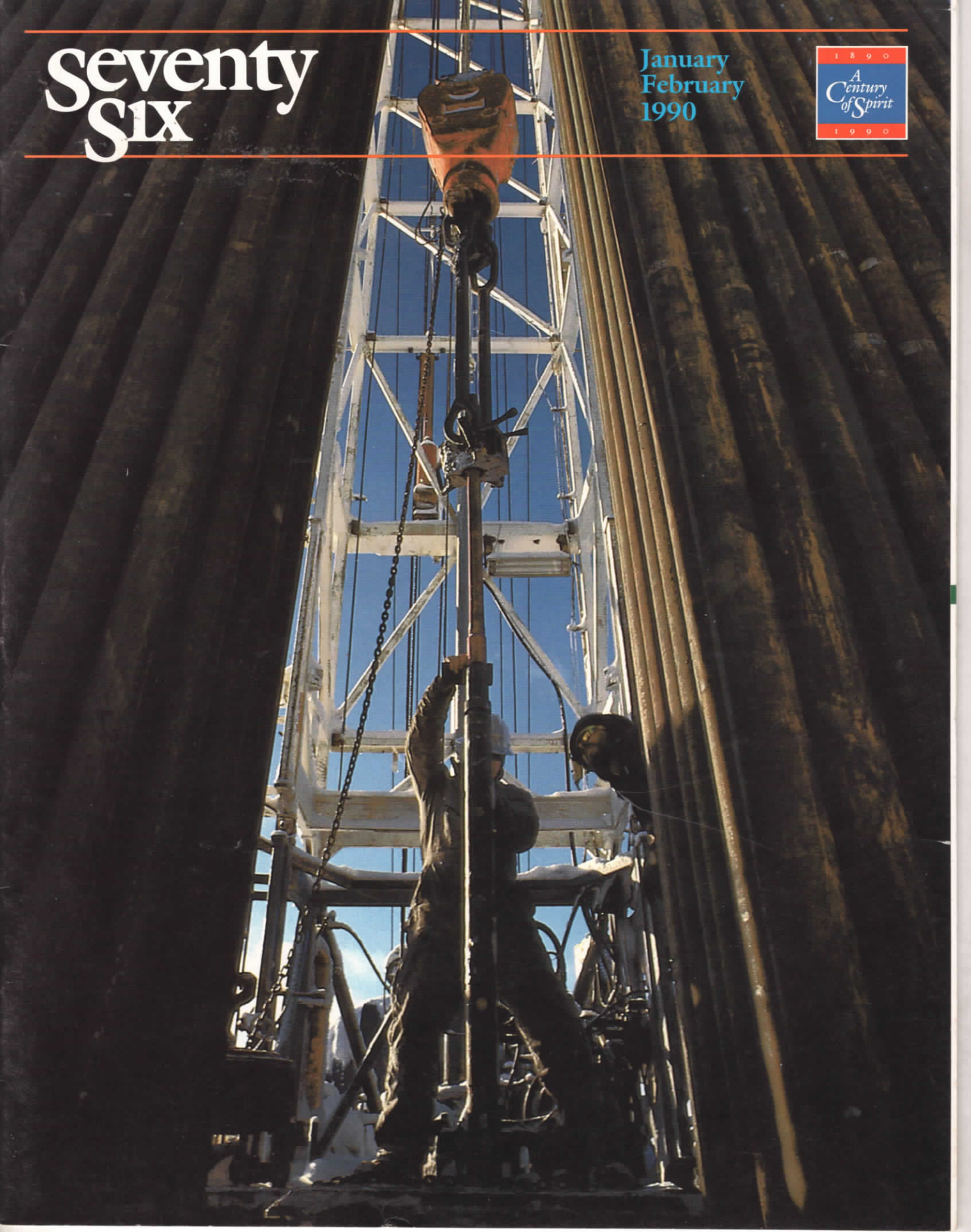

Seventy Six

January
February
1990

1890
A
Century
of Spirit
1990



THROUGH THE YEARS

Energy Resources



1883. Pennsylvania oil man Lyman Stewart (above) comes west to look for “black gold” in California. Stewart and partner Wallace L. Hardison (right) open an office in Newhall, 25 miles northwest of downtown Los Angeles.



1885. Stewart reasons that drilling costs can be drastically cut by burning oil just up from the well to heat drilling-rig boilers. His innovation catches on. Coal-fired boilers quickly disappear from the oil field as the use of fuel oil becomes widespread.



1890. At a meeting in an office above a hardware store in Santa Paula, executives of three oil companies (Hardison & Stewart, Sespe, and Torrey Canyon) merge their operations to form Union Oil Company of California.



1892. Union Oil crude production increases to 180,000 barrels—more than half of California’s total for the year.

1902. Union discoveries in the Santa Maria, Lompoc, Kern River and Coalinga areas prompt the building of a new refinery in Bakersfield.

1883

1904

1884. After drilling seven dry holes in Southern California and nearly going broke, Hardison and Stewart strike their first oil in Pico Canyon near Newhall. The well, Star #1, comes in at 1,620 feet with production of 30 barrels a day.



1888. The Hardison & Stewart Oil Company, now incorporated and based in Santa Paula, makes a major oil discovery at nearby Adams Canyon. Crude bursts out of the casing pipe at Adams Canyon #16, spewing oil 100 feet into the air. California’s first gusher flows at the unheard of rate of 800 barrels a day.

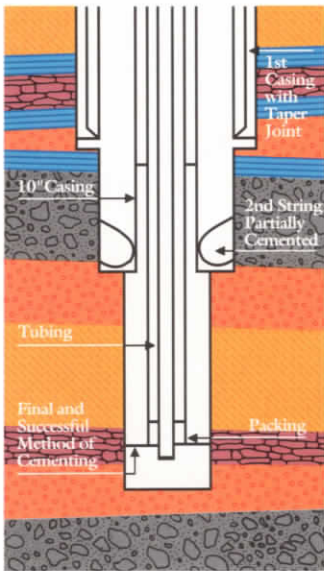


1900. Union establishes the first petroleum geology department in the West. Under the supervision of William Orcutt, the department discovers and maps many of California’s great oil fields.



1904. Union’s Hartnell #1 well in the Santa Maria field, dubbed “Old Maud,” strikes oil. The discovery results from one of the most fortuitous mistakes in California oil history. When a heavy piece of equipment falls off a transport wagon short of the intended well site, the crew decides to spud in there. Old Maud produces a million barrels of crude in the first 100 days.

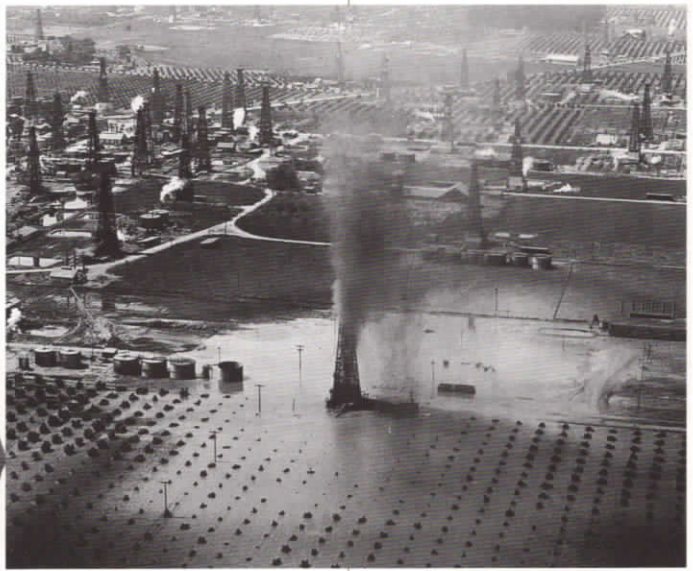




1905. Drilling superintendent Frank F. Hill makes oil industry history when he perfects an oil well cementing process. By cementing the space between the casing and the walls of a hole, water is prevented from flowing into wells, allowing deeper drilling and better recovery.



1917. Union crews begin exploratory drilling in Mexico on a 16,000-acre lease granted by the Mexican government. The venture is Union's first international exploration effort.



1921. The company's production for the year sets a new record—9.8 million barrels. In November, a Union crew drilling east of Los Angeles discovers oil. The Santa Fe Springs field (above) goes on to become one of Union's top producers. Discoveries are also made in Wyoming and Texas.

1926. Union researchers successfully employ a new "gas-lift" enhanced oil recovery method. The technique—involving the reinjection of natural gas into producing formations—helps maintain reservoir pressures, permitting increased oil production in the company's older fields.

1905

1910. Union Oil drillers strike the "world's greatest gusher" at the Lakeview #1 well near Taft, California. The gusher roars for 18 months, spewing out an average of 50,000 barrels per day in a 200-foot high, 20-foot wide stream. To contain this torrent of oil, Union workers dam up the canyon beneath the well and create a 16-acre reservoir. The highest-volume gusher ever seen in the U.S., Lakeview helps California become the nation's number one oil-producing state.

1920. The automobile age is in full swing in California, with more than one-half million cars registered. To help meet the booming demand for gasoline and asphalt (needed for road construction), Union steps up exploration efforts. The company owns or leases nearly 275,000 acres of proven or potential oil lands in California, Texas, Wyoming and Mexico.



AND STILL SHE SPOUTS
Efforts to Harness Lakeview Well Prove Fruitless and She Still Continues to Gush

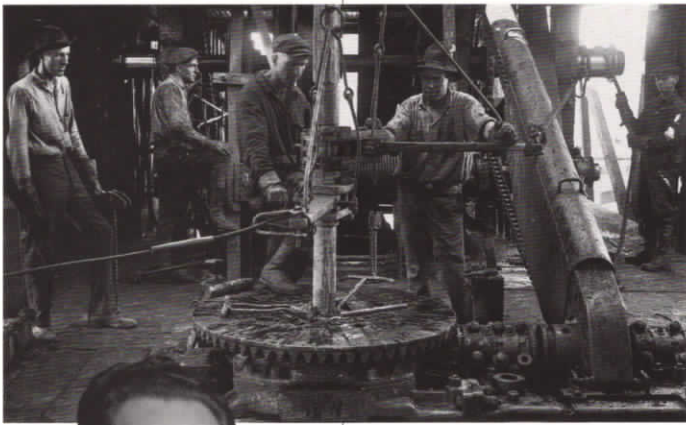
1929

1923. Oil production by Union reaches 18.7 million barrels (51,000 per day)—making the company the biggest producer based in the western U.S.



1929. Pure Oil (later to merge with Union) enters a unitization agreement for the Van, Texas, oil field, located about 70 miles east of Dallas. The agreement, which becomes an industry model, designates Pure as field operator. Other parties receive production shares proportional to their lease holdings.





1939. Union opens an exploration office in Houston as part of the company's expanding search for oil. Managed by veteran geologist Sam Grinsfelder (left), the office focuses on Gulf Coast prospects. The first well Union drills on the Gulf Coast strikes oil at East White Lake, Louisiana. By 1989, more than 25 percent of the company's domestic oil production and over 55 percent of its gas will come from Gulf area operations.

1934. The company's producing oil wells top the 1,000 mark. These include the world's deepest well to date, an 11,377-foot hole in Kern County, California.



1942. Union's work along the Gulf Coast continues to pay off. New discoveries are made in the Freshwater Bayou and Vinton fields in Louisiana. Under the pressure of wartime demands, the company boosts the yield from Gulf Coast fields nearly five-fold in a single year.



1945. Company explorationists discover the Sansinena field east of Whittier, California. The new field augments Union's extensive Southern California reserves.

1949. Union's Canadian Division is organized.

1934

1937. Pure and co-venturer Superior Oil drill the world's first open-water well in the Gulf of Mexico. Dubbed the Gulf of Mexico State #1, the well is located more than a mile from the Louisiana shore.



1940. Union Oil Company of California marks its 50th anniversary, embarking on an ambitious modernization and expansion program under President Reese H. Taylor.



1944. Union buys the Glacier Production Company of Montana, acquiring 90,000 acres of properties. Overall, Union gains 2,700 barrels of crude a day from 172 wells.

1949. Union buys the Los Nietos Company—as well as the production from several leases in California's San Joaquin Valley—from the family of former board member Edward L. Doheny. The purchases up Union's daily production by 13,500 barrels.



1949



1950. Union purchases United Geophysical Company of Pasadena. The acquisition provides company explorationists with the latest seismological expertise to map underground formations.



1953. Union teams with three other oil companies to convert a huge freight barge into California's first offshore drilling rig—dubbed CUSS 1. It later drills a total of 300,000 feet of exploratory holes.

1954. Union discovers the East Lake Palourde field in Louisiana bayou country. Other Gulf area discoveries quickly follow, making Union one of the largest oil producers on the Gulf Coast.



1959. Union and a co-venturer discover the first natural gas field in Alaska, located beneath the Kenai Peninsula, 80 miles south of Anchorage.

1950

1952. A new deep well in California's Torrey Canyon field (below), one of Union's oldest, produces 526 barrels of oil a day. About 9,000 feet deep, the well proves that deep drilling can sometimes give an old field a new lease on life. Later deep wells in the area are even bigger producers.

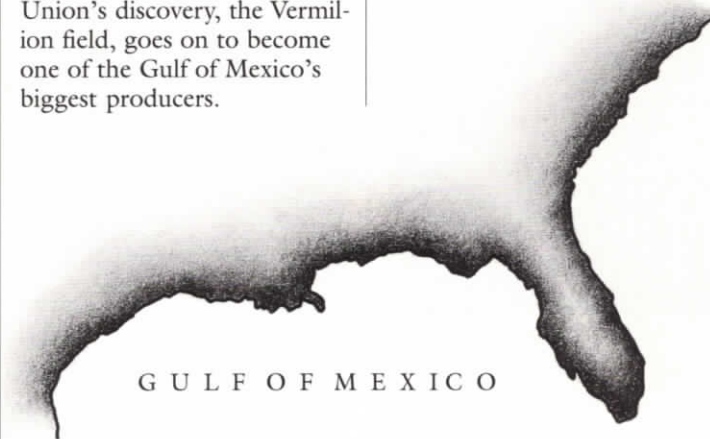


1953. Union's first Canadian oil strike is made at Fairydell in western Alberta. Three years later, the company's northernmost discovery, Red Earth 12-17, comes in with 1,000 barrels a day of high-gravity crude. The oil strike starts one of the greatest land rushes in Canadian history.

1956. A Union Oil wildcat well drilled offshore Louisiana blows out and the platform is abandoned. A new platform and derrick are erected in record time—37 days—to drill a relief well that intersects the wildcat—dubbed "Wild Tiger"—below the surface. Crews stop the escaping gas by pouring mud, water and cement down the relief well. Union's discovery, the Vermilion field, goes on to become one of the Gulf of Mexico's biggest producers.

1960

1960. The company participates for the first time in a federal lease sale covering tracts in the Gulf of Mexico. Two major oil finds result from tracts that Union acquires: Ship Shoal Block 208 and South Marsh Island Block 49.



GULF OF MEXICO



1961. Union and two co-venturers drill a 5,800-foot deep discovery well in Australia's Moonie field. The find represents the first commercial oil discovery in Australia.

1961. Union discovers the Las Cienegas field in metropolitan Los Angeles, the only field with a street address—4848 West Pico Boulevard. More than 20,000 property owners share in the royalties.



1962. Union purchases the properties of Texas National Petroleum, adding 430 oil and gas wells and 350,000 acres of prospecting area in Texas, Colorado, Wyoming and New Mexico.

1962. Union is the first oil company to be awarded exploration rights in Thailand.



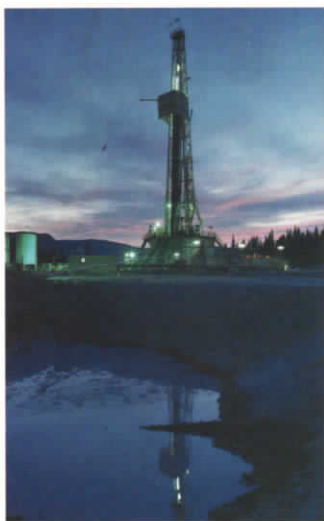
1965. Union merges with Illinois-based Pure Oil Company. The merger lifts Union from regional status to that of a national oil company with operations in 37 states.

1965. Union forms a Geothermal Division under Dr. Carel Otte, who headed the Earth Energy group obtained in the Pure Oil merger. This marks Union's first move into commercial development of an energy resource other than petroleum or natural gas.

1965. Union and four other oil companies participate in the offshore development of the East Wilmington field, which extends westward from underneath Long Beach, California. To maintain the coastline's aesthetics, the development—named "THUMS," an acronym for the co-venturers—incorporates a unique construction approach. Derricks are disguised as buildings, and man-made islands are landscaped with plants, trees and waterfalls.

1961

1961. Union Oil Company of Canada Limited is formed, with Union Oil of California holding 83 percent of the new organization.



1964. Production begins from Platform Eva, Union's first platform located offshore California. Wells drilled from Eva tap a field off the coast of Huntington Beach.



1966

1965. The Sassan field in the Persian Gulf is discovered by a joint-venture team that includes Union. The first shipment of Sassan crude oil—506,000 barrels—is made three years later.

1966. Union discovers oil offshore South Alaska in the Cook Inlet. The company installs a unique "monopod" production platform, which employs a special design to guard the structure against ice and high tides. The monopod features a single large support—rather than multiple legs—reducing exposure to ice and tidal currents.





1966. The International Oil & Gas Division is established under Ray Burke to handle exploration and production activities abroad.

1967. Merging its holdings with those of two smaller independent companies, Union becomes operator of The Geysers geothermal project, located about 90 miles north of San Francisco. By 1989, steam from The Geysers will generate enough electricity to support the needs of a city of about 1 million people.

1969. During the early stages of developing the Dos Cuadras field offshore Santa Barbara, an oil well on Platform A blows out. The well is quickly shut in, but oil and gas erupt through fractures in the sea floor. The escaping oil forms a slick which drifts to shore, coating beaches in the Santa Barbara area. Union employees and volunteers work around the clock to assist in clean-up operations. No lives are lost, and no lasting ecological damage results from the spill.



1973. The huge Chunchula natural gas field is discovered by a Union exploration team in southern Alabama. After several years of production, gas reinjection begins in 1982 to allow production of condensate and other hydrocarbon fluids (storage tanks above).

1974. The company spends \$184 million for interests in more than 280,000 offshore acres in the Gulf of Mexico. Union and its co-venturers enjoy an 80-percent success rate the following year, making discoveries with 23 of 29 wells drilled.

1966

1968. Union and three co-venturers discover oil in the Santa Barbara Channel (below) and set Platform A in the Dos Cuadras field.

1968. Union signs two production-sharing contracts with Pertamina, the Indonesian national oil company, after lengthy negotiations. These contracts serve as models for future production-sharing agreements in Indonesia and other parts of the world.



1970. The first well Union drills offshore East Kalimantan, Indonesia strikes oil. The Attaka field (below) proves to be a giant, containing over 500 million barrels of oil and 2 trillion cubic feet of gas.



1973. Union discovers natural gas in commercial quantities in the Gulf of Thailand, the first step toward the creation of a new hydrocarbons industry which reduces Thailand's dependence on imported oil.

1977. Union constructs the world's first "ice island" in the Beaufort Sea. Located midway between Point Barrow and Prudhoe Bay, Alaska, the 12-foot-thick island is used as a base for exploration drilling.



1977



1977. The 17,000-ton Heather platform jacket is launched in the British sector of the North Sea by Unionoil Ltd., a Union Oil subsidiary. The Heather project is the company's first venture in the North Sea.



1979. Union and Dutch co-venturer Nedlloyd make the first discovery of oil offshore the Netherlands. Production from two fields—Helm and Helder—begins just three years later, with a third field, Hoorn, coming on stream in 1983. Above, John Imle, then general Manager of Union's Netherlands operations, attends the 1982 Helm and Helder field dedication ceremonies. Seated to his right is Queen Beatrix.



1981. The 26,000-ton Cerveza jacket is launched in the Gulf of Mexico offshore Louisiana. At the time, the jacket is the largest structure ever built and launched as a single unit. The completed platform enables Union Oil to tap petroleum reserves lying under Gulf waters 935 feet deep.

1982. A second gas sales contract with Thailand is signed, permitting the development of the Platong, Satun, and Baanpot fields.

