 YEARS	**Ian N. Barber** **Arunya Chayangam** **Sutanya Thavaravut** **Navarat Yusit**

GEOTHERMAL

September 1986

20 YEARS	**Joseph C. Damasius,** Unocal Center
15 YEARS	**Jerry D. Scarbrough,** Santa Rosa, Ca.
10 YEARS	**Stephen A. Davis,** Santa Rosa, Ca.
5 YEARS	**Myron W. Burr,** Santa Rosa, Ca. **Kenneth H. Williamson,** Santa Rosa, Ca.

October 1986

5 YEARS	**Rodney S. Earnest,** Santa Rosa, Ca. **Paula A. Ferguson,** Santa Rosa, Ca. **Ronnie R. Hatfield,** Santa Rosa, Ca. **Ernie J. Szymczak,** Santa Rosa, Ca. **Fred A. Willis,** Santa Rosa, Ca.

Philippine Geothermal, Inc.

September 1986

10 YEARS	**Protacio A. Bacani** **Pio G. Baldo** **Ma Mila L. Bernal** **Domingo B. Clutario** **Julito C. Competente** **Godofredo T. Delos Reyes** **Leocadio V. San Jose**
5 YEARS	**Ma Imelda P. Amador** **Emerita B. Galang** **Manolito M. Manipol**

October 1986

10 YEARS	**Antonia B. Barbonio** **Megdonio T. Borre** **Rodolfo C. Cerdenio** **Antonio T. Dacillo** **Roger M. Lumbo** **Felizardo R. Mallari** **Romeo T. Manalaysay**
5 YEARS	**Ronito T. Caancan** **Atanacio M. Caldo** **Leonardo O. Carpio** **Marianito V. Castillo** **Romeo C. Cruzana** **Guillermo A. Hernandez** **Domingo H. Macasadia** **Susana M. Maligalig** **Eugenio M. Mercado** **Rodolfo V. Morales** **Mateo M. Navarez** **Gaudencio G. Veterana** **Nicasio M. Villegas**

REFINING & MARKETING

September 1986

40 YEARS — **Olive Struebing,** Schaumburg, Il.

35 YEARS — **Robert A. Armstrong,** Los Angeles Refinery
Edwin K. Wills Jr., Charleston, W.V.

25 YEARS — **Delbert H. Brinck,** Cincinnati, Oh.
Roy M. Hester, Charlotte, N.C.
Lowell V. Sayers, Chicago Refinery

20 YEARS — **Jerry R. Barnhart,** San Francisco Refinery
Barbara C. Christensen, Schaumburg, Il.
Darryl L. Hamilton, Santa Maria, Ca.
Emmett E. Harper Jr., Beaumont Refinery
Sally K. Hoskins, Schaumburg, Il.
Harry W. Kairys Jr., Schaumburg, Il.
James H. Knopp, Las Vegas, Nv.
Barbara A. Siebeck, Schaumburg, Il.

15 YEARS — **Leslie G. Bengston,** Abbeville, La.
Marilyn B. Compton, Schaumburg, Il.
John H. Crowley, Columbus, Oh.
Peggy A. Frett, Schaumburg, Il.
J. Michael Gibbs, Schaumburg, Il.
Deborah A. Hall, San Francisco, Ca.
Steve T. Holm, Avila, Ca.
Steve C. Huhn, Los Angeles, Ca.
Charlotte A. King, Chicago Refinery
Walter K. Jenkins, Chicago Refinery
Gregory L. Morris, Los Angeles Refinery
Vicki A. Norwood, Los Angeles, Ca.
James A. Tysiak, Chicago Refinery
Joann R. Watanabe, Seattle, Wa.

10 YEARS — **David E. Allen,** Portland, Or.
James E. Barrow, Beaumont Refinery
Christopher A. Berg, Schaumburg, Il.
Donna J. Gillig, Schaumburg, Il.
Carole L. Glenn, Schaumburg, Il.
Harold M. Gurgone Jr., Chicago Refinery
Steven T. Jackson, San Francisco Refinery
Gene Jiminez, Beaumont Refinery
Bruce W. Kren, Chicago Refinery
Antonio A. Landa, Beaumont Refinery
Mickey R. Lovell, Chicago Refinery
William M. Mack Sr., Beaumont Refinery
Brian L. Martin, San Francisco Refinery
Jimmie R. Maxwell, Beaumont Refinery
Kenneth E. Miller, Chicago Refinery
George M. Milton, Chicago Refinery
Monte B. O'Fiel, Beaumont Refinery
Kirk T. Peregoy, Los Angeles, Ca.
Thalia A. Roberts, Schaumburg, Il.
Nancy L. Swiatek, Schaumburg, Il.
Vincent R. Torres, Honolulu, Hi.
Jess H. Woodfin, Los Angeles, Ca.

