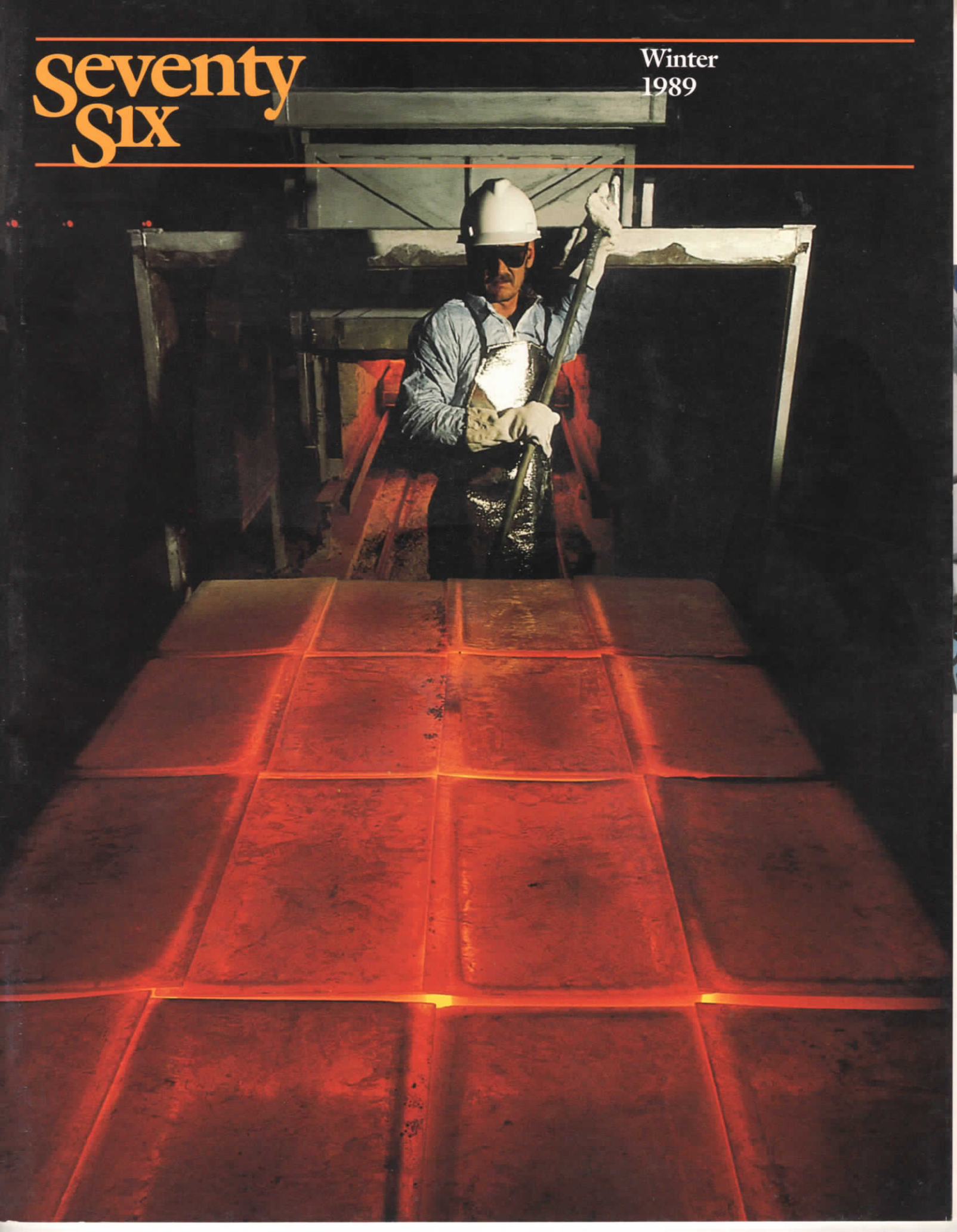
Seventy Six

Winter
1989



THE PRESSURE'S ON

Beneath 40 square miles of pine-covered Alabama countryside is a gas reservoir rich in hydrocarbon fluids — condensate, propane and butane among them. Since 1982, an enhanced oil recovery (EOR) project has helped Unocal tap these valuable resources by regulating the pressure levels in this reservoir, located near the town of Chunchula.

Injection of natural gas and nitrogen has kept reservoir pressure high, enabling these fluids — in a gaseous state — to flow to the surface where they can be condensed and separated. Without the EOR effort, natural reservoir energy would have permitted the recovery of only a small amount of these liquids.

A computer model of the reservoir, maintained at the Science & Technology Division's Fred L. Hartley Research Center in Brea, California, is a key to the project's management. Using data gathered by Unocal geologists and engineers, the model can simulate reservoir conditions decades into the future, says Wally Huang, a Science & Technology senior research engineer who oversaw the model from 1981 to 1988.

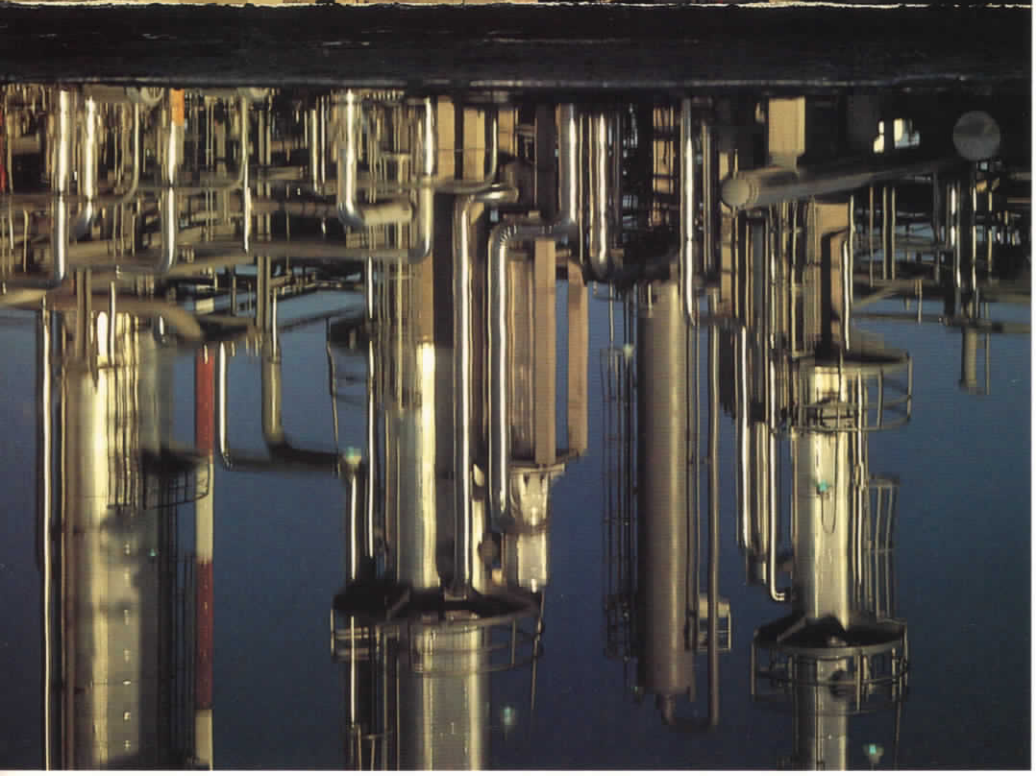
This megabyte soothsayer has played a pivotal role in determining how to optimize the pressures in the field, Huang says. For example, anticipated reservoir conditions help determine where to drill new injection wells to distribute the natural gas and nitrogen. The field currently has 29 producing wells and eight injection wells.

"The natural gas and nitrogen provide the energy to drive the condensate-rich gas out of the reservoir," explains Sheldon Roberdeau, the field's area production manager. "Unlike oil, fluids in a gaseous state can't be pumped. They have to flow by themselves. Since the field doesn't have a natural water drive, we have to provide the energy."

