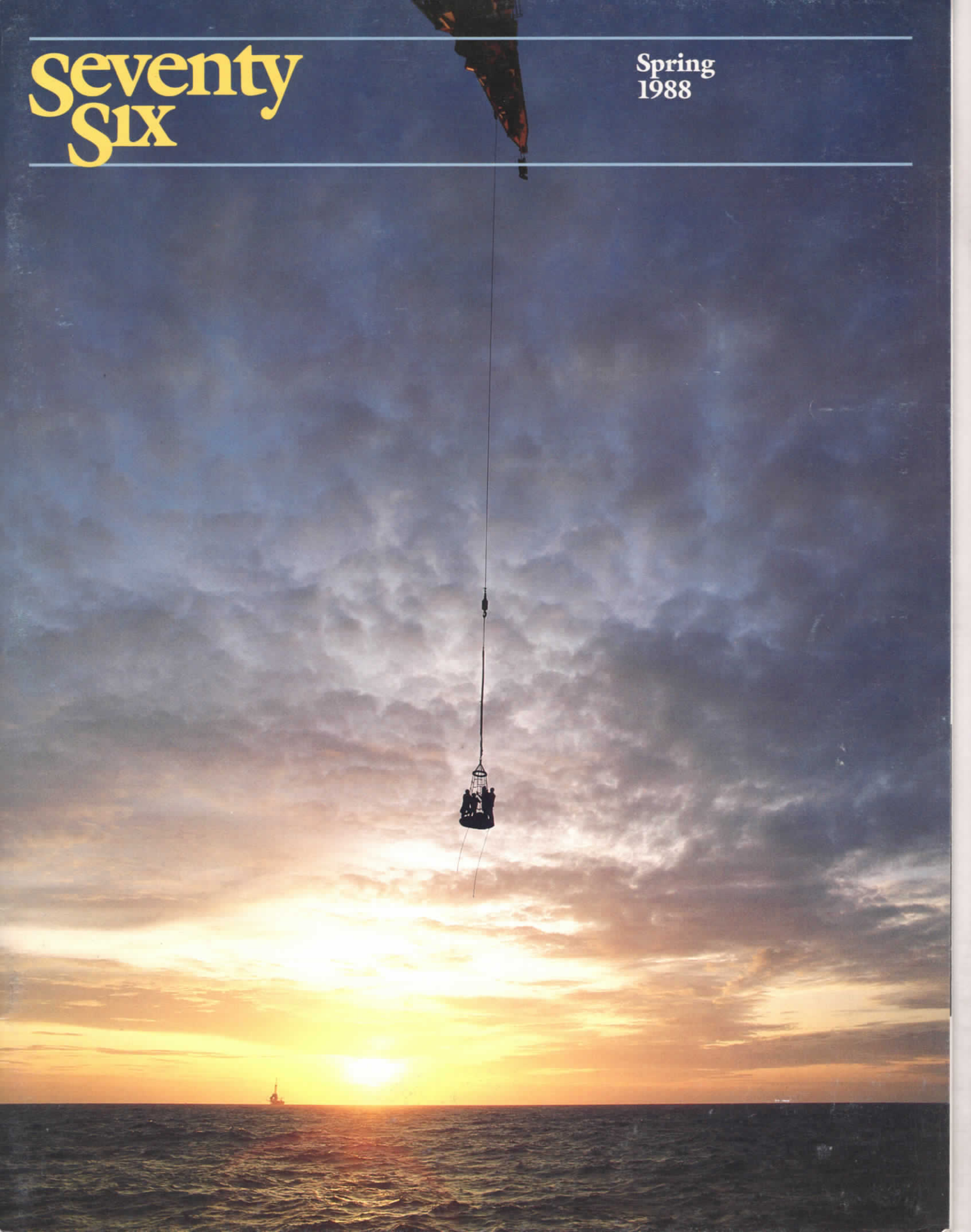

Seventy SIX

Spring
1988



A Strategy for Growth

Unocal Chairman and Chief Executive Officer Fred L. Hartley addressed shareholders at the company's 98th annual meeting, held on Monday, April 25 in Los Angeles. His speech is reprinted here for Seventy Six readers.

Good morning, ladies and gentlemen.

Once again, it is my great personal pleasure to formally welcome all of you to the 98th annual meeting of Unocal Corporation. I hope you'll forgive me if I say, with a note of pride, that I have had the privilege of presiding over 23 of these meetings—a period in which Unocal's revenues have grown from \$1.7 billion to \$9.4 billion.

Just think—in two years, we will be here celebrating the one-hundredth anniversary of this great corporation. I can hardly wait! What with takeovers and all the other Wall Street madness continuing to dominate the business news, it's becoming a rare event for a corporation to survive one hundred years.

Well, let me make a forecast: Unocal will do more than survive—it will move into its second century with strength, with vigor, and with wisdom.

A year ago, I reviewed the company's recovery from the vicious takeover battle that was started in 1985 by Boone Pickens and his camp followers. I also discussed our recovery from OPEC's 1986 crude oil price war. After dealing with the events of these two tumultuous years, I noted that the time had again come to look ahead—to again focus on ways to make your company grow.

In my comments this morning, I will concentrate on the main components of our growth strategy, as well as on some of our recent results. I will also discuss first-quarter earnings and some related events.

Unocal's growth strategy has two main elements. First, we must continue to improve the overall strength of our balance sheet by reducing our corporate debt to more prudent levels. Second, we must focus our investment program primarily on the strengths of our profitable and proven core business—finding, producing, and marketing energy resources. I will discuss each of these elements in turn.

As I mentioned, the first strategic element involves improving the overall strength of our balance sheet. In this effort, we must give a top priority to widening our margin of safety in the event we are again forced to face a period of extremely low crude oil prices. While I think such a development is unlikely, we nevertheless must be prepared to deal with it.

Spot prices for West Texas Intermediate crude oil dropped abruptly from nearly \$30 per barrel at the end of 1985 to below \$15 per barrel in mid-1986. For a few days, in fact, prices fell to nearly \$10 per barrel. This drop, you may recall, was caused by Saudi Arabia's unexpectedly sharp increase in crude oil production.

While late 1986 and early 1987 was mostly a time of modest price recovery (as Saudi production gradually declined), the return of price weakness late in 1987 and early this year served to remind us that this is, indeed, an industry with its ups and downs.

On the other hand, even as I speak, there are favorable signs of a price upturn. Last Friday, for example, West Texas Intermediate crude oil traded at \$18.30 per barrel, so perhaps we are again on our way to better times. But, of course, only Saudi Arabia and the rest of OPEC know for sure.

Despite the severe price instability since 1986, your company has continued to make excellent progress on its high-priority program of reducing its debt burden. We have now reduced our total long-term debt from a peak of nearly \$5.8 billion in October 1985 to below \$4.4 billion at the end of 1988's first quarter. This reduction of \$1.4 billion, I'm pleased to report, was achieved mainly by belt tightening and by the careful use of available cash flow—not by any massive sale of profitable core operating assets.

The structure of our debt has also been improved. At its 1985 peak, roughly two-thirds of it was tied to floating interest rates—thus making the corporation highly vulnerable to a run-up in rates. Today, by contrast, less than one-third of our debt is tied to variable interest rates.

Further, our fixed debt is now mostly at relatively low rates, thus giving the corporation a current average borrowing rate on all of its debt of less than 9 percent.

Our good progress on debt reduction and debt restructuring, as well as our favorable operating results, prompted four major debt-rating agencies—Moody's Investor Services, Standard & Poor's, Duff & Phelps and Fitch Investors Service—to raise our debt ratings last summer. These higher ratings lowered the cost of new borrowings—especially for commercial paper—and opened up new sources of capital to the company.

As you can see, we have made excellent progress on the first main element of our growth strategy—the strengthening of our balance sheet. Since October of 1985, in fact, we have effectively reduced the company's interest rate payments by about \$190 million per year. I can assure you that we expect to continue this progress.

As I noted earlier, our second main strategic element relates to the focus of our investment program. Here, we plan to build on the strengths of our profitable and proven core businesses: finding, producing and marketing energy resources—especially crude oil, natural gas and geothermal power.

There will, of course, always be a few exceptions as new opportunities arise. For example, we expect to continue our profitable investments in real estate and in Molycorp's lanthanides. Most of our available investment capital, however, will go into the finding, developing and marketing of energy resources.

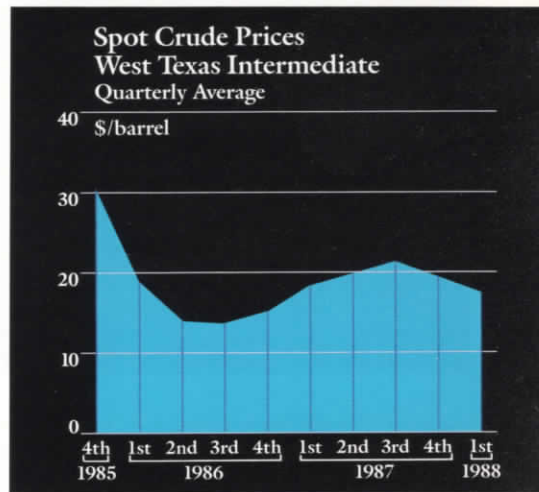


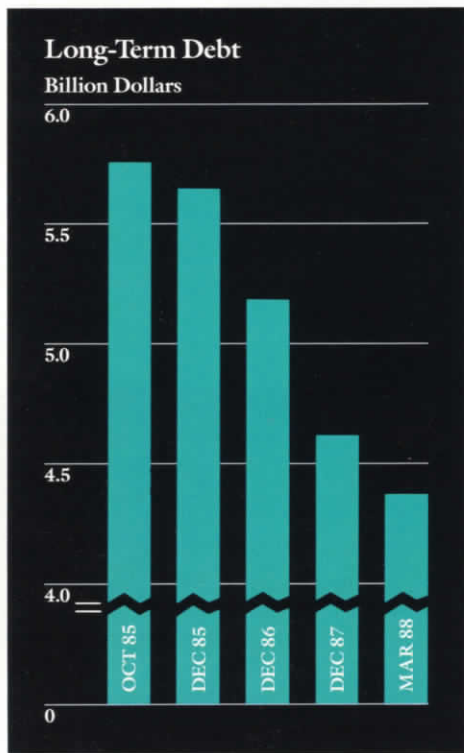
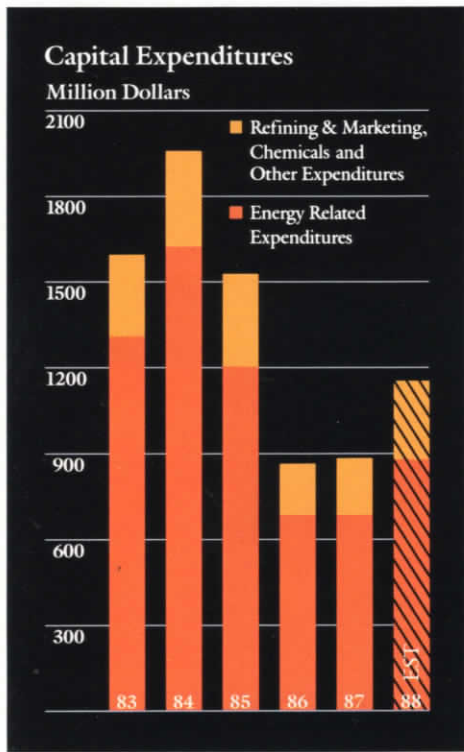
Fred L. Hartley

This focus can be seen quite clearly by reviewing Unocal's yearly capital expenditures since 1983, and by looking at an estimate for 1988.

Three main points are evident. First, when crude oil prices collapsed two years ago, we cut capital spending by 44 percent—from \$1.5 billion in 1985 to \$860 million in 1986. This shows that we can respond quickly to abrupt changes in our business environment.

Second, we have increased the proposed level of capital spending between 1987 and 1988 by nearly 30 percent. This reflects our belief that the long-term level of crude oil prices will move slowly upward. It also reflects our satisfaction with recent exploratory successes and our excellent exploratory land position.





Third, we continue to spend about 80 percent of all our capital dollars on energy-related investments. Unocal's oil and gas finders have an excellent long-term record. Our finding and developing costs are low relative to our competitors. And our petroleum reserves have remained essentially constant over the past five years, despite an overall industry decline.

This is a point worth stressing. Maintaining the company's oil and gas reserves is crucial to Unocal's long-term growth. I want to emphasize that we intend to do all that we can—within the limits of financial prudence—to maintain and possibly expand these reserves in the years ahead.

It is my strong belief that the investment strategy I have just outlined, combined with our improved balance sheet and improving crude oil prices, gives Unocal shareholders much reason for optimism.

Let me conclude this section of my talk by briefly summarizing eight of Unocal's basic strengths—strengths I believe will carry the company through the 1990s and far into its second century. Some of these strengths I have already touched on in my earlier comments. But I believe they are important enough to deserve a special mention.

Strength number one: We have a solid base of oil and gas reserves, especially in the United States.

Strength number two: We have a promising inventory of exploration prospects and a proven record as a low-cost oil and gas finder.

Strength number three: We have a firmly established—and profitable—presence overseas, especially in Thailand and the North Sea.

Strength number four: We are—and expect to remain—the world's leader in geothermal energy development and production.

Strength number five: We have an increasingly efficient domestic refining and marketing system, particularly in the high-growth west coast area.

Strength number six: We have a broad-based chemicals and metals manufacturing and marketing business.

Strength number seven: We have a proven tradition of technological innovation.

Strength number eight: We have a talented and experienced employee and management team. In fact, everything we accomplish is ultimately due to the hard work and dedication of Unocal's employees.

Now I would like to review the company's first-quarter earnings for 1988. This year's first-quarter earnings include two significant special adjustments—one positive, one negative. First, I will discuss net earnings, including these adjustments. Following this discussion, I will review operating earnings, excluding these adjustments.

Unocal's total net earnings for the first quarter (including the special adjustments) were \$178 million, or \$1.53 per share. This compares with net earnings of \$61 million or 52 cents per share in the first quarter of 1987.

One special adjustment in the first quarter involves a \$456 million gain from the cumulative effect of a change in the accounting principle for deferred income taxes. This gain results from the company's adoption, effective in 1988's first quarter, of Statement 96 of the Financial Accounting Standards Board. This new accounting standard requires companies to adjust their deferred income tax accounts to reflect the recent reduction in the federal statutory income tax rate to 34 percent.

The second special adjustment involves a \$322 million after-tax loss resulting from the write-down of certain company assets. Based upon recent analysis, we have concluded that these assets have little chance of generating sufficient future cash flows to enable the company to recover its full investment in them.

The assets included in the write-down are Unocal's remaining investment in its Parachute (Colorado) shale oil project, about half of its investment in the molybdenum mine and processing facilities in New Mexico and Pennsylvania, and about 40 percent of the needle coke production facilities at the Chicago refinery.

The pre-tax book value of these write-downs totals \$525 million. This amount is included as a special one-time depreciation charge in the first quarter's income statement. As noted previously, the after-tax book value of these write-downs totals \$322 million.

I would like to stress that the write-down of the remaining investment in our shale oil project does not mean that we have given up on oil shale. Rather, the likely level of crude oil prices makes it increasingly improbable that we will generate enough cash flow to recover the original plant investment.

We have made a lot of progress in learning how to operate this innovative plant. Last year's production, for example, totaled 600,000 barrels—and we expect our talented scientists and engineers to continue to make progress. In the long run, we believe this new technology will make a vital contribution to the nation's energy security.

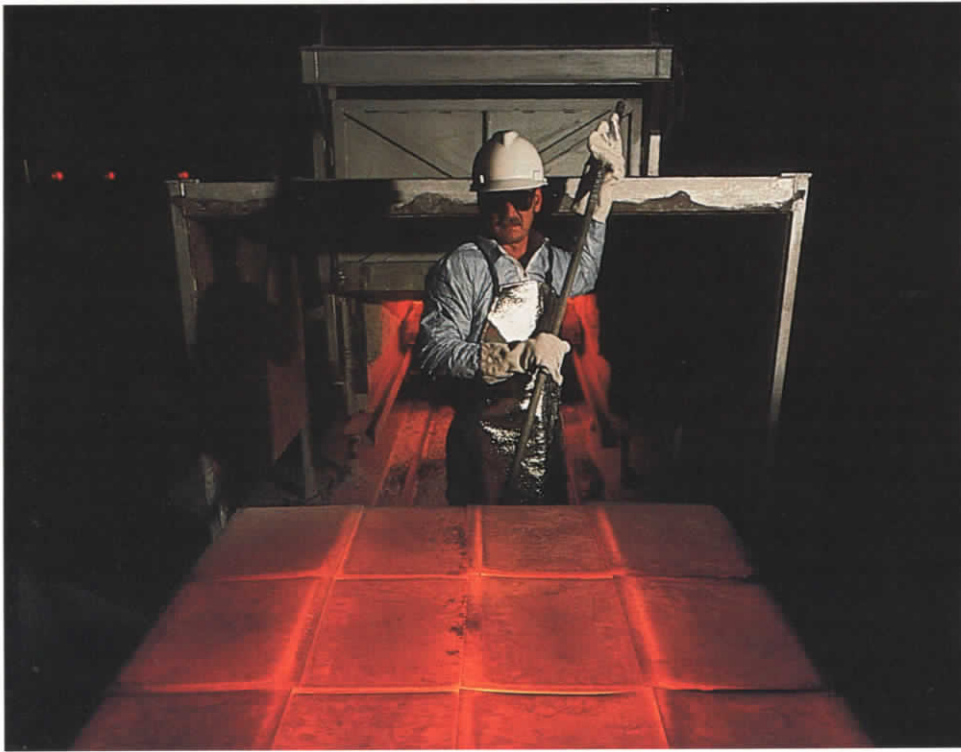
The partial write-downs of the company's molybdenum operations and other assets reflect our present belief that we were too optimistic about market prices when we committed to these investments. While the technology has proven successful, market prices for molybdenum and needle coke have been a great disappointment.

Now that I have described these special adjustments, let me turn to the first quarter's operating earnings, exclusive of these adjustments.

First quarter earnings from operations were just over \$44 million, or 38 cents per share. This result is 27 percent below last year's first quarter, which included \$14 million from the sale of a partial interest in the Veslefrikk Field offshore Norway, and the settlement of a 1980 overpayment of the windfall profit tax.



Enquik (top), an environmentally safe agricultural product which dries up unwanted growth, received EPA approval in 1987. Here, the Unocal-developed product is being applied to a potato field. Above, a unique floating production facility designed by Unocal will be used to develop the Veslefrikk field offshore Norway.



A worker at Molycorp's Mountain Pass mine (top) removes a tray of purified gadolinium oxide from a furnace. Gadolinium, one of several lanthanide elements produced at the mine, is used to intensify X-ray images. Above, new computerized process control systems were installed at two of the company's polymers plants last year.

The major negative factors affecting 1988's first quarter were higher dry hole and exploratory expense—reflecting our step-up in exploratory drilling—lower geothermal energy earnings, and lower domestic crude oil prices.

On the positive side, earnings were helped by higher natural gas production in Thailand and by higher refining and marketing earnings.

Profit projections for the full year are, as always, impossible to make with accuracy. I should note, however, that I see an encouraging sign in the first quarter's strong U.S. oil demand. Gasoline consumption, for example, was up 5.5 percent over a year ago. Moreover, recent data shows a reduction in U.S. oil inventories, and OPEC continues its efforts to restrain excessive oil production. Time, of course, will tell, but today at least I feel optimistic.