1983. Union Oil Company of California reorganizes, becoming an operating subsidiary of a new Delaware holding company, Unocal Corporation.

1977

1979. The first geothermal steam plant in Southeast Asia is dedicated in the Philippines. Built by Philippine Geothermal, a wholly owned subsidiary of Union Oil, the plant is operated under agreement with the government-owned National Power Corporation. Plants supplied by Unocal now provide about 30 percent of the electrical energy on the island of Luzon, where Manila is located.



1980. Union's Brawley geothermal operation goes on stream. Located in California's Imperial Valley, the project marks the first use of the region's highly saline geothermal fluids to power an electrical generating plant.



1981. Production begins from the Erawan field, Thailand's first natural gas field. Erawan is operated by Union's wholly owned subsidiary, Union Oil of Thailand, which later discovers and develops several other gas fields in Thailand.

1985. To enhance shareholder value, the company forms a master limited partnership—under the name Union Exploration Partners, Limited—that contains virtually all assets of the Oil & Gas Division's Gulf Region.

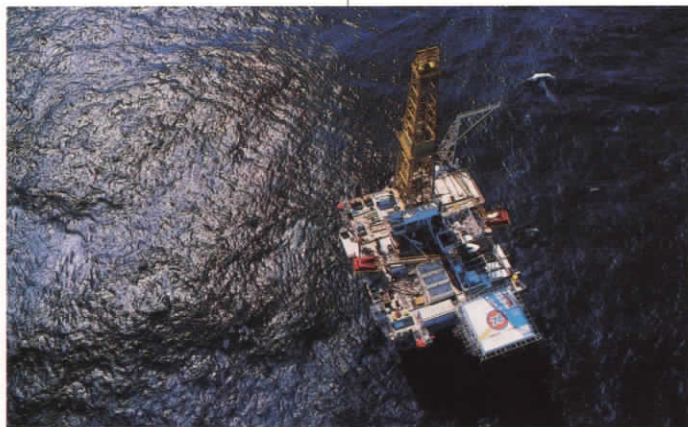


1985



1985. The company begins doing business as Unocal, but retains the famous “76” marketing symbol in its new logotype.

1985. Unocal defeats a hostile takeover attempt by T. Boone Pickens. But the victory is costly, increasing the company’s debt from \$1.6 billion to \$6.1 billion.



1986. A collapse in oil prices, combined with the increased debt, forces a drastic reduction in Unocal’s capital expenditures. But an aggressive program of infill and extension drilling in proven fields helps to maintain oil production and reserves.

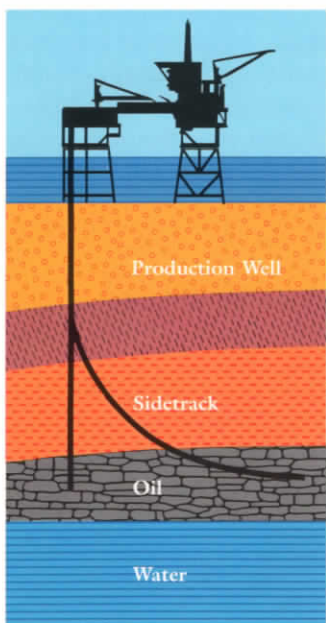
1987. Platform Irene begins production of about 20,000 barrels of oil a day from the Point Pedernales field offshore Southern California.



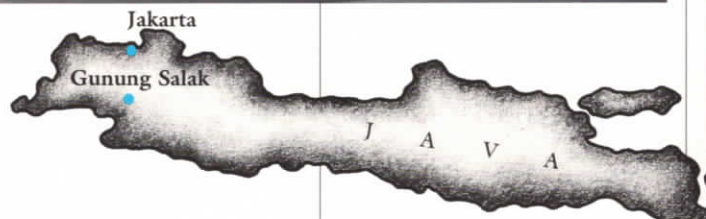
1989. Unocal signs an agreement with the Petroleum Authority of Thailand which places the remainder of the company’s original Gulf of Thailand concession areas under a gas sales contract. Work begins immediately on development of the Funan field, which has geologically estimated reserves of 880 billion cubic feet of gas.

1985

1986. Unocal conducts the North Sea’s first horizontal drilling program in The Netherlands’ Helder field. The technique allows a well to draw oil from a greater area, thus reducing the percentage of water produced and increasing oil recovery.



1988. Unocal marks the 20th anniversary of its production-sharing contract with Pertamina, the Indonesian national oil company. In July, Unocal Indonesia produces its 500 millionth barrel of oil.

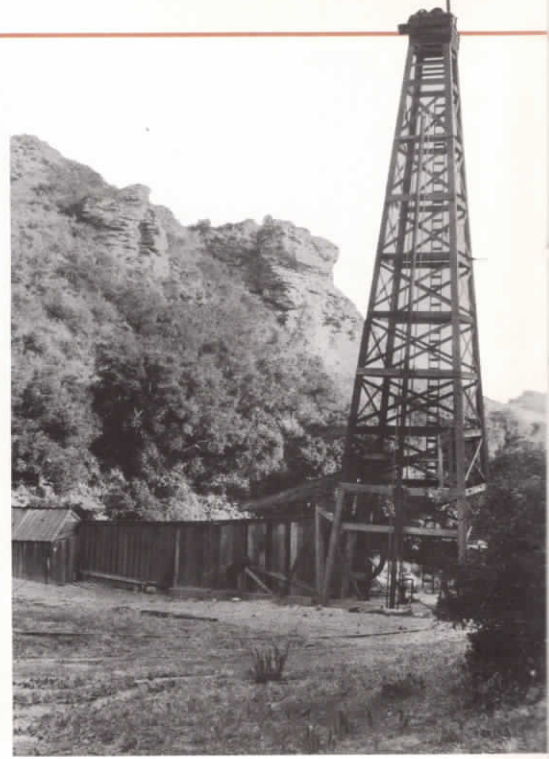


1989. Unocal dedicates its first large-scale geothermal power plant in California’s Imperial Valley. The start-up of Salton Sea Unit 3 (below) culminates more than 25 years of research and development.

1989. In an agreement with Indonesia, Unocal commits itself to develop the Gunung Salak geothermal field on the island of Java. Unocal discovered this field working under the first geothermal joint operation contract in Indonesia’s history. Electricity generated from the field will be delivered to Jakarta, Indonesia’s capital.



1989



A Century OF Success

In 1890, the year Union Oil Company of California was incorporated in Santa Paula, the company produced a total of 84,421 barrels of crude oil from 26 wells, all in Ventura County. A barrel sold for about \$1.75. Most of the oil came from locations that Lyman Stewart, one of Union's founding fathers, had sniffed out himself in the preceding years. Riding on horseback through the brush-filled canyons north of Santa Paula, Stewart looked for tell-tale seeps and outcroppings.

Stewart had a nose for oil and an entrepreneurial spirit. He not only was vice president and general manager of Union Oil Company, but also served as landman, production chief, and the main driving force behind the new company's expansion. Fortunately, he also had the foresight to buy mineral rights to thousands of acres of land for \$2 to \$5 an acre, sometimes conveniently forgetting to mention his new purchases to the board of directors.

Drilling in these early days was done from wooden derricks scarcely more than 20 feet tall, with cable tools that hammered down 500 feet or so, powered by coal-fired steam boilers. Most equipment was designed and fabricated in a Santa Paula shop by Union Oil mechanics, who had a reputation for being able to build almost anything.

The total start-up cost of a well was upwards of \$6,000, with about half of that amount for the essentials of a cable-tool outfit, including engine, boiler, tools and other equipment. The remainder was for rig timber, road construction, hiring teams of horses, supplies and wages. Most crews consisted solely of a driller and assistant, called a tool dresser, working 12-hour shifts.

Two years before Union Oil was incorporated, Stewart and partner Wallace L. Hardison had brought in California's first gusher, Adams No.16, at a depth of 750 feet for 500 barrels a day. The oil strike helped the fledgling company turn the corner financially, but it also created a temporary glut of crude on the west coast. The situation led in part to the consolidation of three oil companies (Sespe, Torrey Canyon and Hardison & Stewart) to form Union Oil.



From left: A turn-of-the-century Union Oil drilling crew; a Lompoc field well; Lyman Stewart (above) and William Orcutt; the Lakeview gusher and its driller, Charles "Dry Hole Charlie" Woods.



As the end of the century approached and the company expanded, the business of finding and producing oil became too much for one person to oversee, even the remarkable Lyman Stewart. Union Oil Company soon hired two young men who would eventually take over these duties and who would have an immeasurable influence on the future of the company and the oil industry itself — William W. Orcutt and Frank F. Hill.

A native Minnesotan who grew up in Santa Paula, Orcutt was an 1895 graduate of Stanford University, where he studied geology and civil engineering. Hired by Union as superintendent of development for the Northern Division in 1899, Orcutt promptly began a geological survey of various districts in the San Joaquin Valley. Lyman Stewart was so impressed with Orcutt's work that he asked him to organize a geology department, the first for a western oil company.

Early oil-hunting geological surveys were mainly surface reconnaissance missions to locate oil seeps and rock outcroppings. The geologist would make rudimentary estimates of underground formations and geological age, and mark his observations on a map of the area. To a geologist in the field, social skills could be almost as important as scientific acumen. During his trips, Orcutt befriended many Basque shepherds who pointed him toward hidden oil seeps and unusual rock outcroppings. At the same time, he had to ingratiate himself with local landowners—without giving away his mission for fear of driving up the price of land.

With the addition of several bright young geologists to the staff, Orcutt's department flourished, compiling an outstanding record over the years. Orcutt himself never lost his taste for tramping around the outdoors, scouting for oil as far afield as Alaska and South America. He compiled the first geological maps of the Lompoc and Santa Maria areas in California, and discovered the now famous fossil beds in the La Brea tar pits of Los Angeles.

Orcutt was credited with the discovery of at least 15 oil fields in California, including the highly productive Santa Maria, Dominguez, Richfield, Santa Fe Springs and Lompoc fields. Several notable discovery wells were drilled on lands originally surveyed by Orcutt. In 1904, "Old Maud" came in at 12,000 barrels a day in the Santa Maria field. In 1910, the prodigious Lakeview No. 1 well came in near Taft, in the southern San Joaquin Valley.

Lakeview, which spurted out an estimated 125,000 barrels of crude in its first 24 hours, was the largest oil well in America up to that time. In these early days of oil hunting, cable tool drilling was the only technology available. Drilling muds were not yet being used to control pressures. When oil was discovered, it came in uncontrolled—sometimes as a gusher—hence the saying, "There she blows!"



Left, a 1920s view of the Santa Fe Springs field. Above, drilling wizard Frank Hill. Right, a Dominguez field crew in 1924.

Successes came steadily for Union's exploration teams, keeping pace with an astonishing growth in demand for petroleum products to fuel and lubricate automobiles, and provide asphalt for roads. In 1917, there were fewer than 5 million autos in the United States. By 1923, there were 23 million—with a good share of the growth coming in California.

According to a report issued by the state, Union Oil was the most successful wildcatter in California for the 10 years between 1914 and 1924. In 1919, the Richfield field was discovered in Orange County. The Santa Fe Springs field followed in 1921, and the company drilled successful discovery wells at Long Beach, Huntington Beach and Torrance in 1922.

In 1923, the well Callender No. 1 opened the Dominguez field. That same year, Union brought in a gas well that set off the first great oil boom in Colorado, and opened the Circle Ridge field in Wyoming. During the year, company wells yielded a record 18.7 million barrels of oil—making Union the biggest producer based in the west.

As Orcutt and his growing team of geologists scouted for new prospects, Frank F. Hill was the man who drilled the wells. Hill came to work for Union as a warehouseman briefly in 1895 and then returned in 1899. He advanced rapidly to driller, then to foreman and finally drilling manager. An even-tempered and patient man, Hill was credited with an uncanny sense of what lay beneath the surface and what was happening underground with a string of tools. Any driller who worked under Frank Hill for a couple of years was said to have a diploma that was good in any oil field.

By 1905, already serving as Union Oil Company's superintendent of drilling, Hill was credited with the industry's first successful oil well cementing job, carried out on Hill No. 4 in the Lompoc field. It was a major breakthrough in drilling technology, opening the way for deeper wells and improved oil production.

In the ensuing years, Hill was responsible for a number of innovations in oil drilling, many of them leading to the standardization of oil well equipment. He also became a pioneer in secondary recovery, perfecting the gas-lift and gas-drive processes. He ultimately shepherded in the era of rotary drilling in California, employing increasingly more massive equipment.

Under Hill's guidance, the company frequently set industry records for deep wells. In 1934, the year in which Union's producing wells topped the 1,000 mark, a company crew drilled the world's deepest oil well to date—an 11,377-foot hole in Kern County, California.

During the tenures of Orcutt and Hill, petroleum geology advanced along with drilling technology, moving from the rough mapping of surface features to the refinement of the anticline theory, the advent of seismology and the study of paleontology. Under Orcutt's direction, Union was quick to employ the latest advances. In the early 1930s, for example, the company established one of the industry's first micropaleontology research laboratories.



Above, the Wilmington oil field in the 1920s. Left (top), a Union Oil pilot prepares to conduct an aerial survey in 1931. Left, an aerial shot of a San Joaquin Valley field taken the same year.

Of course, geologists still had to explore in the field as they do today, and Union's geology department was increasingly on the run as the company's horizons broadened. As early as 1920, Union was using techniques developed by the military in World War I to help produce photographic aerial maps. These often revealed promising geological features not easily spotted from ground level.

One of the more colorful Union Oil scouts was square-jawed Rodney Burnham, geologist and manager of lands. Burnham was a born explorer, and his zest for visiting remote places diverted readers of the *Union Oil Bulletin* in the early 1920s. There were entertaining reports of Burnham slogging through the jungle in Venezuela, flying over Mexico and scrambling over rocky slopes in Colorado, Wyoming and Utah.

By early 1921, Orcutt's team had decided that possibilities for oil shale looked promising in western Colorado. Orcutt, Hill, Burnham and others were making exploratory forays that would soon lead them to Parachute Creek.

Burnham was in the thick of it, jouncing across remote stretches in a Hudson touring car with his equipment strapped to the running boards. "You can see the farsightedness of the company in obtaining this vast future reserve," he wrote. "This will probably [be developed] when the curve of the world's consumption of petroleum approaches that of production."

By the early 1930s, Orcutt was a vice president and director of Union Oil, and Frank Hill had been appointed director of production. Reporting to Hill was a new manager of field operations — a young up-and-comer named Albert C. "Cy" Rubel. Rubel, a mining graduate of the University of Arizona, had been exploring for oil in Mexico when he came to work for the company in 1923. He was soon transferred to the field department, and in 1929 became Union's chief petroleum engineer and then assistant manager of field operations. Like Orcutt and Hill before him, Rubel would be an important factor in the company's growth.

Times were changing rapidly for Union Oil, and sometimes events seemed to sweep away the past abruptly. On one occasion, this was literally true: On January 10, 1933, a fierce Santa Ana wind swooped down off the desert and destroyed 44 of Union's wooden derricks in the Richfield, Brea and Huntington Beach fields.

More damaging was the economic turmoil sweeping the country in the Great Depression. The bottom fell out of gasoline sales, and turned the crude market upside down. At one point in 1931, the wellhead price of some crudes dropped as low as 35 cents a barrel.

Although exploration and drilling continued, the company endured five years of production cutbacks during the Depression. Still, Union Oil continued to expand reserves, with several notable discoveries in the late 1930s. In 1936, Rubel took over for his former mentor, Hill, as director of production. It was a frustrating time for a young man to get his feet planted in the oil business. Just when things seemed to be improving in 1937, the industry was beset by another glut, fed by the opening of huge fields in East Texas and the giant Wilmington field in Long Beach.



When Reese Taylor took command as president of Union Oil in 1938—the same year that Orcutt and Hill retired—much of the company's equipment and facilities were in need of major repair or replacement. Nearly half of Union's 1,200 producing wells were shut down, partly due to overproduction, but also because the infrastructure was wearing out. Taylor brought an aggressive new spirit to the company along with an infusion of borrowed cash. Needed repairs and refurbishing were begun, and Union's explorationists redoubled their efforts as the nation's economy began to turn around.

Early in 1939, Rubel sent geologist Sam Grinsfelder to Texas to study possibilities onshore in the Gulf region. Grinsfelder reported back promptly, describing the geology of West Texas and the Gulf Coast and comparing the two areas. He recommended drilling on the Gulf Coast. Although finding costs would be higher, the oil would have a shorter payout schedule than in West Texas, and the wells would be closer to marine terminals.

Rubel approved, and Union Oil opened an office in Houston with three geologists and a landman. Don't expect immediate success, the cautious Grinsfelder warned. But to everyone's relief, the first four wildcats in Texas and Louisiana struck oil.

On December 7, 1941, the Japanese attacked Pearl Harbor, thrusting the U.S. into World War II. Suddenly, the war effort was the only thing that mattered. The military's appetite for oil was insatiable, and Union cranked its production up to the limit. By the end of 1942, the company was operating 1,566 wells.

In its new Gulf Coast fields, Vinton and Freshwater Bayou, Union boosted the yield nearly fivefold in a single year. In August 1943, Union wildcatters made their first discovery in what was to be the prolific West Texas Division. Union also acquired the Glacier Production Company, which included 90,000 acres of promising oil and gas properties in Montana.

Economics and advancing technology were radically changing the business of finding and producing oil. Slant drilling—with six to 20 wells going down from a single pad—reduced the number of drilling sites needed to develop a field, but put more pressure on geologists to pinpoint optimal well locations. The expense of drilling and the cost of equipment were steadily mounting. Union, which had once owned and operated more than 40 drilling rigs, now began to rely more and more on independent contractors. One of these, the Santa Fe Drilling Company, was formed as an independent company spun off from Union's own drilling department in 1946.

Because of the large investments required, new fields were now often developed by two or more oil companies, employing the field unitization approach. Unitized development was initiated in 1929 by The Pure Oil Company (later to merge with Union) in the Van, Texas field. Under such arrangements, one company operated the field, while the other co-venturers took proportionate shares of production based on their lease holdings.



During the 1940s and '50s, Union explorationists found new oil deposits on some of the company's oldest California properties, such as the Sansinena field (facing page). This page: seismic surveying in the San Joaquin Valley (far left); drillers in the Torrey Canyon field (left and above).

The end of World War II signalled the beginning of an intensive period of exploration for Union Oil Company. In 1949, Union seized the opportunity to purchase two new sources of crude from the heirs of Edward L. Doheny. Together these Southern California properties added approximately 13,500 barrels of production a day, with reserves estimated at more than 46 million barrels. Nevertheless, nearly 40 percent of Union's production still came from properties acquired years earlier by Lyman Stewart. Rubel and his geologists began to take a closer look at these holdings.

One was the 3,400-acre Sansinena tract, east of Whittier, California. Stewart had purchased the tract back in 1903, but no exploration had been undertaken, and company geologists were divided as to whether or not it was a good prospect. Rubel had a hunch that it was—but what was empty land in 1903 was now occupied by homeowners who didn't want oil wells in their midst. After Union promised to camouflage the drilling rigs and locate them in out-of-the-way canyons, the property owners withdrew their objections. On the fourth attempt, drillers struck oil about 5,000 feet down.

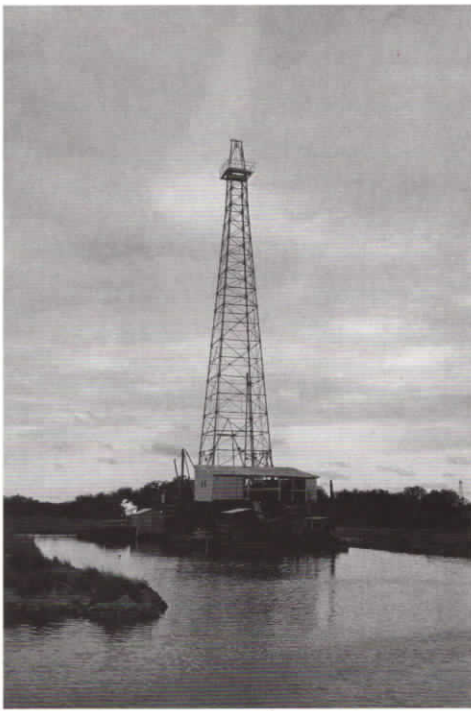
Union geologists also revisited the Torrey Canyon field, where the company's old shallow wells had been producing since 1889. (Some still are producing oil today.) Deeper drilling again paid off: in 1952, Torrey Canyon No. 83—drilled to a depth of 9,000 feet—came in at 526 barrels of oil and half a million cubic feet of gas per day.