The field produces 9,000 barrels of condensate daily. Condensate, which is usually associated with natural gas deposits, resembles automotive gasoline in appearance and consistency. It is richer and purer than crude oil, but shares the same commercial uses, Roberdeau says. Each producing well in the Chunchula field is equipped with its own separator, where the condensate is separated from the gas.

After the gas and condensate are measured, they flow from the well to the Chunchula gas processing plant, operated by Union Exploration Partners (UXP) — the master limited partnership that holds substantially all of Unocal's oil and gas assets in the Gulf Region. In the plant, the condensate is heated to extract any remaining trapped gas, Roberdeau says. The natural gas undergoes a process to remove hydrogen sulfide, a byproduct. The hydrogen sulfide is converted to sulfur, which is later sold.

The Chunchula field produces 50 million cubic feet of natural gas a day, but none of it is marketed. Rather, it is reinjected into the field, permitting the production of the more valuable fluids. In addition to condensate, the field produces 1,300 barrels of propane, 1,000 barrels of butane and 700 barrels of natural gasoline (a mixture of pentane and octane) per day.



The Chunchula field produces about 9,000 barrels of condensate and 50 million cubic feet of natural gas per day. Production goes directly from the wells to the Chunchula gas processing plant, a portion of which is pictured at left. Top, a row of product storage tanks at the facility. Above, an employee adjusts a wellhead valve to regulate flow.

Unlike condensate, butane and propane can't be separated from the gas in the field. They liquify in the processing plant's rather extreme environmental conditions—a temperature of minus 40 degrees Fahrenheit and a pressure level of 600 pounds per square inch.

"The plant is designed to keep everything under pressure," Roberdeau says. "The products are never exposed to the atmosphere. The pressure levels in the plant and storage tanks are high enough to keep the products in their liquid form."

The gas mixture in the Chunchula field's reservoir is composed of hydrocarbon components that may be either gaseous or liquid at atmospheric pressure and room temperature. But these components are all in a gaseous phase in the reservoir's high-pressure, high-temperature environment.

A drop in reservoir pressure, however, can trigger a gas-to-liquid phase change. Normally, reservoir liquids transform into gases as a result of a decrease in pressure. But the Chunchula reservoir's combination of extreme depth, pressure and temperature can reverse this tendency. The resulting precipitation of liquid from the gaseous mixture is called retrograde condensation. The liquid formed in this manner is condensate.

If retrograde condensation occurs down in the formation, rather than at the surface, condensate recovery is greatly reduced. The condensate tends to adhere to the surface of the formation, says Steve Ohnimus, UXP's district operations manager based in Houma, Louisiana. This is why maintaining the reservoir's pressure at a high level is necessary to maximize the recovery of condensate.

"The Chunchula field is unique because the composition of the fluids in the reservoir changes from one point to another," Huang says. "The changes are brought about because the fluid is close to the critical point—the condition in which the liquid and gas phases have the same density. It's then difficult to say whether the fluid is in a gas phase or an oil (liquid) phase."

This ambiguity has made the computer model all the more crucial in predicting reservoir conditions, Huang says. Characteristics of the field's geology also add to the reservoir's volatile and complex nature.

The productive formation at Chunchula is the Smackover, which is composed of dolomite rock. This carbonate rock was originally deposited as limestone but was later altered by magnesium-rich pore fluids migrating through the rock. Deposited 160 million years ago during the Jurassic geologic age, the Smackover formation is buried 18,000 feet underground. UXP engineers and geologists try to place producing wells near the formation's most permeable dolomite, but finding this can be a troublesome task.

"Dolomite rock's permeability—its ability to transmit fluids—is often unpredictable," explains John Forbes, UXP's district exploration manager based in Jackson, Mississippi. "Part of the rock may provide a very permeable zone, but 100 feet away it may not be permeable at all."

"The plant is designed to keep everything under pressure," says Sheldon Roberdeau, area production manager. "The products (natural gas fluids) are never exposed to the atmosphere." Top, a worker monitors the temperature and pressure levels of one of the plant's compressors. Bottom right, a view of the main compressor station.

Right, a worker changes a chart in one of the processing plant's pressure recorders. Top, a drilling rig at work in the Chunchula field, discovered by Unocal in 1973.

To accurately depict the reservoir's present and future characteristics, the computer model in Brea draws upon all available data about the field. This includes information acquired during analysis of conventional whole core samples—cylinders of rock retrieved from the well bore by using a special drilling tool. Geophysical logs—readings from instrument packages lowered into wells to measure a formation's physical parameters—also figure prominently.

The computer model currently holds that the injection of gas should continue until the year 2002, although an actual date can't be determined yet, Huang says. When the injection program ceases, UXP will begin producing natural gas in the field for sale. But first the partnership must install equipment in the processing plant to remove any nitrogen and other contaminants from the produced natural gas.

UXP began injecting gas into the Chunchula field's reservoir in 1982—about eight years after drilling the field's first discovery well. Unocal discovered the field in 1973, after several years of intensive seismic survey work. It remains the largest hydrocarbon field in Alabama.

Initial development of the field posed some rather difficult hurdles. To tap the Smackover formation, crews had to drill wells 3.5 miles deep. The average depth of a natural gas well in the Gulf Coast area at the time was 10,000 to 12,000 feet.

In 1981, sale of Chunchula's natural gas was suspended after unitization of the field cleared the way for the EOR project. As a result, injection wells could be placed in the most optimal locations, regardless of which oil company originally held the lease on that property. The unitization also established UXP as the field operator with a 71-percent working interest.

In 1984, UXP started injecting nitrogen along with the natural gas. Studies from UXP's engineering staff in Houma, Louisiana and from S&T concluded that supplementing the gas with nitrogen would be more economical and effective.

"Nitrogen has a unique property," explains Preston Cates, the supervising district engineer. "Once it enters the reservoir's environment, it is less compressible and takes up more space. Natural gas alone, however, shrinks after it's injected. Carbon dioxide, another gas often used in EOR, shrinks even more. So supplementing the gas injection with nitrogen was a good way to improve the field's economics."

The nitrogen and natural gas must be compressed to a pressure of 6,000 pounds per square inch before they can be injected into the 18,500-foot-deep wells. Four 2,500-horsepower compressors prepare the mixture for injection. The nitrogen supplier is located next to UXP's gas processing plant in Chunchula.

Statistics on how the EOR project has increased production and prolonged the field's lifespan are still unavailable, Huang says. Research on the matter, however, is ongoing. Meanwhile, the collaborative effort of company geologists, engineers and research scientists continues to maximize the reservoir's potential. *C.S.*

TAKING THE HEAT

"Don't ruin that well. That's the best well I have," responded a skeptical Jim McNulty after engineers unveiled plans for Unocal's first thermal recovery project in 1963.

As superintendent of Unocal's oil and gas operations in California's South San Joaquin Valley, McNulty knew that the #14 well was a good producer. In fact, it was the company's most prolific well in the Cymric field's Welport lease, producing 40 barrels of oil daily. But company engineers wanted to attempt an innovative enhanced oil recovery (EOR) method in the field. The new technique was called steam injection—and well #14 was going to be its first major test.

Not surprisingly, McNulty wasn't the only company stalwart who questioned the wisdom of such a departure from accepted oil production procedure.

"We sure had our doubters and scoffers in those days," recalls Don Forster, one of the engineers behind the thermal recovery project. But with the solid backing of Unocal President Cy Rubel, the effort moved forward with few delays.