Before closing, I would like to invite all of you to stop by the exhibit of new company products and technologies that we have set up in the lobby outside the auditorium. In the first part of my talk, I mentioned that a tradition of technological innovation was one of Unocal's basic strengths. This exhibit is a good opportunity to see firsthand about a dozen of the recent innovations resulting from that tradition.

Some of these innovations include new low-cost drilling techniques, environmentally safe agricultural products, and the Unipure wastewater treatment process. You can also see how lanthanides are used in superalloys for jet fighters, optical disks for computers, and several other high-technology applications.

Let me conclude by saying that, on behalf of your board of directors, your management, and the entire Unocal employee team, we very much appreciate the strong and continuing support you have given us during these recent, most challenging years.

Thank you. 76

1987: A Year of Solid Performance

In reviewing Unocal's operations for 1987, President and Chief Operating Officer Richard J. Stegemeier stressed the solid performance of the company's core business—energy production.

In 1987, Unocal's total energy production—oil, gas and geothermal—was the highest in five years, Stegemeier reported. In addition, the company's net crude oil and condensate reserves increased in 1987, rising to 771 million barrels at the end of the year.

"This is the fourth consecutive year we've replaced all of our oil production with new reserves," Stegemeier noted.

The company's worldwide natural gas reserves were also up slightly at year end, while geothermal reserves registered a small decline to 300 million oil-equivalent barrels.

Unocal's net crude oil and condensate production averaged 243,200 barrels per day in 1987, compared with 248,200 barrels per day in 1986. The slight decline was due to the effect of low crude prices, well shut-ins, and reduced drilling activity.

"The company's natural gas production, however, was up 17 percent in 1987," Stegemeier said. "Net natural gas production averaged 1,143 million cubic feet per day, the highest in five years."

Stegemeier noted that Unocal's Oil & Gas Division made a number of significant discoveries in 1987, and progress was made on several major development projects.

Offshore California at Platform Irene, the company started production from the Point Pedernales field. Production from Irene, which began in April of 1987, is approximately 20,000 barrels of oil per day. This represents the first offshore production from California's Santa Maria Basin. Unocal, which serves as operator, holds just over a 20-percent interest in the Point Pedernales unit.



Richard J. Stegemeier

In Alaska's Cook Inlet, drilling continued at the Cannery Loop gas field near Kenai to bring the field on full production by mid-1988. Anticipated production from Cannery Loop, which will supply gas to the company's Kenai Chemical Plant, is 45 million cubic feet of gas per day.

Just to the north, Unocal holds about a one-half interest in the Steelhead drilling and production platform—which is operated by another company. In December 1987, an explosion and fire aboard Steelhead caused significant damage—delaying scheduled gas production until late this year.

Unocal also holds about a 4-percent interest in the Kuparuk oil field on Alaska's north slope. Current production there is approximately 300,000 barrels of oil per day. Offshore Alaska in the Beaufort Sea, production began in November 1987 from the Duck Island unit of the Endicott field, where Unocal holds a 10.5-percent interest.



Shareholders at this year's annual meeting viewed exhibits at Unocal Center. Here, visitors look over a display detailing advancements in drilling technology.

Over 100,000 barrels of oil per day are currently being produced from Duck Island—the first oil production from the offshore area of Alaska's north slope. "During last year and the first part of 1988, the company acquired over 180,000 acres of new exploratory tracts on Alaska's north slope," Stegemeier noted. "These new tracts are located both onshore and offshore."

Unocal's Central Region also turned in an encouraging performance in 1987, Stegemeier told shareholders. "In the last six years, the Central Region has drilled nearly 300 wells in 21 fields to improve their productive efficiency," he said. "Currently, over 25 percent of the region's total oil production comes from these new wells."

Next, Stegemeier discussed Union Exploration Partners (UXP)—a master limited partnership created by Unocal in 1985. UXP holds substantially all of the company's oil and gas exploration, development and production assets in the Gulf Region, which stretches from Texas along the Gulf coast, and up the east coast to Maine. In 1987, UXP made several new discoveries, completed a number of important development projects, and acquired 25 new lease blocks in the western and central Gulf of Mexico.

Offshore Texas, production began from the Cerveza platform in the East Breaks field. At year end, combined production from Cerveza and the nearby Cerveza Ligera platform was 5,700 barrels of oil and 45 million cubic feet of gas per day. UXP holds a one-third interest in the field.

At Mustang Island, also offshore Texas, UXP installed a new tripod platform to produce gas from two wells. Initial production from one well was approximately 2.2 million cubic feet of gas per day. UXP is operator and holds a 42-percent interest.

Onshore Louisiana, UXP made a significant 1987 gas discovery at its North Freshwater Bayou field. The well, which is now on production, tested at 11 million cubic feet of gas and 294 barrels of condensate per day. The well is 100-percent owned by UXP.

In the highly prospective Mobile Bay area, five shallow gas discoveries were made in 1987. UXP holds a 50-percent interest in all five wells, which will go on production when a pipeline is completed in early 1989. The partnership also holds interests in several other offshore discovery and exploration wells in the Gulf Region.

In 1987, Unocal's foreign petroleum operations were highlighted by record production levels in Thailand, an innovative horizontal drilling program in the Netherlands, and increased oil production in Canada for the sixth consecutive year.

In addition, the company acquired promising exploration blocks in the Netherlands, Italy, Egypt, and South Yemen—and will soon sign contracts for blocks in Turkey, Angola, and Ecuador.

"These acquisitions reflect Unocal's long-term strategy of targeting areas throughout the world that have high potential for new petroleum discoveries, yet remain relatively unexplored," Stegemeier said.

In the Gulf of Thailand, the average gross production from Unocal's natural gas fields hit an all-time high in 1987—449 million cubic feet per day, up 43 percent from the year before. Unocal's gas production fueled about 50 percent of Thailand's total electricity generation during the year. Because of the increased demand for natural gas, Unocal plans capital expenditures of \$110 million in Thailand this year, nearly double the 1987 level.

The company celebrated its 25th anniversary in Thailand in 1987. Over the years, Unocal's petroleum operations have helped Thailand move toward energy independence—reducing its reliance on imported oil from 95 percent in 1981, when gas production started, to 60 percent in 1986.

Offshore East Kalimantan, Indonesia, the Attaka field produced its 400 millionth barrel of oil in early 1987. Attaka was discovered in 1970, and an ongoing program of redrilling wells continues to add substantial new oil and gas reserves. The company holds a 50-percent interest in the Attaka unit and serves as operator.



Exhibits of Unocal-developed products, such as new agricultural chemicals, were on display.

In 1987, Unocal signed a new gas agreement with Pertamina, the national petroleum company of Indonesia. Over a 20-year period, the contract calls for Unocal to supply more than 400 billion cubic feet of gas from the Attaka field.

Unocal's operations in the North Sea continued to build on their record of success. The Unocal-operated Heather field, located in the U.K. sector, produced its 80 millionth barrel in 1987. Offshore the Netherlands, Unocal is conducting the first horizontal drilling program in the North Sea. The program should add at least 7 million barrels of recoverable reserves to the Helm, Helder and Hoorn fields.

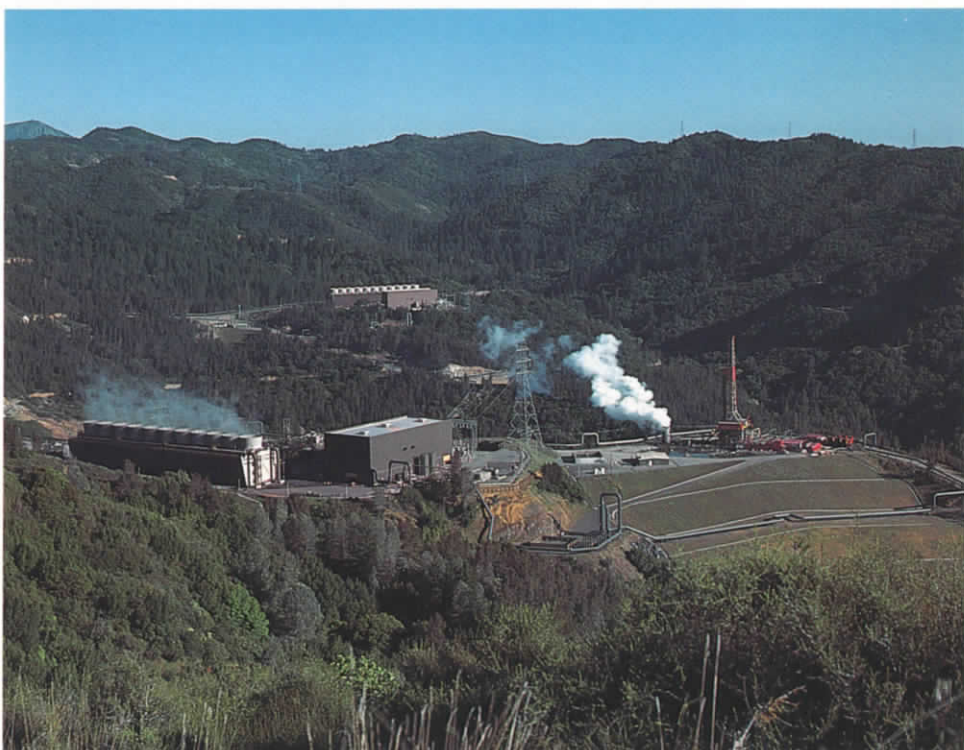
Offshore Norway, the Veslefrikk field is scheduled to go on production in late 1989, with production peaking at about 65,000 barrels per day. Unocal currently holds an 18-percent interest in the field. The company, which serves as technical advisor to Statoil (the Norwegian state oil company) has designed an innovative floating production system to develop the Veslefrikk field.

In Canada, Unocal's net crude oil and condensate production rose for the sixth consecutive year, averaging 17,000 barrels per day. Net natural gas production reached its highest level in 13 years, averaging 68 million cubic feet per day.

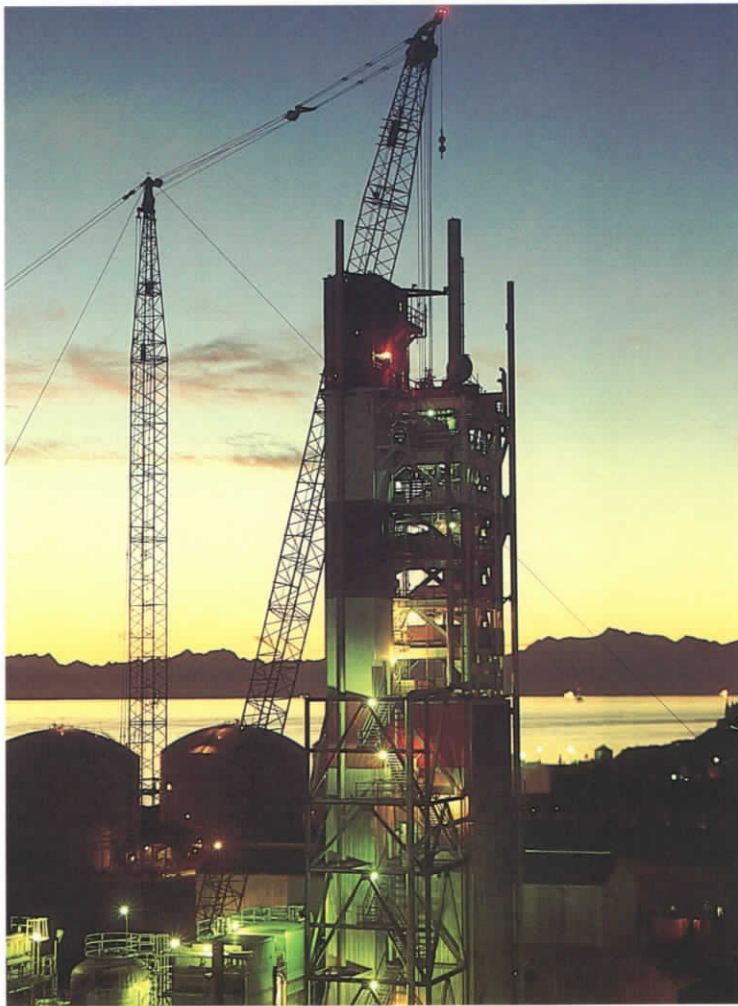
Unocal participated in 149 successful exploration and development wells in Canada in 1987. And the company's Obed thermal coal mine delivered one million tons of coal in 1987, a 16-percent increase over the year before.

Geothermal energy, a field in which Unocal has long been the world leader, continued as a strong performer for the company. In 1987, Unocal's geothermal energy production averaged 23.8 million kilowatt-hours per day. This is enough power to meet the electricity needs of a city of nearly one million people.

At The Geysers geothermal project in Northern California, where Unocal is the major producer, the company's net power generation was over 5 million megawatt-hours in 1987—an all-time high. Unocal's geothermal operations in Southern California's Imperial Valley also continued to grow.



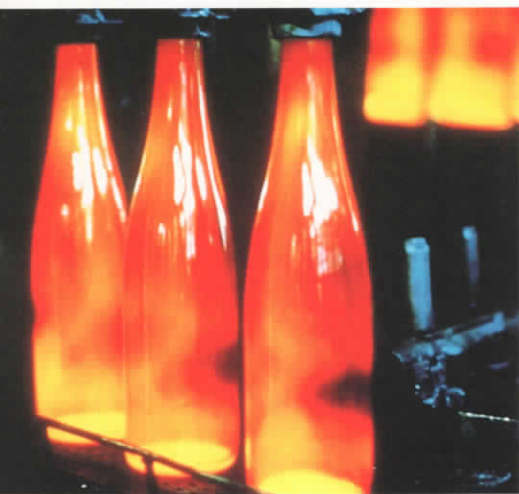
In 1987, Unocal celebrated its 25th anniversary in Thailand. This gas processing platform in the Platong field (top) is one of several Unocal platforms located in the Gulf of Thailand. Below, a portion of the company's geothermal development project at The Geysers in Northern California.



“Desert Power Company, a Unocal subsidiary, is building a 47,500-kilowatt electrical generating plant at the Salton Sea,” Stegemeier said. “The plant is scheduled to start operations early next year.”

In July 1987, Earth Energy, Inc., a second Unocal subsidiary, purchased a 10,000-kilowatt generation plant at the Salton Sea from the Southern California Edison Company. Plans are under way to triple the plant’s capacity. These two projects represent Unocal’s first venture into the electrical generation side of the geothermal energy business.

In the Philippines, Unocal continues to be a contract supplier of geothermal steam. The company can produce enough steam from its Tiwi and Mikiling-Banahao fields to generate a significant portion of the total electricity used on the island of Luzon.



Poco Graphite, a Unocal subsidiary, expanded its marketing last year of Glassmate—a new trademarked material used in handling molten glass.

Turning to the refining and marketing sector, Stegemeier reported that the company increased product sales volumes in 1987 for the fifth consecutive year. And several projects to upgrade Unocal’s refineries continued to move forward.

At the San Francisco refinery, the company completed a new 7,400-barrel per day isomerization unit. This new facility, combined with a second isomerization unit under construction at the Chicago refinery, will increase Unocal’s ability to produce high-octane, unleaded gasoline. Also completed at the San Francisco refinery last year was a 49-megawatt cogeneration plant and a new crude unit.

In March of this year, Unocal completed a new cogeneration plant at the Los Angeles refinery. The plant will supply nearly all of the refinery’s power needs at reduced cost.

“The higher sales volumes we achieved in 1987 improved utilization of our refinery and terminal systems,” Stegemeier reported. “As a result, our refineries operated at 87 percent of capacity last year. This compares with about 83 percent for the industry as a whole.”

On the marketing side, the company added over 900 branded retail outlets to its marketer network in the east. Unocal now services over 8,200 retail outlets in the midwest and southeast, including convenience stores and self-serve marts.

In the Pacific Northwest, Unocal became the first marketer to offer three grades of unleaded fuel— 87, 89, and 92 octane. This marketing strategy will be expanded throughout the west in 1988. And nationally, the company continues to operate one of the country’s largest and most successful auto/truckstop systems, with 149 interstate highway facilities from coast to coast.

Unocal’s Chemicals Division recorded increased sales volumes in almost all of its product lines last year. These products include everything from agricultural chemicals to specialty metals and waste water cleanup systems—over 600 different products in all.

Unocal is a leader in the production of high-quality polymers, the basic building blocks of a wide range of products. Sales of polymer products rose 17 percent in 1987, as demand for paint, paper coating, adhesives, and other polymer applications remained strong.

“Our wholly owned Poco Graphite subsidiary had record sales in 1987—a 14-percent increase over 1986 levels,” Stegemeier reported. Poco manufactures premium graphite materials for use in semiconductors, biomedical instruments, and other advanced technologies.

Unocal’s Molycorp subsidiary is the world’s largest producer of lanthanides, a group of elements with wide uses in industry and high technology. During 1987, demand for lanthanides remained strong, with sales up 14 percent over the previous year. These elements are used in television phosphors, X-ray imaging, high-strength magnets, and catalysts for the refining industry.

Recent research efforts have resulted in a number of new agricultural products for the company’s Chemicals Division. Other company divisions have also developed new products through intensive research.

“At Unocal, we have long believed that research and innovation are the keys to continued growth,” Stegemeier emphasized. “In 1987, our Science & Technology Division developed 56 marketable petroleum products alone.”

In summarizing his review of 1987, Unocal’s president stressed the overall strength and diversity of the company’s operations.

“Despite the challenge posed by low energy prices, Unocal is moving forward—in this country and abroad—with a sound program of petroleum exploration and development,” Stegemeier said. “Our refining and marketing operations are modern and efficient. Our chemicals business is strong, and our geothermal division continues to perform well. In addition, our ongoing investment in research shows Unocal’s long-term commitment to developing new products and new technology for the future.”

“In closing,” he added, “I’d like once again to extend my thanks to everyone in the Unocal family for their hard work and dedication during another challenging year.” 76



Unocal Chemicals’ Kenai, Alaska fertilizer plant is one of the world’s largest. A major revamp of the plant’s urea process unit (facing page) was completed last year. Projects to upgrade the company’s refineries also moved forward. A new isomerization unit (top), used to produce high-octane unleaded gasoline, was completed at the San Francisco refinery.

Above, two Unocal scientists test the properties of advanced magnetic alloys. A firm commitment to scientific research helps keep Unocal at the forefront of technological innovation.

MOVING INTO TOMORROW

Twenty-five years ago, the whirl of a drill making hole and the whoosh of natural gas rushing through a pipeline were unfamiliar sounds in Thailand. The growing Southeast Asian nation was nearly 100-percent dependent on imports to supply its expanding energy needs. But in just a quarter of a century, Unocal has helped Thailand turn the tables on that dependence and begin harvesting the resources at its doorstep.

Last year was a time of jubilation for the Kingdom of Thailand. King Bhumibol Adulyadej celebrated his 60th birthday—an especially important event in Buddhist belief because it marks the completion of the fifth 12-year cycle of life.

“Unocal Thailand also celebrated a milestone in 1987,” says Ray A. Burke, executive vice president of Unocal and chairman of Unocal Thailand. “Last year marked the 25th anniversary of Unocal’s effort to develop Thailand’s energy resources and help the Kingdom ease its reliance on foreign imports.”

The effort has proved a resounding success. Today, production from four natural gas fields in the Gulf of Thailand—Erawan, Satun, Platong and Baanpot—is up to more than 500 million cubic feet per day (Mmcf) and over 17,000 barrels per day of condensate. More than 360 wells have been drilled in the Gulf, and 37 platforms have been installed in the four fields. Thailand’s energy dependence has been reduced by nearly 40 percent—despite more than a 30-percent increase in demand over the last seven years alone.