Subsequent wells turned Torrey Canyon—which provided more than one-third of Union's production during the company's first few years—into one of the top producing fields again. Moreover, the fresh geological data led explorationists to the rich Oakridge field, two miles east of Torrey Canyon.

Enhanced recovery techniques were also employed to boost the yield from producing fields. Union's production group had been working with secondary recovery methods for years. Waterflooding had already succeeded in increasing the flow of Richfield's heavy crudes, and gas injection had kept the Dominguez field alive. In the 1950s, engineers employing improved recovery methods managed to add 70 million barrels from 35 fields to Union's reserves.

At the same time, Union explorationists broadened their search for oil, stepping up the pace on the Gulf Coast, in West Texas, the central states, Canada and Alaska. Rubel and his group were also convinced that there were large deposits offshore California. As early as 1948, Union Oil was participating in seismic surveys of the Santa Barbara Channel. In 1953, Union and three other companies launched CUSS 1 (an acronym based on the company names), a floating drilling platform converted from a huge freight barge.

Equipped with a derrick, drilling rig and crew's quarters, CUSS 1 began to probe promising sites identified by the seismic surveys. A total of 300,000 feet of exploratory holes were drilled from the vessel. In the summer of 1957, CUSS 1 drillers completed six wells in 54 days, some of them in water more than 1,000 feet deep. Rubel's exploration department liked what it saw, but the unresolved question of who owned the tidelands—the state or the federal government—kept lease sales in a tangle of red tape.



Union bought out its partners and formed a subsidiary, Global Marine Exploration, to take advantage of what had been learned with CUSS 1. Global launched several other giant drillships that explored for oil in other oceans. In 1964, Union sold its interest to the subsidiary, which then offered shares to the public.

Oil seekers were beginning to explore some of the most remote and inhospitable regions of the globe. In 1949, Union seismic crews first probed northern Canada. In 1953, the company struck oil at Fairydell, in western Alberta. In 1956, in northern Alberta near the Peace River, Union's Red Earth 12-17 came in at 1,000 barrels a day. This find set off the greatest oil company land rush in Canadian history.

By 1961, Union's Canadian Division had become so big that the company formed Union Oil Company of Canada Limited. Union exchanged the wells, facilities and land leases for an 83 percent stake in the new company. By 1965, Union Oil of Canada was producing 12,000 barrels of crude and more than 10 million cubic feet of gas a day from 280 wells.

Union was also exploring in Alaska. In 1959, along with Marathon Oil (then Ohio Oil Company), Union drillers were looking for oil on the Kenai peninsula when they discovered gas at 4,232 feet. Deeper drilling failed to find oil, but four more wells proved up a prolific gas field. After a pipeline was laid, the Kenai field supplied the first natural gas to the city of Anchorage, 80 miles away. Later, gas from the Kenai field and a subsequent discovery — the Cannery Loop field — would supply a fertilizer plant built by the company near the town of Kenai.

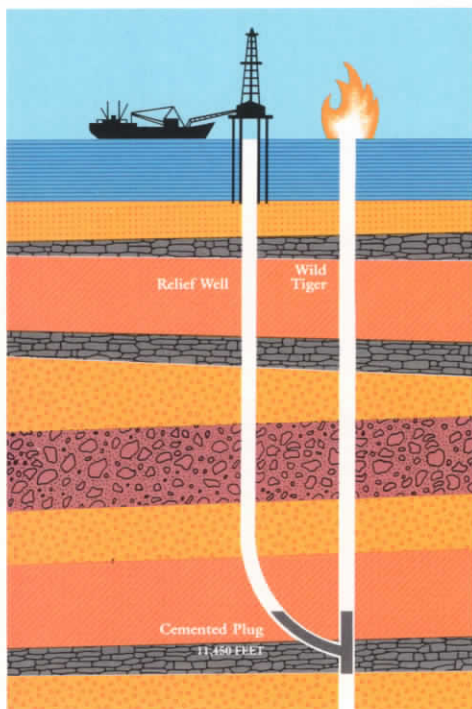
After the initial successes along the Gulf Coast in the 1940s, Union's oil finders hit a drought period in the Louisiana bayou country. In 1952, the manager of the Gulf Division, Dudley Tower, dispatched a young geologist, Ray A. Burke, to New Orleans to get things moving.

Burke, a Navy combat pilot during World War II, was a graduate of the University of Texas. He already had five years of experience with another oil company when Union hired him in 1951, one of several Texans employed to fill out the district staff in the Corpus Christi office.

The confident, assiduous Burke brought a fresh point of view to the company's Gulf Coast operation. One of the first properties he looked at was East Lake Palourde, Louisiana, where Union had drilled a 12,000-foot dry hole 10 years earlier. Burke recommended trying again. Tower was reluctant and thought the company should farm the project out, but Burke successfully argued his case and received the green light.

The resulting discovery well, drilled in 1954, turned out to be spectacular. Almost overnight it made Union one of the major producers on the Gulf Coast. "Lake Palourde gave the whole organization a lot of confidence," said Burke, who immediately began to push for offshore drilling in the Gulf. Like Grinsfelder before him, Burke believed there was oil to be found.

"It took no great vision as a geologist to see that the prolific fields of Louisiana had to extend offshore," he said. Dudley Tower had already tried and failed to get corporate approval for an offshore project in the Gulf. Rubel and others at headquarters felt that California properties should be developed first, since they supplied Union's refineries directly.



Far left, facing page: a wildcat well in the Louisiana bayou country; workers in the Vermilion field, Gulf of Mexico. This page, far left: diagram of the relief well drilled to plug the "Wild Tiger." Left, a "swamp buggy" used to transport oil crews in the bayous. Above, left to right: Cy Rubel, Dudley Tower, Ray Burke.

Burke finally managed to win approval for a seismic survey on the South Pecan Island prospect that extended into the offshore area. The results were promising, and Burke personally carried the report to Los Angeles. Grinsfelder, then Union's vice president of exploration, approved drilling. When the project was presented to Rubel, he looked it over thoughtfully.

"Good looking prospect," he said.

Thus, Union began drilling in the Gulf. The first well was spudded in on the Vermilion "Block 14" prospect. By now, Burke was stationed in Houston as chief geologist for the Gulf Region, and he went out personally to check the well logs. "There was so much pay, I couldn't believe it," he said.

But on the night of June 7, 1956, the mood of exhilaration abruptly ceased. Drillers on the platform suddenly encountered unexpectedly high pressures in the formation. A blowout prevention valve ruptured, and by morning the well was out of control.

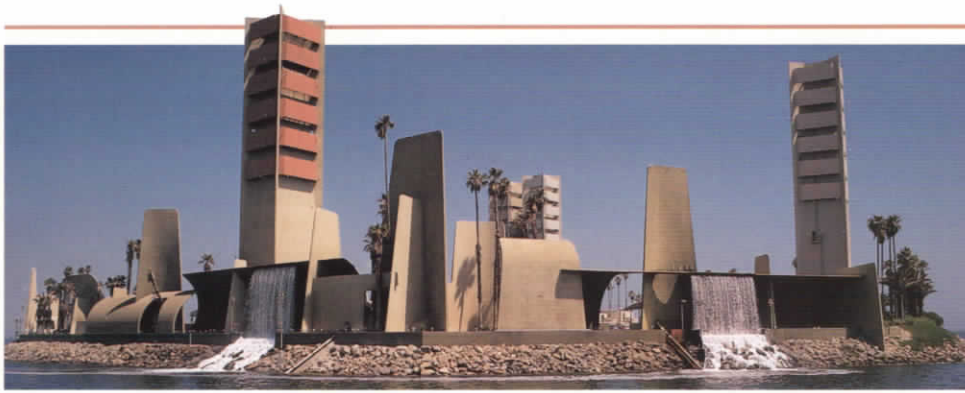
Within a few days, the rig and platform had vanished into a crater gouged out of the sea floor by the escaping gas. Navy pilots ignited the plume with tracer bullets, to keep clouds of gas from drifting into populated areas. The well became an inferno, earning the nickname: "Wild Tiger of the Gulf."

While the Wild Tiger burned, a new platform and derrick were erected nearby in the record time of 37 days. A new hole was slant-drilled to intersect the original one, and thousands of barrels of mud, sea water and cement were forced down into the well. On November 20, over five months after the blowout, the Wild Tiger was finally tamed.

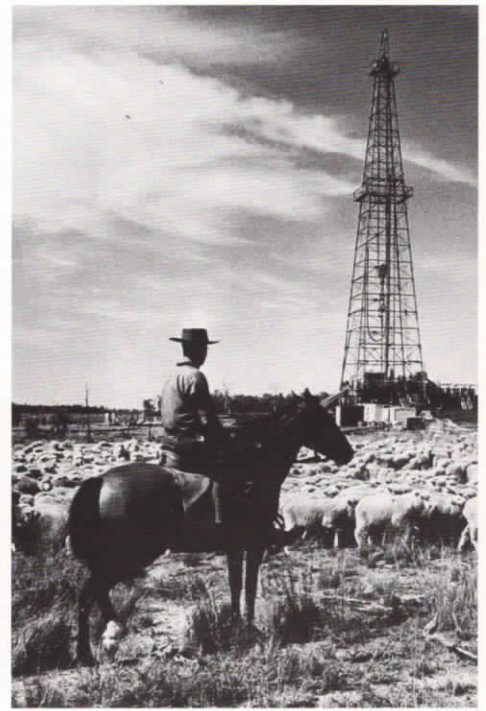
Meanwhile, Union Oil's co-venturer in the lease had completed another discovery well, and soon Vermilion Block 14 proved to be the Gulf Region's most prolific gas field. Explorationists discovered other new Louisiana fields onshore at West White Lake, Tigre Lagoon, Freshwater Bayou and at East Timbalier Bay, where in 1959 Union tapped into a new reservoir at 17,395 feet, the company's deepest well up to that time.

Burke had impressed Rubel and Reese Taylor. In 1961, after serving two years as manager of the Central Region out of Midland, Texas, Burke came to Los Angeles to serve as Union's director of exploration. At the time, Union's daily oil production was about 90,000 barrels, but Burke was aiming higher. "In five years," he told an associate, "I'm going to have this company producing 150,000 barrels per day." In 1962, he became vice president in charge of exploration and production, and by the end of 1965, he had achieved his goal.

The 1960s were enormously productive for Union Oil Company, despite a series of management upheavals. Rubel, who had become president of the company in 1956, retired in 1960 and was replaced by Dudley Tower. Then Reese Taylor, who was serving as Chairman and CEO, died suddenly in 1962, and Rubel came out of retirement to lead Union again. In 1964, Rubel retired a second time, with Fred L. Hartley succeeding him.



This page, clockwise from above: one of the THUMS islands offshore Long Beach; an oil well in Australia's Moonie field; Platform Eva offshore Huntington Beach, California. Facing page, from left: a platform complex in the Attaka field, offshore Indonesia; a chopper departs a Union platform at the nearby Sepinggan field.



During this period, Union made a major strike in its own front yard with the discovery of the Las Cienegas field. Rubel and Grinsfelder had recognized the promise of Los Angeles' west side area as early as the 1950s. But the urban environment posed special problems for oil exploration and development. More than 100 landmen set out to sign up owners of 30,000 lots, covering 7,000 acres. Seismic work had to be performed along an old railroad right of way between two busy streets. Drilling rigs were set up behind billboards, on vacant lots and in supermarket parking areas.

The first three attempts at drilling came up dry. The fourth well, drilled at a steep slant, nicked sedimentary rocks with oil shows. However, at 3,500 feet it had passed under the edge of a reservoir that lay only 2,500 to 3,000 feet beneath the surface.

"It was the first time in exploration drilling history that an oil field had been found by drilling underneath it," said John E. Kilkenny, chief geologist of the Pacific Coast Division.

Development offshore California also began in earnest during the '60s. In 1965, Union joined with four co-venturers in a consortium called THUMS (an acronym for the participating companies) to develop the huge East Wilmington field offshore Long Beach.

Drilling was done from four man-made islands. Because they were built close to shore, the islands were landscaped with shrubs, palm trees and waterfalls to camouflage them. Derricks were disguised to resemble modern buildings that would blend in with the cityscape of Long Beach. Within three years the field was producing 81,000 barrels of oil a day, with new wells still being drilled.

Offshore Santa Barbara, Union began drilling on an 11,500-acre lease, for which it had paid a \$3.6 million fee to the state of California. Offshore Huntington Beach, the company paid more than \$6 million to drill on a 2,000-acre parcel. A drilling barge found oil, and Union invested another \$2.3 million for a permanent offshore platform.

By the time a giant (for those times) prefabricated rig was towed in two sections from Houston through the Panama Canal and erected at the Huntington Beach site, the company had invested \$10 million.

Burke named the platform "Eva" after the bayou houseboat used as headquarters for the first successful crews in Louisiana. Within a year, daily production from Eva was 8,000 barrels and increasing steadily.

In Alaska, success on the Kenai peninsula had encouraged explorationists to expand their search—particularly in Cook Inlet, where seismic surveys revealed some startlingly large structures. In 1962, Union teamed up with Marathon Oil to acquire drilling rights in the Inlet, under the first lease sale conducted by the state of Alaska.

In the summer of 1965, three of four exploratory wells in Cook Inlet turned up major producers. The following year, Union installed two offshore platforms—the 7,200-ton Grayling platform over the McArthur River field, and the world's first single-legged, "monopod" platform to produce oil from the Trading Bay field.

By 1969, Cook Inlet was providing more than 12 percent of Union's total supply of domestic crude oil. Until oil from Alaska's North Slope began flowing through the Trans-Alaska pipeline in 1977, Union was the state's largest producer.



Despite a string of domestic successes, it was becoming increasingly clear to Union management that major growth for the company would be possible only by expanding the search for oil into international arenas. Initial attempts did not turn out well. In 1958, Union wildcatters had found oil in Argentina, but the company later had its concession cancelled. During an unsuccessful exploration of the Spanish Sahara, a seismic crew was kidnapped and held for ransom by bandits.

A venture in Australia turned the tide. On December 17, 1961, Union and two co-venturers brought in Moonie No. 1 in Queensland for 2,200 barrels a day of high-gravity crude. Australia, which had imported all its oil until then, threw a celebration. In Brisbane on March 6, 1963, Union Oil's Cy Rubel, Bill Stewart, Ray Burke and their colleagues received personal commendations from Queen Elizabeth II.

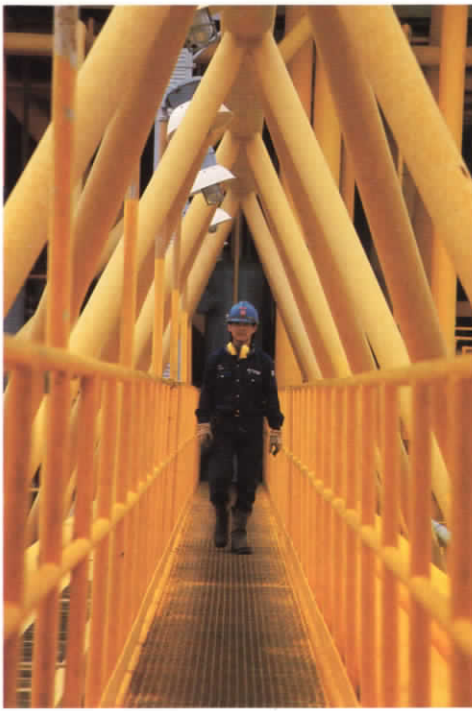
Under Fred Hartley in the ensuing years, Union became a major international player. Before the decade of the '60s was out, the company had an established presence in the Middle East, Indonesia, and the North Sea. Union Oil also had a foothold in Thailand, where exploration was proceeding both on and offshore.

In 1965, Hartley guided the company through a merger with The Pure Oil Company of Illinois. On July 16, the shareholders of both companies approved an agreement that would nearly double the size of Union Oil. The resulting company had total assets of \$1.8 billion, more than 1.2 billion barrels of crude oil and natural gas liquids, and nearly 9 trillion cubic feet of natural gas reserves located in 21 states and four foreign countries. Pure's producing properties in Illinois, Texas, Louisiana and Wyoming, in addition to Canada and Venezuela, were consolidated with Union's operations.

In 1966, Fred Hartley created the International Oil & Gas Division, appointing Ray Burke to be its president. Burke also was elected senior vice president and a director of the company. Kenneth C. Vaughan was president of the Oil & Gas Division, responsible for domestic exploration and production. Vaughan was also a director and senior vice president of the company.

Working in the newly formed International Division required a tolerance for air travel, well-honed negotiating skills, and lots of patience and perseverance. Union's venture in Indonesia demanded all these qualities. It took 10 years for the company to get established there, starting with the arrival in Jakarta of landman Hank Brandon in 1960. The effort finally paid off when Union, as operator, drilled the discovery well of the Attaka field (located offshore East Kalimantan) in August, 1970.

Meanwhile, Union representatives negotiated landmark production-sharing contracts with Pertamina (the Indonesian national oil company) and a unitization agreement with Japex, a Japanese firm with holdings adjacent to Union's acreage. The negotiating team, working under Charles M. Schwartz, head of company operations in Australia, included two men Ray Burke was coming increasingly to rely on—Richard J. Stegemeier, who had served as manager of production for Union in Australia, and Sam A. Snyder, associate legal counsel.



Stegemeier had already achieved success as an international negotiator, having helped to work out an agreement between Union and the Tokyo Gas Company regarding the possible sale of liquefied natural gas from Alaska. In Indonesia, his job was to negotiate pioneering production-sharing contracts with Pertamina for two areas: offshore Northwest Sumatra and offshore East Kalimantan.

“The contract we negotiated for Northwest Sumatra was one of the first production-sharing contracts in the industry,” Stegemeier recalled. “It set the stage for the modern production-sharing contracts under which all of our operations in Indonesia have been conducted. We use that same type of contract in other parts of the world.”

Throughout the 1970s and beyond, Union continued to make commercial discoveries in the East Kalimantan region. Development steadily progressed in Attaka and several other fields. By July of 1988—the 20th year of the company’s operations in Indonesia—500 million barrels of oil had been produced. The company had also produced approximately 775 billion cubic feet of natural gas.

Another Southeast Asian success story was also coming together for the company during the same period. In 1962, Union had become the first oil company awarded exploration rights in Thailand after Burke personally made a pitch to government officials. Once again, perseverance paid off. It took a decade of preparation and exploration before Union discovered the Erawan gas field in the Gulf of Thailand in 1973.

Also in that year, major changes occurred in the management of the company’s exploration and production arm. Burke was promoted to senior vice president in charge of Energy Resources, making him responsible for both domestic and international exploration and production, as well as for the Geothermal Division, acquired in the Pure Oil merger (see following story).

John Sloat replaced Burke as president of the International Division, and Harry E. Keegan became president of the Oil & Gas Division, replacing Vaughan, who retired. Keegan, a graduate of the University of California at Berkeley, had joined Union in 1948 as an engineer trainee and worked his way up in the Central Region, becoming vice president in 1969.

Early on in the Thailand project, Ray Burke envisioned the possibility of replacing that nation’s imported fuel oil with new commercial quantities of natural gas. International vice president Robert R. Roethke was sent to Bangkok to devise a practical plan for this new industry. Most of Thailand’s power was generated by burning imported fuel oil, and the Thais were eager to convert to their own natural gas. But the plan would require construction of a new pipeline infrastructure. Union raised the matter with the World Bank, which agreed to fund the project.

Reserves at Erawan were estimated to be 1.5 trillion cubic feet of gas, and discoveries of other fields continued to add to this total. In 1978, Union and the government of Thailand signed their first gas sales contract. “That was probably the most important single commercial contract that had ever been signed in Thailand,” said Burke. “It created a completely new industry.”

Within three years, however, the project was in serious jeopardy. Drillers at Erawan encountered extremely high reservoir temperatures, and wells had to be shut in when down-hole equipment failed. In addition, it became apparent that the geology of the producing formations was more erratic and complex than originally thought.