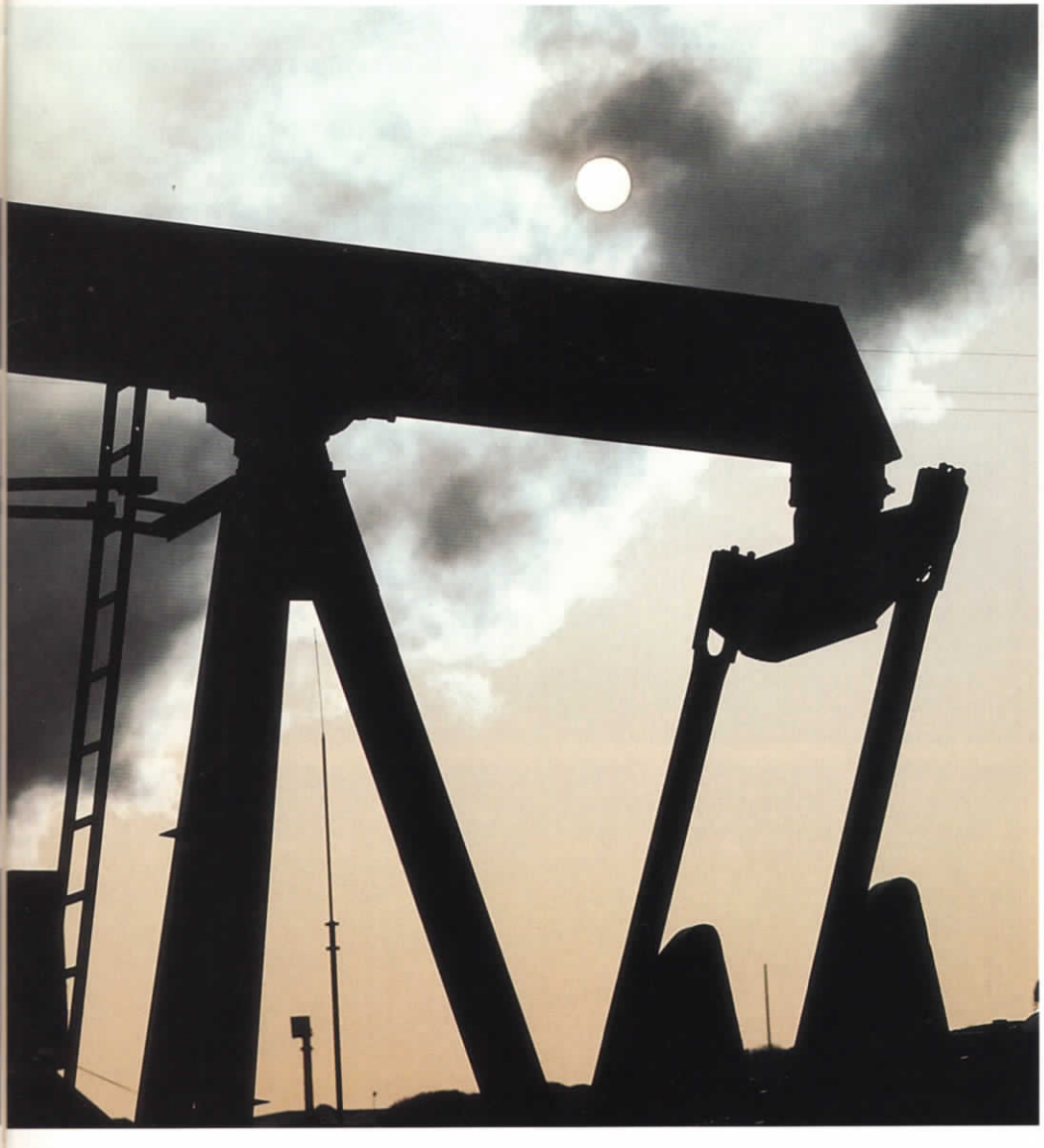
Steam injection at well #14 began even before arrival of a new steam generator. Eager to proceed, the project team secured the purchase of a temporary source of steam—two locomotive-style boilers built in the 1940s.

In spite of their age, the boilers had never been used. Another oil company with local operations had bought the boilers for a drilling rig but later opted to use a diesel-powered rig instead. "When diesel rigs came on the market, steam rigs became obsolete," Forster says. "So the oil company that owned those boilers just stored them in a yard without ever firing them."

Unlike the modern generator, the boilers required 24-hour attention. Nonetheless, they produced the necessary steam until the new equipment arrived. And, as hoped for, the injection of steam markedly improved Welport #14's oil production, squelching all suspicions about the new EOR method.

During periodic two-week stretches, steam was injected into the well with production shut down. In the first month after production resumed, the well averaged 285 barrels of oil a day. This considerable boost prompted McNulty to pay a visit to Forster's office in nearby Bakersfield. "I'd like you to ruin a few more of my wells," he told the engineer, wearing a big grin.

Although unconventional in 1963, this form of steam injection—known as cyclic steaming—evolved largely from the successful use of downhole heaters, a widely accepted recovery method during that era. Downhole heaters pumped hot water down a string of tubing and circulated the water inside the well.



Located in California's San Joaquin Valley, Unocal's Cymric field was the site of the company's first attempt at steam injection. The method is now a widely used enhanced oil recovery technique.

Instead of stimulating oil in the formation, the heaters merely warmed the oil that was already flowing to the wellbore. The heat made this oil less viscous, permitting easier pumping.

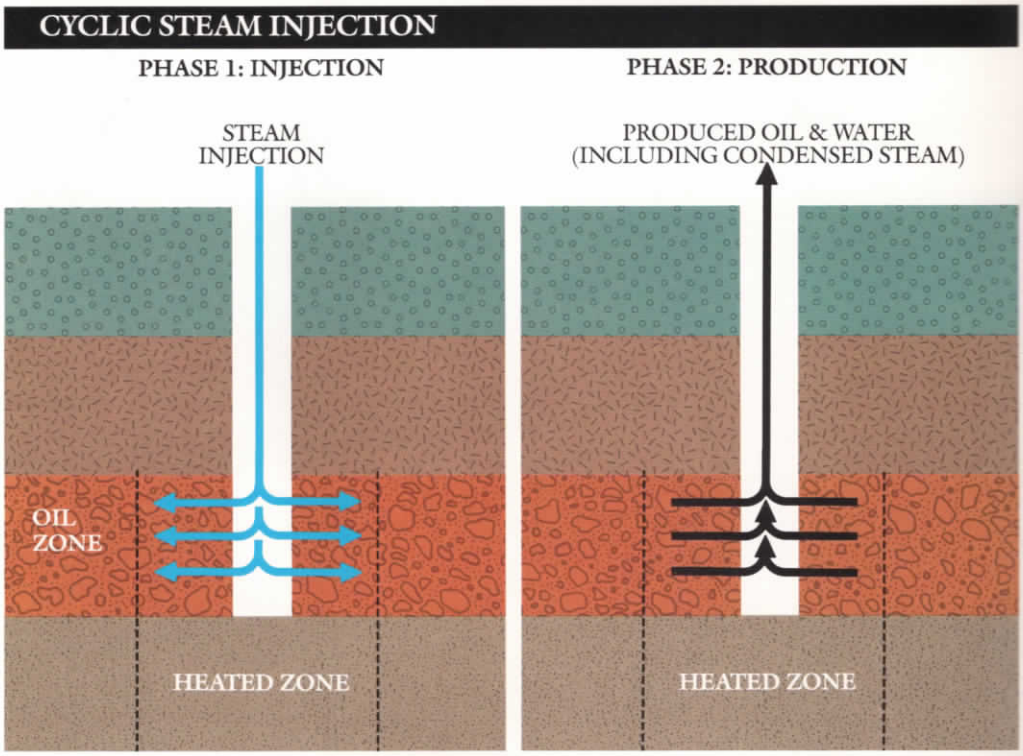
"The efficiency of downhole heaters made us realize that introducing larger volumes of heat into the reservoir beyond the wellbore would probably increase our production dramatically," Forster says.