Reducing this import need has allowed Thailand to save enormously, according to Vane E. Suter, president of Unocal Thailand. “Without natural gas,” Suter explains, “the country would have to burn much more fuel oil to generate electricity. The government would have to import that oil—and it has historically been much more expensive than natural gas.”

Unocal’s gas project has also boosted the Thai economy in other ways. “We have created a lot of new jobs,” Suter says. “We employ 660 people, 90 percent of whom are Thais. And that’s just the tip of the iceberg. Other companies that support our project also employ Thais.”

Richard Keller, vice president and manager of operations, Unocal Thailand, agrees. “Our project has also been very beneficial to the city of Songkhla, where our training center is located,” he says.

In addition, the gas project has provided opportunities for a number of support and service companies to become established in Thailand. “For example, since we began drilling in 1980,” Suter says, “the platforms we’ve installed have been manufactured outside Thailand in various Southeast Asian locations. But future platforms will also be built in Thailand.”

The natural gas enterprise has also given rise to several state-run projects. Soon after signing the Erawan Gas Sales Agreement with Unocal in 1978, the Petroleum Authority of Thailand (PTT) began construction of a 270-mile, 34-inch gas pipeline. The line, which stretches along the Gulf floor from the Erawan field to a gas separation plant onshore in Rayong (and then on to Bangkok), was completed in time for the first delivery of natural gas in 1981.

The PTT is now adding a second unit to its gas separation plant in Rayong, which began operation in 1985. The plant manufactures liquified petroleum gas for use in homes and vehicles. The expansion should be complete and the new unit operating by late next year. A new petrochemical plant, also in Rayong, should be completed by 1989 as well.

Production from four natural gas fields in the Gulf of Thailand is up to more than 500 million cubic feet per day.





“Back in 1980, it took us 50 to 60 days to complete a well,” says Richard Keller, Unocal Thailand vice president and manager of operations. “Now drilling time is down to just under three weeks.”



Since 1981, when production began, gas purchased by the PTT has increased steadily to over 500 Mmcf. To exploit the increasing level of natural gas production from the Gulf, the state-run Electricity Generating Authority of Thailand (EGAT)—the primary consumer of natural gas in the country—has plans to expand its gas-fired generating capacity.

“Since early last year, the PTT has been purchasing more and more gas,” says Keller. “And our estimates show that demand will continue to increase at least 7 to 8 percent each year.”

Although the natural gas industry in Thailand is still relatively young, formation of the resource dates back 50 to 60 million years. Streams running down from ancient hills and mountains deposited silt and organic matter in the lowlands. When the streams dried up, they left sandbeds that now lie deep beneath the Gulf of Thailand. These sandbeds contain the hydrocarbon reservoirs that wells are able to tap today.

The reservoirs lay untouched until the early 1960s, when Unocal explorationists began searching Southeast Asia for potential oil and gas deposits. These studies—the first ever performed by an oil company in the region—turned up several encouraging locations, both onshore and off. In 1971, Unocal spudded its first exploratory well in Thailand at an onshore site in the northeast. Unfortunately, the hole was dry. The search then moved offshore to the Gulf of Thailand, where six more exploration wells were drilled—but, again, no oil or gas was found.

The string of dry holes ended in 1972 with the discovery of the Erawan gas field, located near the center of the Gulf, 300 miles south of Bangkok. Unocal officials and Thai authorities heralded the discovery as one of the most important developments in Thailand’s commercial history.

In 1978, the company signed a Gas Sales Agreement with the Thai government to develop its concessions in the Erawan field. As with many pioneering efforts, the going was not always easy. Before natural gas from Erawan could flow freely, geologists and drilling crews had to hurdle several obstacles. The geologic structure of the area was extremely complex, with individual sandbeds rent by severe faulting. This complexity, however, was not fully apparent until after drilling had begun. Initial estimates of reservoir size had to be recalculated, and Unocal had to drill more wells than originally planned in order to meet production commitments.

A second problem involved abnormally high temperatures in the reservoirs. New equipment that could withstand the heat had to be installed, resulting in a temporary slowdown of production.

These initial troubles, however, eventually served to expand Unocal’s project in the Gulf. To offset smaller than anticipated initial production levels, the company volunteered to speed up development of additional gas fields. In May, 1982, Unocal and the PTT signed the Second Gas Sales Agreement, a contract that covered four new fields in the Gulf—Baanpot, Satun, Platong, and Kaphong.

Three of these fields are now on production. And the experience that crews gained working the Erawan field paid off in faster, smoother development of the newer fields. Baanpot began production in October, 1983—14 months ahead of schedule. Satun and Platong commenced production in early 1985, also well ahead of schedule.

Today, production from all four gas fields is still going strong. Indeed, total output recently hit new peaks. In April, the company set a record for average daily production of 530.6 million cubic feet of gas per day.

According to Keller, Unocal Thailand plans to further increase production capacity by adding more platforms. “Two are scheduled for installation at Erawan in April, and two are planned for the Kaphong field later this year,” he says. Each of the new platforms will accommodate 12 wells.

The greatest limitation presently facing the natural gas project is pipeline capacity, Suter says. “At the beginning, Thailand had a choice: build a big, expensive pipeline or build a smaller one and add capacity later. It made economic sense to go with the smaller line, and that’s what the government did. But now we’ve just about achieved the high-end production the pipeline can handle.”

The PTT owns the pipeline and has the responsibility for adjusting its capacity to meet energy needs. Unocal is currently working with the PTT to boost the line's capacity by designing a compression system. "Adding compressors will allow us to increase pressure in the line, and thus ship more gas," Suter explains.

Advancements in offshore production techniques and geophysical technology have played a major role in Unocal's success in Thailand. Perhaps the most important development is that of three-dimensional seismic processing. The 3-D system allows the use of complex computer programs to map individual faults and, in many cases, the individual sandbeds.

Although the technology has not yet advanced enough to determine whether the sands contain hydrocarbons, the 3-D system has greatly enhanced the ability to spot potential objectives. "We would not have been able to complete our detailed well development work without the 3-D program," explains Ken Bradley, exploration manager for the Thailand project. "Since the geology of the area is so complex, the old method of using large grids to locate sandbeds could not give us the intricate detail we need to find potential reserves quickly and accurately."

The project has also been spurred along by advancements in drilling technology. When the company began drilling more wells to make up for the smaller than anticipated reservoirs, engineers searched for ways to drill more quickly and economically.

"A major effort went into experimenting with different drilling fluids," Keller explains. "We also tested new casing programs and drill bits. The effort has paid off. Back in 1980, it took us 50 to 60 days to complete a well. Now drilling time is down to an average of just under three weeks."

The success of these experiments has also reduced the cost of drilling in the Gulf—to about one-half the cost per well when drilling began in Erawan in 1980.

Suter credits the drilling department for reducing costs and improving drilling speed. "We have a highly motivated drilling department that always works hard to improve operations," he says. "Having the right attitude is the key. You can get complacent after drilling so many wells, or you can try to do even better. We're always striving to improve."

Putting together such a dedicated and experienced staff—in all departments of Unocal Thailand—has not been easy. Since the company was the first to develop the oil and gas industry in Thailand, the Kingdom did not have a cadre of people with oil field or production experience.

To develop a skilled workforce, Unocal established a training facility at Songkhla in southern Thailand. The company set a high priority on training Thais to take over as many positions as possible. Candidates were recruited from the nation's top technical schools.

Now in its eighth year of operation, the training program begins with an intensive course in English—the international language of the oil and gas industry. Students are then instructed in various specialties, such as instrumentation and production operation. Graduates are assigned to positions on the offshore production platforms.

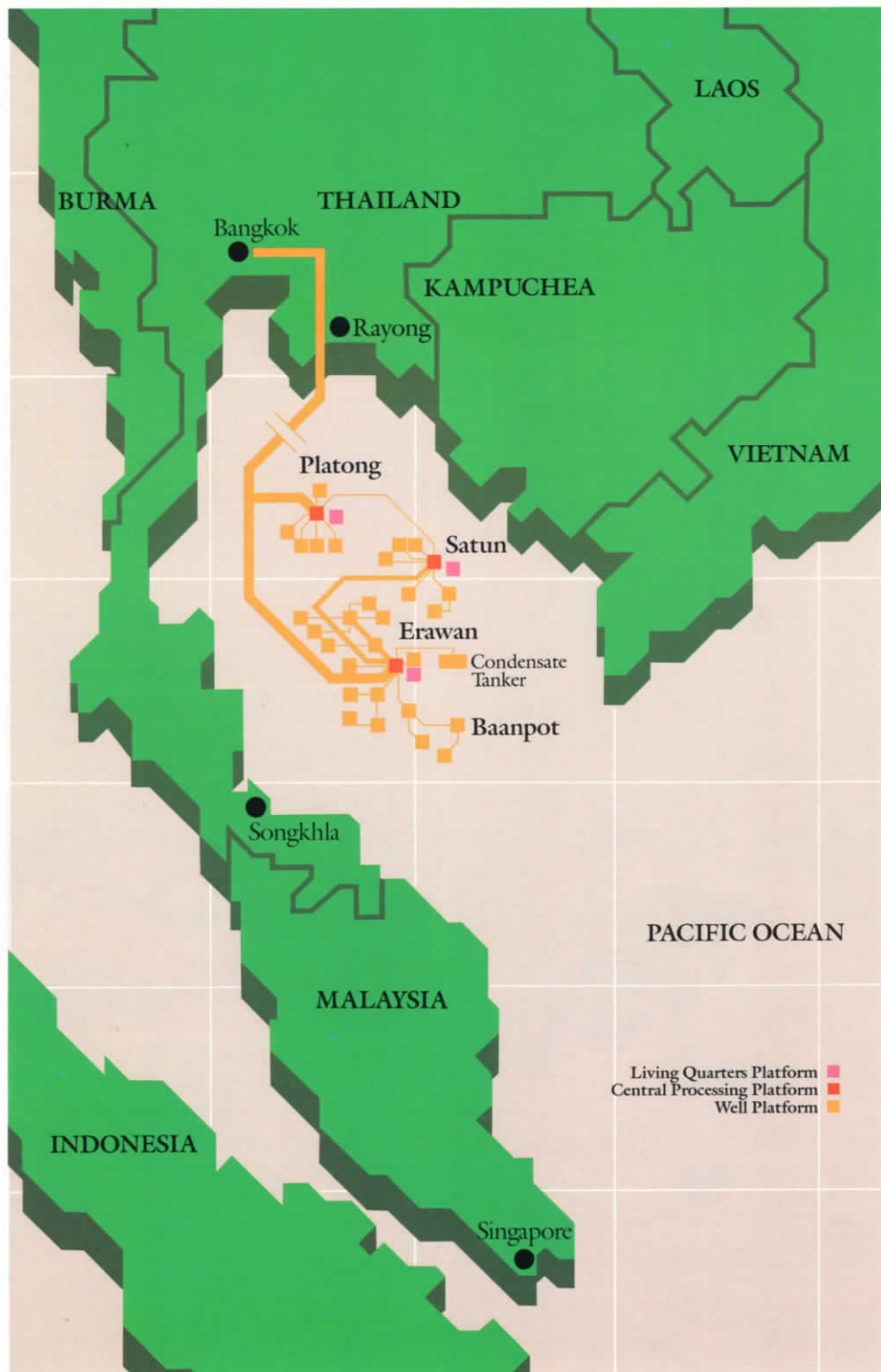
Unocal presently employs close to 315 graduates of the training center in offshore positions. Because all current jobs are filled, the center is now being used for supervisory and fire safety instruction. "But as our operations expand, we will resume training for offshore positions," Keller says.

To commemorate Unocal's 25 years in Thailand—and celebrate the project's success—the company held a number of anniversary galas in Bangkok and Songkhla.

"At the Songkhla training center, we set up a fair that featured an exhibition of Unocal's history in Thailand," Suter says. "The event also gave our independent support companies the opportunity to show their wares." Local dignitaries and students from grade schools and universities in the area were treated to demonstrations of oil field technology.



Left, a drilling crew at work in the Gulf. Top right, a view of the Erawan platform complex. Above, the permanently moored tanker Erawan, where produced condensate is stored.



Government and private officials who have been instrumental in the project attended a reception in Bangkok. Says Suter, "We wanted to celebrate what we have accomplished in 25 years because we're proud of it."

The future of the Thailand project looks bright. "Thailand is continuing to develop," Suter says. "The economy is improving and the energy demand will continue to grow."

All production thus far—from Erawan, Satun, Platong and Baanpot—has been covered under the first and second gas sales agreements. "That only includes about half of our concession area and half of our reserves," says Suter. "So there is a lot of room to grow."

While production continues in existing fields, negotiations are presently under way for a third sales contract to explore and develop Unocal's remaining concessions in the Gulf.

"The natural gas development in Thailand represents the largest single investment by Unocal in any project," says John Imle, president of the International Division. "We've invested over \$1 billion in the project thus far, and expect to invest at least that much more in the future. There is still a lot of natural gas to be found and produced in the Gulf. Thailand will remain a very significant part of our operations well into the 21st century." 76

Story by Kelley Farley

TAKING A LOOK BACK

Dr. Harold M. Lian, president and chief operating officer of Unocal Thailand, Ltd. since 1983, retired in March after serving Unocal for more than 35 years.

Dr. Lian joined Unocal in 1952 as a geologist, following completion of a Ph.D. in geology at UCLA. He spent 19 years with the International Oil & Gas Division, serving as the division's president from 1976 to 1983. In 1983, Dr. Lian was named president of Unocal Thailand and relocated to Bangkok.

In an interview with Seventy Six, Dr. Lian discusses the challenges and successes of the Thailand natural gas development project.

How did the Thailand project move forward after the initial gas sales agreement was signed?

Both Unocal and the Thai government committed substantial resources to developing the Erawan field. The Thais set up a new organization, the Petroleum Authority of Thailand (PTT), to purchase the gas from us and distribute it. They invested a huge amount of capital in constructing the world's longest underwater pipeline, and contracted for the building of a gas separation plant to extract liquified petroleum gas from the gas stream. The principal customer for the produced gas is the Electricity Generating Authority of Thailand. This state-run enterprise made very large investments to build and convert generating plants to utilize natural gas.

The Thai government also initiated the Eastern Seaboard Development Project. This is an industrial development based on the utilization of natural gas. It is located on the eastern shore of the Gulf of Thailand, about 100 miles south of Bangkok. Today it's well on its way, and will include deep-water ports and several petrochemical plants, among other industries.

The pace quickened substantially for Unocal once that first sales agreement was signed in 1978. Development of the Erawan field proceeded, with the first gas arriving onshore in the fall of 1981. When work on the Satun, Platong and Baanpot fields began in 1982, we were developing four fields simultaneously. We had up to seven rigs drilling, and at one point we had six platforms being fabricated simultaneously.

At the same time, we wanted to maintain very close relations with the government and the state enterprises. Our situation was and is a bit unique in that respect. Since there is only one customer for our gas production in Thailand—the PTT—and Unocal is the only producer in the Kingdom, we are in effect an energy arm of the government. So we have to work closely with them on both short-range and long-range planning.

Development of a new gas field can take up to four years of lead time, so we need to keep abreast of what the Thais' long-range plans are. On the other hand, they have to know what our capabilities are. We accomplish this by keeping in close contact with the cabinet ministers, and with officials of the PTT and the Thai government's Department of Mineral Resources.



What obstacles has the company faced over the course of the Thailand project?

We had some technical problems at the beginning because, as we got more information from drilling development wells, we learned that the geology of the region was much more complex than it appeared to be from the earlier exploratory drilling. The area is intensely faulted, and the faults are closely spaced so the reservoirs are confined to a multitude of narrow blocks. These blocks are both pressure-separated and fluid-separated from adjacent blocks. As a result, each reservoir is very restricted in its extent.

In addition to having these structural complications, the region is also stratigraphically very complex. The gas-bearing sands are deposits left by streams and rivers which flowed over the landscape 10 to 25 million years ago. But there are no “blanket” sandbeds that cover a large area. Instead, we’re dealing with up to 10 or 15 sands per well—and each sand has a limited extent because of the manner in which it was deposited, plus the barriers imposed by faulting.

As a consequence, production from these reservoirs declines more rapidly than is normal. In order to reach and maintain our production goals, we had to drill many more wells than originally planned.

The Unocal Thailand project also had a temporary temperature-related problem. The Gulf of Thailand basin has one of the highest thermal gradients in the world. When we reach certain depths, the temperatures are so high that the then-available downhole production equipment couldn’t stand up to the heat. Fortunately, a new synthetic material was developed that could handle the extreme temperatures and that problem has been solved.

These problems served, for a time, to limit production. But there was no development history to alert us to these obstacles. No one had ever drilled for or produced oil and gas in the region before. We were pioneers, doing it all for the first time. And once we understood the problems, we were able to devise solutions.



How has Thailand benefited from Unocal's presence?

Unocal's natural gas projects have changed the energy scene in Thailand forever. The signing of the Erawan contract set in motion a series of developments with far-reaching consequences, and which are still continuing. Our gas projects have lessened Thailand's dependence on imported fuel oil to a very large extent, with lower energy costs and with a significant savings in foreign exchange. Today, more than half of Thailand's total electricity demand is met by using our natural gas as the generation fuel.

Downstream projects are producing lower-cost products for the Thai consumers. The Thai government receives more than \$50 million a year in royalties alone, in addition to taxes.

The development of human resources has proceeded hand in hand with the physical developments. Hundreds of Thais have been trained to operate the offshore production platforms. Thai geologists, geophysicists, engineers and computer specialists work in our Bangkok headquarters. They are routinely applying some of the most sophisticated oil industry technology in the world. The transfer of technology is a daily event at Unocal Thailand.

In what ways has Unocal benefited from the project?

In addition to its commercial viability, the project has given our geologists, engineers and other technical staff the opportunity to be on the leading edge of exploration, drilling and production technology. That will serve the company well in the future.



In what other ways has Unocal been active in Thailand?

I believe that a responsible company doing business overseas should play a role in the social, educational and cultural fabric of the host nation. Unocal has done this.

We are on the Advisory Council of the Sasin Graduate Institute of Business Administration at Chulalongkorn University, the principal university of Thailand. Unocal has endowed a chair in Management and Energy Economics at the Institute. It will feature distinguished lecturers in these fields from around the world. Unocal has provided lecturers to many universities and technical schools in Thailand, supported local and national charities, served on social and cultural boards and commissions and, in general, has tried to participate in the non-industrial sector in a meaningful way.



What does the future hold for Unocal in Thailand?

The future for Unocal Thailand is promising and exciting. We have discovered five additional gas fields and are now negotiating a third gas sales agreement for those fields. We plan to develop them on a regular basis during the 1990s to offset the natural decline of our existing fields and to meet the increasing demand for gas.

Unocal is in an excellent position to meet the Kingdom's gas requirements for many years to come and to continue to play a leadership role in energy developments. Our 25 years in Thailand span a history of promises made and promises fulfilled. That will continue as we move into the future. 76



FOCUS ON SAFETY

Unocal Corporation Safety Policy

Unocal Corporation recognizes its obligation to provide all employees with a safe and healthful workplace. The company has provided—and will continue to provide—the human, physical and financial resources necessary to meet this objective. We expect employees at all levels of the company to use these resources to make our operations as safe and healthful as is humanly possible.

The operating divisions and staff departments are responsible for developing detailed practices and procedures to carry out this Corporate Safety Policy.