5 YEARS — **George H. Adair,** Berwyn, Il.
William G. Bandstra, Berwyn, Il.
Raymond M. Chavez, Los Angeles, Ca.
Paul A. Clark, Los Angeles Refinery
Eric Erga, Edmonds, Wa.
Daniel M. Ginosar, San Francisco Refinery
Hazel M. Harry, San Francisco, Ca.
Lynda J. Holiday, Tukwila, Wa.
Wanda J. Jenkins, Los Angeles, Ca.
Dennis I. Keys, Nederland, Tx.
George F. Kopacz, Berwyn, Il.
Mark C. Litzau, San Francisco Refinery
Michael F. Meaney, Atlanta, Ga.
James H. Mellom, Berwyn, Il.
David Reed, Berwyn, Il.
Leonard M. Ruth, Seattle, Wa.
Peggy Ryan, Schaumburg, Il.
Travis L. Weaver, Wildwood, Fl.
Donald R. Wenzel, Los Angeles, Ca.

October 1986

40 YEARS — **Albert Breau Jr.,** Beaumont Refinery
Fredericks C. Mills Jr., Atlanta, Ga.
Myron D. Robey, St. Paul, Mn.

35 YEARS — **Maureen Bell,** Los Angeles Refinery

30 YEARS — **Donald B. Christoffel,** Schaumburg, Il.
Reno A. Forza, Portland, Or.
Imants Krastins, Schaumburg, Il.
Robert V. Wentworth, Jacksonville, Fl.
D. M. Williams, San Francisco, Ca.

25 YEARS — **George E. Doss,** Beaumont Refinery
Leroy K. Kalash, Schaumburg, Il.

20 YEARS — **Shirley M. Bollman,** Los Angeles Refinery
James W. Coleman, Los Angeles Refinery
Jay L. Dorado, Santa Maria, Ca.
Marilyn D. Dunlop, Schaumburg, Il
Larry R. Ely, Los Angeles Refinery
Donald I. Krenke, San Francisco Refinery
Juana Martinez, San Francisco, Ca.
Mary F. Paoli, San Francisco, Ca.
Elizabeth J. Piena, Honolulu, Hi.
Stuart M. Taylor, San Diego, Ca.
Bettie J. Thomas, Atlanta, Ga.

15 YEARS — **Stephan E. Campbell,** Los Angeles, Ca.
Phillip W. De Shazo, Richmond, Ca.
Richard D. Hall, Chicago Refinery
Allen R. Hinderliter, Mokena, Il.
William G. Orr, Torrance, Ca.
Carl Prather, Indianapolis, In.
Lawrence E. Prichard, Schaumburg, Il.
Robert J. M. Sams, Charleston, S.C.
Richard A. Schroeder, Schaumburg, Il.
Phillip L. Smalley, San Francisco Refinery
Eric Spendlove, Los Angeles, Ca.
Cecil G. Underwood, Chicago Refinery
James B. Wallin, Chicago Refinery
Karen S. Weaver, Los Angeles, Ca.
Beth R. Wright, Los Angeles, Ca.

Service Awards

10 YEARS — **Arthur A. Beese,** Schaumburg, Il.
Richard Bravo, Bakersfield, Ca.
Rickey L. Costanza, Moab, Ut.
Kathryn E. Steele, Torrance, Ca.
Sheldon L. Stein, Brisbane, Ca.
Jon F. Whitacre, Nederland, Tx.

5 YEARS — **James K. Byers,** Seattle, Wa.
Marc L. Flanary, Sacramento, Ca.
Carl E. Guidry, Beaumont Refinery
Patrick J. Hartigan, Southfield, Mi.
George L. Hudspeth Jr., Los Angeles, Ca.
Kimberly U. King, San Francisco, Ca.
Henry F. Kube, Beaumont Refinery
Steven W. Martin, Santa Maria Refinery
Josa A. Morales, Los Angeles Refinery
Karl R. Rackel, Santa Maria Refinery
Todd R. Sandberg, North Hollywood, Ca.
Scott J. Stevenson, Los Angeles, Ca.
Jackie L. Wright, Beaumont Refinery
Craig C. Zimber, Los Angeles, Ca.