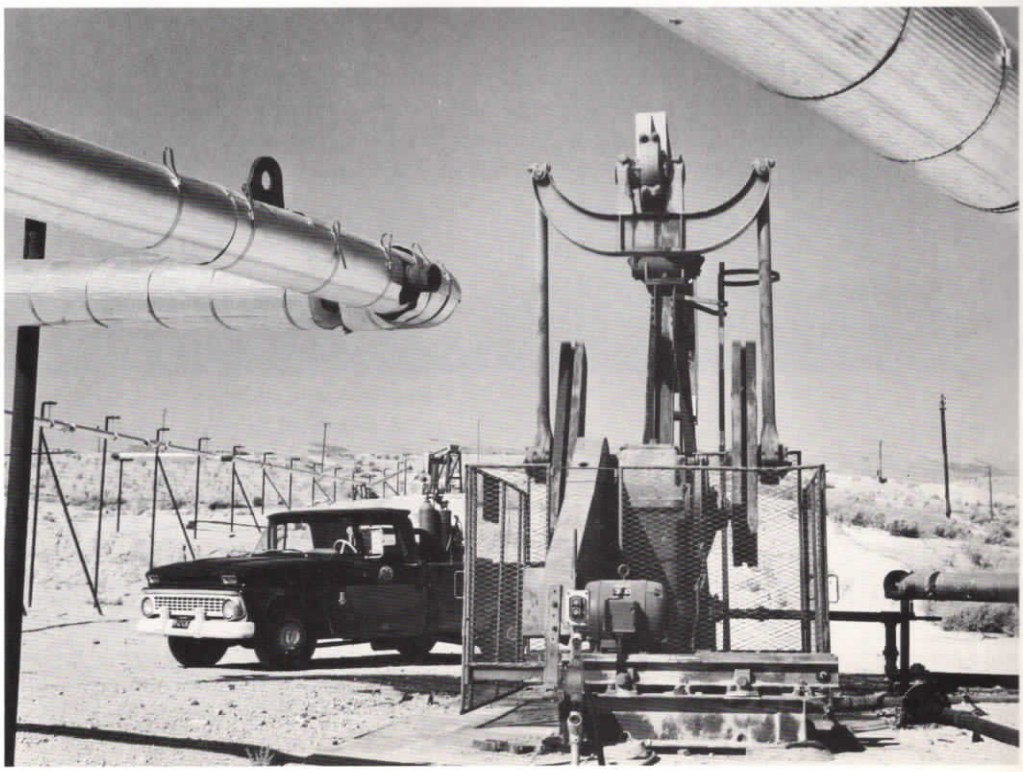
Forster, now the Oil & Gas Division's manager of regulatory compliance, likens the Cymric field's exceptionally heavy oil to honey. "When honey is refrigerated, it almost becomes a solid," he says. "But if you take that same jar of honey and heat it in a microwave oven, it will almost pour like water. Heavy or viscous oil behaves the same way when it's heated."

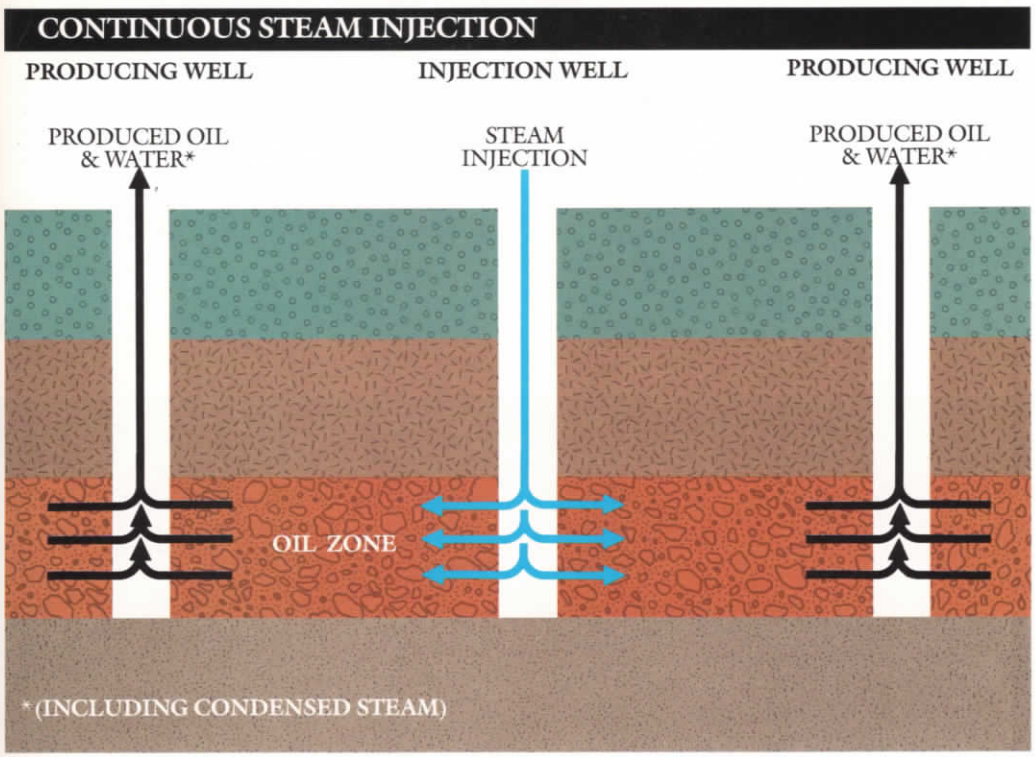
Forster credits his boss at the time, Supervisor of Joint Operations Vaughn Moyer, for spearheading the Welport #14 project. Moyer continually challenged his staff of engineers to generate innovative and creative ideas—at times using a rather offbeat approach.

"One time, Vaughn walked into my office while I was punching away on my adding machine," Forster recalls. " 'Why don't you take a break from that?' he said. 'Put your feet up on the desk, close your eyes and think of new ideas.' "

Welport #14's good fortune quickly paved the way for more cyclic steaming projects in California's South San Joaquin and Santa Maria areas. Perhaps more importantly, cyclic steaming's success eventually gave impetus to the advent of steam drive projects in Unocal fields.







Two steam injection techniques—cyclic steaming and steam drive—are in common use today. Both processes (depicted above) are highly effective in boosting production from heavy oil reservoirs. Far left, one of the Wellport lease wells in the early 1960s, just after steam injection began. At left, a drilling rig at work on the lease today.

Unlike cyclic steaming, the steam drive method employs special wells that inject steam continuously. By increasing reservoir pressure and heating the oil, injection wells can drive oil to nearby producing wells. Steam drive continues to enjoy tremendous success companywide in fields with heavy oil and low reservoir pressures.

Today, the 80-acre Welport lease still relies on cyclic steaming, producing 3,600 barrels of oil daily. A total of 92 producing wells are now active. In 1988, about 1.7 million barrels of steam were injected into the lease's wells.

"Approximately 95 percent of our production in the South San Joaquin area can be attributed to thermal stimulation—both cyclic steaming and steam drive," says Jeff Tenzer, area engineer. In 1988, the company's wells in the South San Joaquin Valley produced 6.5 million barrels of heavy oil. Before thermal recovery, Unocal produced less than 500,000 barrels of heavy oil annually in the area.

"Last year when I received (Unocal President and CEO) Mr. Stegemeier's newsletter that said new ideas should be nurtured, I was instantly reminded of our early days of thermal recovery," Forster says. "Those projects provided great opportunities for our employees to bring forth new, creative ideas on oil recovery—in spite of the obstacles."

Today, 11.5 percent of the Oil & Gas Division's total production of crude oil and condensate results from enhanced oil recovery methods. *C.S.*

A VISIT TO MOUNTAIN PASS

Molycorp's Mountain Pass, California mine and processing facility is the only operation in the world developed solely for the production of lanthanides. Facing page, workers tend the facility's flotation plant, where bastnasite is separated from the mined and crushed ore.