Union's international presence expanded greatly beginning in the late 1960s. Above, the Heather platform jacket is towed to its placement site in the U.K. sector of the North Sea. Left, the Helm platform, offshore The Netherlands. Facing page: development in the Gulf of Thailand. Production began from the Erawan gas field (center) in 1981.

Rather than the large reservoirs characteristic of most gas fields, the Gulf of Thailand deposits existed in small, unconnected pockets. When produced, the gas in these small reservoirs was depleted much faster than anticipated—and it took more wells than had been planned to get at it.

The situation was critical for both the Thai government and Union. The country was in the process of converting its power generation to gas fuel. It began to appear that Union would not be able to fulfill its promises. But Hartley was determined that Union would live up to its commitments.

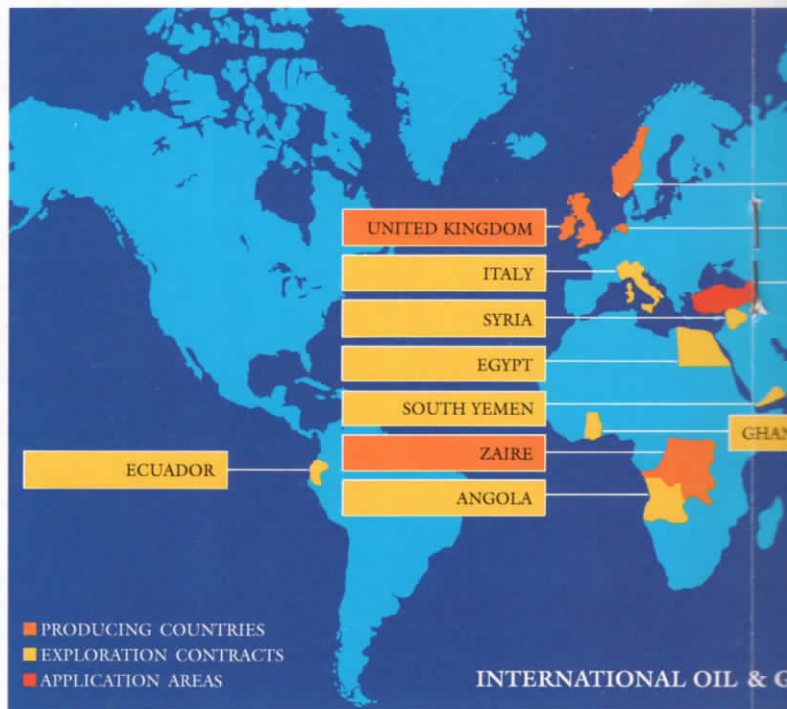
Harold Lian, who had succeeded John Sloat as president of the International Division in 1974, was transferred to Bangkok as president of Union Oil of Thailand to provide senior representation on the scene. Union accelerated its drilling and development schedule, adding wells and platforms to produce the smaller deposits faster. New down-hole materials that could better withstand the heat were employed, and production soon improved. The Baanpot field was brought on stream in just seven months. By the spring of 1985, the Platong and Satun fields were also on production.

Union used highly sophisticated techniques, including three-dimensional seismic data collection and advanced computer analysis, to increase finding rates and cut down on dry holes. The company also supplied the Thai drilling crews with the latest technology, including top-drive rigs, polycrystalline-edged drill bits and special oil-base muds. As drilling crews gained experience they achieved remarkable improvements in speed and efficiency, cutting drilling costs about 60 percent. By the end of 1985, half of Thailand's electricity was generated by burning natural gas from Union's fields.

The company was also busy in other parts of the world. Since the late 1960s, Union had been active in the North Sea, a high-stakes area where one exploratory well could cost millions. But when oil prices soared after the Arab embargo in 1973, the economics of exploring the North Sea became more promising. Union, serving as operator with three co-venturers, struck oil in 500 feet of water 75 miles east of the Shetland Islands, in the U.K. sector of the North Sea. In 1978, production started from platform Heather, set the previous year. By 1982, Heather had reached its peak production rate of 33,400 barrels a day.

In 1979 and 1980, Union also discovered oil in the Dutch sector of the North Sea. The fields were small and marginally commercial, but under the creative direction of John Imle, Jr., Union's general manager in the Netherlands, the two fields (Helm and Helder) and then a third field (Hoorn) were developed in record time. By the mid-1980s, production from the three fields had reached more than 30,000 barrels per day, well above estimates. In 1983, Burke appointed Imle, a graduate of Texas A & M in petroleum engineering, to succeed Lian as president of International Oil & Gas.

The company's oil hunting activities also ranged to the Middle East. In 1965, Union had become part of a joint-venture group forming the Lavan Petroleum Company to conduct operations in Iran's huge Sassan field, under an agreement with the National Iranian Oil Company. The 1978 revolution in Iran, however, led to the seizing of all Lavan properties. It wasn't until 1986 that the company reached a settlement with the Iranian government covering the lost assets.



Domestically, the company's exploration and production operations had their share of adversity as well as success. In February of 1969, an offshore tragedy thrust Union Oil into the national and world headlines. During the early stages of developing the Dos Cuadros field offshore Santa Barbara, an oil well on Union-operated Platform A blew out. The well was quickly shut in, but oil and gas erupted through fractures in the sea floor. The escaping oil formed a slick which drifted to shore, coating beaches in the Santa Barbara area.

Union employees and volunteers worked around the clock to assist in clean-up operations along the coast. No lives were lost, and no lasting ecological damage resulted from the spill. But intensive media coverage of the incident served to galvanize the environmental movement of the 1970s.

As Union moved into deeper offshore waters and more severe climates, new technology became a key to success. In the Arctic Ocean, the company drilled in the winter from a man-made ice island. And in the Gulf Region, Union geophysicists employed a new "bright spot" analysis technique to identify potential offshore gas deposits on seismic readouts.

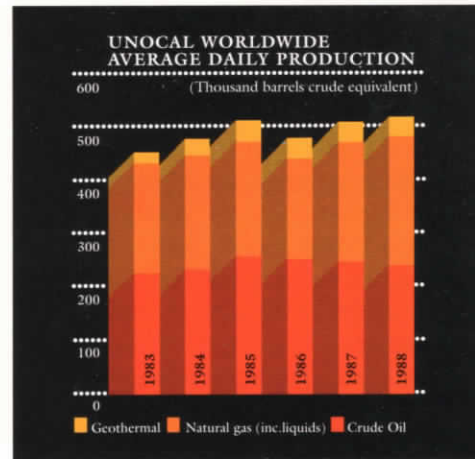
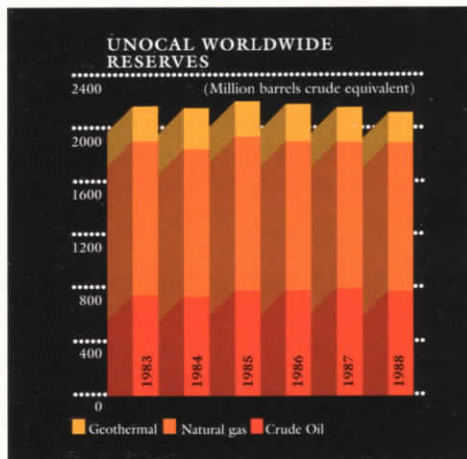
Deep drilling represented another new frontier for Union Oil. The company discovered new natural gas deposits in the Chunchula field in Alabama by drilling below 18,000 feet. Union also formed a deep-water technology team to experiment with new ways to drill far offshore. In 1976, the International Division drilled some exploratory wells in 2,000 feet of water off the coast of Thailand.

In the Gulf of Mexico, Union set two massive platforms in the early 1980s—Cerveza and the slightly smaller Cerveza Ligera. Both platform jackets were constructed on shore in one piece, then towed to the drilling sites on barges. The 952-foot Cerveza was the largest single-piece jacket built and launched up to that time.

Between 1981 and 1985, Union continued to add to its domestic land holdings, purchasing federal leases in the Gulf of Mexico, Alaska, California and the Atlantic Coast. From 1983 through 1985, Union increased its offshore position in the Gulf of Mexico from 141 blocks to interests in 283, acquiring 465,000 net acres after the U.S. Government's area-wide leasing plan went into effect in 1983.

Union's oil and gas production offshore California continued to expand during the 1980s. In 1981, platforms Gina and Gilda were set offshore Southern California. About 100 miles north along the coastline, the company confirmed the discovery of the Point Pedernales field, an offshore section of the highly productive Santa Maria basin. Union's Platform Irene, set in August of 1985, began production from the field the following year. By July of 1987, Irene was producing 20,000 barrels of oil per day.

In 1985, the company, now doing business as Unocal, successfully fought off a hostile takeover raid by T. Boone Pickens, Jr. and his investment group, Mesa Partners II. As a move to enhance shareholder value, Unocal's board of directors approved the formation of a master limited partnership—Union Exploration Partners, Limited (UXP)—containing most of the assets of Unocal's Gulf Region. UXP units were offered to the public and distributed to shareholders, who then shared directly in the Region's profits.



Facing page, far left: A Union Oil volunteer (top) helps in the Santa Barbara oil spill clean-up; Dos Cuadros field platforms (bottom); detail of a seismic readout. Immediate left: the Cerveza platform, Gulf of Mexico.

Trying times and difficult challenges faced the Energy Resources arm of the company as it moved through the mid-1980s. The Pickens battle left Unocal with a \$6.1 billion debt, compared to \$1.6 billion in the months before the ordeal. Then in early 1986, oil prices collapsed. Stung by this one-two punch of mountainous debt and plummeting oil revenues, the company had to react quickly. Capital expenditures were slashed, drilling projects were curtailed, and marginal production from some 550 domestic wells was shut in.

"It felt like a life or death situation," said Stegemeier, who had been Unocal's president scarcely a month when the bottom fell out of the oil price. "We tightened the screws on everything we did. We had to survive by reducing our capital expenditures, cutting our operating costs, and trying to maximize revenues at a time when prices were falling in both natural gas and crude oil."

Despite the necessary belt-tightening, Unocal managed to hold its reserve position and maintain production (see charts) during this difficult time. The company did this primarily by squeezing more oil out of its older fields through infill and extension drilling.

When oil prices started to recover in 1987, Unocal was able to increase capital expenditures, and the company's exploration and development efforts rebounded. At the end of 1988, with Unocal once again on solid footing, Ray Burke announced his retirement. He was succeeded by John Imle, who became senior vice president, Energy Resources, and was appointed to the board of directors. Harry C. Lee took over as president of International Oil & Gas, with HD Maxwell replacing the retiring Harry Keegan as president of the Oil & Gas Division.

In 1989, with oil prices holding stable in the \$18-to-\$22 range, Imle set about streamlining Energy Resources into a leaner, more flexible operation. The restructuring was designed to enable Unocal's exploration and production arm to respond more effectively to a rapidly changing and highly competitive business environment (see accompanying interview with John Imle).

As part of this restructuring, the company's domestic Oil & Gas Division was reorganized by Maxwell into six new regional exploration and production groups — each a stand-alone business unit.

The objective was to give more autonomy to the regions, allow for quicker decision-making, and encourage management and innovation at lower levels, where local manager have their "hands on" the work.

Exploration strategy was also reformulated, becoming more aggressive and focused. This was in response to heightened competition and government-imposed restrictions on new domestic oil and gas development. A seventh business unit, Unocal Canada, was added to round out a nicely balanced and newly named North American Oil & Gas Division.

At the end of its first 100 years, Energy Resources is ready to face the future with a worldwide presence, a solid reserve base, an excellent land position, and a strong tradition of developing and utilizing new technologies. While having the technical and financial resources of a major oil company, Unocal's Energy Resources Division and business units are structured to compete with large companies and smaller independents alike.

Had he been able to peer into the future, Lyman Stewart would undoubtedly have approved. ☺

Story by Marshall Lumsden.

HARNESSING THE HEAT

In 1965, when Union Oil merged with Pure Oil Company of Illinois, a part of the bargain was a small Pure Oil subsidiary called Earth Energy, Inc. The company's manager was Dr. Carel Otte, a Dutch-born geologist and graduate of California Institute of Technology.

Otte was fascinated with the possibilities of harnessing the earth's natural energy by drilling into underground geothermal reservoirs of steam and hot water. Heated by molten rock in the earth's crust, these fluids can be used to drive turbines that generate electricity. In the early 1960s, Earth Energy had drilled three wells in Southern California's Imperial Valley. The geothermal energy tapped by these Salton Sea-area wells was not used for electricity generation, but in a pilot plant to recover minerals from the hot brines—primarily potash for use as a fertilizer.

At the time of the merger, Union's president, Fred L. Hartley, was also intrigued by geothermal energy. Hartley could envision the long-term potential of this alternative energy resource, and he was willing to commit capital and personnel to Otte and his group. As an engineer, Hartley was also challenged by the problems of producing geothermal energy.

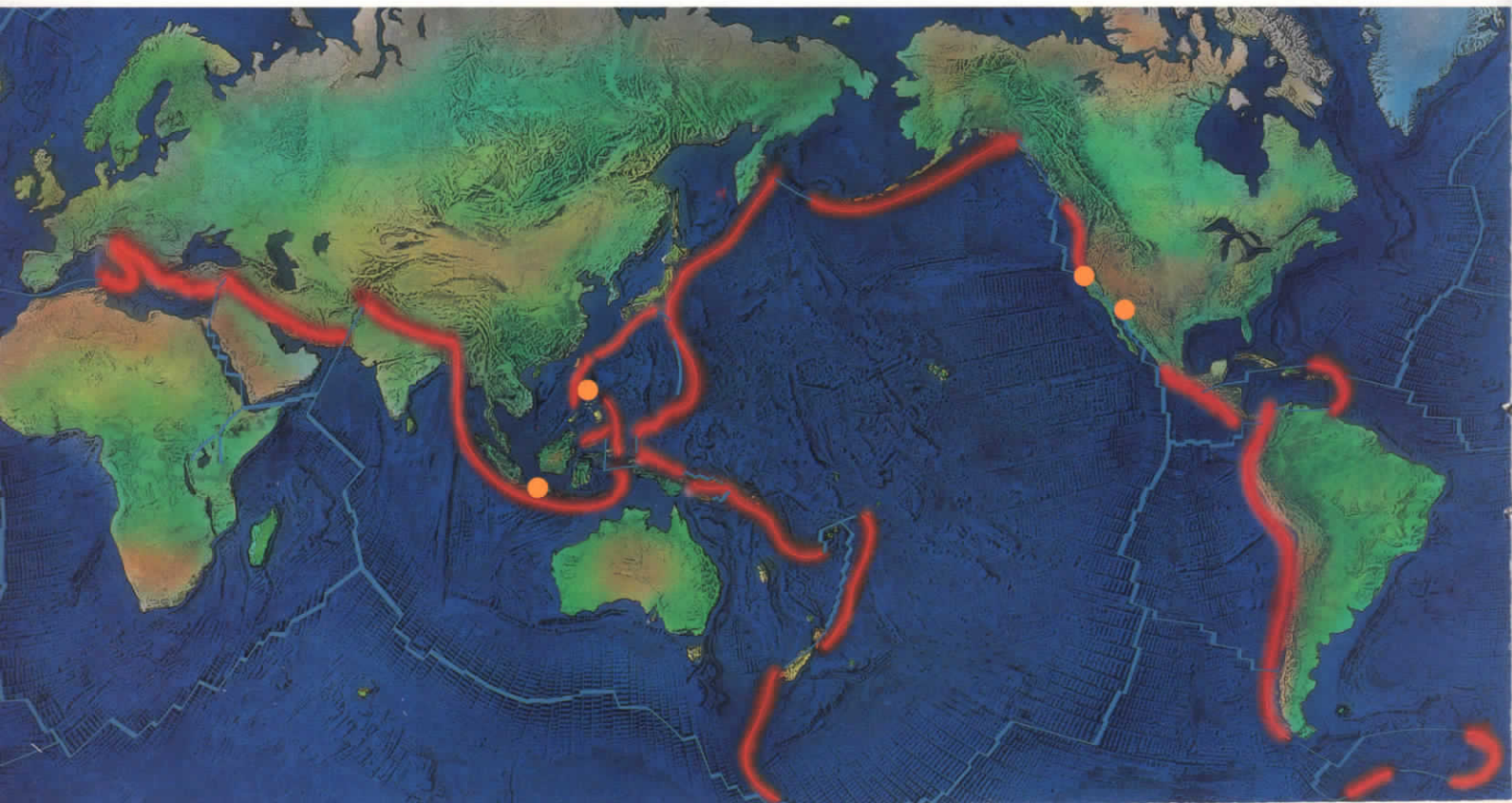
The problems, in fact, were daunting. Oil drilling equipment—designed to drill through softer, sedimentary layers of rock—had to be modified to succeed in the denser, harder rock and high temperatures that characterize geothermal deposits. At the Salton Sea, where the geothermal fluids are extremely salty and mineral-laden, another set of problems beset drillers. Corrosive brines at temperatures up to 700 degrees Fahrenheit ate through ordinary casings—or would have if it hadn't been for deposits of silica and other minerals inside the pipe.

"Corrosion wasn't the worst problem," noted Otte, a bit ruefully, "but only because the pipes plugged up before they had a chance to corrode."

Union's interest also became drawn to a Northern California area known as The Geysers, located about 90 miles north of San Francisco. Pure Oil had already leased properties in the area, which was discovered in 1847 by a hunter trailing a wounded grizzly bear.

Dotted with natural steam vents and fumaroles, The Geysers had been developed into a popular summer resort. Ulysses S. Grant, Mark Twain, Horace Greeley and J.P. Morgan were among the notables who visited the retreat to soak in its natural hot-water spas and view the picturesque surroundings.

By 1926, when a writer for the *Union Oil Bulletin* visited The Geysers, the resort's owner J. D. Grant had already tried drilling for steam to heat his buildings. His attempt was a dismal failure. But a professional driller named Fred Stone had succeeded in drilling eight wells, each between 500 and 600 feet deep, using a rotary rig and special bits for gouging through the extremely hard rock. Steam tapped by these early wells, however, had not yet been harnessed to produce electric power.



By the time of the Union Oil-Pure Oil merger some 40 years later, two independent companies were successfully producing steam and selling it to Pacific Gas & Electric Company (PG&E), a California utility which had built several small generating units at The Geysers. Otte and Dick Dondanville, a geologist with Earth Energy, had been scrutinizing the region closely. They theorized that the area's geothermal resource extended further north than was believed at the time.

In early 1965, Otte began to buy leases for Pure on lands that had been dismissed as unpromising by the other companies. There were some unique problems associated with the ownership of geothermal rights in these lands that were resolved by a young lawyer with the company — Sam Snyder, who is now vice president and general counsel of Unocal. The leases Otte ultimately obtained on about 9,000 acres were acquired by Union in the merger.

In 1967, Union signed an agreement with two companies already operating at The Geysers — Magma Power and Thermal Power — that would merge their holdings with Union's. Under the contract, Union owned 50 percent of the holdings and became the operator on a total of 15,000 acres. Pure's Earth Energy subsidiary was the forerunner of the group that became the Union Geothermal Division.

"This is Union's first move into the commercial use of a form of energy other than petroleum or natural gas," Fred Hartley said. "We are most optimistic about its potential as a means of producing dependable and economical electrical power."

Union's drilling department, led by Del Pyle and Don Ash, set to work to adapt oil drilling technology to the hard-rock, high-temperature conditions of The Geysers. The company carried out exploratory drilling over the next three years, and Union engineers Bill Flint and Chet Budd (now vice president of operations for Unocal Geothermal) found ways to apply petroleum reservoir management techniques to steam and hot-water reserves.

By 1970, Union was selling enough steam to generate 83,000 kilowatts of electrical power. In that year, PG&E signed a long-term sales contract with Union for steam to run a series of planned 100,000-kilowatt plants.

In 1972, the National Society of Professional Engineers named The Geysers project one of the 10 most outstanding American engineering achievements of the year, and honored Union and three other firms for pioneering the development of geothermal energy.

The new and stricter environmental regulations of the early 1970s favored the smaller geothermal generating projects over large, oil-fueled power plants. In 1973, the Arab oil embargo drove up the price of oil and gave an additional boost to geothermal energy. By 1974, The Geysers was producing about 400,000 kilowatts of electrical power, making it the largest project of its kind in the world.