The subject is safety, and the message from Unocal management is strong and clear. "When it comes to safety, there can be no compromises," says President and Chief Operating Officer Richard J. Stegemeier. "We simply won't settle for anything less than the safest possible workplace for every employee."

Although safety has always been a Unocal priority, in the last two years the company has re-focused and strengthened its efforts to reduce accidents in the workplace.

"It's not that we were unsafe before," says Stegemeier. "But after taking a good hard look at our safety program, and comparing it with the most successful programs run by some other industrial companies, we simply realized that we could do better."

Key to the success of Unocal's safety effort is increasing the safety awareness of employees throughout the company's worldwide operations. "Safe operations depend on more than having good equipment and facilities," says Stegemeier. "Safety is also a *state of mind*. It's essential that we instill in all our employees the commitment to be responsible for their own safety—and for the safety of their co-workers."

Unocal's new accident reporting system reflects the importance accorded safety by senior management. When a "lost-workday case" (an on-the-job injury that results in the employee losing a work day) occurs anywhere in the company, including overseas, the injured employee's immediate supervisor must promptly report the details of the accident directly to Mr. Stegemeier.

"We recognize that reporting to the president of the company can seem somewhat threatening," says Stegemeier. "But it's a good way to send a clear signal to our people in the field that safety is a top priority."

When an accident report is submitted, it must describe what occurred and why, and what action the supervisor is taking to ensure the same kind of accident doesn't happen again. "Our goal here," says Stegemeier, "is not to punish or to fix blame, but to determine exactly why accidents occur—so we can better prevent them."

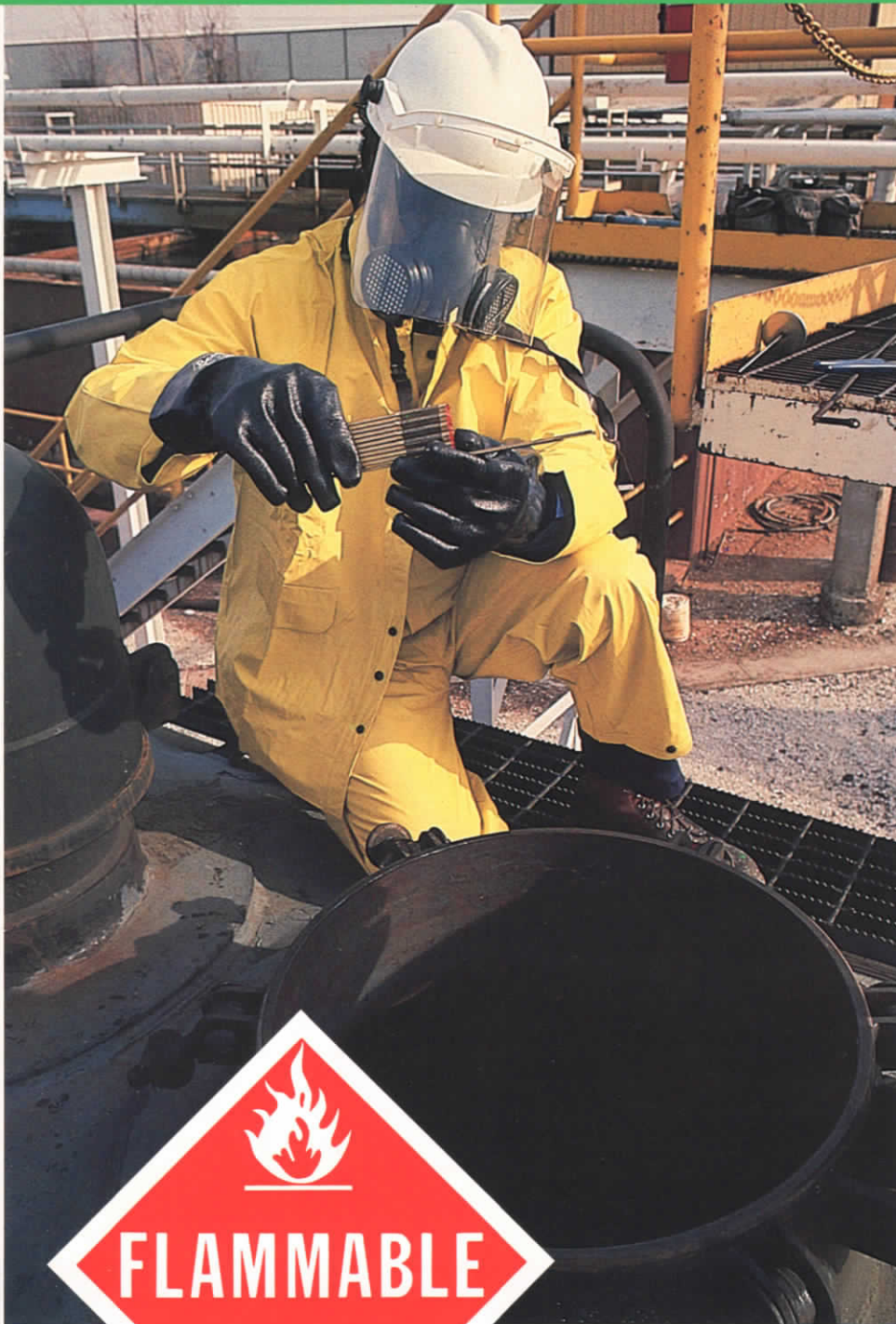
Unocal's concern with safety isn't confined to the workplace. The company is encouraging employees to adopt safe habits at home, too—and for good reason. Statistics show that the average American worker is much safer on the job than off. For example, in 1986 there were nearly 11,000 deaths in the U.S. from work-related accidents, according to the National Safety Council. But that same year, over 36,000 workers died in off-the-job accidents. (Total accidental deaths in the U.S. in 1986—including non-worker fatalities—numbered about 94,000.)

"We're interested in our employees as people—not just in their work performance," says Stegemeier. "We want to promote their health and well-being 365 days a year."

To strengthen the company's overall approach to safety, Unocal formed a corporate Department of Safety & Risk Management in 1986. The group is part of Corporate Engineering & Construction, which is headed by Unocal Vice President Darcel L. Hulse. Ronald Runge is director of the new department, which is responsible for monitoring the company's safety performance and ensuring that high safety standards are employed throughout Unocal's operating divisions.

"The goal behind creating the new safety group was not to replace the existing programs within each division, but to offer an added resource," says Runge. "We're fairly small—just six professionals—so ours is primarily a consulting function. We monitor safety programs within each operating division, establish uniform standards and guidelines, implement training, and offer suggestions. We also assist in major accident investigations, and communicate the lessons learned."

Runge, who has a degree in chemical engineering, has more than 30 years of experience in the refining side of the oil business. "One way our new safety group can really help the company is by keeping up on what's new and effective in safety—both within Unocal and in other companies," he says. "In that way, we can serve as a central resource of safety information for the different divisions."



Above, Safety & Risk Management Department director Ron Runge (center) is flanked by safety manager Lawrence McKelvie (right) and N. Sankaran (left), manager of risk assessment. Bottom left, a worker at the Chemicals Division's Bridgeview, Illinois polymers plant dons a protective suit and breathing apparatus. Top left, measuring the level of vinyl acetate in a rail car.





Emergency response training is an important element of Unocal's safety program. Classes and drills are held regularly at all company plants and facilities. Pictured here is the fire school at the Los Angeles refinery.



One of the group's main jobs is to compile accurate statistics on accidents in order to track the company's overall safety performance. Another key responsibility is keeping track of changes in federal and state regulations that pertain to employee safety, and ensuring that Unocal's operating procedures meet or exceed these standards. When new OSHA (Occupational Safety and Health Administration) regulations appear, such as guidelines for handling a particular chemical, the safety group will help to update procedural manuals and ensure that the company's operating divisions have the necessary information to be in strict compliance.

Runge emphasizes that creation of the corporate safety department does not shift the responsibility for safe operations away from individual facilities. "Safety has always been, and should always be, a line function," Runge says. "Safe operations depend upon every employee and every supervisor following safe procedures and being appropriately trained."

Lawrence McKelvie, safety manager for the department, has just finished updating company safety manuals for handling benzene—a chemical used in the refining process. "In addition to OSHA laws, we also keep up with DOT (Department of Transportation) regulations that affect ships, motor vehicles and pipelines, as well as state fire codes and industry guidelines established by the American Petroleum Institute (API)," says McKelvie. Unocal's approach to safety calls for more than just operating within the letter of the law, however. In many cases, the company adopts safety standards which are far more stringent than those prescribed by regulations.

The Safety & Risk Management group also plays a key role in safety training. McKelvie, for example, coordinates an annual fire school for supervisors which is held at the University of Nevada in Reno. Last year, a record 93 students from the company's operating divisions attended the four-day training session, learning the latest techniques in fire control and prevention.

"The toughest part of any safety program is to change attitudes about safety," says McKelvie. "You can train someone to do a job safely, but unless safety awareness is a part of that employee's daily behavior, the training becomes ineffective."

Risk assessment is another vital function performed by the new safety group. N. Sankaran, manager of risk assessment, helps the company's operating divisions evaluate potential risks and take action to reduce them.

"The risk factor," says Sankaran, "is really a function of two variables—the probable frequency of an occurrence, and the magnitude of the consequences." For example, the failure rate of a given piece of equipment may be very low. But if the consequences of that failure are likely to be catastrophic, the risk factor is still unacceptably high.

Of course, there is always a degree of risk involved in virtually any activity. "What we try to do is quantify risks," explains Sankaran, "and then determine whether those risks are acceptable or unacceptable." On a simpler level, of course, each of us makes these kinds of judgments daily. We walk up stairs, cross the street, drive the freeways—not because these actions are devoid of risk, but because we believe that the risks are acceptably low.

The science of risk assessment makes similar judgments—but only after exhaustive study. One of the preferred tools for determining risk is called the Hazard and Operability Studies (HAZOP) technique. In essence, it's a brainstorming approach conducted by a team of experts. HAZOP is often used during the design and construction of new facilities to determine the potential hazards of mechanical failure or human error.

At the company's Los Angeles refinery, for example, construction of a new cogeneration plant has been accompanied by regular meetings of engineering personnel to evaluate potential risks. And Unocal's Geothermal Division has completed a comprehensive HAZOP study of a new 47,500-kilowatt electrical generating plant currently under construction in California's Imperial Valley.



Safety has always been, and should always be, a line function. Safe operations depend upon every employee and every supervisor following safe procedures and being appropriately trained.





Unocal must seize the initiative to forge strong partnerships with the communities where we do business. One way to do that is to show these communities that we're every bit as concerned with health and safety as they are.



At a typical HAZOP meeting, engineers may spend hours analyzing just one small aspect of the plant's design—discussing the possible effects of every conceivable malfunction. A thorough risk assessment is a time consuming process. But it's one of the best ways to anticipate problems and correct them before they can cause accidents.

Unocal's new safety group is just one part of the company's overall effort to reduce work accidents, promote employee health, and protect the public and the environment. Joseph Byrne, vice president of Corporate Human Resources, chairs the Environmental Health and Safety Committee. The group meets regularly to coordinate the company's health, safety and environmental programs. Other members of the committee include Ron Runge; Carleton B. Scott, director of Environmental Sciences; Dr. Reynold Schmidt, director of the Corporate Medical Department; and Karen Sikkema, vice president, Corporate Communications.

"Not so many years ago," recalls Byrne, "what took place within the boundaries of a company facility related to employee health and safety, and what took place outside was environmental. Now, with the growing public concern about plant safety, toxic chemicals, air emissions and the like, there is a good deal of overlap."

For example, the new Superfund Reauthorization Act (SARA) charges industry with strict reporting requirements on the presence of hazardous chemicals in facilities and their release into the environment. The law also mandates a partnership between the public and private sectors to plan for emergencies that involve hazardous chemicals.

Given the public's growing concern over plant safety, especially as it relates to toxic chemicals, it is essential for Unocal to take an active role in educating the public about the strict safety procedures observed at company facilities.

"Unocal must seize the initiative to forge strong partnerships with the communities where we do business," says Byrne. "One way to do that is to show these communities that we're every bit as concerned with health and safety as they are."

Although Unocal has re-focused its safety program, one thing hasn't changed. The primary responsibility for safety continues to reside with the men and women who manage the day-to-day operations of Unocal facilities around the world. Following are just a few examples of the kinds of innovative safety programs being developed at various Unocal locations.

To promote family health and safety, Steve Findlay—manager of loss prevention for the Petrochemical Group (Chemicals Division) in Schaumburg, Illinois—has organized seminars for employees and their families. The sessions, planned and implemented by employees at individual plant sites, cover topics such as defensive driving, drug and alcohol abuse, crime prevention and home safety.

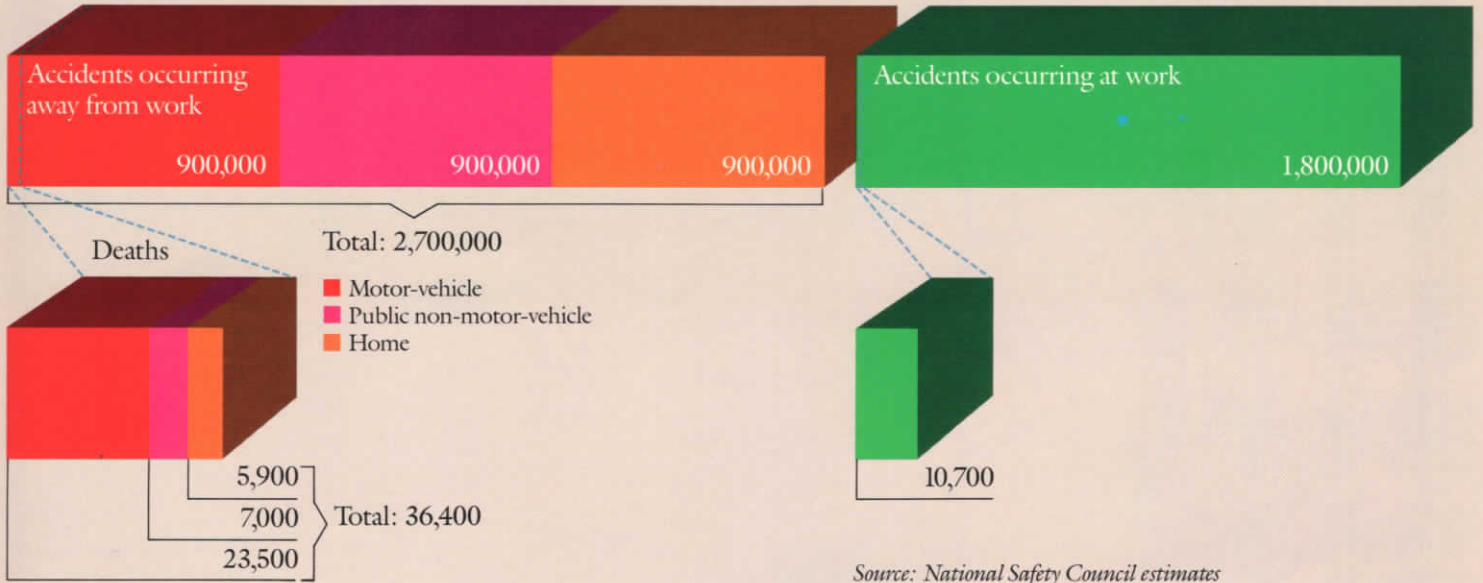
Findlay has also developed a chemical safety brochure aimed at both customers and employees. "The brochure is proving to be an excellent training aid for our employees," says Findlay. "It's also a great promotional tool. We've sent the brochure to our chemical customers, and it's been very well received."

Unocal's International Oil & Gas Division employs an inspection program called the "Good Operations Task Force." Under this plan, teams from neighboring regions inspect each other's operations. For example, a team from Indonesia will inspect operations in Thailand, and vice versa. The plan has proved a good way to bring a fresh set of eyes and a new perspective to the task of making operations safer.

At Molycorp's lanthanide mine at Mountain Pass, California, plant manager Robert Sega and safety supervisor Andy Manzanares have introduced a program called the STOP system to reduce accidents. Developed by the DuPont Corporation, STOP (Safety Training Observation Program) is designed to make every supervisor and employee a skilled safety observer. When a worker sees a fellow worker acting in a potentially unsafe manner, he hands the employee a STOP card—a reminder to work more safely. At the end of each month, the number of cards given out and the types of incidents observed are reviewed by supervisors. The results are discussed at regular safety meetings.

Accidents Involving U.S. Workers – 1986

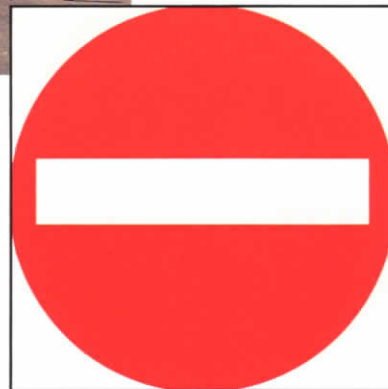
Disabling Injuries



Source: National Safety Council estimates



Above left, Unocal truck drivers test their safe-driving skills at the annual Truck Rodeo. At right, Unocal Canada's Obed thermal coal mine emergency rescue team. The Obed team placed first in Alberta's annual Surface Mine Rescue Competition.



We're definitely on the right track. But the job isn't finished—not by a long shot. When it comes to something as critical as safety, we can't afford to be complacent.



Above, Unocal workers undergo spill control training in Ventura harbor, California. Bottom, offshore workers practice marine rescue techniques in the Gulf of Mexico.



Safety is serious business, but promoting safety awareness can be fun, too. Last year, for example, Refining & Marketing's management services group used a monthly telephone quiz to encourage home safety. Employees selected at random were called and asked if they knew the monthly safety slogan. Winners were awarded \$25 in auto scrip, redeemable at Unocal 76 service stations. The safety slogans were printed on colorful wall calendars supplied to every employee.

For the past nine years, the western marketing group has also sponsored a "Truck Rodeo" as part of its safe-driving effort. Only Unocal truck drivers with flawless safety records for a given year are eligible to compete. The rodeos consist of competitions in various truck categories that range from small flatbeds to large truck-and-trailer rigs. The competition stresses safety, with drivers performing slow-speed backing, turning and parking maneuvers in tight quarters. Winners of area events compete for trophies and cash prizes at the finals held each summer.

Innovative training programs are also a key part of Unocal's safety effort. Bill Lovell, safety coordinator for the Oil & Gas Division's Gulf Region, and Tim Creswell, offshore foreman, created a marine rescue training module that includes slides and videotape. The training is aimed at platform, boat and helicopter crews who might be called upon to rescue a man in the water. The module has been well received and is currently being developed into an API Recommended Practice.

In the last year, a number of Unocal facilities have distinguished themselves by their exceptional safety records. Offshore Southern California, Unocal's Platform C in the Dos Cuadras field received a SAFE award (Safety Award for Excellence) from the U.S. government's Minerals Management Service (MMS). The award cites Unocal for conducting oil and gas operations on Platform C with particular concern for human safety.

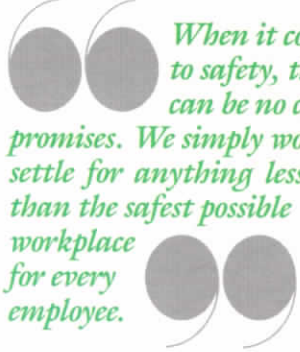
During a six-month period, the MMS (a part of the Interior Department) performed 19 inspections on the platform and found that workers were exceptionally well trained in environmental awareness, safety, fire fighting and operating regulations. The award, which commended "Unocal's commitment to maintain an extremely qualified work force," was followed up by a personal note of congratulations from California Governor George Deukmejian.