Nestled at the foot of Clark Mountain, just a stone's throw from Interstate 15 near the California-Nevada border, is a small open pit mining operation. Little noted by the cars and trucks that zoom past, the mine is well known to high-technology industries the world over. That's because the facility supplies the strategic raw materials and finished products these industries need to produce their wares.

Welcome to Mountain Pass, California, located in the high desert hills about 60 miles west of Las Vegas. The treasure being harvested here is bastnasite, an ore rich in the lanthanide elements. Discovered in 1949, the deposit is the world's largest, containing more than 30 million tons of bastnasite ore.

Molycorp, Inc., a wholly owned subsidiary of Unocal, has owned and operated the mine and processing facilities here since 1951. The Mountain Pass complex employs a total of 235 individuals, about half of whom are on the job at any given time.

"Other mines produce lanthanides as a byproduct," says Bob Sega, general manager of Mountain Pass. "But we're the only facility in the world developed solely for long-term production of lanthanides."

The lanthanides (formerly called "rare earths") are a group of 15 chemically similar elements usually occurring together in deposits. (A similar but lighter element, yttrium, is usually found with the lanthanides.) Those in common commercial use today are cerium, lanthanum, neodymium, praseodymium, samarium, europium, gadolinium and yttrium.

For years, however, the lanthanide elements were thought to be of little practical value. Indeed, when the Mountain Pass deposit was discovered 40 years ago, there were only two known applications for lanthanides: as lighter flints and glass polishes. In the ensuing years, however, scores of lanthanide uses and applications have been discovered and developed.

The glass, steel, automotive, electronics and oil industries—to name just a few—make ever-widening use of these elements. Everything from color televisions and stereo headphones to oil refining catalysts and fiber optic systems use one or more of the lanthanides in their components or manufacturing processes.

The explosion of lanthanide applications shows no signs of abating. Indeed, the elements are integral to several leading-edge technologies and products, including a new generation of powerful permanent magnets (the central component of advanced electric motors), high-strength and heat-resistant ceramic machine parts, and promising new superconducting materials.

While each element has its own distinctive properties, all of the lanthanides have a high affinity for combining with other materials. This allows for the creation of compounds that exhibit new physical and chemical characteristics. These in turn can lead to product innovations that are weight, size, energy and cost efficient.

Worldwide competition in lanthanide production continues to grow along with new product applications. But Molycorp has kept pace, remaining a reliable, high-volume supplier. Facilities for separating, concentrating and purifying the lanthanides are located at the mine site in Mountain Pass. More specialized processing is performed at Molycorp plants in Louviers, Colorado and York, Pennsylvania, as well as at a metal products facility in Washington, Pennsylvania.

The Mountain Pass processing plants are highly automated. Sophisticated computer systems, such as this one (below left) in a plant producing 96-percent cerium, monitor the flow of all materials. Center, a view of the mining pit.

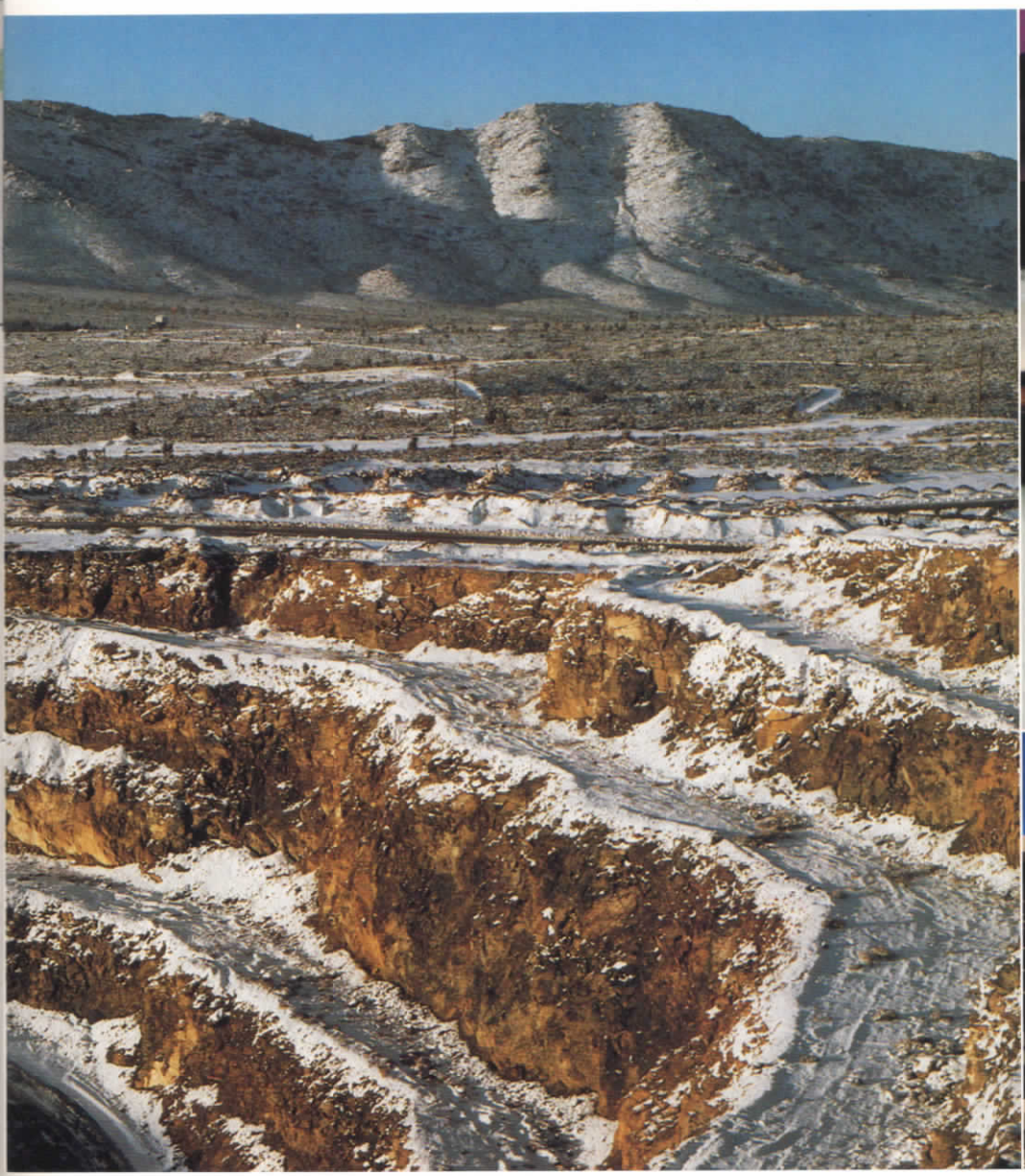
The company supplies lanthanide products in a multitude of forms — as oxides, alloys, metals of varying purities, and in numerous chemical compounds.