In 1975, President Gerald Ford paid a visit to The Geysers. Along with Frank Zarb, head of the Federal Energy Administration, Ford was treated to a full tour of the facilities, hosted by Hartley, Carel Otte and PG&E Chairman Shermer Sibley.



Far left, geological conditions necessary to produce a geothermal resource exist only in certain parts of the world — most often along the Pacific Rim's "Ring of Fire" (red). Dots indicate Unocal geothermal operations. Left, a well is drilled at The Geysers. Right, President Gerald Ford tours The Geysers in 1975 with Dr. Carel Otte (center) and Fred L. Hartley (far left).



Meanwhile, Union's success at The Geysers had caught the attention of the U.S. Overseas Private Investment Corporation, which referred government officials in the Philippines to Union. An island nation located in the western Pacific, the Philippines was dependent on imported oil for more than 90 percent of its energy. But the country had highly promising and as-yet untapped geothermal potential—and Union had the experience and expertise to develop the resource.

In 1971, Union formed a subsidiary, Philippine Geothermal Inc. (PGI), under contract to deliver steam to generating plants that would be built and operated by the government's National Power Corporation (NPC). In June of the following year, PGI discovered the Tiwi field, located about 200 miles southeast of Manila on the nation's principal island of Luzon. The first well was successful and development began in 1973. In 1975, PGI discovered a second field at Makiling-Banahao, about 35 miles from Manila.

NPC quickly began construction of power plants to take advantage of this new energy resource. The first electricity was produced in 1979. By late 1984, Union's geothermal operations in the Philippines could supply enough steam to produce about 30 percent of the electricity used on Luzon.

During these years, the company's geothermal development moved forward in California as well. PG&E continued to add generating capacity at The Geysers, and in 1984, Union brought its ownership of the field up to 75 percent. The successes at The Geysers, and the skyrocketing price of crude oil in the late '70s and early '80s, encouraged Union management to step up its efforts in the Imperial Valley.

Experts estimated that the reservoir of hot brine in the Salton Sea area had the potential to produce 3 million kilowatts of electricity. In the early '80s, Union Geothermal began to explore that potential in earnest. The company built two demonstration plants, at Brawley and at Niland, each with a 10,000-kilowatt generating capacity.

The problems associated with developing the Imperial Valley's geothermal resource had not gone away. Ordinary casing could not withstand the hot brine, and dissolved solids still caked the insides of the pipes. But the company worked diligently to find solutions. Geothermal Division personnel worked closely with scientists in the newly-formed Science & Technology Division, then headed by Richard J. Stegemeier, an enthusiastic supporter of geothermal energy development.

A solution to the corrosion problem seemed particularly elusive. "We'd try one alloy, and find out six months later that it didn't work," said Otte. "So then we'd try a more exotic alloy. The process was extremely costly and time-consuming."

Ray Burke, senior vice president, Energy Resources, came up with a way to accelerate the testing process. Instead of trying out a single alloy at a time, Burke suggested putting together a string of different alloys to see which pipe segment would hold up best.



Left, a section of Unocal's Tiwi field in the Philippines. Below, an Indonesian crew drills a well at Gunung Salak. Right, a section of The Geysers. Far right, a view of Unit 1, the 10,000-kilowatt geothermal electrical generating plant operated by Unocal at the Salton Sea.



Using this approach, researchers found that the alloy Beta C titanium stood up to the severest conditions. Union was granted a patent for this innovative use of titanium. Although the alloy was expensive, its cost was mitigated by the fact that its high strength permitted a thinner casing.

Union scientists also conquered the scaling problem by refining an existing process of injecting solid particles into the produced geothermal fluids. Dissolved minerals in the brine that would otherwise have solidified on the pipe walls were attracted by these particles, which were then extracted from the fluids. The resulting material, called "seed," is nearly pure silica—a non-hazardous byproduct that resembles beach sand.

In 1987, the company, now doing business as Unocal, began to move into the power generation side of geothermal energy for the first time. The price of oil had dropped drastically early in 1986, and Southern California Edison Company (SCE), which had contracted for the Imperial Valley geothermal resource, was reluctant to build another generating plant there.

A new Unocal subsidiary revived the name Earth Energy, Inc., the original geothermal entity acquired in the Pure Oil merger. The new company took over the ownership and operation from SCE of a 10,000-kilowatt geothermal electrical generating plant at the Salton Sea. A second Unocal subsidiary, Desert Power Company, was formed to build and operate a bigger, 49,900-kilowatt plant in the same area. In 1989, this new facility began to produce electricity, which was sold to SCE.

Meanwhile, the search was continuing for new geothermal fields. During the 1980s, the company studied prospects in New Mexico and Japan. Neither turned out to be commercially viable. However, a joint exploration venture with Pertamina, Indonesia's state oil company, confirmed the existence of a major geothermal field at Gunung Salak, a mountainous region located about 40 miles south of Jakarta on the island of Java.

Unocal agreed to develop and produce the resource. Indonesia's national power company will supervise construction of a 110,000-kilowatt electrical generating plant, expected to begin operation in 1992.

Early in 1989, Carel Otte stepped down as president of Unocal Geothermal and was succeeded by vice president Stephen C. Lipman. Unocal's geothermal operations continue to produce substantial revenues, and the company is looking to the future in pursuing new geothermal energy prospects. Promising areas in Central and South America are currently being scouted out, and exploration is also expanding in Indonesia and the Philippines.

As the decade of the 1990s begins, the future for geothermal development looks bright. And Unocal—still by far the world's largest producer of geothermal energy—supplies natural heat from the earth to power more than 1.5 million kilowatts of electrical generating capacity worldwide. 76

Story by Marshall Lumsden



MOVING INTO THE 1990s

A conversation with
John Imle, Jr.
Senior Vice President,
Energy Resources

What are Unocal's objectives for Energy Resources in the 1990s?

The best way to answer that question is to quote the mission statement for our Energy Resources activities: "To find, produce and sell oil, gas and geothermal fluids and electrical power in a manner that increases shareholder value and enhances long-term resource growth." The single most important objective we must meet to fulfill this mission is to achieve major success in our oil and gas exploration efforts.

Unocal's exploration effort has become increasingly global and aggressive in recent years. Has our strategy changed?

I think "evolved" is a better description. We realize it will be very difficult to find the large oil and gas fields needed to build our resource base in mature or highly explored areas. Therefore, we are increasing our level of activity in areas of the world that are underexplored. Often this means exploration in countries that were previously inaccessible for political reasons.

This isn't to say there aren't exploration opportunities in mature producing areas. There certainly are, and we're pursuing these opportunities in selected areas, both domestically and abroad. Some previously explored areas have potential that wasn't recognizable in the past. But today's advanced technology—especially new geophysical, geochemical and basin modeling techniques—enables us to spot such potential. So these "technological frontier" areas are another type of exploration opportunity we're pursuing.

Have more underexplored areas opened up to oil hunters in recent years?

Definitely. We recognized several years ago that countries previously closed to oil companies were beginning to consider opening their doors. We started visiting some of these places to gather data and make contacts. As some of them have indeed opened up, we've been ready. Myanmar (previously known as Burma), where we recently signed a production sharing contract, is an example of how that kind of "enlightened aggressiveness" has paid off for us in terms of Unocal obtaining an early land position.

The competition among oil companies to explore in frontier areas is obviously keen. How can we differentiate ourselves from our competitors?

We do that in a number of ways. Our annual report reveals that we're large enough in terms of organization, balance sheet and technical capability to participate in any exploration project that makes sense. We also have a record of operating cost-effectively, and of developing and employing cutting-edge technologies. One of our principal objectives, by the way, is to be the lowest-cost producer wherever we operate.

The fact that we're smaller than the giant oil companies also can work in our favor. Some governments feel more comfortable dealing with a company the size of Unocal. Host country officials have frequent opportunities to meet Unocal's top executives and develop a feeling of mutual trust. We can communicate more effectively, make quicker decisions and simply outmaneuver the very large companies in terms of doing things quickly and well.

Finally, and most important, we have a worldwide reputation for dependability and integrity. We keep our promises and commitments. We treat host governments with respect and have avoided all forms of corruption. This tradition of ethical conduct began with Unocal's founders 100 years ago and has been steadfastly maintained.



As we move into new areas overseas, will we continue to pursue a policy of hiring and training nationals, and stressing technology transfer?

Absolutely. An important part of our business relationship with any host country is to help stimulate their internal growth. We do this by providing technology transfer, education, training, and challenging employment for nationals.

At an employee meeting in Thailand, Dick [Stegemeier] was asked, "What is the highest level that a Thai national can aspire to in Unocal?" He replied that there is no limit. Throughout the corporation, we traditionally hire people at an entry or near-entry level, train them, and work them up through the organization to the limits of their capabilities. There's a full commitment to this, because we know that it is simply good business—good for Unocal as well as for our hosts and our employees.

Which overseas areas that we're looking at now show the most exploration promise?

In terms of large discoveries, I'd say we have the greatest hopes in South Yemen, Angola, Syria and Myanmar. We also have applied for areas in Pakistan that we're hopeful about. In Egypt, Ecuador and Italy we are seeking more modest-sized discoveries, but ones that would certainly be commercial. Although not new areas, we still have active exploration programs in progress in Indonesia, Thailand, the United Kingdom and The Netherlands.

Of course, you must keep in mind that there's a lot of exploration risk in this business. Of the places I've mentioned, if we have a medium or large oil discovery in one or two, we'll be very happy.

You mentioned that we're still pursuing domestic exploration opportunities. Where are we concentrating our efforts?

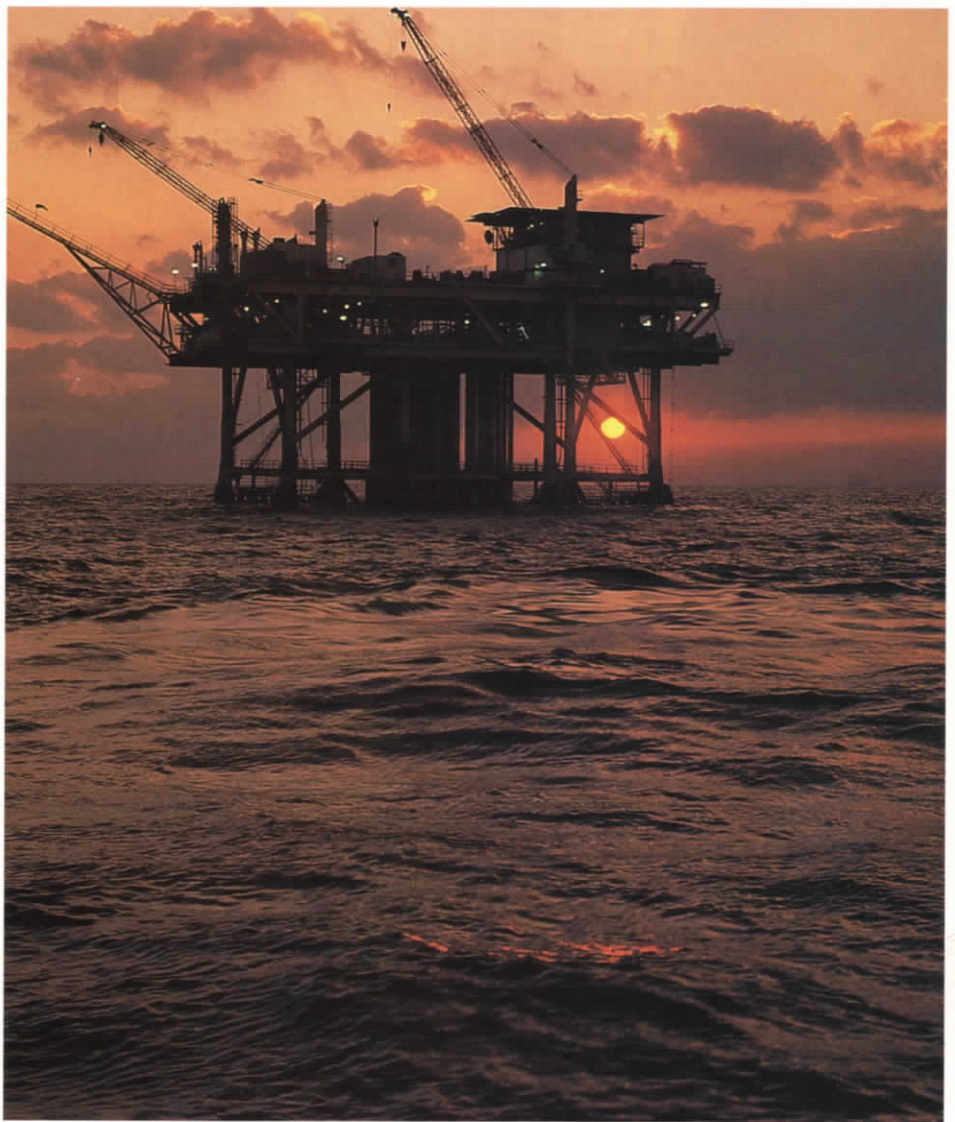
We're continuing to lease new lands in several areas of North America. We're typically looking for more subtle exploration targets, and employing new exploration methods to try to spot them. In many cases we are dealing with higher-risk exploration concepts than in the past, and this should be accompanied by higher reserves when we drill successful wells.

The U.S. Gulf Coast, both onshore and offshore, will continue to be a very active area. Several offshore areas in Alaska and California are very promising. Some of these are reasonably low-risk in terms of the probability of oil and gas being there. We're interested in exploring these areas, and I believe we can do so in a way that's compatible with the ecology and economy of each state. Unfortunately, political controversy has put some of these areas off limits for the time being.

In recent years, we've managed to boost production from many of our North American properties through infill and extension drilling. Are we still looking to expand in that way?

Yes. The potential for further infill drilling is limited, but the application of advanced geophysical techniques can help uncover new potential in some of our proven fields. For example, we recently made substantial gas discoveries below existing oil fields in Canada and in Michigan. I think there are many more opportunities like this that we can pursue in North America.

We're also very active in developing and employing enhanced oil recovery technology. We're the operator of the Dollarhide field CO₂ flood in West Texas, for example, which is one of the more successful CO₂ efforts going on in the United States.



Above right, the Cerveza platform, Gulf of Mexico. Right, CO₂ injection in the Dollarhide field, West Texas. "The U.S. Gulf Coast, both onshore and offshore, will continue to be a very active area for Unocal," says John Imle.



Would you comment on the reorganization of the Oil & Gas Division?

The reorganization was embarked upon primarily to improve performance. That's not to say our performance was bad. In fact, our operating costs per equivalent barrel of oil produced are among the lowest in the industry. But that doesn't mean we can't be even better. With the reorganization, we will improve performance in two ways: by improving our ability for quick, effective decision-making; and by allowing for more innovation at the working level.

We've gone about this by creating separate business units—six in the U.S., plus one in Canada—each of which is a separate profit center within the North American Oil & Gas Division. Each unit is run by a general manager who has responsibility for all aspects of the exploration and production business within his geographic area. The objective is to push authority levels, decision-making and responsibility as far down in the organization as possible.

Another cultural element we're working hard to instill at all levels is the idea of portfolio management—that every producing or exploration property we have is part of a profit center's portfolio. We want to encourage managers to look at each of their properties carefully, and understand clearly how much profit each contributes. Then the challenge becomes finding ways to improve performance. In the case of those properties that aren't performing and can't be improved, we'll look for ways to dispose of them. I don't think we have many which fit that profile.

One thing I want to stress is that we're going to maintain all of our properties in good condition, and operate them as safely and cleanly as possible. I think we can do that as well as anybody.

Above left, a group of workers are hoisted aboard a Unocal Thailand gas processing platform in the Satun field, Gulf of Thailand. Left, a Unocal production platform offshore The Netherlands, where employment of horizontal drilling technology has helped improve oil and gas recovery.

Could you give us a status report on our major International Oil & Gas operations?

In Thailand, we opened another chapter last year when Unocal Thailand and the Petroleum Authority of Thailand signed a third major gas sales agreement. This places essentially all the remaining areas of our original concessions under a gas sales agreement, so now they can all be developed. The Funan field is the first part of this new development, which will keep Unocal busy in Thailand well into the next century.

In terms of output, we're selling about 535 million cubic feet of gas per day right now. That will increase to more than 600 next summer when we install the compressors being built to boost pipeline capacity. Then in early 1992, with the Funan field on stream, we should be producing about 700 million cubic feet a day. That level will continue for several years.

We're also pursuing another opportunity in Thailand by "farming in" to some new acreage south of our three contract areas. We will start exploring there early this year, and we have high hopes for this area as well.

I cannot discuss Thailand without thinking of the tragedy which occurred in early November last year, when a typhoon suddenly developed in the Gulf of Thailand. The storm capsized the *Seacrest* drillship, resulting in the loss of 91 lives. This tragedy is a reminder that we work in a business in which we are subject to the worst surprises that nature can produce. The loss of loved ones, co-workers and employees is a heavy burden which is easing slowly, but will never be forgotten.

We're now focused on the problem of typhoon prediction and early detection. Unocal plans to make major investments in a typhoon warning system in cooperation with the Royal Thailand Meteorological Service. This newly designed warning system will incorporate the best available technology, and will be one of the most intensive typhoon warning systems in existence when it begins service next fall.

Moving on to our Indonesian operations, Unocal has now been active for more than 20 years in that nation. We have produced over 500 million barrels of oil in East Kalimantan. Production peaked back in 1977 at 146,000 barrels per day, and technology and innovation have enabled us to flatten the decline curve. Our Indonesian production has held at about 60,000 barrels a day now for three or four years, and development continues at an active pace. We expect to extend our production sharing contract, which would otherwise expire in 1998, in order to continue operating in Indonesia longer.

Gas production is also becoming more important for us in Indonesia. We'll be putting gas into the Pertamina LNG complex at Bontang for a long time to come. Right around Balikpapan, where our operations base is, there are smaller gas discoveries that we're trying to find a market for. We're already selling gas to the Pertamina refinery there, and we're looking for other markets. We also have what turned out to be a modest (considering its location) gas discovery in the Teweh block in central Kalimantan, and are exploring market possibilities for that gas.

Let's turn to the North Sea.

As you know, we've decided to sell our Norwegian subsidiary, including our interest in the Veslefrikk field, if we can get the right price. When production began early this year, Unocal Norge became a very well-performing asset in terms of cash flow and earnings. But our future in Norway beyond Veslefrikk production is very uncertain. By selling now, we can redeploy the value of that asset into longer-term opportunities which have more strategic value for us.

In the United Kingdom, we plan to continue operating the Heather platform as long as it remains economically viable. We believe Heather has several more years of productive life. We also picked up some very attractive exploration acreage in the U.K. Eleventh Round licensing, awarded last summer, which we plan to begin exploring this year. We are also considering possible U.K. North Sea property acquisitions.

If we find an opportunity that makes sense, we will consider a purchase as a way of building the business. Our plan is for a long-term presence in the U.K.

Our business in the Netherlands is mature in most respects, although there are a couple of older discoveries there—one gas and one oil—that we believe can be made commercial using horizontal drilling technology. One of the wells planned for this year is going to test a gas discovery, which was actually made back in 1967. The gas is in a very tight reservoir, and we hope that by drilling an extended-reach or near-horizontal well into that reservoir we can achieve commercial gas production rates. There are a number of remaining exploration possibilities in the Netherlands as well. None is very large, but taken together they would help sustain the business well into the next century.



Looking to the future, will natural gas and other non-oil energy resources become increasingly important for Unocal?

Definitely. We've had a marvelous 100 years as an oil company. In Energy Resources, about half of our revenue is still from oil. But very soon, I believe we will turn the corner on that, and become more of a gas company than an oil company.

This shift is not something that only Unocal is experiencing; it's taking place throughout the nation and the world. In the future, we'll see natural gas replace oil in a number of energy applications—stationary boilers, power generation, perhaps even to some extent in the transportation sector. I think there's great opportunity in gas, and we're well-positioned for it. We have a lot of gas-rich property, and a lot of experience in the gas business.

Will the energy shift away from oil also benefit our geothermal operations?

Yes, geothermal energy is definitely a growth area for Unocal. It's clean, it's a very good source of power for electrical generation, and it's a part of our business we intend to build on for the future—both here and overseas.

Could you give us an update on our geothermal operations?