In Alberta, Canada, Unocal's Obed thermal coal mine surpassed 240,000 employee-hours in 1987 without a disabling injury. This far exceeds the facility's previous high of 60,000 hours. The mine's eight-man emergency rescue team also brought Obed recognition for outstanding safety by winning first place in the 7th Annual Surface Mine Rescue Competition, sponsored by the Alberta Chamber of Resources. The Obed team surpassed 11 others—all representing different Alberta mining operations—in responding effectively to simulated emergencies.

Perhaps the most impressive safety achievement was earned by Unocal's San Francisco refinery (SFR). During 1987, SFR surpassed five million employee-hours—more than five years of continuous, 24-hour-a-day operation—without a single disabling injury. That's a new company record, and one of the best marks ever achieved in the refining industry. Refinery manager John Dietzman, personnel superintendent and safety coordinator Henry Thatcher, and all SFR employees take great pride in their accomplishment.

Overall, Unocal's company-wide statistics on accidents for 1987 indicate that the new emphasis on safety is paying off. The frequency of on-the-job injury has declined from 1.4 per 200,000 employee-hours for the 1984-86 period to just 1.0 in 1987—a 28-percent improvement.

Unocal management is encouraged by the results so far. "We've made real progress in reducing accidents," says Stegemeier. "We're definitely on the right track. But the job isn't finished—not by a long shot. When it comes to something as critical as safety, we can't afford to be complacent." 76



When it comes to safety, there can be no compromises. We simply won't settle for anything less than the safest possible workplace for every employee.

Story by Clark McCann, Unocal staff writer

PIONEERING WORK WINS HONORS

Dr. Carel Otte, president of Unocal's Geothermal Division, recently received one of the highest honors bestowed on engineers in the United States: membership in the National Academy of Engineering (NAE).

Only 1,417 engineers belong to the elite NAE, which was established in 1964. The academy has previously recognized two other Unocal engineers. Chairman and Chief Executive Officer Fred L. Hartley was honored with membership in 1980, and retired research engineer L. Wally Holm was elected to the academy in 1986.

Academy membership honors those who have demonstrated "unusual accomplishment in new and developing fields of technology." Potential NAE members are nominated each year and voted on by the group's membership. Dr. Otte was elected for his pioneering work in exploring for and developing geothermal energy.

"This is certainly a pleasure," Dr. Otte says, "because it's an honor to be recognized by your peers for your efforts. And, there's a universality attached to the award that draws national attention to Unocal's accomplishments in the field of geothermal energy."

While being an honored form of recognition for outstanding achievements, membership in the NAE does not come without responsibilities. Academy engineers are often called upon to assist in the preparation of policy studies and assessments of technology for the U.S. Congress and the government's executive branch.

Otte views his NAE honor as reflecting on Unocal for the company's pioneering effort in geothermal energy development. "We always felt we were on the frontier, because no one else had ever tried to harness geothermal energy in a large-scale way," he explains.

The effort involved much more than overcoming difficult technical obstacles, Otte says. Since geothermal energy was a new industry, the company had to operate on the cutting edge of a number of areas—geothermal ownership rights, government regulation and environmental protection, to name a few.

"Our success is due in large measure to the active support and guidance of Unocal's executive management," Otte says. "With their endorsement, we have gathered a talented staff of engineers, geologists and other professionals over the years. All of them have worked together—and with individuals from other parts of the company—to develop our geothermal projects."

Dr. Otte was raised in the Netherlands and received a Bachelor's Degree in Geology from the University of Amsterdam in 1943. His curiosity to explore brought him to California, where he received a Master's Degree from the California Institute of Technology in 1950. He went on to earn his Doctorate there in 1954.

During his career, Dr. Otte has been recognized by the National Society of Professional Engineers and the Institute for the Advancement of Engineering. He was a Distinguished Lecturer for the Society of Petroleum Engineers in 1980. In 1984, he received the California Institute of Technology's Distinguished Alumni Award.

Otte was with Pure Oil when it merged with Unocal (then Union Oil Company) in 1965. "I had just started working on the development of geothermal energy while at Pure Oil," Otte says. "But it wasn't until the merger that the project gained momentum. Unocal's upper management had the foresight to recognize the potential of geothermal energy. They were willing to look at new ideas and support them."

The geothermal operation born of that innovative collaboration is now the world's largest. Unocal's net worldwide geothermal production generated an average of nearly 24 million kilowatt-hours of electrical power per day in 1987. This is enough to meet the combined electricity demands of a city of nearly one million people. The company has found and developed geothermal resources in California, the Philippines and Indonesia, and other locations are presently being explored.



Unocal's development of The Geysers geothermal field in Northern California—the world's largest—began in 1965. The area was judged ideal because it contains a dry steam reservoir (the underground fluids are already in steam form). The produced steam can be used directly to run the turbines in electricity-generating power plants.

"The project was greatly expanded in 1967 when Unocal merged its land holdings with those held by the Magma Power and Thermal Power Companies," Otte says. "Under the new arrangement, Unocal became field operator with a 50-percent interest in the project. From that time on, development of The Geysers greatly accelerated."

The northern part of the state is not the only fertile geothermal ground in California. Beginning in 1980, Unocal has also developed geothermal resources in the Imperial Valley, southeast of Los Angeles. The Imperial Valley project was the first to demonstrate the feasibility of producing highly saline hot water geothermal fluids and extracting steam to generate energy.

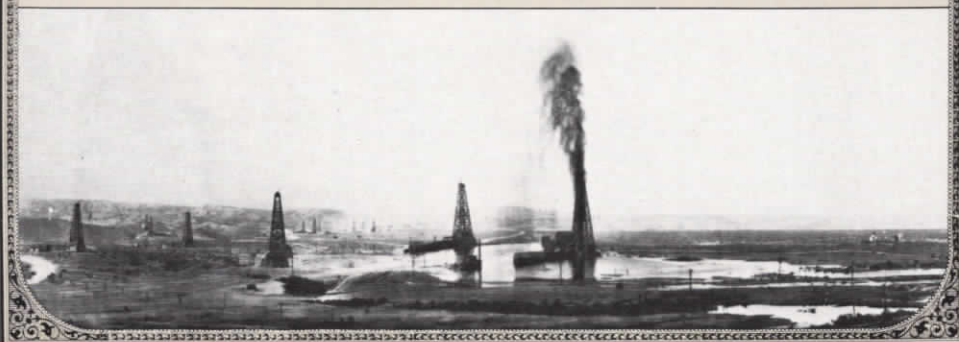
Engineers on the project had to find ways to capture the heat energy in the fluids efficiently—while controlling the corrosion and scaling caused by the highly saline nature of the reservoirs. Together with researchers at Unocal's Science & Technology Division, Otte and his team pioneered the design of production systems and engineering technology for the hot water gathering systems. These efforts led to the development of a wide range of systems to control corrosion, scaling and emissions in the Imperial Valley. Some of the technology is currently being applied at other geothermal development locations.

"We are also expanding in a new direction in the Salton Sea area of the Imperial Valley," Otte says. "Desert Power Company, a Unocal subsidiary, is currently building a 47,500-kilowatt power plant there. This facility, scheduled to be operational in early 1989, will be the first commercial-sized electrical generating plant Unocal will own and operate. So we will not only be producing geothermal energy, but also generating electricity."

Unocal's overseas geothermal operations have also been highly successful. The company's Philippine Geothermal Incorporated subsidiary, formed in the early 1970s, operates two major liquid-dominated geothermal fields in the Philippines. "We are currently supplying a significant share of the energy generated on the island of Luzon, which includes the city of Manila," Otte says. Exploration and development are progressing in the Philippines and other overseas locations that have geothermal energy potential, including Indonesia, Japan and Turkey.

The future of geothermal energy is very bright, Otte feels. "In the future, there will be a growing demand for alternative energy that can be produced efficiently and competitively," he explains. "By continuing in the forefront of geothermal development, Unocal will be well positioned to help meet that demand in the years ahead." 76

LAKEVIEW NO. 1: A HEROIC RESPONSE



Unocal's commitment to safety is primary in all of the company's operations (see story page 20). That commitment is by no means new. Indeed, it extends back to the company's beginnings, when oil field technology was still in its infancy.

In those early years, heroic action was sometimes called for in response to emergency situations. One such instance from Unocal's past involved one of the most significant oil discoveries in the company's history—and one of most spectacular oil gushers of all time.

The story began shortly after the turn of the century, when independent oilman Julius Fried convinced six friends to join him in establishing the Lakeview Oil Company in California's San Joaquin Valley. For the group's first drilling venture, Fried settled on a spot in the southwest end of the valley, amid the gently rolling hills near Taft. The seven men erected a 72-foot derrick at the site, and on January 1, 1909, spudded in to drill a wildcat well they christened Lakeview No. 1.



AND STILL SHE SPOUTS

Efforts to Harness Lakeview Well
Prove Fruitless and She Still
Continues to Gush

The Lakeview gusher continues to gush as hard and fierce as ever. Today it rounds out its thirty-third day of continuous spouting and gives every promise of keeping it up indefinitely.

APRIL 16, 1910.

*The Maricopa Oil News
Kept tabs on the mighty
gusher.*

← *A geologist's map of the
area circa 1920.*

The type of rig the Lakeview crew used was called a cable-tool drilling rig. Developed in the late 1800s, the cable-tool method was the most advanced drilling technology of the day. The rig consisted of the derrick, a thick hemp cable, and a large, steam-powered engine. The cable was wound around a spool connected to the engine, and looped through a pulley system at the top of the derrick.

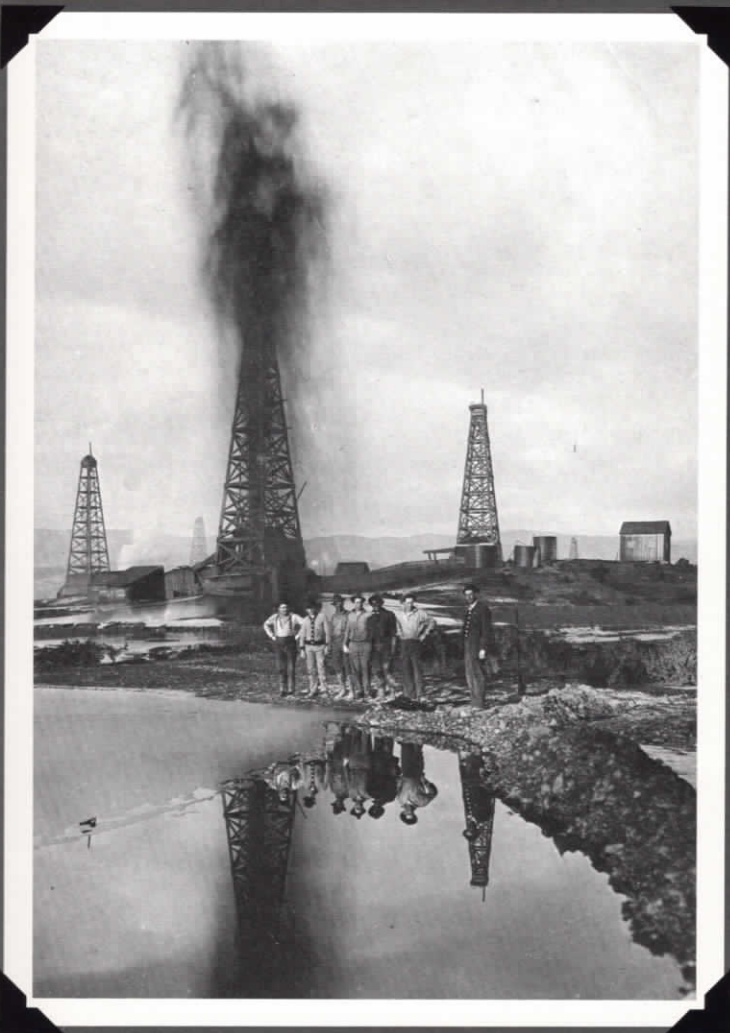
"The crews would tie a heavy bit to the end of the cable, and then alternately raise and drop the rope," explains Gary Bush, Northern California District drilling superintendent. "The effect was similar to the action of a pick. The bit would drive into the rock, 'drilling' the well. To remove the debris that collected at the bottom of the hole, the workers would lower a bailer."

Cable-tool drilling was a painstakingly slow process. Work on the Lakeview well continued for about a year, progressing to nearly 1,800 feet before the rig broke down and Fried and company ran out of money. Like many early independent oil firms, the Lakeview Oil Company was severely undercapitalized. The partners had to add funds repeatedly just to keep their lone rig running. Now, with empty pockets, they turned for assistance to Unocal (then Union Oil Company), which held a number of drilling leases in the area.

At the time, Unocal was still a relatively young company itself. Although already established as a successful west coast oil producer and marketer, the 20-year-old company was hoping for a major discovery to put it on a solid footing for the future. After considering the plight of the Lakeview partners, Unocal agreed to buy a 51-percent (and controlling) interest in the Lakeview No. 1 well.

Company officials liked the deal for two reasons. Unocal founder Lyman Stewart maintained a policy of helping out struggling independent operators, which gained him a loyal following among the independents. And several of the company's own wells in the area had already proved to be oil producers, so Lakeview No. 1 was considered a good prospect. But the purchase was conditional: Unocal would drill the hole—which as yet showed no evidence of oil—only when it had a spare crew.

Unocal's part-time interest in the well may have been reflected in the assignment of Charles Lewis Woods as foreman on the job. Although considered a top-flight driller of the time, Woods was better known by his nickname: Dry Hole Charlie. When he began work on Lakeview No. 1, Woods had yet to bring in a producing well. His luck was about to change radically.



Aided by an army of volunteers, Unocal drilling crews worked around the clock to control Lakeview's torrent of crude.

After Unocal's purchase, the Lakeview equipment was repaired and, during odd hours, the well was punched to 2,200 feet—with still no signs of oil. The morning of March 14, 1910 found Woods and his crew drilling away on Lakeview. As dawn broke, it became evident that something unusual was happening deep below the surface. First, a low, gurgling sound began to emanate from the wellbore. Soon, water filled with sand and bits of shale began to bubble up out of the hole.

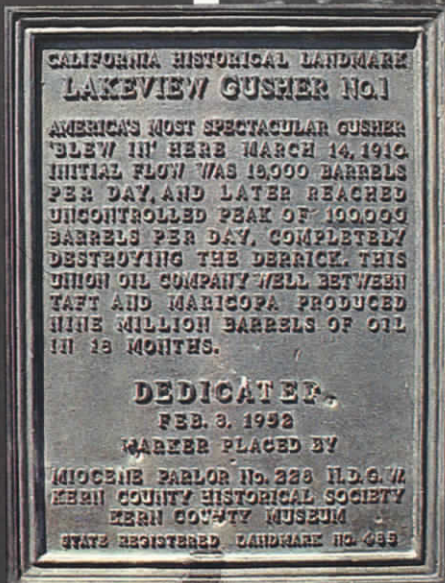
The crew stood dumbstruck as the noise grew increasingly louder, and the derrick began to vibrate. Then they ran—and none too soon. With a tremendous thunderclap, a 20-foot-wide column of oil burst through the drilling floor, spewing up through the top of the derrick 200 feet into the air.

The crew stared back at the gusher, hooting and hollering in astonishment and exultation. This was a major oil strike, beyond the wildest dreams of Dry Hole Charlie. Lakeview No. 1 had come in, and come in big.

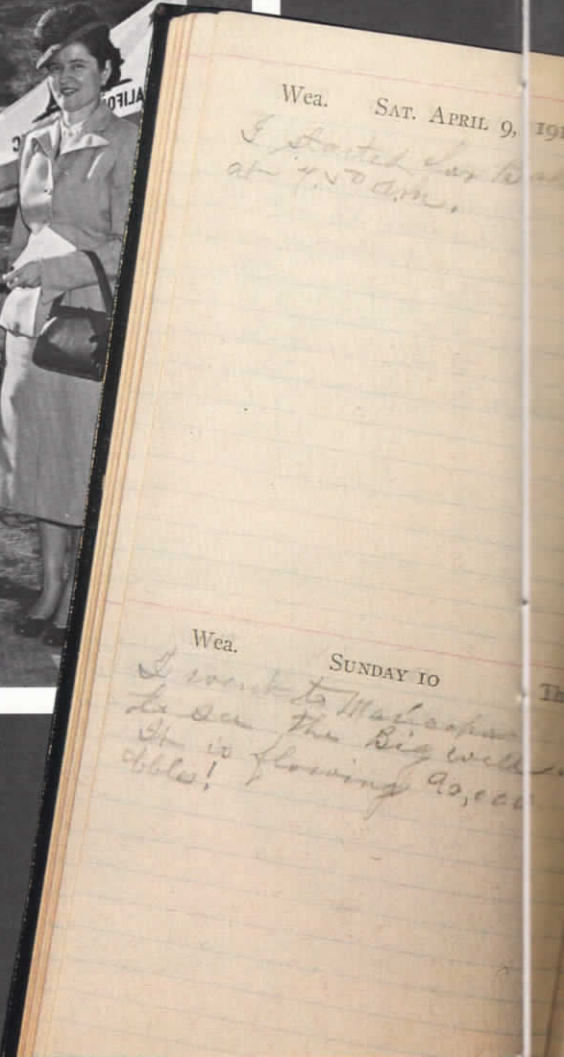
But the joy soon turned to serious concern. For instead of gradually subsiding as the pent-up reservoir pressure was released, the Lakeview gusher continued to build in intensity. Incredibly, the well spurted out an estimated 125,000 barrels of crude in just 24 hours—an amount equal to more than half of Unocal's total average daily production in 1987. And still the oil continued to come. Dry Hole Charlie summed up the onlookers' amazement, yelling, "My god, we've hit an artery!"

Woods and his crew realized they would have to take action to prevent a possible disaster. Among the concerns upmost in their minds: that the oil would flow into nearby Buena Vista Lake and contaminate water supplies, or that a huge fire would break out. "But what we feared most was rain," Woods wrote in an account of the event. "A flash flood could have spread the oil over the valley below."

Such a tremendous gusher was impossible to cap with the technology of the day. So the task at hand became finding a way to safely contain the flow—and fast. Unocal hurriedly recruited an army of 600 men to aid in the effort. Working around the clock, they dammed up the mouths of the canyons below Lakeview by constructing earthen walls 20-feet high and 50-feet thick.



Local dignitaries gathered at a ceremony marking the site as a historic monument in 1952.



The dams created a 16-acre reservoir of crude oil dubbed the "Cornfield." A two-mile-long pipeline was then constructed, leading from the reservoir to eight 55,000-barrel storage tanks. Working feverishly, the pipeline crew completed this job in just four hours.

Week after week, the gusher roared on, as the well continued to produce more than 50,000 barrels of oil per day. But the earthen dams held. Lakeview's torrent of oil had been controlled—and a potential calamity averted—through the men's heroic action.

Understandably, the Lakeview site attracted a slew of curious onlookers. A preacher conducted regular tours, asking visitors to pray that the oil might not cover the world. The well also caught national attention as Gifford Pinchot, adviser to Presidents Roosevelt and Taft, traveled across the country to view the site. Through it all Unocal's crews remained vigilant, guarding against the chance of fire or breaks in the earthen dams.

Finally on September 9, 1911, after producing some nine million barrels of crude over 544 days, the Lakeview gusher caved in and quit as abruptly as it had started. But the aftermath from California's biggest gusher was felt for quite a while.