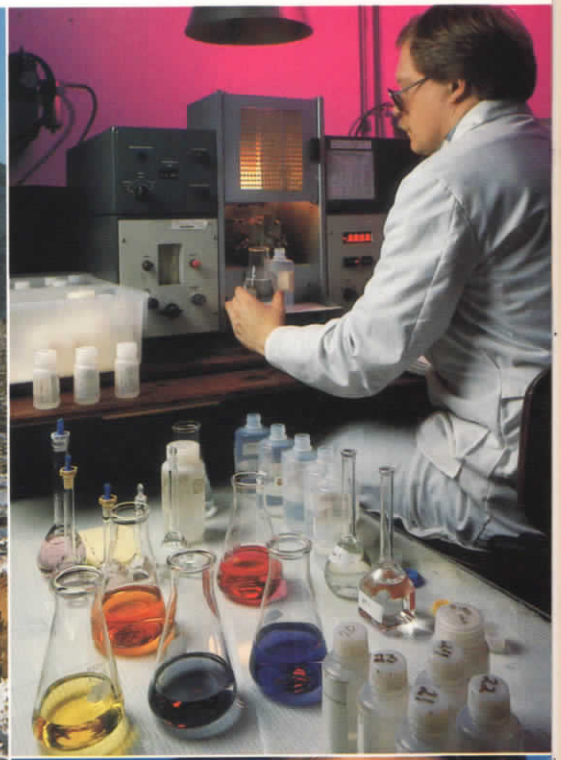
Molycorp research scientists work with chemists and engineers at Unocal's Science & Technology Division on an ongoing basis to develop new processing techniques and product applications. The company's technical sales force also works closely with customers to help tailor lanthanide products to their needs. In addition, Molycorp aids customers' own research efforts by making its technical files on lanthanides available.

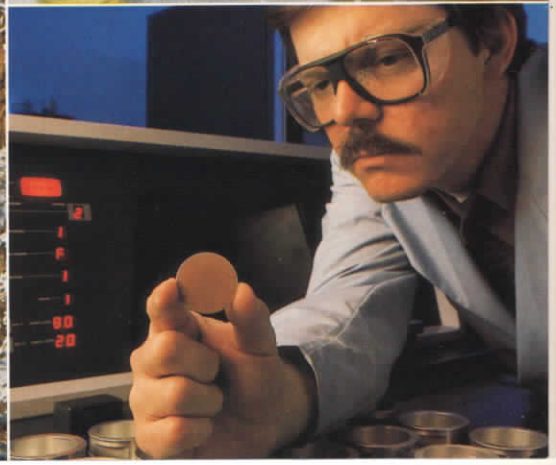
"The market for lanthanides is wide-ranging, with a lot of potential for growth," says Sega. "That's what makes our ore deposit here at Mountain Pass so valuable."

In the barren hills around Mountain Pass, however, there is little to indicate to the layman that anything valuable or unique lies about. "This is a small-scale endeavor as mining operations go," says mine engineer Gary Eisebraun, gazing down into the mining pit from its south rim. "But due to the high grade ore and low waste-to-ore ratio, we are able to produce large quantities of lanthanides without disturbing a large area."

Purities and concentrate levels of all Mountain Pass products are checked in an on-site testing lab. Two of the advanced analytical processes used are atomic absorption (below) and X-ray optical fluorescence (bottom).







Geologically, the deposit of bastnasite ore at Mountain Pass—which contains all the lanthanide elements in a natural mixture—is called an "intrusive igneous carbonate mass." Left behind by volcanic activity millennia ago, the ore body lies at a 45-degree angle, is 200 to 300 feet thick and extends underground several hundred feet.

"The ore averages 9 percent bastnasite, which is a rich grade as ore bodies go," Eisebraun says. "It's also very accessible for mining—a fortunate geological accident."

Because the deposit is so large and accessible, mining it is a straightforward operation. Front-end loaders scoop up chunks of the reddish-brown ore, filling dump trucks which transport it up and out of the mining pit. During a typical work day at Mountain Pass, about 2,000 tons of ore are mined in this fashion. If demand warrants, the mine can operate 24-hours-a-day.

On this afternoon, a portable drilling rig is set up on one of the pit's lower benches. The rig is being used to drill a series of six-inch-wide, 36-foot-deep holes on the bench.

After 80 to 100 holes have been drilled, spaced in a uniform grid, explosive charges will be placed in each one. Detonated in a controlled fashion and in a specific pattern, the blasts will expose a new layer of ore for mining.

Below, a dump truck is filled with bastnasite ore on the mining pit floor. About 2,000 tons of ore are mined each working day.

"We blast as needed to go deeper into the ore body, and to maintain a stable pit wall," explains Eisebraun, whose responsibilities include developing a continually evolving mining plan. "The operation is carefully planned out and controlled."

A certain amount of drilling is also performed each year to fulfill assessment requirements for the company's claims, and to develop new sections of the ore body. "The geology of the structure is not entirely uniform," Eisebraun says. "At this point we still have a lot to learn about the deeper sections of the ore body. So we're continually evaluating it as we plan for future development of the mine."

Once trucked out of the pit, mined ore is taken to the crushing plant for mechanical size reduction. Sitting adjacent to the pit, this operation consists of a series of interconnected belts, drums and hoppers.

The primary crusher — a huge rotating hammer mill — takes rock fragments that are up to two feet in diameter and breaks them down into four-inch chunks. A secondary crusher reduces these to two-inch pieces, and a screen separates out those fragments five-eighths of an inch in diameter and smaller.

The crushing plant reduces rock fragments from two feet in diameter down to two inches and under.

While mining and crushing the ore are a fairly straightforward operation, processing bastnasite is more involved than processing most other ores and minerals. As a first step, the crushed bastnasite is blended for uniformity of size and grade. It is then transported by conveyor belt to a facility called the concentrator. Here, the bastnasite is separated from the crushed ore by a special "froth flotation" technology developed by Molycorp.

Upon arrival at the concentrator, the ore is mixed with water and further ground down to the consistency of sand in a ball mill—a large cylinder half-filled with grinding balls. The ball mill discharge is classified according to size and sent to the flotation circuit, where chemicals are added that cause the bastnasite to separate out.

"The chemicals coat the bastnasite particles, causing air bubbles to adhere to them," explains production manager Carlos Kovacs. "When the slurry is heated and agitated in flotation machines, the bastnasite rises to the top of the vessels and is skimmed off."

The flotation process yields bastnasite concentrate, in which all the lanthanide elements coexist in a natural mixture. While the mined ore is about 9 percent bastnasite, the concentrate is 60 percent bastnasite. Some of the concentrate is kiln dried, packaged and sold directly to customers. But the largest portion moves on to nearby chemical and separations plants at the Mountain Pass complex for further processing.

The diagram below illustrates the relative yields of various lanthanide elements from bastnasite. Bottom, final products at Mountain Pass are packaged for shipment to customers in several different volumes and types of containers.

Most of this lanthanide "refining" takes place in the separations plant, where a process called solvent extraction (SX) is employed to break the bastnasite up into its component elements.

Pioneered for large-volume lanthanide production by Molycorp, SX is a highly exacting process in which the various lanthanide component solutions are mixed with chemicals that selectively absorb one or another of the minerals. The process takes place in a series of solvent extraction cells, with the solution in each successive cell becoming increasingly concentrated.

When the desired level of concentration is achieved, the lanthanide components are precipitated out of the solutions. The end products of SX are concentrates and compounds of the various lanthanide elements. These are produced with purities as high as 99.999 percent.

The highest yields of the solvent extraction process are products of lanthanum and cerium. These two elements exist within bastnasite in larger proportions than the others. (See illustration on page 16.)

The processing plants at Mountain Pass are all highly automated. Sophisticated computer systems monitor the flow of materials and control their volumes, temperatures and pH value, helping to ensure uniform product quality.

Below, bastnasite is separated into its component elements in the solvent extraction plant.