The Geysers, our flagship geothermal project, continues to be a major resource for us. It is now producing steam that generates over 700 megawatts of electricity. The field has been fully developed, so our challenge now is to find ways to make the best use of the energy remaining in the resource.

Our operations in the Imperial Valley are a growing success story. We've been developing the Salton Sea area's geothermal resource for many years, and have overcome tremendous technological challenges in dealing with the highly corrosive, mineral-laden fluids.

We reached an important milestone early last year, when Salton Sea Unit 3 came on line. This was our first commercial venture in the power-generation side of the business. The plant, which has a 49,900-kilowatt net generating capacity, has performed beautifully. This year we will come on line with Salton Sea Unit 2, which will give us another 17,500 kilowatts of generating capacity.

In the Philippines, our Tiwi and Mak-Ban fields continue to provide steam to supply 660 megawatts of installed generating capacity. We are now working to find ways of fine-tuning these operations to get more energy out of them as efficiently as possible in the years ahead.

What does the future hold in terms of new geothermal opportunities for Unocal?

The most promising is Indonesia, where we are set to begin development of the Gunung Salak area on Java. It's a very good resource, near the capital city, Jakarta, so it's close to a large market for electric power. The state power company is building a 110-megawatt power plant, for which we'll supply the steam. If the plant is completed on schedule, it will come on line in 1993. It will be followed by a 55-megawatt plant about one year later.

We are presently looking at opportunities elsewhere in Indonesia. The nation has tremendous geothermal resources and a growing market for electricity. We're currently negotiating for concessions in western Java and in north Sumatra, which is especially promising.

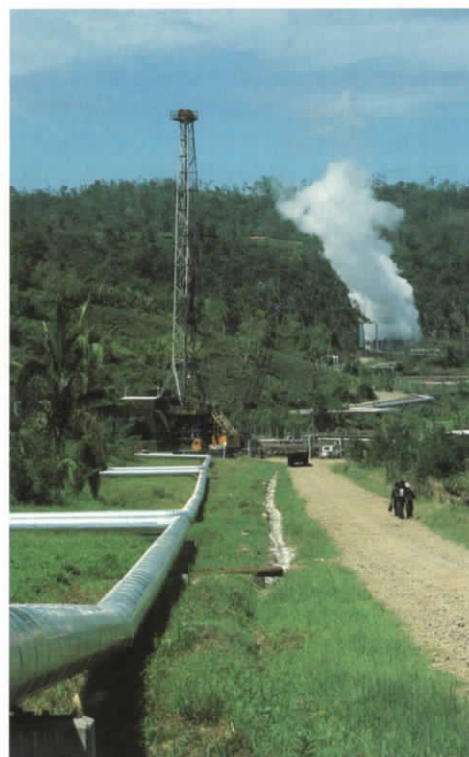
We're also evaluating new geothermal areas in the Philippines, and in other parts of the world. We are investigating a resource appraisal and development opportunity in Guatemala, and we're engaged in very preliminary discussions with other Latin American nations. The government of Kenya has also expressed interest in our skills, and has invited us in to make a preliminary evaluation and contract proposal.

Is there potential for expansion in the United States?

There's a great deal of potential, particularly in the Imperial Valley. There is also a geothermal resource in Northern California, near Mt. Shasta, which is potentially commercial.

Are we planning to pursue additional opportunities on the power generating side of geothermal energy?

Yes. By operating two resource/power station units at the Salton Sea, we've shown that substantial cost savings and operational improvements can be achieved by combining the power generation and field operations into one integrated package. We believe the third unit will demonstrate further efficiencies. Given that experience, we see a promising future for the company in power generation and sales. ☺



Above, development of The Geysers (top) and the Tiwi field in the Philippines. "Geothermal is a part of our business we intend to build on for the future—both domestically and overseas," Imle says.

A TEAM FOR THE '90s

Energy Resources enters the new decade with a senior management team that is committed to pursuing the strategies outlined in the preceding interview. From left to right, they are: **H D Maxwell**, president, North American Oil & Gas Division; **Harry C. Lee**, president, International Oil & Gas Division; **Stephen C. Lipman**, president, Geothermal Division.

H D Maxwell joined the company in 1960 as a reservoir engineer. He holds a bachelor's degree in agriculture, and bachelor's and master's degrees in petroleum engineering from Texas A&M. Maxwell spent much of his early career with Unocal in Louisiana, before becoming the manager of special projects for the Los Angeles-based Natural Gas Department in 1971. In 1974, he was named manager of operations for Unionoil Company of Great Britain, later serving as president and managing director. In 1985, Maxwell returned to Texas as vice president of the Central Region. In 1987, he became Western Region vice president, based in Pasadena, California. He took over as president of the North American Oil & Gas Division on November 1, 1988.



Harry Lee began working for Unocal in 1959 as a staff geologist. He holds bachelor's and master's degrees in geology from the University of Oklahoma. After assignments in several different states, Lee moved to Alaska in 1969 as district exploration geologist. In September of that year he became district exploration manager, a post he held until December of 1978, when he was named general manager of the company's Indonesian operations. Lee became vice president of the Gulf Region in 1986, and was appointed executive vice president of International Oil & Gas in September of 1988. On November 1 of that year he was named the division's president.

Steve Lipman joined Unocal in 1963 as an engineering assistant. He holds a bachelor's degree in geology from the University of California at Berkeley, and a master's degree in petroleum engineering from the University of Southern California. After completing Oil & Gas Division assignments in four California locations, Lipman was named the company's coordinator of environmental programs. He moved to the Geothermal Division in 1976, becoming district operations manager at The Geysers in 1979. In 1984, Lipman was named the division's vice president of domestic operations. He became executive vice president in July of 1988, and was named Geothermal Division president in February of 1989.

Dateline

New Gas Sales Agreement Signed In Thailand

Unocal Thailand's successful natural gas operation has reached another milestone with the signing of a third gas sales agreement with the Petroleum Authority of Thailand (PTT).

Combined with plans to boost pipeline capacity in 1990, the new contract assures the company of maintaining its role as the principal supplier of natural gas to the PTT. The PTT, in turn, delivers the gas to the Electricity Generating Authority of Thailand. Currently, gas produced by Unocal Thailand is used to generate about half of the nation's electricity.

Under the new gas sales agreement, the remainder of Unocal Thailand's original Gulf of Thailand concession areas are now placed under contract for development. The addition of these areas triples the total acreage awarded in the Second Gas Sales Agreement.

"This agreement extends our long-term relationship with Thailand," says Graydon Laughbaum, president of Unocal Thailand. "We expect that increased production from the third gas sales area will give us the capability to meet a significant part of Thailand's increasing energy demands into the next century."

Under the new agreement, Unocal Thailand will develop additional natural gas fields from five discovery areas. The first platforms will be installed in the Funan field in mid-1990, with development drilling scheduled to begin late in the year.

The company's tentative plan is to increase production incrementally, beginning in 1990. Currently, total production amounts to 535 million cubic feet per day (mmcf) of natural gas. This summer, a new compression facility will be installed to expand pipeline capacity, boosting output to 605 mmcf. With the Funan field on stream in early 1992, production should reach 700 mmcf and remain at that level for several years.

Lafayette Open House Celebrates Community Involvement

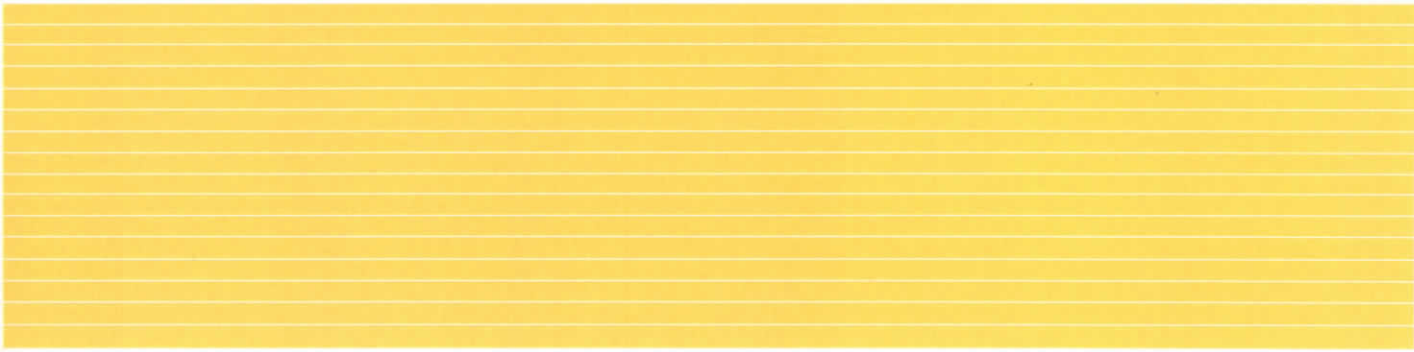
When Louisiana Region employees got together last December to celebrate the opening of a new headquarters office in Lafayette, they partied with a purpose. "A Caring Christmas" was the theme of the event, an open house attended by more than 500 employees, retirees and members of the local community. Festivities included a ribbon cutting ceremony, the presentation of Unocal-raised funds to United Way, and the giving of Christmas gifts to local charities.

Louisiana Region Vice President Marty Miller and Lafayette Mayor Dud Lastrapes kicked off the event by cutting the ribbon at 401 Audubon Boulevard, the location of the new office. On hand from Los Angeles were Senior Vice President of Energy Resources John Imle, North American Oil & Gas President H D Maxwell, and division vice presidents Clyde Barton, Thomas Fisher and John Van Amringe. All five were given the title of "Honorary Cajun" by Mayor Lastrapes.

After the ribbon cutting, Miller presented a \$126,130 donation to the local chapter of United Way. Half the total was raised from local Unocal employee pledges, which were then matched by a donation from the Unocal Foundation. The celebrants also donated a half ton of canned goods, other nonperishable foods and about 250 toys to Food Net of Acadiana and Toys for Tots, the event's designated charities.

"The Christmas season was an appropriate time for us to demonstrate Unocal's commitment to community involvement here in Acadiana," Miller said of the event. "Unocal has deep roots in the area, and so do many of our employees. We care about the community because we're a part of it."

A special exhibit was set up for the open house that traced the company's historical involvement in the Louisiana Gulf Coast oil industry. The exhibit featured a timeline of notable company events, a display of oil field artifacts and other memorabilia on loan from employees and retirees.



Unocal has been active in Louisiana since the mid-1920s, when Pure Oil (later to merge with Unocal) began developing the Sweet Lake oil field in Calcasieu Parish. Now the eighth-largest producer of oil and gas in the state, Unocal currently operates 42 fields, 264 oil wells and 189 natural gas wells, both onshore and offshore. About 50 new wells are planned for 1990.

Lafayette was chosen as one of seven new regional headquarters for Unocal's North American Oil & Gas Division in May of 1989, as part of a corporate reorganization. The purpose of the new structure is to increase "hands-on" management by those at the working level, and to shorten the time needed for making key decisions.

"The Lafayette-based regional office is one of the company's largest business units, and we have many opportunities for long-range growth," Marty Miller said at the ribbon cutting. "With this in mind, we have established the Region's headquarters here in Lafayette. We look forward to a long and mutually rewarding relationship between Unocal and the Acadiana community."

Lafayette has already felt the presence of Unocal's new regional headquarters. The company currently employs 470 in the Louisiana Region, and 200 of these workers are based in Lafayette.

Full Steam Ahead For Indonesia Geothermal Project

Unocal's Geothermal Division is ready to begin developing a promising geothermal resource in the Gunung Salak area on the island of Java, Indonesia. This year, Unocal will begin drilling production wells in the field, located south of Jakarta, Indonesia's capital city. The wells will supply steam to a 110-megawatt electrical generating plant being built by Indonesia's national power company. If construction is completed on schedule, the facility is expected to come on stream in 1993. A second plant with a 55-megawatt generating capacity will follow one year later.

"Indonesia has the greatest geothermal potential of any country in the world that we know of," says Chet Budd, Geothermal Division vice president. "We're very eager to get our development under way."

Unocal concluded negotiations with Pertamina, Indonesia's state-owned energy resources company, last year. The project represents Indonesia's first private enterprise geothermal energy endeavor. Development of the field's resources will substantially boost Java's energy supply.

"Using our drilling and reservoir test results from the past several years, we've confirmed 230 megawatts of reserves for 30 years," says Erick Mack, the Geothermal Division's vice president of business development, who represented Unocal in the project negotiations with Pertamina.

Unocal discovered the Gunung Salak field several years ago. Since 1982, the company has drilled 12 exploratory wells in the area. Before Unocal's involvement, the discovery of steam vents and hot springs had prompted speculation about the region's promise for geothermal development. But efforts to explore the prospect were limited.

"Some surface geology work had been done, but not much," says Neil Stefanides, vice president of exploration. "We still haven't drilled the limits of the field. The reservoir's ultimate potential may be even greater than we've confirmed thus far."

Once under way, drilling activity will continue over the next three years, providing enough producing and injection wells for both the first and second power plants.

The electricity generated from the resource's steam will find a ready market in densely populated Jakarta. Efforts to further industrialize this developing nation also figure to stimulate power demand on the island.

"Java has a huge population—about 80 million people," Mack explains. "Fortunately, the island has an interconnected power grid. No matter where electricity is generated, it can be sent where it is needed."

Dateline

Indonesia's economy also stands to benefit from further development of the nation's geothermal resources. As geothermal energy replaces fuel oil as a means of generating power for domestic use, more oil can be sold abroad. "Indonesia depends on oil exports for the bulk of its foreign exchange," Mack says. "Whenever oil can be replaced with an alternative indigenous source of energy, Indonesia's balance of trade improves."

Unocal and Pertamina are now considering the development of additional geothermal fields. "We're currently negotiating for concessions in western Java and in north Sumatra, which is especially promising," says Steve Lipman, president of the Geothermal Division. "We will continue to look at opportunities elsewhere in Indonesia. The nation has tremendous geothermal resources and a growing market for electricity."

Salton Sea Unit 2 Comes On Stream

Completion of a new geothermal facility and power plant in California's Salton Sea area has raised Unocal's total power generation capacity in the Imperial Valley to about 78,000 kilowatts. Dubbed Salton Sea Unit 2, the new plant will begin operation early this year. The 17,500-kilowatt facility is located adjacent to the 10,000-kilowatt Unit 1 plant, which went on line in 1982. A Unocal subsidiary, Earth Energy, Inc., is operator of both plants.

"We're essentially going to operate Units 1 and 2 as a single facility," says Greg Gritters, the area production engineer overseeing Unit 2. "Both share the same control room, where we monitor all operations." (Nearby Unit 3, operated by Desert Power Company, another Unocal subsidiary, began generating 49,900 kilowatts of electricity early last year.)

Unit 2 will employ new, innovative technology designed to prevent particles suspended in the geothermal fluids from forming deposits that can clog production pipes. Called pH modification, the method keeps dissolved solids in solution by altering the fluid's acidity.

Units 1 and 3 use a different brine handling process to inhibit pipe clogging. Their technique, known as the crystallizer/clarifier method, removes clogging particles from geothermal brine. But Unit 2's pH modification technique eliminates the need to precipitate, separate and dispose of the solids. That means a significant reduction in equipment and costs.

"When we add acid to the brine, the fluid remains hot and the solids stay in solution," explains Steve Pye, the Geothermal Division's manager of drilling operations. "We tested this process during operation of a demonstration plant in nearby Brawley."

Unit 2 has a complex system of turbines to generate an increased amount of electricity. The plant primarily will employ a 10,000-kilowatt turbine taken from the Brawley Unit, which operated from 1980 to 1985. Added to it will be a new low-pressure, 4,000-kilowatt turbine that will harness previously unused steam.

A third turbine, a turbo-expander, will further increase efficiency by using steam energy collected when pressure is reduced between the well-heads and crystallizers. This process will generate an additional 3,500 kilowatts of electricity.

"In contrast, Unit 3 relies on a stand-alone, higher pressure turbine," says Chet Budd, Geothermal Division vice president. This isn't meant to imply, however, that Unit 3's technology is antiquated. To the contrary, Geothermal Division management is giving the facility — Unocal's first large-scale, commercial geothermal operation and power plant in the Imperial Valley — high marks after its first year of operation. Output has been greater than expected.

"Unit 3 has performed beautifully," says Steve Lipman, Geothermal Division president. "We reached an important milestone last year when the plant came on line. Unit 3 was our first commercial venture in the power generation side of the business."

Wells currently providing the Salton Sea plants with geothermal fluids are the most productive in the world. The biggest producer is the Vonderahe No. 1 well, which is capable of supplying energy to generate 42,000 kilowatts. That is eight to 10 times larger than the typical producing well at The Geysers or in the Philippines geothermal fields.

The Salton Sea wells extend about 5,000 feet below the surface, where the reservoir's highly saline, mineral-laden fluids average a temperature of about 520 degrees Fahrenheit. Portions of the casing in these wells are composed of alloys and linings developed by Unocal.

The alloys, some of which the company has patented, are unique in their ability to withstand the reservoir's highly corrosive brines. "We've overcome tremendous technological challenges in dealing with the Salton Sea area's corrosive fluids," Lipman says. "Our operations in the Imperial Valley are a growing success story."

New Drilling Record Set On Platform Irene

Drilling crews working on Unocal's Platform Irene off the California coast burrowed their way into the history books last summer. The team set a new west coast record for extended-reach drilling, punching a well nearly two and one-half miles from the surface location.

The record was set in August, when the crews directionally drilled well A-16 a distance of 12,739 feet laterally from the well site. The distance falls short of records set in the North Sea and the Gulf of Mexico, but the Platform Irene accomplishment was superior in one respect: A-16's average drilling angle was 71 degrees, while the other extended-reach records were in the 60-degree range.

"This is the furthest a well has been taken from the surface location at such a shallow vertical depth—just 4,420 feet below the rig floor," says Mike Bunyak, Santa Maria district drilling superintendent. "We probably have a new world record in relation to the well's vertical depth."

Despite lengthy preparations, drilling the highly deviated well was far from easy. The steep drilling angle necessitated applying a tremendous amount of force to drive the drill bit forward. "We had to come up with some new techniques to solve the problems we encountered," recalls drilling engineer Mark Mueller.

Bunyak estimates that A-16, which took 38 days to drill, will produce some 2,000 barrels of oil per day. A total of 50 people were involved in the project, and each feels a sense of accomplishment in setting the new drilling record.

"I think this record means a lot to all of us," says Bunyak. "Everyone here shares a feeling of pride in what we accomplished."

For all of their hard work, everyone involved hopes the record won't stand for long. "We have other projects planned that could go a couple thousand feet further," says Mueller.

Cogeneration Helps Cut Costs In San Joaquin Valley

Unocal's Dome Fee cogeneration plant near Bakersfield, which is currently saving the company more than \$1.5 million annually in reduced power and steam expenses, is about to be joined by a neighboring plant in the Southern San Joaquin Valley.

The new 3.8-megawatt Welpport cogeneration plant, located at the company's Cymric oil field, is scheduled to be placed in continuous operation by late March. The Welpport plant is expected to save Unocal an additional \$800,000 annually, a figure which will rise with future development of the Cymric field.

Cogeneration plants use boilers to generate electricity and transform waste heat into steam, eliminating the need to purchase higher-cost power from outside sources while at the same time supplying steam for heavy oil production. The Dome plant employs two 4,000-horsepower natural gas-fired turbines with twin waste heat recovery boilers, while the Welpport plant is equipped with a 5,000-horsepower turbine and a single recovery boiler.

Construction of the Welpport plant follows the September 1988 completion of the Dome facility, located 12 miles away in the Midway Sunset field. The Dome plant—the North American Oil & Gas Division's first cogeneration facility—generates 6.0 megawatts of electricity.

"The Dome plant has been very reliable, and we're hoping the Welpport plant will turn out to be just as trouble-free," says Bakersfield district production engineer Ron Morin.

The new Welpport plant will supply the 2.0 megawatts needed to power field equipment for the six Unocal leases in the Cymric field. The remaining 1.8 megawatts will be sold to Pacific Gas & Electric. The Dome plant has been providing 3.0 megawatts for Unocal leases in the Midway Sunset field, and likewise selling the remainder to PG&E.

Dateline

Together, the two plants will supply an impressive 85 percent of Unocal's electrical power needs in the Southern San Joaquin Valley. Both plants were designed by engineers Kurt Bair, Mike Gelbs and Bruce Stanton.