MARKETERS & DISTRIBUTORS

August 1986

5 YEARS — **Matthews Oil Co., Inc.,** Shreveport, La.

September 1986

50 YEARS — **G. W. Wharton,** Woodland, Ca.
Sampson Bladen Oil Co., Elizabethtown, N.C.

30 YEARS — **Turner Oil Co., Inc.,** Salisbury, N.C.

25 YEARS — **Saluda Tire & Oil Co., Inc.,** Saluda, S.C.
Michael Spanish, Walla Walla, Wa.

20 YEARS — **Alpine Oil Co.,** Gaylord, Mi.

15 YEARS — **Central Virginia Oil Co., Inc.,** Waynesboro, Va.
Mille Lacs Oil Co., Inc., Cambridge, Mn.

10 YEARS — **Lipsey Petroleum Co.,** Prentiss, Ms.

5 YEARS — **Micro Metrics, Inc.,** Honolulu, Hi.

October 1986

20 YEARS — **Sheffield Oil Co.,** Ozark, Al.
Webb's Oil Corp., Hollins, Va.

15 YEARS	**Blackman Oil Co., Inc.,** Corning, Ar. **Huguley Oil Co., Inc.,** Lafayette, Al. **O'Steen Oil Co., Inc.,** Tuscumbia, Al. **Page Oil, Inc.,** Jacksonville, N.C. **Remington Oil Co., Inc.,** Remington, In.
10 YEARS	**Benville Service & Superette, Inc.,** Babbitt, Mn.
5 YEARS	**Corder Leasing, Inc.,** Beileville, Mi. **Orton Motor, Inc.,** Walker, Mn.

CHEMICALS

September 1986

30 YEARS	**Raymond Santillan,** Arroyo Grande, Ca.
20 YEARS	**Johnnie L. Adams,** Bridgeview, Il. **Frederick S. Bartholomew,** Schaumburg, Il. **Richard A. March,** Oakland, Ca.
15 YEARS	**James T. Bierfeldt,** Brea, Ca. **Thomas R. Jankowsky,** Carteret, N.J. **Tsukada Nobuo,** Kenai, Ak. **John F. Pratus,** Lemont, Il. **David A. Whitney,** La Mirada, Ca.
10 YEARS	**Joseph E. Adolf,** Kenai, Ak. **Donald J. Goodwin,** Arroyo Grande, Ca. **Larry Mobley,** Bridgeview, Il. **Theresa T. Morris,** Charlotte, N.C. **Paul E. Schneider,** Kenai, Ak. **Kenn R. Stephens,** Kenai, Ak. **Lyle E. Winter Sr.,** Kenai, Ak.
5 YEARS	**Elise B. Archer,** Unocal Center **Eric R. Christensen,** Schaumburg, Il. **Nancy A. Cossitt,** Newark, Ca. **James M. Goforth,** Charlotte, N.C. **Mark A. Koneski,** Conshohocken, Pa. **James V. Nardone,** Brea, Ca. **Nora L. Pearce,** Wilmington, Ca. **Ronald F. Rover,** St. Paul, Mn.

October 1986

30 YEARS	**William C. O'Donnell,** Carteret, N.J.
25 YEARS	**Robert M. McCoy,** Bridgeview, Il.
20 YEARS	**Lee A. Dodgion,** Schaumburg, Il. **Lester McManus,** Charlotte, N.C. **Ann Rice,** Providence, R.I.
15 YEARS	**James M. Jones,** Kenai, Ak. **Patricia A. Weihmuller,** Schaumburg, Il.
10 YEARS	**Eddie Hill,** Charlotte, N.C. **William F. McGahan,** Kenai, Ak. **Alan S. McQueen,** Kenai, Ak. **Robert L. Putman,** La Mirada, Ca.
5 YEARS	**David W. Charlesworth,** Kenai, Ak. **Linda Comeau,** Schaumburg, Il. **John L. Gates Jr.,** Lemont, Il. **Peter W. Ischi,** Kenai, Ak. **Darryl L. Magolan,** Lemont, Il. **Juan C. Martinez,** La Mirada, Ca. **Walter P. Tajdus,** Lemont, Il.