For a time, the Lakeview strike created severe economic disruption in the west. While today's modern industrial economy—with its vast machinery and millions of vehicles—could easily absorb the Lakeview oil, the west coast in 1910 had no such demand. The Lakeview crude literally flooded the oil market, and prices plunged.

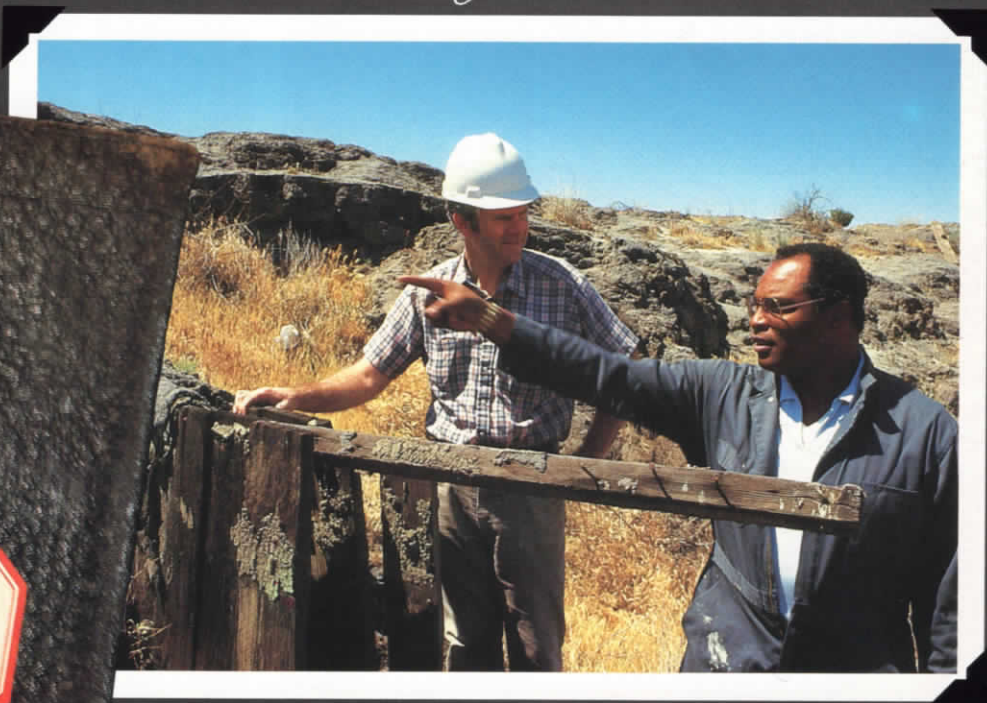
But eventually the market stabilized, and Lakeview's positive impact was more long-lasting. The discovery helped firmly establish the California oil industry, and it solidified the position of Unocal as one of the west's premier integrated oil companies.

The Lakeview well may also have been a turning point for oil drilling and production technology. In the aftermath of the torrent of crude, oil companies realized that new equipment and drilling techniques were needed to prevent such uncontrolled gushers from occurring.

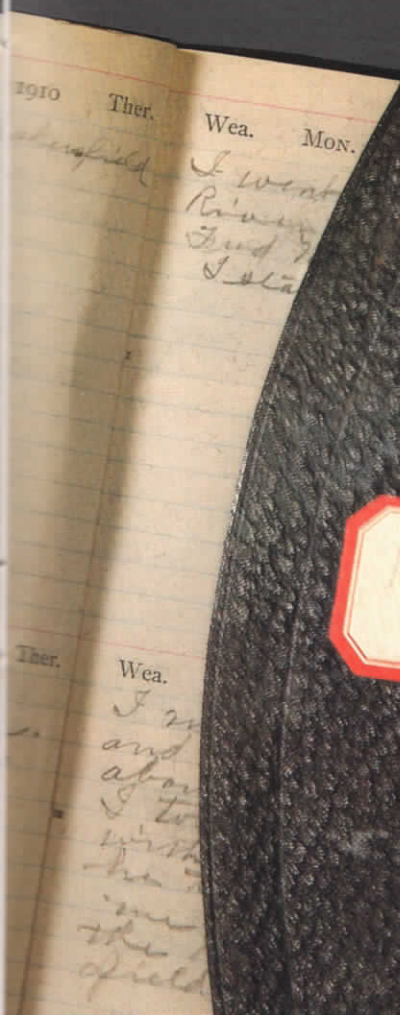
"Early wells like Lakeview were simply open holes," says Gary Bush. "When drillers hit a reservoir with exceptionally high pressure, there was no way to prevent the oil from flowing. Today we can counteract the downhole pressures with specially formulated drilling muds. We also have sensitive pressure-monitoring gear, so there are no surprises. And of course, we have blowout prevention equipment that can instantly seal off a well at the surface if necessary."

Today's drilling crews also use down-hole measurement equipment to gauge the expected flow from a well. And the output itself can be strictly controlled with modern oil production technology.

Reservoir engineer Marco Bent (right) inspects a section of the well's original derrick.



The 1910 diary of Unocal co-founder Wallace L. Hardison makes mention of the Lakeview gusher.



By regulating the pressure in a well, we can dictate how many barrels it produces each day—so producing oil wells can be safely and reliably controlled,” Bush explains. “Wildcatters in 1910 just had to accept whatever the wells gave them. But what they experienced and learned from gushers like Lakeview helped us develop the tools we have today.”

Perhaps most importantly, Lakeview and other gushers like it underscored the importance of safety awareness and emergency response in oil and gas operations. Quick thinking and fast action on the part of the Lakeview crew prevented a potential catastrophe. That attitude and operating philosophy still guides Unocal in its far-flung operations today.

And what became of Lakeview No. 1? Two years after the big gusher played out, Unocal redrilled deeper on the Lakeview site. But the once-mighty well only yielded a feeble 35 barrels per day—and even that had to be pumped. The well was capped and abandoned shortly thereafter.

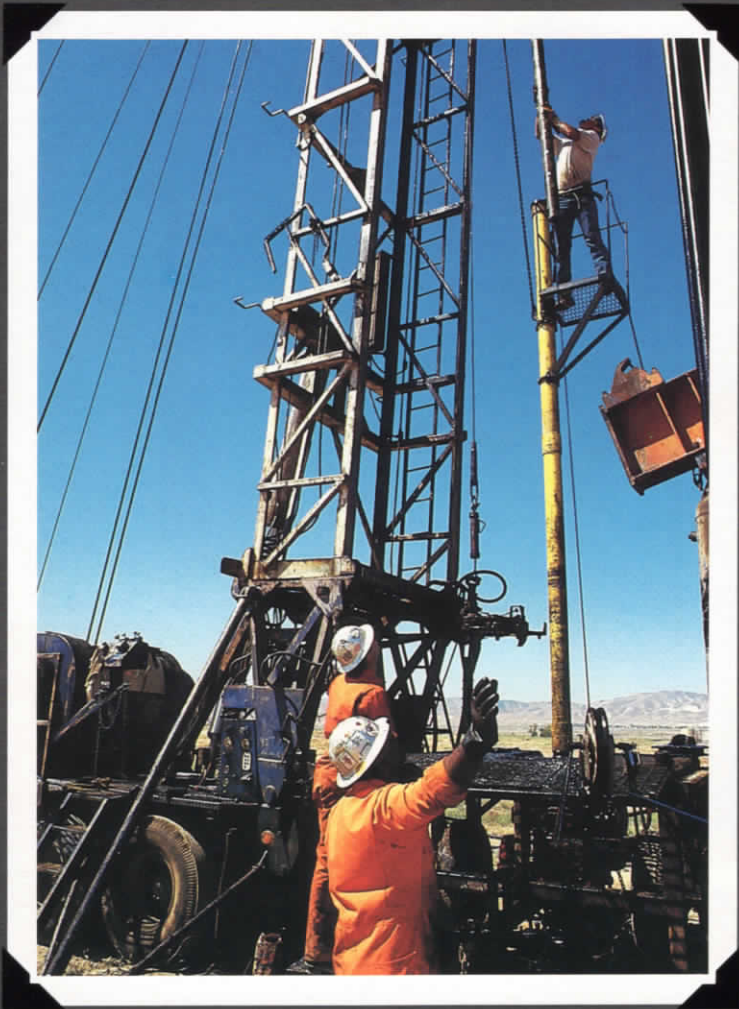
But Unocal still has oil production in the area, and the company remains active in the southern San Joaquin Valley today. Indeed, at press time, a crew was reperforming a Unocal well just a few miles from the Lakeview site. Several other well recompletions and deepenings are currently being planned.

“This is a proven oil-producing area, and we continue to study our properties here to see if we can get more oil out of the ground,” says reservoir engineer Marco Bent. “Results so far are encouraging.”

It’s quiet now at the site of Lakeview No. 1. The hills and gullies of the “Cornfield” long ago reverted to their natural state. Rabbits and ground squirrels occasionally dart through the grass and scrub brush, ever watchful of swooping hawks. Today, it’s hard to imagine the mighty gusher, or the heroic actions of the men who fought so hard to control it back in the spring of 1910.

All that remains at the wellsite itself is a small sunken crater, with a few pieces of the original wooden derrick protruding from the walls. A monument, placed in 1952 by the Kern County Historical Society, marks the famous spot, commemorating “America’s most spectacular oil gusher.” 76

This is the second in a series of articles focusing on Unocal’s heritage. The series will continue through the company’s centennial year of 1990.



Drilling activity continues near the Lakeview site today.



Inspecting the results of a reformation.



Several old wooden derricks still stand in the area.

UNISULF HELPS CLEAR THE AIR

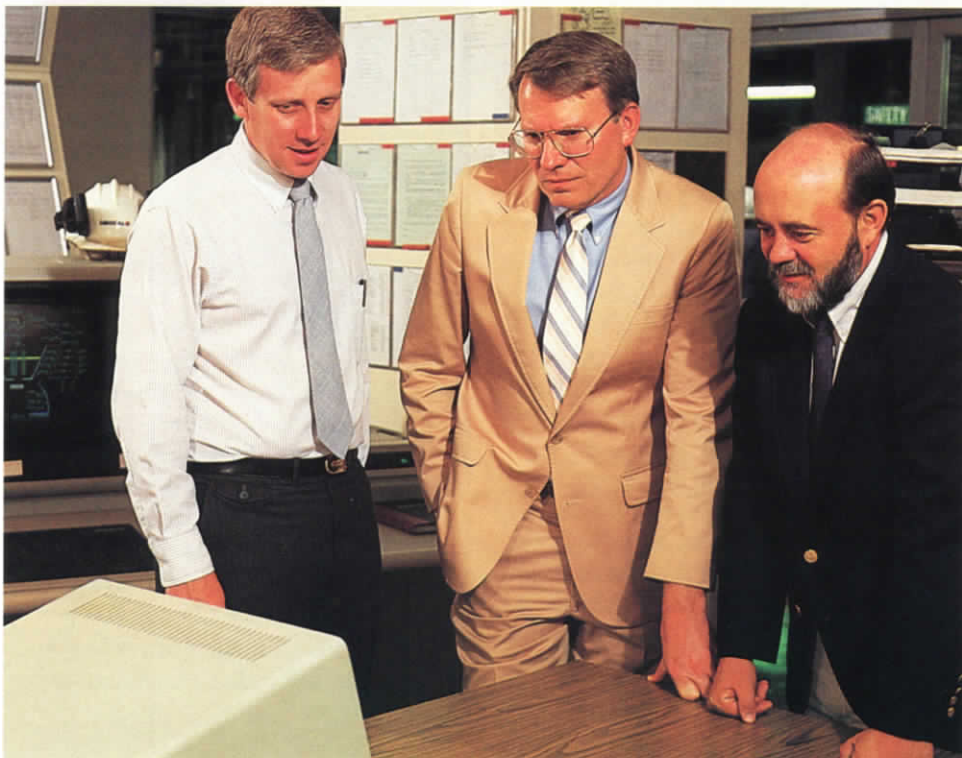
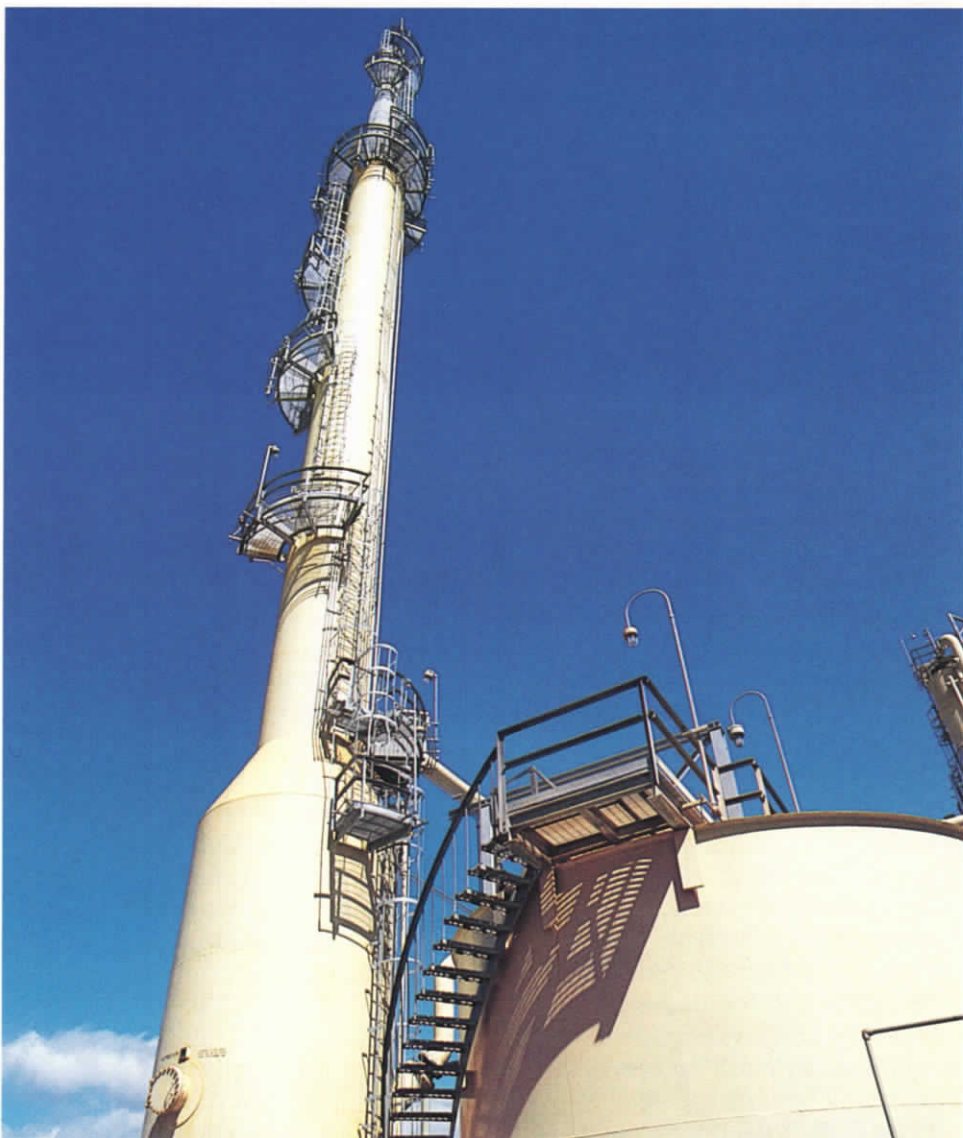
As a motorized stirring rod revolves, a frothy layer of yellow bubbles begins blanketing the surface of the large tank. Nearby gauges monitor the system's air pressure, amid a configuration of pipes, wires and receptacles. Only a small area surrounding the high-tech swizzle stick reveals the presence of an adobe-red solution beneath the bubbles.

The apparatus, part of a pilot plant at Unocal's Fred L. Hartley Research Center in Brea, California, is demonstrating how Unisulf works. When coupled with another process, Unisulf results in the recovery of more than 99.9 percent of the sulfur from gases containing hydrogen sulfide, a byproduct created during fuel processing. The Unocal-developed method uses a special solution to convert the hydrogen sulfide gas to elemental sulfur—a solid.

Unisulf can reduce refinery sulfur emissions without creating substantial chemical waste of its own. And at the same time, the process produces marketable sulfur.

"If you succeed in mitigating an environmental problem, you not only have an engineering and economic success, you also have a public success," says Unisulf co-inventor Donald Fenton, the Research Center's manager of new technology development. Fenton invented Unisulf along with Engineering Associate Hugh Gowdy.

At top, the Unisulf unit's absorber tower at the Santa Maria refinery stands next to the froth tank, where hydrogen sulfide is converted into elemental sulfur. Below, S&T researchers Dennis Delaney, Hugh Gowdy and Emmett Bingham evaluate process conditions in the Unisulf pilot plant's control room at Brea.



The Unisulf process was recently honored as one of five finalists for the prestigious Kirkpatrick Award, which the magazine *Chemical Engineering* sponsors to recognize outstanding achievement in chemical engineering. Every two years, the magazine's publisher, McGraw-Hill, assembles a panel of experts to decide which new products and processes are worthy of the honor.

Unisulf's impressive showing in the Kirkpatrick Award competition culminates several years of research, development and commercialization. More precisely, Unocal's attorneys decided Unisulf warranted a patent about eight years ago. But work on the technology began well before then and has continued ever since.

"The development of Unisulf has been a succession of improvements," Fenton says.

Unisulf was first introduced commercially in December 1985, when it was integrated into a natural-gas treatment facility in Santa Barbara County. "We now have over two-and-one-half years of operation at this plant, and everything has been very stable," says Unisulf co-inventor Hugh Gowdy. "Basically, the plant has proven our technology."

The plant, which is owned and operated by another company, also demonstrated Unisulf's potential as a marketable technology.

"One of the most positive measures we have of success is when we put something into the marketplace and somebody buys it," says John Duir, vice president of engineering and development for Unocal's Science & Technology Division. Duir is responsible for assembling the 23-member Unisulf team that successfully developed and commercialized the process.

Today, three more processing plants are employing Unisulf. Unocal's retort and upgrade shale oil plants in Parachute, Colorado began using the process in the summer of 1986. In the fall of that same year, Unisulf was installed at the company's Santa Maria refinery.

Because of the diversity of the types of facilities that can benefit from Unisulf—as well as the characteristics unique to these individual plants—some fine-tuning is required after Unisulf's implementation. Research on how to optimally adapt the Unisulf process to the Santa Maria refinery is continuing.