"The Dome plant has been an economic success, thanks to cost savings and the revenue we've generated from power sales," says Bakersfield district production manager Steve Heiter, who anticipates similar results from the Welpport facility. "If additional cogeneration plants are considered for other Unocal fields, I think the Dome and Welpport plants will serve as excellent models."

Canada Gas Storage Project Enhances Flexibility

Located in remote northeast British Columbia, Unocal Canada's Aitken Creek natural gas field has been one of the company's most enduring success stories. Discovered in 1959, the field had produced some 35 billion cubic feet of natural gas and nearly 6.5 million barrels of oil by 1987. In that year, Aitken Creek took on a new and important role for the company: that of a natural gas storage reservoir. Today it is one of only two such Unocal projects in North America.

Although Aitken Creek had proven reserves of 60 billion cubic feet of natural gas, the field was solely an oil producer in its early years because of its remote location. A gas processing plant was built in 1965, allowing the company to produce oil and gas liquids while reinjecting the gas back into the reservoir. Completion of a pipeline link in 1976 finally made the gas marketable, and production and sale of gas began that year.

But Unocal Canada envisioned another type of potential for Aitken Creek down the road. The reservoir's uncommonly high permeability made it exceptionally well-suited for natural gas storage.

The capacity to store gas was desirable because it would enhance the company's flexibility. During the warm summer season, when gas prices usually drop as demand falls off, Unocal Canada could continue to produce gas from all of its properties at optimum rates. The gas—stored at Aitken Creek—could then be sold in the winter months, when prices tend to rise.

By the mid-1980s, Unocal Canada had received government approval to use Aitken Creek for gas storage. The project was initiated in 1987, and has been highly successful thus far. As the company's marketing department secures new high-return seasonal markets for Unocal Canada's natural gas, storage volumes at Aitken Creek will be expanded.

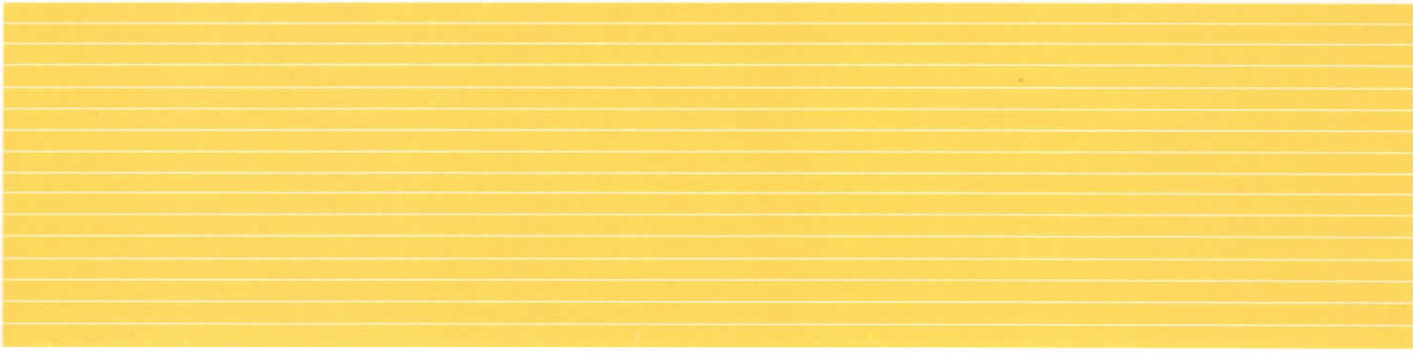
"The Aitken Creek storage project is still in the development stages, and it is generating substantial profits," says John Vandermeer, senior vice president of Unocal Canada Limited. "I certainly see those profits increasing in future years."

Deep Pool Gas Discovery Yields "Hidden Treasure"

Unocal's Mid-Continent Region recently received a big boost with a "deep pool" gas discovery at the Beaver Creek oil field in Crawford and Kalkaska Counties, Michigan.

Deep pool reservoirs—hydrocarbon accumulations located beneath oil fields already in production—are especially rewarding because they enhance the value of producing properties. The Beaver Creek field has been an oil producer since the late 1940s. As of early March, it will also go on line as a gas field, expected to produce at an initial rate of more than 8 million cubic feet of natural gas daily.

"We've worked on this project for six years, and it looks like a keeper," says geologist Dave Buthman, who evaluated the area's gas potential along with geophysicist Jesse Noah.



"During initial production tests, the discovery well flowed at 4.47 million cubic feet per day," Buthman says. "We expect production to increase as development proceeds." The discovery well is operated by Unocal, which has a gross working interest of about 50 percent.

The discovery came as a surprise to some, since a Unocal crew had drilled for gas in the vicinity during the 1970s without success. But Buthman and Noah reexamined the data, hypothesizing that earlier seismic tests may not have been conclusive. The duo was proved correct when a drill stem test conducted last October came up positive.

"The Beaver Creek discovery is a very exciting one for us," says Robert Meyer, Mid-Continent Region exploration manager. "It's our first exploratory success in the newly formed Mid-Continent Region." According to Robert Shurtleff, regional operations manager, tests indicate the reservoir has production potential that is in excess of 11 million cubic feet of natural gas per day.

Regional Vice President Russell Briggs says future plans call for expeditious development of the field. "We may drill up to five additional wells in the near future," he says.

The Beaver Creek success will likely inspire future exploration of the gas potential below existing fields in the Mid-Continent Region and elsewhere. "The discovery has certainly accelerated our drilling plans in Michigan," says Buthman.

Unocal U.K. Acquires New Exploration Blocks

Unocal U.K. was a big winner in the United Kingdom's Eleventh Licensing Round, held last year. The British government awarded the company seven offshore exploration blocks in the U.K. sector of the North Sea.

Licensing rounds—similar to government lease sales conducted in the U.S.—have been held by the British government periodically since 1964. Firms are invited to apply for blocks by submitting exploration analyses and six-year work program proposals. Given the field of 84 competitors, the licensing results were a victory for Unocal U.K.

Unocal U.K.'s preparations for the Eleventh Licensing Round date back to late 1987. They intensified in July 1988, when the British government nominated the blocks to be offered. Bids were submitted in February of 1989. In all, oil companies submitted applications on 125 blocks.

In June of 1989, the licenses were awarded. Unocal's seven blocks included five operatorships, meaning the company is the principal co-venturer in these blocks and will conduct any exploration and development work. Together, Unocal U.K.'s awards cover a total of 260,000 acres of exploration blocks.

Under British regulations, firms can maintain their licenses for 36 years, but must relinquish 50 percent of their holdings after six years. Many of the blocks offered in the Eleventh Round were relinquished several years ago, before the development of new geophysical techniques and exploration concepts. That makes them particularly attractive now.

"Applying new ideas and exploration techniques can enable us to spot previously overlooked opportunities," says Unocal U.K. Resident Manager Bill Pace. "A great deal of excellent potential remains in the U.K. sector of the North Sea. It is one of the most competitive exploration areas in the world."

Pace says the company will spend the better part of 1990 conducting seismic surveys and analyzing the data on the new blocks before beginning any drilling. "But we do have one block which will probably be drilled later this year," he says. ☺

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CORPORATE

- 35 YEARS Russel F. Groesbeck, Unocal Center
- 30 YEARS George I. Ozaki, Unocal Center
Robert M. Vukojevich, Unocal Center
- 25 YEARS Joe I. Mosteller, Unocal Center
Donnelly P. Rogers, Unocal Center
- 20 YEARS Paul M. Corley, Unocal Center
Gordon L. Dolfie, Unocal Center
Christy Hiruko, Unocal Center
Catherine L. Norwood, Unocal Center
- 15 YEARS Cliffine F. Bateman, Unocal Center
Denise Hallis, Unocal Center
Timothy R. Thomas, Unocal Center
- 10 YEARS Tony S. Ayad, Unocal Center
James Chang, Unocal Center
James T. Esswein, Unocal Center
David B. Ezarik, Schaumburg, Il.
Sumio T. Goishi, Unocal Center
Michael L. McQueen, Unocal Center
Darline A. Miller, Unocal Center
Jeanette T. Pfister, Unocal Center
Craig S. Reid, Unocal Center
Wai-Ming Wong, Unocal Center

REAL ESTATE

- 25 YEARS Patricia A. Ellis, Unocal Center
Oneil Theriault, Unocal Center
- 20 YEARS Edward C. McCracken, Unocal Center
- 15 YEARS Dennis J. Chapman, Unocal Center
- 10 YEARS Janis M. Derrick-Sain, Unocal Center

ENERGY MINING

- 10 YEARS Steven L. Bergquist, Parachute, Co.
Steven R. Hill, Parachute, Co.
Richard H. Maddock, Parachute, Co.

SCIENCE & TECHNOLOGY

- 35 YEARS Robert K. Knight, Brea, Ca.
- 25 YEARS Scott M. McIrvin, Brea, Ca.
- 20 YEARS William T. Hosband, Brea, Ca.
- 15 YEARS John W. Jost, Brea, Ca.
- 10 YEARS Susan Addis, Brea, Ca.
Prabha Amin, Brea, Ca.
Lorraine P. Bisaha, Brea, Ca.
George A. Crawford, Brea, Ca.
Julia Fuentes, Brea, Ca.
Darrell L. Gallup, Brea, Ca.
John L. German, Brea, Ca.
Mohammad H. Ghandehari, Brea, Ca.
Charles F. Griswold, Brea, Ca.
Paul Hensen, Brea, Ca.
Frank J. McKeon, Brea, Ca.
Loc Huu Nguyen, Brea, Ca.
Candelario L. Rodriguez, Brea, Ca.
Mary C. Tobin, Brea, Ca.
Robert J. Varga, Brea, Ca.

ENERGY RESOURCES

NORTH AMERICAN OIL & GAS

- 40 YEARS Louis B. Evans, Houston, Tx.
Herbert S. Harry, Los Angeles, Ca.
Richard G. Lawson, Houma, La.
- 35 YEARS Robert H. Andrews, Port Hueneme, Ca.
James E. Schuetz, Los Angeles, Ca..
Russell G. Stansel, Midland, Tx.
- 30 YEARS Troyal R. Brooks, Jr., Oklahoma City, Ok.
Leo C. Hebert, Houston, Tx.
William E. Heydrick, Houston, Tx.
Wallace W. Lovell, Lafayette, La.
Billie E. Reed, Oklahoma City, Ok.
Gaylord N. Richmond, La Habra, Ca.
Alfred R. Romaine, Lafayette, La.
Paul D. Sellers, Erath, La.
Barbara A. Yarbrough, Los Angeles, Ca.
Jack D. Young, Oklahoma City, Ok.
- 25 YEARS Dukin D. Arceneaux, Dulac, La.
A. Russell Allen, Placentia, Ca.
David L. Cone, La Habra, Ca.
Louis Delarosa, Orcutt, Ca.
Ronald N. Donaghu, Santa Fe Springs, Ca.
E. Alonzo Flores, Houston, Tx.
James E. Green, Bakersfield, Ca.
A.J. Geverink, Jr., Santa Fe Springs, Ca.
Willard R. Guidry, Welsh, La.
Richard M. Hart, Orcutt, Ca.
Jackie Herdes, Liberty, Il.
Phyllis T. Larson, Pasadena, Ca.
Earnest Moore, Houston, Tx.
Robert W. Whitney, Houma, La.
Edwin L. Wilbanks, Van, Tx.
- 20 YEARS Roy L. Alsup, Santa Paula, Ca.
John F. Berthiaume, Andrews, Tx.
Micah L. Clement, Cocodrie, La.
Kirby B. Fabre, Houma, La.
Macklin Hawkins, Piru, Ca.
Jerry D. Hedger, Orcutt, Ca.
George J. Jaubert, Dulac, La.
Glen M. Karman, Taft, Ca.
Brian C. Kimmel, Houston, Tx.
John F. Kowalski, Bakersfield, Ca.
George J. Martin, Lafayette, La.
Eugene Mercado, Worland, Wy.
Steven L. Mitchell, Orcutt, Ca.
Jeffrey T. Plowden, Lafayette, La.
Darrell W. Powers, Midland, Tx.
Dennis W. Romero, Houston, Tx.
Joseph C. Smith, Houma, La.
Charles B. Snow, Lafayette, La.
Louis J. St. Germain, Jr., Houma, La.
Donna L. Travis, Clay City, Il.

- 15 YEARS Clark A. Bagley, Midland, Tx.
Ira A. Bergeron, Amelia, La.
Wilbert A. Billiot, Theriot, La.
Ronald E. Booker, Orcutt, Ca.
Richard L. Burger, Kenai, Ak.
Gary S. Bush, Anchorage, Ak.
Bobby G. Cloud, Andrews, Tx.
William L. Davidson, Orcutt, Ca.
Kenneth W. Doyle, La Habra, Ca.
Randall J. Dutton, Lovington, N.M.
Marion L. Earles, Jr., Snyder, Tx.
Richard L. Ellithorp, Houma, La.
Jesse A. Faragan, Orcutt, Ca.
James K. Frederick, Kaplan, La.
Lester G. Gimbel, Bloomfield, N.M.
Everette J. Guidry, Abbeville, La.
Maria L. Hinojosa, Houston, Tx.
Janie L. Joubert, Houston, Tx.
Charles E. Leak, Clay City, Il.
Michael E. Leavitt, Kenai, Ak.
John M. Locarnini, Orcutt, Ca.
Terrial L. Long, Liberty, Il.
Clark C. Lucas, Lander, Wy.
Michael G. McClure, Breckenridge, Mi.
Paul R. Ownbey, Orcutt, Ca.
Wesley David Patterson, Compton, Ca.
Janelle C. Paul, Lafayette, La.
Booker T. Powell, Houma, La.
Larry G. Ragland, Andrews, Tx.
Arthur J. Richards, Los Angeles, Ca.
Don Ruffin, Dulac, La.
Ricky L. Russell, Van, Tx.
Charles A. Schile, Oklahoma City, Ok.
Douglas J. Seyler, Oklahoma City, Ok.
Lonnie W. Shepard, Cisne, Il.
Gary L. Smith, Anchorage, Ak.
Russel C. Speer, Las Cienegas, Ca.
Herman R. Stone, Van, Tx.
Winifreda A. Standley, Bakersfield, Ca.
Anastacio R. Subia, Jr., Andrews, Tx.
Clarice H. Szeto, Los Angeles, Ca.
Joe A. Tristan, Placentia, Ca.
Steven M. Weise, Kenai, Ak.
Robert A. Young, Houston, Tx.
- 10 YEARS Edward J. Amo, Freeport, Tx.
Karen A. Arends, Ventura, Ca.
Deborah L. Bertrand, Lafayette, La.
Jimmy D. Bilbrey, Midland, Tx.
Andrew G. Blakely, Jr., Taft, Ca.
Edward J. Boufford, Freeport, Tx.
Bruce A. Bowman, Oklahoma City, Ok.
Dennis L. Brucker, Santa Fe Springs, Ca.
Brent O. Bullock, Moab, Ut.
Michael A. Cain, Bakersfield, Ca.
Eugene J. Coates, Houston, Tx.
Gayla E. Cruz, Houston, Tx.
Josie R. Davis, Midland, Tx.
Albert M. Diaz, Lafayette, La.
Linda W. Dukes, Anchorage, Ak.
David P. Eichen, Houston, Tx.
Frank J. Fedeli, Abbeville, La.
Lindsey M. Fontenot, Dulac, La.
Golden J. Gasser, Freeport, Tx.

Brenda D. Geske, Bakersfield, Ca.
 Alexander S. Gomez, Coalinga, Ca.
 George S. Harris, Lafayette, La.
 Steven L. Hart, Bakersfield, Ca.
 Thomas J. Hebert, Freeport, Tx.
 Melinda M. Hemken, Houston, Tx.
 David F. Holloway, Coalinga, Ca.
 Brian E. Houlihan, Houston, Tx.
 Gary D. Hout, Moab, Ut.
 Mary C. Huddleston, Houston, Tx.
 Sonia D. Hudgens, Bakersfield, Ca.
 Bob D. Hunt, Taft, Ca.
 Lane A. Iver, Houma, La.
 Anne B. Jeffries, Houston, Tx.
 Thomas A. Kaldenberg, Bakersfield, Ca.
 Randall Kalton, Orcutt, Ca.
 Troy C. Kuykendall, Taft, Ca.
 John W. Lampkins, Jr., Orcutt, Ca.
 Clayton C. Leischer, Oklahoma City, Ok.
 Wayne F. LeBoeuf, Dulac, La.
 Thomas M. Litton, Jr., Lafayette, La.
 Darrel G. Lowe, Taft, Ca.
 Michael J. Lynch, Dulac, La.
 Thomas M. Lyons, Ventura, Ca.
 Timothy M. Marquez, Ventura, Ca.
 Robert F. Marsalek, Orcutt, Ca.
 Carrol J. Martin, Kenai, Ak.
 Michael C. Martin, Taft, Ca.
 Barbara A. Mayfield, Ventura, Ca.
 Thomas J. McCollum, Carpinteria, Ca.
 Greg H. Meaux, Abbeville, La.
 Boyd T. Miller, Chunchula, Al.
 Donovan P. Mooney, Santa Fe Springs, Ca.
 Jude T. Mosely, Houma, La.
 Jeffrey Pigg, Bakersfield, Ca.
 Craig P. Pitre, Dulac, La.
 Yolanda Polony, Pasadena, Ca.
 Willie Rodriquez, Jr., Andrews, Tx.
 Ricky L. Robinson, Hominy, Ok.
 Beverly A. Scheliga, Houston, Tx.
 Jon E. Severson, Anchorage, Ak.
 Robert J. Sevin, Jr., Midland, Tx.
 Reggie L. Shook, Jr., Oklahoma City, Ok.
 Ross A. Sigur, Abbeville, La.
 Bonnie D. Smith, Lafayette, La.
 Thomas W. Smith, Kenai, Ak.
 Steven W. Sperry, Houston, Tx.
 Millard F. Standifler, Jr., Midland, Tx.
 Robert B. Starr, Freeport, Tx.
 Jean M. Stevens, Anchorage, Ak.
 Veronica M. Stevenson, Oklahoma City, Ok.
 Robert B. Taylor, Orcutt, Ca.
 Kenneth H. Tofteland, Antler, N.D.
 Hikmet Ucock, Santa Fe Springs, Ca.
 Antonio Ugues, Taft, Ca.
 Geary D. Umsted, Midland, Tx.
 William D. Watson, Oklahoma City, Ok.
 James C. Waugaman, Anchorage, Ak.
 Clark L. Weaver, Anchorage, Ak.
 Mohammad Zabihi, Houston, Tx.

Unocal Canada, Ltd.

25 YEARS Roger L. Rimbey, Calgary, Alberta
 20 YEARS Richard G. Byers, Calgary, Alberta
 10 YEARS Catherine J. Hicks, Calgary, Alberta
 Gerald T. Robinson, Fort St. John, B.C.
 Garry A. Schmidt, Calgary, Alberta

INTERNATIONAL OIL & GAS

20 YEARS James F. Friberg, Los Angeles, Ca.
 15 YEARS Michel R. Estachy, Syria
 William D. Howard, Los Angeles, Ca.
 Jerry R. Kukula, Thailand
 Jesse M. Martinez, Los Angeles, Ca.
 10 YEARS Venson L. Brown, Thailand
 Patrick W. M. Corbett, Indonesia
 Arthur T. Foley, Los Angeles, Ca.
 Michael C. Hankins, Los Angeles, Ca.
 Stephen A. Martinez, Netherlands
 Philip A. Norby, Norway
 Michael J. Pomfret, Thailand
 Gilbert R. Stern, Los Angeles, Ca.
 Douglas E. Thomas, Thailand

Unocal Norge A/S

Sissel Knudsen, Norway

Unocal Thailand, Ltd.

10 YEARS Viboon Boonbandit
 Sampao Deerot
 Wilai Pinyovitayawong
 Ronayuth Puntusima
 Skol Sangthong
 Dhira Soyrayar
 Chiraphongs Thipaphandhu

Unocal Indonesia, Ltd.