Service Awards

MOLYCORP, INC.

September 1986

35 YEARS	**Leonard Y. Tarman,** York, Pa.
20 YEARS	**Edwin J. Tomasi,** Louviers, Co.
10 YEARS	**William J. Ulrich,** Mountain Pass, Ca.
5 YEARS	**Carlos J. Bustos,** Questa, N.M. **Stanley M. Cisneros,** Questa, N.M. **Raymond M. Dabe,** Mountain Pass, Ca. **Barry T. Kilbourn,** Washington, Pa. **Margaret J. Klein,** Mountain Pass, Ca. **Frank M. Mares,** Questa, N.M. **Andrew L. Weingarten,** Questa, N.M. **Gary G. Wneck,** York, Pa.

October 1986

35 YEARS	**Curvin W. Knaub Jr.,** York, Pa.
25 YEARS	**Baum Brownlee Jr.,** Washington, Pa. **Clinton H. Carroll,** Washington, Pa. **Meredith D. Cashdollar,** Washington, Pa. **Ray A. Montgomery,** Washington, Pa. **Thomas E. Tarr,** Washington, Pa.
20 YEARS	**Mildred B. Axe,** Mountain Pass, Ca. **James T. Christensen,** Louviers, Co. **Gordon S. Knaub,** York, Pa. **Clarence C. Pearson,** Louviers, Co. **Thomas A. Wilson,** Unocal Center
10 YEARS	**Donald C. Elliott,** Mountain Pass, Ca. **John C. Evans,** Mountain Pass, Ca. **William A. Sampson,** Mountain Pass, Ca. **Richard A. Sixberry,** Mountain Pass, Ca.
5 YEARS	**William E. Cudaback Jr.,** Washington, Pa. **Fred W. Simpson,** Washington, Pa.

POCO GRAPHITE, INC.

September 1986

5 YEARS	**Nasra Farhataziz,** Decatur, Tx.

October 1986

30 YEARS	**Earl S. Crumbie,** Decatur, Tx.
10 YEARS	**Sherman W. Hobbs,** Decatur, Tx.
5 YEARS	**Lucius A. Powell Sr.,** Decatur, Tx.

RETIREMENTS

June 1986

Harley F. Barbee, Chemicals, Concord, N.C., September 29, 1969

July 1986

David M. Carlson, Refining & Marketing, Eureka, Ca., April 1, 1962
Donald L. Comegys, Refining & Marketing, Tigard, Or., April 18, 1949
Charles C. Curtis, Refining & Marketing, Los Gatos, Ca., September 23, 1953
Lawrence L. Davies, Refining & Marketing, Portland, Or., June 5, 1953
Henry F. Dupea, Chemicals, Whittier, Ca., February 25, 1969
Donald L. Egerer, Refining & Marketing, Minneapolis, Mn., March 1, 1965
Jeanne J. Hain, Oil & Gas, Van Nuys, Ca., February 24, 1955
Oscar J. Newman, Chemicals, Fairburn, Ca., July 16, 1958
Eric G. Taylor, Geothermal, Roswell, N.M., March 4, 1975

August 1986

Maria E. Brown, Refining & Marketing, Los Angeles, Ca., July 30, 1956
John J. Clarke, Chemicals, San Marino, Ca., November 1, 1959
Richard W. Dodds, Geothermal, Rancho Palos Verdes, Ca., April 27, 1948
Manuel A. Fernandez, Refining & Marketing, San Pedro, Ca., November 18, 1974
Richard A. Goddard, Oil & Gas, West Covina, Ca., June 21, 1948
Wendell R. Gott, Refining & Marketing, Nuevo, Ca., September 27, 1955
Douglas L. Jackson, Refining & Marketing, Hacienda Heights, Ca., November 2, 1964
Elizabeth Lavers, Corporate, Los Angeles, Ca., March 13, 1956
Howard J. Miller, Refining & Marketing, Newark, Oh., May 16, 1949