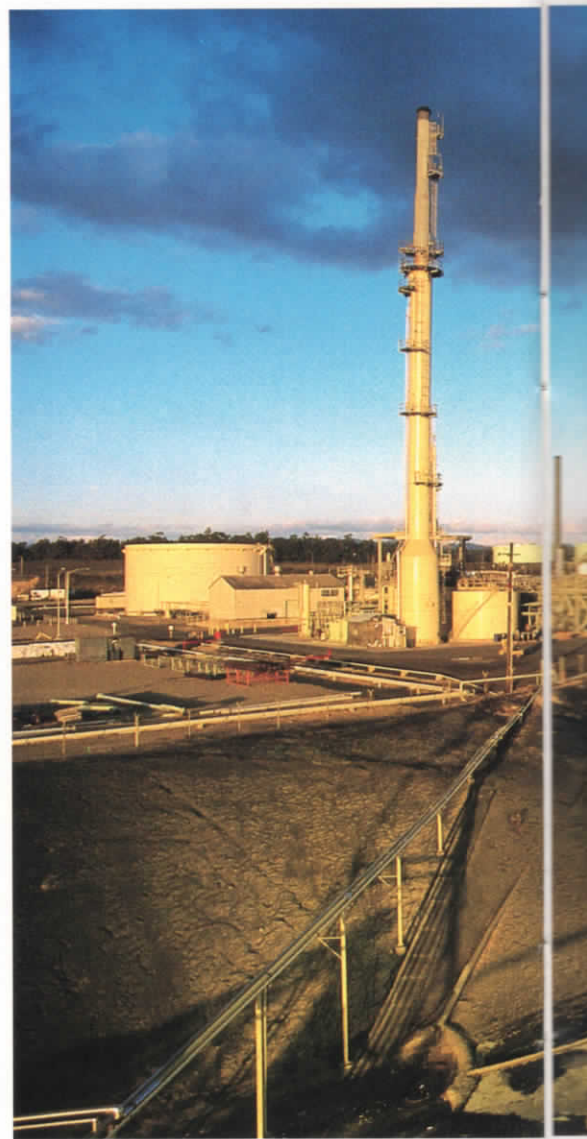
Although Unisulf is a new technology, sulfur removal has long been a goal of fuel processing operators. The Claus process, invented over 100 years ago, was introduced commercially to oil refineries on a large scale in the 1940s and '50s. Today, the method is still used to convert most of the hydrogen sulfide from refinery gas streams into sulfur.

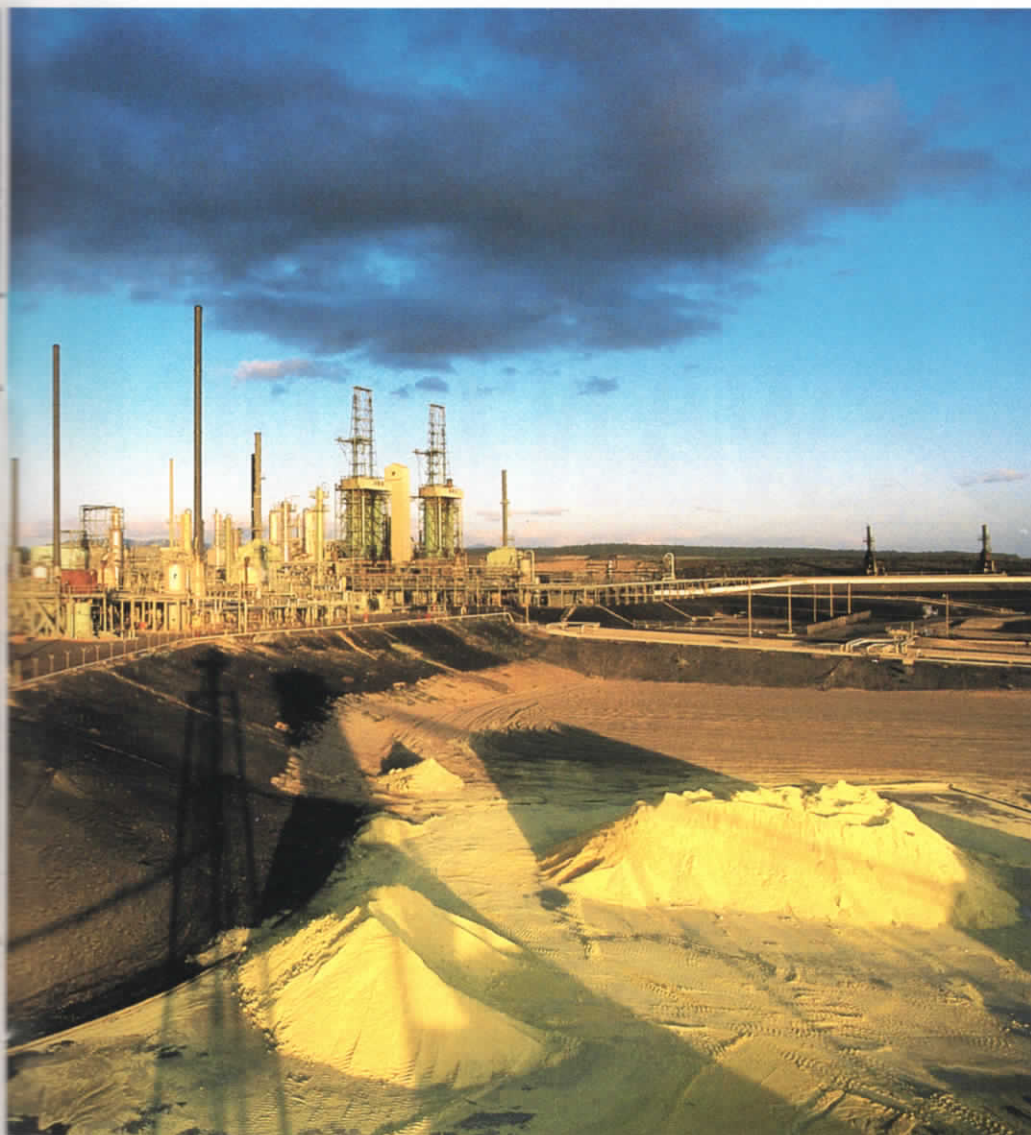
The Claus system employs a furnace in which hydrogen sulfide gas reacts with oxygen to produce sulfur dioxide. In the furnace (and subsequently in catalyst beds), the sulfur dioxide reacts with additional hydrogen sulfide to form elemental sulfur.

The Claus process can successfully convert 95 percent of the hydrogen sulfide into sulfur. And because the process takes place before the remaining gas is vented, the sulfur is recovered instead of being emitted into the atmosphere.

In the 1960s and '70s, however, environmental concerns heightened, prompting legislators to tighten regulations governing sulfur emissions. Unocal responded by working with the Ralph M. Parsons Company to develop a process that could convert an even higher percentage of the hydrogen sulfide into elemental sulfur. The result of this collaborative effort was the Beavon Sulfur Removal Process (BSRP), which, like Unisulf, results in the removal of virtually all of the sulfur.

In 1973, the first BSRP plant began operation at the company's Los Angeles refinery. Eventually, Unocal and Parsons jointly licensed the process to more than 60 commercial plants. But although BSRP achieves its goal of converting essentially all the hydrogen sulfide into sulfur, the process is not without operational drawbacks. For one, the catalytic solution used to absorb the hydrogen sulfide needs to be replaced too often—an average of once every nine months. And when this solution deteriorates, byproducts form which can cause corrosion.





The major value of Unisulf is that its solution can be used for long periods of time—up to 10 years or more, depending upon the application. Therefore, plants employing Unisulf can avoid the high costs of frequent disposal of deteriorated catalytic solution. Moreover, the solution does its job without creating corrosive byproducts.

“There are a large number of plants in the world currently using BSRP,” says Technology Sales representative Paul Robinson. “Many of them could benefit from a conversion to Unisulf, and there are other potential markets as well.”

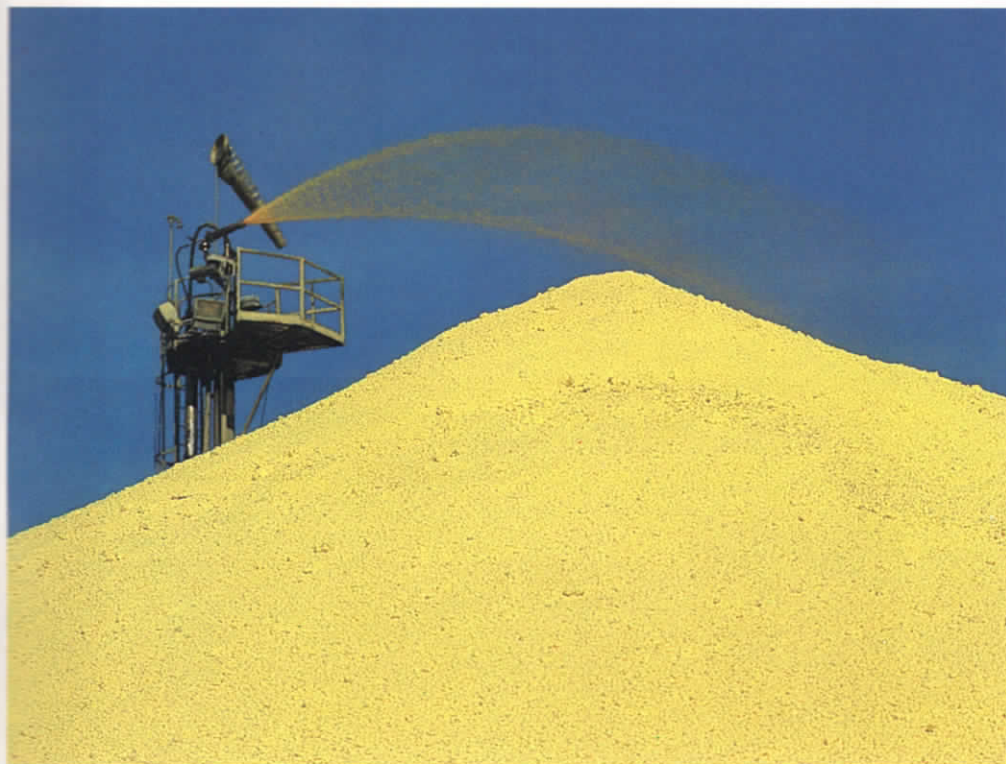
The need for efficient and environmentally safe means of removing sulfur from gas streams is tremendous. And once reduced to its elemental state, the sulfur itself is a valuable commodity. “Unisulf actually converts the pollution problem into a marketable product,” Gowdy says.

Sulfur produced at Unocal’s refineries is used to create sulfuric acid and to manufacture Popcorn sulfur—a Unocal-developed agricultural product used extensively throughout the west. The remainder of the company’s produced sulfur is sold to outside manufacturers. It is used in a wide variety of products, including paper, steel, pharmaceuticals, antifreeze, dyes, explosives, synthetic fibers, detergents and matches.

Unisulf promises to become a significant technology for the energy industry at large. In addition to being used in refineries and other petroleum processing facilities, Unisulf may find application in coal gasification and coal liquification plants.

Fenton readily acknowledges the personal gratification arising from his pivotal role in Unisulf’s invention.

“I’ve heard it said that for chemists, only one in 10 throughout their whole career produces an important new process or product,” Fenton says. “So you don’t do this every day.” C.S. 76



The Unisulf unit at Santa Maria (top) was installed in 1986. Elemental sulfur produced by the unit is used to manufacture Popcorn sulfur (in foreground and bottom photos), a Unocal-developed agricultural product.



WANTED: TREASURE HUNTERS

Unbolt that attic door and push aside those cobwebs. It's time to sort through your hidden treasures, because you may be holding a gem from Unocal's past.

As our company's 100th anniversary draws near, we are working hard to document our colorful history. Numerous events and activities are already being planned for our centennial year of 1990. And the Unocal story is being chronicled in a new, updated version of the company's history book.

To make these projects a success, we need your help. We're looking for letters, publications, diaries, photographs, souvenirs, hats, patches, belt buckles, signs—anything that might shed more light on Unocal's past.

Even if your search comes up empty, you can still help. If you have an anecdote or remembrance that illuminates a significant company event, or illustrates how the company has progressed, we'd like to hear about it. It may be just the hidden treasure we're looking for to help make our centennial celebration the best it can be.

Please write us a brief description of any historical items you would like to donate or lend, as well as any stories or anecdotes you can contribute. Send all inquiries to:

Karen Sikkema
Vice President, Corporate Communications
Unocal Corporation
P.O. Box 7600
Los Angeles, CA 90051.

Please include your telephone number.
Thank you!

CORPORATE

30 YEARS Ruth A. Bradford, Unocal Center
Russell J. Hermann, Unocal Center

25 YEARS Jack J. Laak, Unocal Center

20 YEARS Robert E. Dolan, Unocal Center
James R. Donovan, Unocal Center
Robert J. Endecavageh, Unocal Center
Bobby G. Hill, Unocal Center

15 YEARS Olive W. Arnott, Unocal Center
Joseph G. Bower, Unocal Center
Rosalina T. Cueva, Unocal Center
Jeri M. Ogata, Unocal Center

10 YEARS Silvia Keating, Unocal Center
Barry Lane, Unocal Center
David A. Monroe, Unocal Center
Donald F. Nesci, Schaumburg, Il.
Benjamin Y. Sabino, Unocal Center
Nancy A. Schurtz, Houston, Tx.

ENERGY MINING

10 YEARS David A. Rudd, Parachute, Co.

REAL ESTATE

35 YEARS William C. Huston, Unocal Center

25 YEARS Robert W. Fest, Unocal Center

20 YEARS Eldon R. Jackson, Unocal Center

15 YEARS Michael A. Biggi, Unocal Center

SCIENCE & TECHNOLOGY

40 YEARS Cloyd P. Reeg, Brea, Ca.

35 YEARS Homer E. Rea, Brea, Ca.

30 YEARS Duane L. Flint, Brea, Ca.

25 YEARS Milan Pavlovich, Brea, Ca.
Lenke E. Staumont, Brea, Ca.
Gary H. Wilkinson, Brea, Ca.

20 YEARS Danford E. Clark, Brea, Ca.
Roger L. Hughes, Brea, Ca.
Reon P. Moag, Brea, Ca.
Dale L. Pickering, Brea, Ca.
Jerry W. Steinhardt, Brea, Ca.
Gerald A. Wessler, Brea, Ca.

15 YEARS Charles B. Anderson, Brea, Ca.
Patrick L. Burke, Brea, Ca.
Danilo M. Capampangan, Brea, Ca.
Rudolph Gonzales, Jr., Brea, Ca.
Romeo S. Jaojoco, Brea, Ca.
Jerry L. Marmolejo, Brea, Ca.
Frank Mireles, Brea, Ca.
Robert E. Palmer, Brea, Ca.
Stanley G. Shatford, Brea, Ca.
Michael S. Sheets, Brea, Ca.

10 YEARS Richard A. Anthony, Brea, Ca.
Kenneth Baron, Brea, Ca.
Steven A. Bates, Brea, Ca.
Laura L. Bell, Brea, Ca.
Allen W. Doty, Brea, Ca.
John B. Dunham, Brea, Ca.
Ronnie Lee Freeman, Brea, Ca.
Alicia M. Gonzales, Brea, Ca.
James F. Landry, Brea, Ca.
John D. Levy, Brea, Ca.
Anthony B. Osborne, Brea, Ca.
Donna J. Perez, Brea, Ca.
David L. Shaffer, Brea, Ca.

ENERGY RESOURCES**OIL & GAS**

35 YEARS Malcolm C. Hardesty, Coalinga, Ca.
Bobby J. Hays, Orcutt, Ca.
Billy L. Kofahl, Taft, Ca.

30 YEARS Ernie L. Guidry, Lafayette, La.
Vernon E. Roe, Pasadena, Ca.

S E R V I C E**UNOCAL 76****A W A R D S**

25 YEARS Tommy N. Crouch, Madill, Ok.
Edward D. Hannah, Casper, Wy.
Gordon Hockman, Houma, La.
Thomas W. Miller, Cisne, Il.
Bill D. Sharp, Oklahoma City, Ok.
James H. Stevens, Ardmore, Ok.
Mark A. Voisin, Houma, La.

20 YEARS Jim L. Altman, Lafayette, La.
Michael J. Boquet, Houma, La.
Ben M. Burns, Lafayette, La.
Duffy J. Duplantis, Houma, La.
David L. Miller, Unocal Center
Richard Y. Salisbury, Santa Fe Springs, Ca.
Ronald E. Thompson, Grayling, Mi.
Larry E. Waterman, Orcutt, Ca.

15 YEARS Mark C. Atkins, Pt. Pedernales, Ca.
Monte R. Bemount, West Liberty, Il.
Freddie R. Billizon, Houma, La.
Johnny E. Broussard, Lafayette, La.
Louis J. Brown, Lafayette, La.
Steve D. Butler, Anchorage, Ak.
Oscar Chavez, Carpinteria, Ca.
Edwin R. Ditto, Andrews, Tx.
Lyle L. Goodrich, Beckenridge, Mi.
Wayne E. Jones, Orcutt, Ca.
Johnny D. Nichols, Orcutt, Ca.
Harold L. Province, Orcutt, Ca.
Lloyd G. Shipley, Worland, Wy.
Wayne L. Stockton, Grayling, Mi.

10 YEARS Brian A. Authement, Houma, La.
Clarence R. Baxley, Carmi, Il.
Donald E. Bean, Carpinteria, Ca.
Carl J. Boyd, Van, Tx.
Allen L. Brown, Cut Bank, Mt.
Robyn A. Brown, Unocal Center
John D. Chauvin, Jr., Houma, La.
Georgia M. Cruess, Midland, Tx.
Larry Dace, Sr., Houma, La.
Kenneth G. Davis, Houston, Tx.
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Steven W. Gregory, Moab, Ut.
Hildegard V. Gross, Orcutt, Ca.
Astrid S. Gunn, Pasadena, Ca.
Olan D. Ingram, Ganado, Tx.
Elizabeth A.E. Johnson, Unocal Center
James A. Johnson, Hominy, Ok.
Max R. Kilcrease, Hominy, Ok.
Linda C. Lemons, Piru, Ca.
Rodney A. Monighetti, Taft, Ca.
Carol A. Moudy, Santa Maria, Ca.
Carroll M. Murphy, Anchorage, Ak.
Robert N. Nelson, Cut Bank, Mt.
Rhonda E. Nolley, Midland, Tx.
Robert W. Norris, Grayling, Mi.
Kevin L. Ramage, Taft, Ca.
George R. Ramirez, Houston, Tx.
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Linda L. Townsend, Lompoc, Ca.
Gary W. Uhland, Midland, Tx.
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Craig H. Williams, Grayling, Mi.
Elvin R. Williams, Lafayette, La.

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10 YEARS Donald Mackay, Jakarta, Indonesia
Mark E. Thistlewaite, Balikpapan, Indonesia

Unocal Indonesia, Ltd.

15 YEARS Ngdianto
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Salewe
Sjachran
Sudjarwoto
Umberi
Washingan
Sujitno A.
Nurul Achmad
George Affidon
Harun Arbain
Benjamin Baru
Simon Becy
Idjab Dangas
Abdul Halim Haq
Marzuki Hasan
Efraim Naslawi Inung
H. Mei Kusdiah
Jackson Makagiansar
Syakur Makkasau
Etrelias Labuha Medelu
Abdul Muin
Bambang Muwahyu
Bistok Nainggol
Anung Nindita
Unding Noor
Johannes Picaulima
Bambang Djati Poernomo
Slamet Ryanto
Bambang Seinendan
Hadi Siswanto
Tentu Sitepu
Soedarti Sjachroni
Awang Sjamsudin
Tony Subagio
Franciscus Sudarto
Mashudi Taher
Thomas Tato

10 YEARS Suprawoto
Burhanuddin Achmad
Bambang Supriyanto Ah
Martino Noma
Roynulus Simorangkir
Sedyo Utomo
Bambang Wijanarko

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10 YEARS Leonard Grant, Aberdeen, Scotland

Unocal Limited (Singapore)

15 YEARS Ahmad bin Ariffin

Unocal Thailand, Ltd.

20 YEARS Joseph W. Tallman

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15 YEARS William F. Houston, Calgary, Alta.

10 YEARS Marcus J. Gidluck, Calgary, Alta.
Cheryl D. Lidfors, Calgary, Alta.
Barry C. Smith, Fort St. John, B.C.

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15 YEARS Gilbert T. Jojola, Santa Rosa, Ca.