20 YEARS Zarkany Abdarisman
 15 YEARS Abubakar
 Arbain
 Buhari
 Djohansjah
 Rasno
 Rosadi
 Soekardi
 Soeratman
 Suardi
 Suprpto
 Sudjono
 Surono
 Sutopo
 Tohirwidjaja
 Wagimun
 Andoeng Heroe Baskoro
 Ukat Handan Buya
 Eddy Dharmawan
 Johnny Hary Dumais
 Ronny Fachrudin
 Mansyah H.S.
 Pudjo Hartono
 Arkan Harun
 Kadar Ismanto
 M. Kholil
 Achmad Kosim
 Natan Lamba
 Adry Lantu
 Alex Mamoto Londa
 Sujindro Mulyono
 Albert F. Muntu
 Asmawati Nuryadi
 Yusran R.
 Rambat Riyadi
 Daud Rombedatu
 Sutrisno S.
 Paikan Ati Sajogo
 Asli Simatupang
 Adi Siswanto
 Eko Asnan Subiyantoro
 Edi Sudaryanto
 Djoko Suhadi
 I. Ketut Suindra
 Olga E. Sumarandak
 Victor Emmanuel Tentoea
 Willy Worotitjan
 R. Adang Yusuf

10 YEARS Baharuddin
 Noersasi
 Rusmanto
 Sadjino
 Subagiyono
 Sudarto
 Supardi
 Antoeng Bahran
 Yuswo Basuki
 Ariansyah Hanafiah
 Soedewo Bambang Irawan
 Muhammad Kasim
 Sulianto Lubis
 Iskandar Masrur
 Syahdan M. Saleh
 D. Supramono
 Kasut Suyadi
 Soetomo Herman Y.

SERVICE AWARDS



Unocal U.K., Ltd.

15 YEARS Donald Dawson, Sunbury, England
 10 YEARS Brian Galvin, Aberdeen, Scotland
 Mike Lewellyn, Aberdeen, Scotland
 Charles Shaw, Aberdeen, Scotland
 Ian Young, Aberdeen, Scotland

Unocal Suez, Ltd.

15 YEARS Azza Osman

GEOTHERMAL

20 YEARS Steven Maione, Santa Rosa, Ca.
 Diane Winsby, Santa Rosa, Ca.
 10 YEARS Charles Burch, Imperial Valley, Ca.
 Warren Canfield, Santa Rosa, Ca.
 William Christensen, Philippines
 Jack Crawford, Imperial Valley, Ca.
 Claude English, Santa Rosa, Ca.
 Diana Gabbert, Santa Rosa, Ca.
 Victor Gillespie, Imperial Valley, Ca.
 John Grice, Santa Rosa, Ca.
 Jim Messick, Imperial Valley, Ca.
 Leon Pope, Imperial Valley, Ca.
 Miguel Rodrigo, Imperial Valley, Ca.
 Debbie Sandberg, Santa Rosa, Ca.
 Joseph Tapia, Imperial Valley

Philippine Geothermal, Inc.

15 YEARS Concepcion A. Villanueva, Makati
 10 YEARS Leonardo B. Aguila, Makati
 Benjamin M. Amante, Bulalo
 Alejandro R. Centeno, Bulalo
 Guillermo V. Malagno, Bulalo
 Apolinario M. Malamog, Bulalo
 Rolando M. Perea, Bulalo

REFINING & MARKETING

40 YEARS Clarence T. Cheatham, Charleston, W.V.
 35 YEARS Wayne P. Carroll, Avenal, Ca.
 Jay C. McMullan, Schaumburg, Il.
 John H. Moore, Portland, Or.
 William E. Ridgeway, Schaumburg, Il.
 James E. Sinyard, Albany, Ga.

SERVICE AWARDS



- 30 YEARS Mark K. Akaka, Honolulu, Hi.
Floyd H. Clifton, Phoenix, Az.
Thomas A. Foster, Portland, Or.
Ralph M. Guenther, Jr., Schaumburg, Il.
John W. Guthrie, Pasadena, Ca.
William H. Morrison, Tallmadge, Oh.
Judith A. Polson, Chicago Refinery
David R. Stewart, Southfield, Mi.
John L. Story, Richmond, Ca.
- 25 YEARS Kathe R. Butt, San Francisco, Ca.
Murphy S. Carr, San Francisco Refinery
Frank W. Conklin, San Diego, Ca.
Kerrick D. Cowell, San Francisco Refinery
R.O. Devincenzi, San Francisco, Ca.
William B. Dill, San Luis Obispo, Ca.
Richard J. Estlin, Schaumburg, Il.
James S. Foster, Jr., Fresno, Ca.
Raymond W. Geisler, Denver, Co.
Milford D. Hodges, San Francisco Refinery
Edwin T. Kido, Honolulu, Hi.
Duane E. Koehring, Amlin, Oh.
Dwight E. Lee, Santa Maria Refinery
Martin L. Massey, Sacramento, Ca.
Stella C. Murphy, San Francisco, Ca.
Anthony Reed, Los Angeles, Ca.
Clarence W. Schoenbeck, Chicago Refinery
Ervin S. Short, Jr., Los Angeles, Ca.
Hilary A. Singleton, Los Angeles, Ca.
Joanne M. Vaiana, Los Angeles, Ca.
- 20 YEARS Neil B. Arnberger, Birmingham, Al.
Donald K. Binner, Chicago Refinery
Charles Bradley, Jr., Taft, Ca.
Joseph M. Chirco, Los Angeles, Ca.
James S. Clark, Edmonds, Wa.
Stephen K. Colclasure, Torrance, Ca.
Charles Collins, Beaumont, Tx.
Peggy L. Crane, Los Angeles Refinery
Joseph O. Elridge, Los Angeles Refinery
Joan H. Foley, Schaumburg, Il.
Jean A. Gillock, Schaumburg, Il.
Juliana C. Gordijn, San Francisco, Ca.
Ray J. Hoffpauir, Beaumont Refinery
Daniel T. Homerding, Chicago Refinery
Ronald L. Humphrey, Los Angeles, Ca.
Henry C. Johnson, Portland, Or.
T.L. Jones, Bettendorf, Ia.
Newey F. Kearney, Chicago Refinery
Carole M. Kirchner, Schaumburg, Il.
James F. Lasneski, Atlanta, Ga.
James R. Lawrence, Beaumont Refinery
George F. Masek, Jr., Schaumburg, Il.
John D. Matthews, Richmond, Ca.
Roy H. Murata, Honolulu, Hi.
Stephen K. Ostafin, Chicago Refinery
Nelly T. Ramirez, San Francisco, Ca.
Larry W. Rosenthal, Schaumburg, Il.
Wayne A. Sawyer, Schaumburg, Il.
Carol E. Severinghaus, Schaumburg, Il.
Teddy L. Sharp, Chicago Refinery
Wayne E. Shaw, Dayton, Oh.
Phyllis T. Smith, San Francisco, Ca.
Charles T. Smoak, Savannah, Ga.
Eugene J. Tolomei, Taft, Ca.
Donita Ucherek, Schaumburg, Il.
Albert L. Washington, Los Angeles Refinery
Thomas M. Wood, Chicago Refinery
Roy A. Wyatt, Beaumont Refinery
Alfred R. Yurkiewicz, Santa Maria, Ca.

- 15 YEARS Joan L. Allan, Schaumburg, Il.
Darvin R. Awe, Houston, Tx.
Edward E. Banker, Savannah, Ga.
John L. Connors, San Francisco, Ca.
John A. Donner, Schaumburg, Il.
Gary F. Gyssler, Schaumburg, Il.
Mark K. Hebert, Los Angeles, Ca.
Starla R. Ibbs, Los Angeles, Ca.
J.V. Jenkins, Birmingham, Al.
John E. Johnson, Atlanta, Ga.
Douglas W. Juras, Southfield, Mi.
Elizabeth S. Kraus, Schaumburg, Il.
Scott P. Leibert, Schaumburg, Il.
Mark A. Lindstrom, Schaumburg, Il.
Terry L. Mann, Ft. Morgan, Co.
Richard W. Mortimer, Taft, Ca.
Robert A. Newton, Phoenix, Az.
Jerome E. Niesen, Los Angeles Refinery
Cay L. Noble, Schaumburg, Il.
Melton L. Powell, Frankston, Tx.
Peter J. Rubino, Los Angeles Refinery
Dale W. Weedner, Olney, Il.

- 10 YEARS Giordani B. Acu, San Francisco, Ca.
Sandra L. Allen, Los Angeles, Ca.
Filemon Baca, San Francisco Refinery
Daniel F. Brito, Los Angeles Refinery
Michael K.H. Chang, Honolulu, Hi.
Ernest K. Clayton, Los Angeles, Ca.
Cecilia B. Delacruz, Walnut Creek, Ca.
John Ferguson, Richmond, Ca.
Michael P. Fernandez, Los Angeles, Ca.
Glenn G. Gerber, Los Angeles, Ca.
Richard C. Gossett, Los Angeles, Ca.
Valorie J. Hall-Cooper, Los Angeles Refinery
John W. Hamilton, Portland, Or.
Gregory K. Holland, Athens, Ga.
Michael A. Hudspeth, Los Angeles, Ca.
Melanie M. Hughes, Los Angeles Refinery
Ronnie C. Johnson, Chicago Refinery
Michael P. Kirchner, Los Angeles, Ca.
Charles Licitra, Norwalk, Ca.
Richard L. Liss, Los Angeles, Ca.
Fredrick C. Lucas, Los Angeles Refinery
Michael Meszaros, Schaumburg, Il.
Kevin Murray, Nederland, Tx.
Michael A. Neagle, San Diego, Ca.
Susan F. Nixon, Portland, Or.
Miguel A. Oropeza, Los Angeles, Ca.
Manuel Perez, Jr., Los Angeles Refinery
James D. Porter, Monticello, Il.
Kris R. Rittger, Los Angeles, Ca.
Robert G. Roberts, San Francisco Refinery
Steven J. Rogers, Los Angeles, Ca.
Dawn A. Rychlewski, Schaumburg, Il.
Ana M. Salazar, Los Angeles, Ca.
Joan S. Sanders, Schaumburg, Il.
Andrew H. Seed, Avenal, Ca.
Dennis L. Shigeno, San Francisco Refinery
Ronald Smolka, Chicago Refinery
Emiliana I. Spooner, San Francisco, Ca.
Betty A. Stanford, San Francisco, Ca.
Richard D. Tackett, Seattle, Wa.
Mike R. Tate, San Francisco Refinery
John Taylor, Tallmadge, Oh.
Paul S. Tish, Los Angeles Refinery
Eileen J. Todd, Schaumburg, Il.
Danilo E. Urrutia, San Francisco, Ca.
Kimberly Vincent, Abbeville, La.
Jerry L. Walker, Los Angeles Refinery
Wally D. Wallin, Edmonds, Wa.
Rowena Yeung, San Francisco, Ca.
James E. Yucuis, Schaumburg, Il.
Hung N. Yuk, San Francisco, Ca.

MARKETERS & DISTRIBUTORS

- 65 YEARS Marlette Oil & Gas Co., Inc., Marlette, Mi.
50 YEARS Brown Oil Co., Wilson, N.C.
25 YEARS Horton Oil Co., Inc. Huntsville, Al.
20 YEARS Jim Hinton Oil Co., Inc. Live Oak, Fl.
New Paris Oil Co., Inc. New Paris, Oh.
L.S. Rankin & Sons Gastonia, N.C.
Riggs Oil Co., Inc. Big Stone Gap, Va.
Shelby Service, Inc., Greenfield, In.
- 15 YEARS Dyball Oil Co., Inc., Vincennes, In.
Service Oil of Monroe, Inc., Monroe, N.C.
Sheppard Oil Co., Inc., Laurel, Ms.
- 10 YEARS S&J Unocal 76, Charles City, Ia.

CHEMICALS

- 35 YEARS Ernest J. Weber, Carteret, N.J.
30 YEARS Charles J. Hoar, East Providence, R.I.
20 YEARS Mitchell Edenfield, Charlotte, N.C.
Calvin S. Henley, Kenai, Ak.
Dennis D. Laxton, Kenai, Ak.
Frank T. McSwain, Tucker, Ga.
Joseph W. Pieczeski, Carteret, N.J.
Robert E. Wright, Unocal Center
- 15 YEARS Charlie Brown, Wilmington, Ca.
Randall N. Everson, Schaumburg, Il.
Hallam N. Fain, Kenai, Ak.
Donald Freeman, Brea, Ca.
Darlene R. Gonyo, Schaumburg, Il.
Gideon Lorenzana, Unocal Center
Danny Martin, Rodeo, Ca.
Amaryllis F. McGlooin, Schaumburg, Il.
Larry S. Morgan, Brea, Ca.
Robert C. Roth, Kenai, Ak.
Jean E. Sperow, Charlotte, N.C.
Franklin J. Trigg, Kenai, Ak.
- 10 YEARS James W. Bergevin, Kenai, Ak.
Jerry W. Floyd, Charlotte, N.C.
Dan H. Caldwell, Charlotte, N.C.
Raymond W. Caudell, Lemont, Il.
Thomas K. Haight, Schaumburg, Il.
Michael S. Hardison, Nashville, Tn.
Eric H. Hunger, Nashville, Tn.
Ralph F. Kimbrell, Unocal Center
David L. Lyons, Brea, Ca.
James H. Roberts, Charlotte, N.C.

MOLYCORP, INC.

- 40 YEARS Myrl R. Shuemaker, York, Pa.
25 YEARS Robert B. Brown, York, Pa.
20 YEARS Harvey L. Bridges, Mountain Pass, Ca.
10 YEARS Anders S. Bjorklund, Mountain Pass, Ca.
Sheldon G. Clark, Mountain Pass, Ca.
Karen Culvey, Louviers, Co.
Gary V. Fleming, Mountain Pass, Ca.
Peter Gillett, Questa, N.M.
Karen E. McMaster, Louviers, Co.
R.A. Mullenix, Mountain Pass, Ca.
Michael R. Nees, Mountain Pass, Ca.
Kenneth P. Rainey, Mountain Pass, Ca.

POCO GRAPHITE, INC.

- 15 YEARS Gene E. Jones, Decatur, Tx.
10 YEARS Margaret Blackmon, Decatur, Tx.

RETIREMENTS

Corporate

H.R. Broussard, November 28, 1955

North American Oil & Gas

Richard B. Adams, December 8, 1950
Boyd M. Barnett, August 17, 1955
Virginia L. Cummings, May 3, 1954
Kenneth E. Martin, February 20, 1952
Wendell F. Ramage, July 24, 1953
Harry E. Richardson, January 4, 1953
Barbara Yarbrough, August 17, 1959

Joseph S. Adelizzi, June 1, 1971
 Patricia A. Blaine, January 18, 1955
 Fred W. Bollinger, June 18, 1973
 John W. Braddock, December 5, 1966
 Elizabeth K. Conry, February 3, 1958
 Paul D. Critton, October 3, 1955
 Humberto L. Diaz, April 30, 1956
 William A. Ewing, August 11, 1969
 Joyce N. Fowler, April 19, 1951
 Farrell R. Gallaher, February 4, 1963
 Alfred F. Gilman, September 15, 1972
 Andrew A. Goerger, June 12, 1961
 Robert E. Hardinger, March 16, 1966
 Patricia R. Higgs, September 10, 1979
 Gene E. Klein, June 6, 1966
 Nadia A.H. Laham, September 14, 1959
 David Mair, June 11, 1973
 Jay C. McMullan, January 1, 1955
 Stanley A. Miller, August 15, 1967
 Ronald E. Newgard, January 23, 1956
 Albert R. Partington, November 30, 1956
 Joseph M. Peterson, July 7, 1952
 E. Walker Polson, February 2, 1948
 Abraham C. Reyna, March 15, 1982
 Billy S. Roberson, August 1, 1964
 Lowell V. Sayers, September 5, 1961
 James O. Shaw, June 28, 1948
 Edwin G. Themig, July 21, 1968
 Robert Lee White, June 26, 1973
 Gene V. Wilson, July 9, 1956

Chemicals

William F. Kennedy, February 14, 1972

Geothermal

Wayne V. Blackwell, September 24, 1979

IN MEMORIAM

EMPLOYEES

Corporate

Margarite Mallen, October 4, 1989
 Sanford Burke, November 5, 1989
 Charles M. DeMoss, November 9, 1989

Refining & Marketing

Ray Adams, October 19, 1989
 Charles L. Burk, November 11, 1989
 Kenneth A. Shilman, September 7, 1989

Science & Technology

Jonathan N. Burke, September 3, 1989

North American Oil & Gas

Harold E. Adair, October 22, 1989
 Lynn A. Dore, September 23, 1989

Chemicals

Jonnie R. Berry, October 4, 1989

RETIREEES

Corporate

Chester M. Gjerde, October 29, 1989

North American Oil & Gas

Vesper B. Bailey, September 10, 1989
 John L. Bates, August 30, 1989
 Jack W. Boothe, September 19, 1989
 O'Neal Copell, October 29, 1989
 Robert C. Fowler, November 8, 1989
 George Franklin Phillips, September 14, 1989
 Joe S. Sanders, October 10, 1989
 Gordon R. Saunders, September 1, 1989
 James D. Scantlin, September 27, 1989
 Ercell Henry Smith, September 18, 1989
 Chester Thomas, June 12, 1989
 David Louis White, October 6, 1989
 Kenneth Winch, May 27, 1989
 Harry G. Yost, September 27, 1989

Joseph Matthew Bernadin, August 29, 1989
 Hilda H. Bills, October 23, 1989
 Meyer Blicher, October 12, 1989
 Ernest Borrer, October 23, 1989
 Lloyd Brightman, October 13, 1989
 Thomas E. Buskirk, October 25, 1989
 Joe R. Cherry, August 30, 1989
 Robert N. Creek, September 28, 1989
 Harry A. Deenis, October 22, 1989
 Agnes E. Denick, October 8, 1989
 Agnes C. Dougan, October 4, 1989
 Michael Falkowski, July 13, 1989
 Georgie May Forbes, October 12, 1989
 James B. French, III, September 6, 1989
 Joe J. Fritts, December 10, 1988
 Helen E. Haling, October 23, 1989
 Ellis Harding, September 23, 1989
 H.R. Harrison, September 20, 1989
 Albert L. Heinberg, September 20, 1989
 Clara G. Bickers Hicks, September 29, 1989
 C.E. Hilliard, October 9, 1989
 Herbert Wallace Inman, October 9, 1989
 Ellen Johnson, October 25, 1989
 Walter E. Johnson, September 1, 1989
 Bengovan W. Kenworthy, September 3, 1989
 Leslie C. Kiehl, October 30, 1989
 John Krumm, August 12, 1989
 Clinton J. Larama, October 17, 1989
 Milford Lemley, April 14, 1989
 Richard C. Maxfield, September 3, 1989
 H.R. Morrison, September 20, 1989
 John L. Munich, November 15, 1989
 Robert Naftzger, April 9, 1989
 Eldon V. Newland, October 26, 1989
 Mark J. Nichols, August 19, 1989
 George Perlite, September 20, 1989
 Edgar H. Prouty, October 1, 1989
 Hubert D. Rex, September 2, 1989
 Vern T. Robins, September 29, 1989
 David H. Ross, August 22, 1989
 Lawrence R. Rowland, October 19, 1989
 William Ruffert, October 31, 1989
 Earl R. Sanson, October 10, 1989
 Wilfred J. Sauriol, November 2, 1989
 Henry M. Savelle, June 29, 1989
 Clark L. Snyder, July 17, 1989
 Jonas Steacy, September 23, 1989
 Robert Steinley, October 8, 1989
 William E. Tomasini, October 10, 1989
 Vernon F. Valerri, October 9, 1989
 William H. Walters, October 24, 1989
 Glen E. Wetherell, September 19, 1989

Chemicals

John L. Coley, November 3, 1989
 Aubrey J. Dunbar, October 23, 1989
 Gordon Taylor, September 7, 1989

Molycorp, Inc.

A. Rea Dunkle, October 24, 1989

Science & Technology

Benjamin T. Anderson, September 26, 1989
 Hazel M. Corcoran, July 30, 1989
 William R. Harper, August 18, 1989
 Leroy W. Holm, October 23, 1989

GARY L FOY
16823 LIGGETT STREET
SEPULVEDA CA 91343

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Use of the name "Unocal" in Seventy Six may refer to either "Unocal Corporation" (a Delaware corporation) or "Union Oil Company of California" (its wholly owned subsidiary) or, at times, to subsidiaries of either of these companies.