September 1986

James G. Baird, Refining & Marketing, Prospect Heights, Il., June 26, 1950
Glenn O. Burk, West Coast Shipping Co., Fullerton, Ca., July 1, 1950
Robert K. Carlson, Chemicals, Decatur, Tx., June 1, 1959
Richard L. Cook, International Oil & Gas, Lafayette, La., March 8, 1950
George W. Coombes Jr., Oil & Gas, Midland, Tx., July 3, 1950
Richard R. Culp, Chemicals, Middletown, N.J., October 1, 1957
Norman L. Denton, Refining & Marketing, Hacienda Heights, Ca., July 16, 1951
Charles S. Dunn, Chemicals, Arroyo Grande, Ca., November 14, 1960
Shirley A. Gaudet, Refining & Marketing, Beaumont, Tx., January 12, 1953
Robert J. Geer, Refining & Marketing, Nederland, Tx., June 11, 1962
Sara E. Gibson, Corporate, La Canada, Ca., March 1 , 1971
Richard W. Gillespie, Corporate, Loomis, Ca., June 23, 1959
Dan M. Harrell, Refining & Marketing, Nederland, Tx., July 19, 1949
Charles L. Heaberlin, Chemicals, Decatur, Tx., June 25, 1951

Bill W. Hodges, Oil & Gas,
Arroyo Grande, Ca., April 19, 1950
C. Richard Ingels, Refining & Marketing,
Santa Monica, Ca., August 10, 1949
Norman F. Jensen, Refining & Marketing,
Arroyo Grande, Ca., March 7, 1955
Edward C. Look, Refining & Marketing,
Barrington, Il., October 23, 1953
Bruce W. MacMurray, Refining & Marketing,
Birmingham, Al., September 1, 1957
O.F. (Pete) Noss Jr., Refining & Marketing,
Arroyo Grande, Ca., August 29, 1949
Keith Openshaw, Chemicals,
Long Beach, Ca., January 16, 1951
Wayne S. Rallings, Refining & Marketing,
Lakewood, Ca., December 8, 1954
Rosetta Russell, Corporate,
Agoura, Ca., September 24, 1946
Donald E. Silva, Refining & Marketing,
Arroyo Grande, Ca., March 28, 1955
Johnny G. Strawbridge, Refining & Marketing,
Birmingham, Al., April 18, 1949
Bob J. Taylor, Energy Mining,
Los Angeles, Ca., January 30, 1951
Margaret E. Vincze, Oil & Gas,
Los Angeles, Ca., February 22, 1954
William R. Wilkins, Refining & Marketing,
West Dundee, Il., June 26, 1950
Kenneth V. Zerda, International Oil & Gas,
Hermosa Beach, Ca., July 18, 1955

October 1986

Fred J. Andrews, Refining & Marketing,
Vallejo, Ca., June 22, 1942
Ralph J. Bowman, Corporate,
Long Beach, Ca., November 1, 1964
Palmer C. Bucholtz, Corporate,
Chicago, Il., August 9, 1948
Patricia Busk, Corporate,
La Canada, Ca., June 17, 1957
Melvin L. Carter, Refining & Marketing,
Meridian, Ms., May 12, 1947
George R. Cheyney, Oil & Gas,
Midland, Tx., July 7, 1952
James S. Cloninger, Energy Mining,
Grand Junction, Co., February 1, 1950
James R. Courtney, Corporate,
Sherman Oaks, Ca., May 21, 1951
James F. Dickens, Chemicals,
Torrance, Ca., July 2, 1956
Freeman L. Dickey, Refining & Marketing,
Savannah, Ga., January 16, 1950
Donald C. Eichten, Refining & Marketing,
Arlington Heights, Il., July 16, 1953
Max A. Ervin, Oil & Gas,
Houston, Tx., August 15, 1949
Wayne L. Gerdon, Refining & Marketing,
Tampa, Fl., April 1, 1963
Milton D. Griffeth, Refining & Marketing,
Anderson, S.C., October 18, 1954
Kirby G. Hanks, Corporate,
Arcadia, Ca., May 5, 1948
Howard P. Henderson, Refining & Marketing,
Hillsboro, Or., June 30, 1966
Billy Hendricks, Refining & Marketing,
Covington, Ga., May 16, 1950
William A. Hood, West Coast Shipping Co.,
Los Angeles, Ca., June 14, 1944
George C. Hoytal, Chemicals,
Shawnee, Ks., June 23, 1960
Reginald C. Huggins, Refining & Marketing,
Concord, Ca., June 2, 1952
Wayne M. Hunt, Oil & Gas,
Arcadia, Ga., April 13, 1947
Neil Justice, Refining & Marketing,
Conyers, Ga., February 1, 1956
Sophie M. Krauze, Oil & Gas,
Rancho Palos Verdes, Ca., August 15, 1955
Earl I. Lash, Refining & Marketing,
Hacienda Heights, Ca., August 14, 1950
Dena T. McCrory, Oil & Gas,
Houston, Tx., November 26, 1956
George W. Meadows, Refining & Marketing,
Birmingham, Al., August 1, 1948
Fredericks C. Mills Jr., Refining & Marketing,
Decatur, Ga., October 7, 1946
Constance Nelson, Corporate,
Hacienda Heights, Ca., April 25, 1969
Bobby A. Payne, Refining & Marketing,
Charlotte, N.C., April 15, 1953
John S. Reimer, Chemicals,
Avondale Estates, Ga., January 1, 1961
Clyde E. Rhodes, Corporate,
Arlington Heights, Il., January 30, 1950
Lawrence E. Stover, Refining & Marketing,
Cleveland, Oh., August 16, 1950
Lonnie B. Tackett Jr., Oil & Gas,
La Mirada, Ca., November 29, 1948
Albert A. Totten, Corporate,
Seal Beach, Ca., July 3, 1950
Andrew Vargo, Chemicals,
Wheeling, Il., June 1, 1954
Lee C. Vogel, Science & Technology,
Brea, Ca., June 5, 1951
Roy L. White, Refining & Marketing,
Beaumont, Tx., August 27, 1945