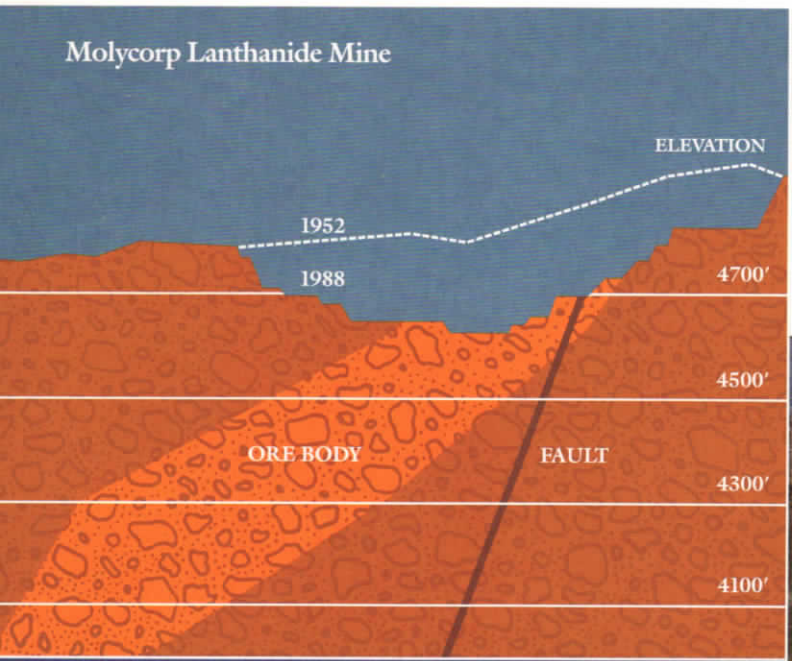
"Lanthanide processing is a complex undertaking," says Sega. "The elements are very similar chemically, so separating and concentrating them requires a lot of precision. The need for high purities also leaves little margin for error."

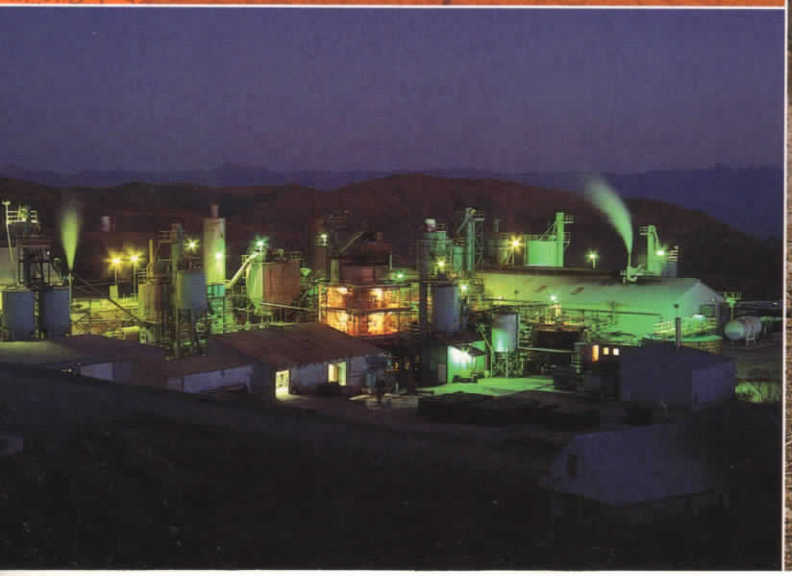
Efforts to improve and advance the processing technology are ongoing. "We're always trying to come up with new wrinkles," says chemist Dick Witham, who works with a staff of three at Mountain Pass to research new processing techniques. Studies in this area are also undertaken at the Louviers and Washington plants, as well as at Unocal's Science & Technology Division.

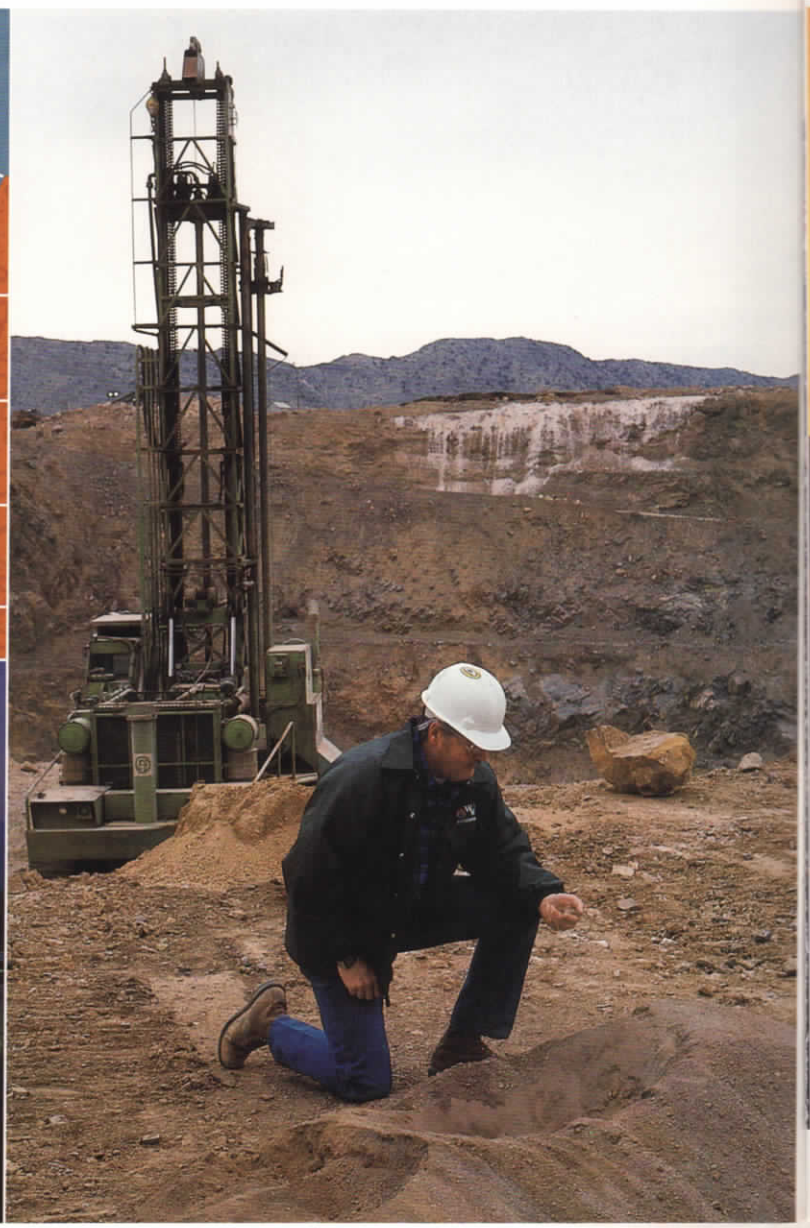
"The work involves a good deal of methodical, trial-and-error experimentation," Witham says. "But the processing advances we develop tend to build on themselves. As we become able to produce purer lanthanide concentrates and a wider variety of compounds, this in turn can lead to new products and product applications."

In 1987, Molycorp launched an expansion and modernization program to increase its capacity to produce specific refined oxides at Mountain Pass. As part of this program, two new processing plants were opened in 1988. One produces 96-percent cerium oxide, used principally in automobile exhaust catalysts. A second plant produces 96-percent neodymium, used in the newest generation of high-power permanent magnets, glass and electronic ceramics.

Clockwise from below: a cross-section of the Mountain Pass ore deposit, mine engineer Gary Eisebraun checks a hole drilled for blasting in the mining pit, a view of the processing complex at night. If customer demand warrants, the mine and processing plants can operate 24-hours-a-day.







In all, an average of 38,000 tons of crushed ore are now processed at Mountain Pass each month, yielding 1,850 tons of products. The products, which emerge in the form of fine-grained powders, are tested for purity and uniformity at an on-site laboratory. Mass spectrometry, atomic absorption and X-ray optical fluorescence are some of the methods used to analyze product samples on a daily basis.

Some of the products are sent for further processing to the other Molycorp plants, while the bulk are packaged for direct shipment to customers. Products are shipped in several different volumes and types of containers. Large-volume concentrates such as lanthanum are packaged in one-ton bags or 55-gallon drums. The lower-volume products, such as europium, are shipped out in five-gallon containers.