10 YEARS Lawrence M. Farnady, Santa Rosa, Ca.
Tim F. Garrison, Imperial Valley, Ca.
Richard G. Hoke, Santa Rosa, Ca.
Mark D. Mosby, Philippines

Phillipine Geothermal

10 YEARS Ernesto C. Brutus
Danilo S. Cruz
Adelio A. Fernandez
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Virginia L. Lauron
Roger M. Lofamia
Jose E. Reyes, Jr.
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REFINING & MARKETING

40 YEARS James E. Ganzmann, Chicago Refinery
Stanley J. Pinta, Los Angeles, Ca.
E. Walker Polson, Chicago Refinery

35 YEARS Marilyn L. Arsint, Chicago Refinery
Robert D. Burnham, Los Angeles, Ca.
Alice E. Dykhuizen, San Francisco Refinery
J. L. Gallien, Jr., Beaumont Refinery
Harold E. Granquist, San Francisco Refinery
Clayo M. Martin, Bakersfield, Ca.
Arthur K. Mayfield, Schaumburg, Il.
Beverly H. Miller, Chicago Refinery
Merrell T. Mitchell, Jr., Beaumont Refinery
Carl V. Perricone, Sr., Beaumont Refinery
Donald D. Perricone, Beaumont Refinery
Jimmy G. Simmons, Beaumont Refinery
Dwan W. Warner, Beaumont Refinery
Clarence B. White, San Francisco Refinery

30 YEARS Clyde K. Carrier, Hayward, Ca.
Elizabeth K. Conry, Los Angeles, Ca.
Kenneth G. Elder, Pasadena, Ca.
Sherer B. Guin, Paw Creek, NC
Thomas W. Matthews, Schaumburg, Il.
Elaine E. Murphy, Los Angeles, Ca.
Mary J. Shewchuk, Los Angeles, Ca.
H.R. Taylor, Los Angeles, Ca.

25 YEARS John E. Berwick, Beaumont Refinery
Michael B. Brashers, Beaumont Refinery
David J. Cahoon, Los Angeles Refinery
Raymond F. Fisher, Chicago Refinery
Gerald W. Fletcher, Beaumont Refinery
Farrell R. Gallaher, Pasadena, Ca.
Michael R. Garrity, San Francisco Refinery
William R. Harvey, Schaumburg, Il.
William C. Hill, San Francisco Refinery
Carl E. Hjort, Renton, Ca.
Robert A. Kielma, Chicago Refinery
Raymond J. Koerner, Chicago Refinery
D.G. Kollmansberger, Los Angeles, Ca.
Robert A. Matson, Schaumburg, Il.
James W. Nash, Beaumont Refinery
Dean W. Phillips, San Francisco Refinery
Jimmy D. Rose, Fresno, Ca.
Thomas M. Rowley, Los Angeles Refinery
Paul J. Shimer, Eugene, Or.
Dixie D. Tuck, Avenal, Ca.
Daniel M. Waldorf, Los Angeles, Ca.

20 YEARS Philip G. Baker, Schaumburg, Il.
Edward J. Brooks, Schaumburg, Il.
Gary W. Broussard, Beaumont Refinery
Ross D. Brown, San Francisco Refinery
David Cave, Chicago Refinery
Raymond R. Collins, Chicago Refinery
Marion J. Courtney, Schaumburg, Il.
Raymond C. Crotty, Chicago Refinery
Wallace M. Dawson, Santa Maria Refinery
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Joe D. Epps, Beaumont Refinery
Rickey L. Flanigan, McKittrick, Ca.
Edwin W. Forbes, San Francisco Refinery
Richard J. Fuhrman, Chicago Refinery
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Frank E. James, Portland, Or.
John E. James, San Francisco Refinery
James L. Kyle, Los Angeles Refinery
Marvin E. Lash, Houston, Tx.
Carolyn Leong, Honolulu, Hi.
Thomas L. Letulle, San Francisco Refinery
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Donald A. McCreery, Beaumont Refinery
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Consuelo Stoklosa, Schaumburg, Il.
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15 YEARS Gerald J. Allison, Chicago Refinery
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James T. Bates, Tacoma, Wa.
Merlin J. Bird, Los Angeles Refinery
Robert E. Blalock, Chicago Refinery
Francis X. Blum, Los Angeles, Ca.
Joseph A. Bonner, Los Angeles Refinery
Jerriell D. Broussard, Abbeville, La.
Allen G. Burson, Beaumont Refinery
Timothy K. Davis, Van, Tx.
Vito J. Debellis, Portland, Or.
David P. Devincenzi, San Francisco, Ca.
Jerry D. Eastridge, Phoenix, Az.
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Kay Foster, San Francisco, Ca.
Edward R. Frost, Los Angeles Refinery
Harry E. Frost, Chicago Refinery
June Gibson, Wildwood, Fl.
Robert B. Glover, Chicago Refinery
Manuel V. Gonzalez, Los Angeles Refinery
Louis Charles Guillory, Beaumont Refinery
Jerald J. Hall, Beaumont Refinery
Kenneth E. Henning, Portland, Or.
Herman Hodges, Los Angeles Refinery
Richard G. Hokanson, Schaumburg, Il.
Dale K. Iverson, San Francisco Refinery
Lawrence E. Jackson, Beaumont Refinery
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Bernadette Kopecky, Schaumburg, Il.
Georgia C. Lane, Schaumburg, Il.
Ruth M. Liatos, San Francisco, Ca.
Oscar M. Lopez, Richmond, Ca.

UNOCAL 76



SERVICE AWARDS

Joan Lowery, Schaumburg, Il.
Richard F. Manley, City of Industry, Ca.
Randy L. McFarlane, Walnut Creek, Ca.
William A. McNeil, Los Angeles, Ca.
Thomas O. Mueller, Bloomington, Ca.
Rhonda D. Ornelas, San Francisco, Ca.
Richard W. Petersen, Chicago Refinery
David A. Peterson, Bloomington, Ca.
Thomas W. Ragsdale, Los Angeles Refinery
Thomas Ramirez, Beaumont Refinery
Manuel D. Ramos, Jr., Beaumont Refinery
Alvaro Rivas, Brosbane, Ca.
Joe F. Robbins, Beaumont Refinery
Raul S. Rosales, Schaumburg, Il.
Refugio Ruvalcaba, Jr., Los Angeles Refinery
Robert Ryan, Chicago Refinery
Domingo Sanchez, Chicago Refinery
Alice J. Satkovich, Schaumburg, Il.
Edward E. Schultz, Jr., Chicago Refinery
Norman Ephriam Simon, Jr., Richmond, Ca.
Joseph Torres, Los Angeles Refinery
Rizalina C. Torres, San Francisco, Ca.
Thomas Washington, Jr., Beaumont Refinery
Arthur L. Wells, Beaumont Refinery
Mary Lu A. Williams, Norfolk, Va.
Frank J. Wilson, Los Angeles, Ca.
Douglas T. Wong, Los Angeles Refinery
Hector Yescas, Jr., Los Angeles Refinery

10 YEARS Roosevelt Alexander, San Francisco Refinery
Paul J. Bauer, Norwalk, Ca.
Judith A. Blum, San Francisco, Ca.
Robert S. Boucher, Hayward, Ca.
George A. Brown, San Francisco Refinery
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William F. Busse, Beaumont Refinery
Billy D. Castleman, Beaumont Refinery
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Willie E. Dade, Beaumont Refinery
Robert L. Dalton, Los Angeles Refinery
Earl D. Desues, Los Angeles Refinery
William M. Deviny, Jr., Santa Maria Refinery
Steve A. Donnelly, Richmond, Ca.
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William C. Draper, Schaumburg, Il.
Jon A. Dunnington, Chicago Refinery
Terri M. Edstrom, Portland, Or.
Illa J. Edwards, Chicago Refinery
Timothy P. Eggleston, Santa Paula, Ca.
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Daniel Esquivel, Jr., Beaumont Refinery
Paul K. Evans, Beaumont Refinery
Dolores A. Felix, Los Angeles, Ca.
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James V. Fillar, Schaumburg, Il.
Chris L. Flink, Schaumburg, Il.
Elizabeth A. Flores, Los Angeles, Ca.
Ronald Fontenot, Beaumont Refinery
Bettie L. Gong, Schaumburg, Il.
Wesley K. Gonsalves, San Francisco Refinery
Carl J. Guardia, Chicago Refinery
Connie R. Harris, Los Angeles Refinery
Richard G. Hindman, Los Angeles Refinery
Clint A. Hollier, Beaumont Refinery

Danny L. Hopkins, Beaumont Refinery
 Milton L. Hucks, San Francisco Refinery
 Paula Hutchinson, Schaumburg, Il.
 Bruce E. Irion, Los Angeles Refinery
 Kenneth J. Ivaska, Chicago Refinery
 Eugene H. Ketchum, Chicago Refinery
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 Arvin M. Maldonado, Chicago Refinery
 David L. Mastrud, Los Angeles Refinery
 Pelayo Mazorra, Miami, Fl.
 James Lee McDonald, Beaumont Refinery
 Anita R. McGowin, Beaumont Refinery
 Becky L. Mitchell, Beaumont Refinery
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 Helen E. Morel, San Francisco Refinery
 Norman Naylor, Los Angeles Refinery
 Harold M. Nelson, Jr., Santa Maria Refinery
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 Gary A. Olpinski, Los Angeles, Ca.
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 Elizabeth Payerli, Schaumburg, Il.
 David L. Pepper, Chicago Refinery
 Thelma J. Perkins, Beaumont Refinery
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 Patricia A. Piccolo, Schaumburg, Il.
 Richard J. Picha, Chicago Refinery
 Rodney W. Pilz, Chicago Refinery
 Harvey Polovin, Schaumburg, Il.
 James H. Rapinac, Chicago Refinery
 Roger E. Reimer, Los Angeles Refinery
 Manuel T. Rodriguez, Los Angeles Refinery
 Francis R. Romano, Los Angeles Refinery
 Theodore A. Sams, III, Beaumont Refinery
 William H. Sanders, Beaumont Refinery
 Theresa D. Snider, Columbus, Oh.
 Charles M. Spade, Los Angeles Refinery
 Linda C. Stark, Chicago Refinery
 William C. Stone, Los Angeles Refinery
 Thelma M. Thibodeaux,
 Beaumont Refinery
 Viola L. Valsin, Beaumont Refinery
 Stephen T. Webb, Sacramento, Ca.
 Larry S. Whitman, Southfield, Mi.
 Deborah A. Wright, Richmond, Ca.
 Cleveland J. Young, Beaumont Refinery
 Joseph L. Zuech, Beaumont Refinery

MARKETERS & DISTRIBUTORS

35 YEARS Darnell Oil Co., Ontario, Ca.
 Jamestown Oil Co., Jamestown, Oh.
 James C. Nolan, Fall River Mills, Ca.

30 YEARS Kivett Oil Co., Statesville, NC
 Nenana Fuel Co., Inc., Nenana, Ak.

25 YEARS Georgetown Oil Co., Georgetown, Oh.
 Goldfinch Distributors, Inc., Conway, SC
 Petroleum Energy Products, Inc.,
 Willamina, Or.

20 YEARS Balco Oil Co., Inc., Bridgeport, Oh.

15 YEARS Alleghany Oil Co., Inc., Covington, Va.
 Grantham Oil Co., Inc., Douglas, Ga.
 Maui Petroleum Co., Inc., Kahului, Hi.

10 YEARS Robert Gilbertson, Mariposa, Ca.
 Mid-States Petroleum, Inc., Troy, Mi.

CHEMICALS

30 YEARS Bobby Lynn Paslay, Unocal Center
 Margaret R. Wood, Unocal Center

25 YEARS Peter Ambrunn, Newark, Ca.
 David E. Barth, Unocal Center
 Richard B. Reed, Arroyo Grande, Ca.
 Ralph A. Riker, Clark, NJ

20 YEARS Luis M. Barreto, La Mirada, Ca.
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 Lonnie R. King, Charlotte, NC
 Evord F. Knights, Fullerton, Ca.
 Robert C. Krimminger, Charlotte, NC

15 YEARS Austin D. Byers, Lemont, Il.
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 Robert M. Moeller, Lemont, Il.
 Hazel H. Parker, Charlotte, NC
 Gary D. Richards, La Mirada, Ca.
 Carl C. Sarvis, Jr., Charlotte, NC
 David E. Shullaw, Lemont, Il.

10 YEARS Alan R. Adamson, La Mirada, Ca.
 Douglas E. Anderson, Kenai, Ak.
 Odell W. Armstrong, Brea, Ca.
 Charles W. Black, Kenai, Ak.
 Albert Davis, Sr., Charlotte, NC
 Lupe Diaz, Bridgeview, Il.
 Ruth A. Farrell, Clark, NJ
 Donna M. Hammond, Birmingham, Al.
 Lawrence F. Harper, La Mirada, Ca.
 Dale D. Keith, Kenai, Ak.
 Jay B. Kidd, Kenai, Ak.
 Kenneth H. Laing, Kenai, Ak.
 Alicia C. Lopez, Unocal Center
 Richard W. Losier, Wilmington, Ca.
 Marian Luka, Lemont, Il.
 Doris M. Parry, Brea, Ca.
 David A. Robles, Brea, Ca.
 Joan L. Sammons, Brea, Ca.
 Stanley M. Smolarczyk, Bridgeview, Il.
 Donna M. Turner, Unocal Center

MOLYCORP, INC.

35 YEARS Lael D. Dillon, Washington, Pa.

20 YEARS John O. Landreth, Unocal Center

15 YEARS Richard A. Berkheimer, York, Pa.
 Terry K. Bradshaw, Mountain Pass, Ca.
 Clair E. Doll, Jr., York, Pa.
 Walter M. Edwards, White Plains, NY
 Howard C. Fitzgerald, Mountain Pass, Ca.
 Jimmy D. Heacock, Mountain Pass, Ca.

10 YEARS Dennis D. Axe, Mountain Pass, Ca.
 Mary Jane Brenneman, York, Pa.
 Oscar R. Palmer, Mountain Pass, Ca.
 Mark T. Powell, Mountain Pass, Ca.

RETIREMENTS

Oil & Gas
 Kenneth I. Garlinger, August 15, 1955
 Leopoldo M. Hernandez, June 1, 1965
 Ralph G. Ladd, Jr., July 1, 1956

International Oil & Gas
 Harold M. Lian, July 14, 1952

Refining & Marketing
 Fred Burkstaller, October 21, 1948
 Thomas M. Early, December 17, 1951
 Irene M. Falkenberg, March 17, 1970
 Robert J. Gorski, October 1, 1944
 Robert J. Knotts, February 10, 1955
 Howard S. McKinney, July 29, 1968
 Lawrence Ramil, March 9, 1970

Chemicals
 Melvin R. Gregory, May 3, 1954
 Edwin E. Kirschner, April 1, 1974
 Ezell Singleton, August 18, 1969

Molycorp, Inc.
 Cletus C. Eyster, July 28, 1970
 Elizardo J. Pacheco, March 4, 1968

IN MEMORIAM

EMPLOYEES
 Science & Technology
 Ruth Richardson, March 3, 1988

Oil & Gas
 Brian W. Maassen, March 10, 1988
 J.D. Norman, February 6, 1988

Refining & Marketing
 Robert L. Price, March 21, 1988

RETIREES
 Corporate

George H. Anderson, December 12, 1987
 Ethel L. Watson, March 13, 1988

Science & Technology
 John F. Condon, January 26, 1988
 Frederick L. Mueller, January 12, 1988

Oil & Gas
 Wayland L. Brewer, February 25, 1988
 Arthur N. Crawford, February 9, 1988
 Roy A. Dickens, December 18, 1987
 Allen C. Dyrda, February 16, 1988
 Everett E. Guinn, January 18, 1988
 William M. Hensley, February 25, 1988
 Donald E. Johnson, March 12, 1988
 William H. Litherland, March 9, 1988
 George W. Nunez, March 4, 1988
 Samuel E. Patterson, February 12, 1988
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 George H. Stoner, Jr., January 21, 1988
 William R. Timmons, II, February 17, 1988
 Fred H. Vaughan, March 12, 1988

Refining & Marketing
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 Earl R. Allan, March 6, 1988
 Ford A. Andrews, February 10, 1988
 Fred J. Andrews, March 2, 1988
 Maurice E. Baker, March 9, 1988
 Alvin B. Benson, February 9, 1988
 Daniel S. Buckley, January 18, 1988
 Thurman L. Clark, February 26, 1988
 June Cole, February 28, 1988
 William J. Cozad, Jr., March 11, 1988
 William V. Criddle, March 21, 1988
 Philip B. Dougharty, February 29, 1988
 John C. Frank, February 3, 1988
 Edward V. Frary, February 22, 1988
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 James A. Lahey, February 21, 1988
 Lynn K. Lee, February 15, 1988
 John W. LeFevre, March 4, 1988
 Paul A. Matz, January 25, 1988
 John J. McKeown, March 10, 1988
 George W. Meadows, February 17, 1988
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 Edith V. Scher, January 27, 1988
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 Henry E. Tempest, January 21, 1988
 Eugene R. Thompson, February 12, 1988
 John B. Todd, February 5, 1988
 Jesse A. Wright, February 7, 1988

Chemicals
 Seldon D. Reese, January 15, 1988

Molycorp, Inc.
 Francis E. Enoch, Sr., January 25, 1988

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CONTENTS



10

A Strategy For Growth Page 1

Addressing shareholders at Unocal's annual meeting, Chairman and Chief Executive Officer Fred L. Hartley discussed the company's continuing effort to build upon its basic strengths.

1987: A Year Of Solid Performance Page 5

In reviewing Unocal's operations for 1987, President and Chief Operating Officer Richard J. Stegemeier stressed the performance of the company's core business—energy production.

Moving Into Tomorrow Page 10

Unocal Thailand celebrates a milestone—and looks ahead.

Taking A Look Back Page 17

Dr. Harold M. Lian, recently retired as president and chief operating officer of Unocal Thailand, reviews the challenges and successes of the natural gas project's first 25 years.

Focus on Safety Page 20

Unocal's Safety & Risk Management department helps ensure that safety remains paramount in all company operations.

Pioneering Work Wins Honors Page 28

Dr. Carel Otte, president of Unocal's Geothermal Division, is awarded membership in the prestigious National Academy of Engineering.

Lakeview No. 1: A Heroic Response Page 30

Back in 1910, oil field technology was still in its infancy. Here's the story of how Unocal drillers struck—and controlled—one of the biggest oil gushers in history.

Unisulf Helps Clear The Air Page 35

Unisulf—a sulfur removal process invented by researchers at Unocal's Science & Technology Division—is recognized as an important new environmental protection technology.

Wanted: Treasure Hunters Page 38

As the company's centennial year draws near, Unocal is searching for artifacts from its past—and we need your help!



20

Service Awards Page 39

Cover: Sunrise captures a group of workers being hoisted aboard a gas processing platform in the Gulf of Thailand's Satun field. With a quarter-century of success behind it, Unocal Thailand is moving aggressively into the future. Story on page 10.

Seventy Six is published by the CORPORATE COMMUNICATIONS DEPARTMENT, Unocal Corporation, Box 7600, Los Angeles, California 90051. **Karen Sikkema**, Vice President, Corporate Communications; **Tim Smight**, Acting Editor; **Cathy Stephens**, Assistant Editor; **Heidi Siegmund**, Editorial Assistant; **Ray Engle and Associates**, Art Directors.

Editor Barbara Pederson has been temporarily assigned to a special corporate centennial project.

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SIX** VOL. LXVII
NUMBER 2
SPRING 1988