IN MEMORIAM

Employees

Terry D. Jones, Science & Technology,
Yorba Linda, Ca., July 20, 1986
Curtis L. Mays, Refining & Marketing,
San Pablo, Ca., July 21, 1986

Retirees

Ann Anderson-Avery, Refining & Marketing,
Pompano Beach, Fl., July 19, 1986
Joseph W. Bendik Jr., Molycorp,
Washington, Pa., July 29, 1986
William H. Bracken, Refining & Marketing,
Winston-Salem, N.C., July 22, 1986
Fred E. Carter, Oil & Gas,
Minola, Tx., June 30, 1986
George C. Crabtree, Refining & Marketing,
Torrance, Ca., August 1, 1986
Mary E. Dye, Chemicals,
Bloomington, In., July 19, 1986
Lewis A. Feldman, Refining & Marketing,
Stockton, Ca., August 5, 1986
Hobart L. Fisher, Refining & Marketing,
Evanston, Il., July 14, 1986
Charles K. Foster, Refining & Marketing,
Newark, Oh., July 16, 1986
Alvin T. Gammon, Refining & Marketing,
Columbus, Oh., August 2, 1986
Joyce A. Gordon, Corporate,
Beverly Hills, Ca., August 5, 1986
Myrtle Grant, Refining & Marketing,
Wilmington, Ca., August 5, 1986
James H. Hilt, Refining & Marketing,
Columbus, Ga., May 18, 1986
Andy E. Jacobson, Refining & Marketing,
Ely, Mn., July 18, 1986
Adolph Kempf, Refining & Marketing,
Crystal Lake, Il., July 10, 1986
Hans Kuhn, Refining & Marketing,
Villa Park, Il., July 30, 1986
Samuel H. Leggett, Refining & Marketing,
Siloam Springs, Ar., June 6, 1986
Gilbert E. McDade, Refining & Marketing,
Six Lakes, Mi., June 1, 1986
William B. Myres, Refining & Marketing,
Carson, Wa., August 12, 1986
Helen L. Prushing, Refining & Marketing,
Trent, S.D., June 29, 1986
Marjorie Rutledge, Corporate,
Montrose, Ca., May 27, 1986
Willie E. Sandlin, Refining & Marketing,
Nederland, Tx., August 10, 1986
George H. Schulz, Refining & Marketing,
Wilmette, Il., April 30, 1986
Thomas T. Shelby, Refining & Marketing,
South Bend, In., August 12, 1986
Carl G. Smith, Refining & Marketing,
Newark, Oh., July 17, 1986
William H. Spomer, Refining & Marketing,
Arlington Heights, Il., July 24, 1986
Helen Whitham, Refining & Marketing,
Tucson, Az., July 14, 1986
Florene Wilcox, Refining & Marketing,
Miami, Fl., July 6, 1986

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Seventy Six

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COVER: A worker is dwarfed by a storage tank at the company's Beaumont Refinery, one of five crude oil processing facilities that Unocal maintains. The refining system is a crucial element of the company's success. Story on page 1. **Photo by Bob Thomason.**

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