As dusk falls at Mountain Pass, the trucks continue to roll, carrying loads of ore to the crushers. Inside the mine's general office, Bob Sega prepares to head home for the night.

"You know, we've literally just scratched the surface of the resource here," he says, glancing at a wall chart that depicts a cross section of the Mountain Pass ore deposit. "This mine will be producing long after we're gone."

Not a bad legacy for a geological accident. *T.S.*

Boasting the world's largest deposit of bastnasite ore — over 30 million tons — Molycorp's Mountain Pass mine will be a reliable supplier of lanthanides for years to come.

On January 2, Seventy Six *assistant editor Cathy Stephens was invited to join the troupe of entertainers that accompanied Unocal's prize-winning Mardi Gras float in the 100th annual Tournament of Roses Parade. Following is her account of what it's like to make the 5.5-mile trek down Pasadena's Colorado Boulevard.*

Unocal's Sweepstakes Award-winning float featured 12 different varieties of roses. Street dancers and a Dixieland jazz band accompanied the entry.

MARDI GRAS MIRTH

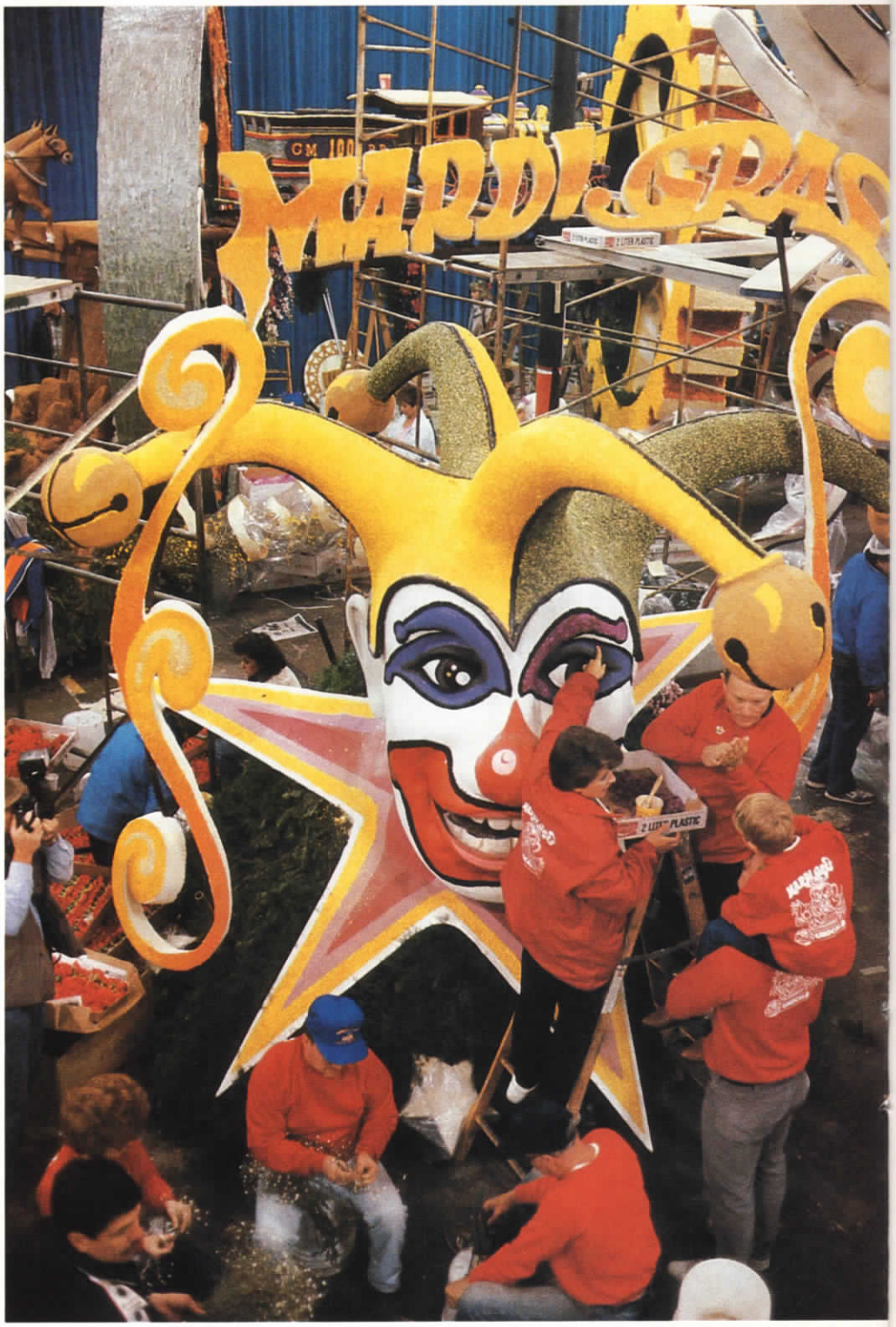
So many cameras were flashing in the early morning darkness that Pasadena's Orange Grove Boulevard appeared to be bathed in strobe lighting. Throngs of adults and children—bundled in coats and sweaters to ward off the chill—wandered from float to float, marveling at the floral artistry and posing for snapshots.

More sedate paradegoers lined the sidewalk, some dozing in sleeping bags, others wrapped in blankets and relaxing on lawn chairs. The aroma of bacon and eggs wafted through the air as some of the sidewalk spectators prepared breakfast on portable camping stoves and barbecues. White-suited officials roamed the street on motor scooters, urging pedestrians to keep clear.

"Did you see the girls on the Long Beach float dressed in togas? They must be freezing," commented Dave, one of my fellow street performers, as the four of us worked our way through the crowd. We had just been dropped off at the float formation area for the Tournament of Roses Parade. In under two hours, we would be prancing and dancing alongside the Unocal float—a spectacular floral celebration of Mardi Gras that had earlier been awarded the Sweepstakes Trophy as the parade's most beautiful float.

The float's builder, C. E. Bent & Sons, selected all the entry's entertainers—18 dancers and seven members of a jazz ensemble. I was the only Unocal employee. We were all dressed in the traditional garb of Mardi Gras revelers. I wore a royal blue, purple and turquoise shirt, embellished with sequins, along with a gold headdress sporting an erect blue feather. I looked like a cross between a drum major and a Rockette.


PLASTIC


MARDI GRAS

Many of the other performers wore costumes even more outlandish than mine. One woman was dressed in a jester outfit—a pastel print with giant pink, turquoise, yellow and purple diamonds. Another reveler wore a feather headdress that would have made any Las Vegas showgirl envious. Two teenage twins wore elegant, Renaissance-period hooped gowns.

While waiting for the parade to begin, I spent some time inspecting the main unit of the Unocal float up close. Standing within arm's reach of the 26-foot tall masked Mardi Gras reveler, I found the float's beauty all the more dazzling. The symmetry of the intricate floral designs was flawless. The vibrant purple orchids on the headdress were particularly striking, yet they meshed perfectly with the cloak's wide array of roses.

I wandered over to the front of the float, where the jazz band—*Spirit of America*—was offering a daybreak sampling of New Orleans nightlife. The swirling horns, driving bass drum and rhythmic banjo strumming blended for some infectious renditions of classic Dixieland tunes. Several spectators danced and clapped along, rousing even the most weary sidewalk campers.

"Even though I'm here on Orange Grove Boulevard, it looks more like Bourbon Street," said Jann Carl, a local television reporter. She was standing in front of the Unocal float's other, smaller unit—a jester. "What mood were you trying to achieve?" she asked float designer Art Aguirre.

"I wanted to capture the spirit, energy and life of Mardi Gras, and I think we've really done that here," he responded. My eyes turned to our rollicking band leader, a tuxedo-clad dancer named Valentino. So this was how I was supposed to dance to Dixieland jazz, I thought. I studied his steps and moves intently, but soon concluded I'd be better off just winging it.

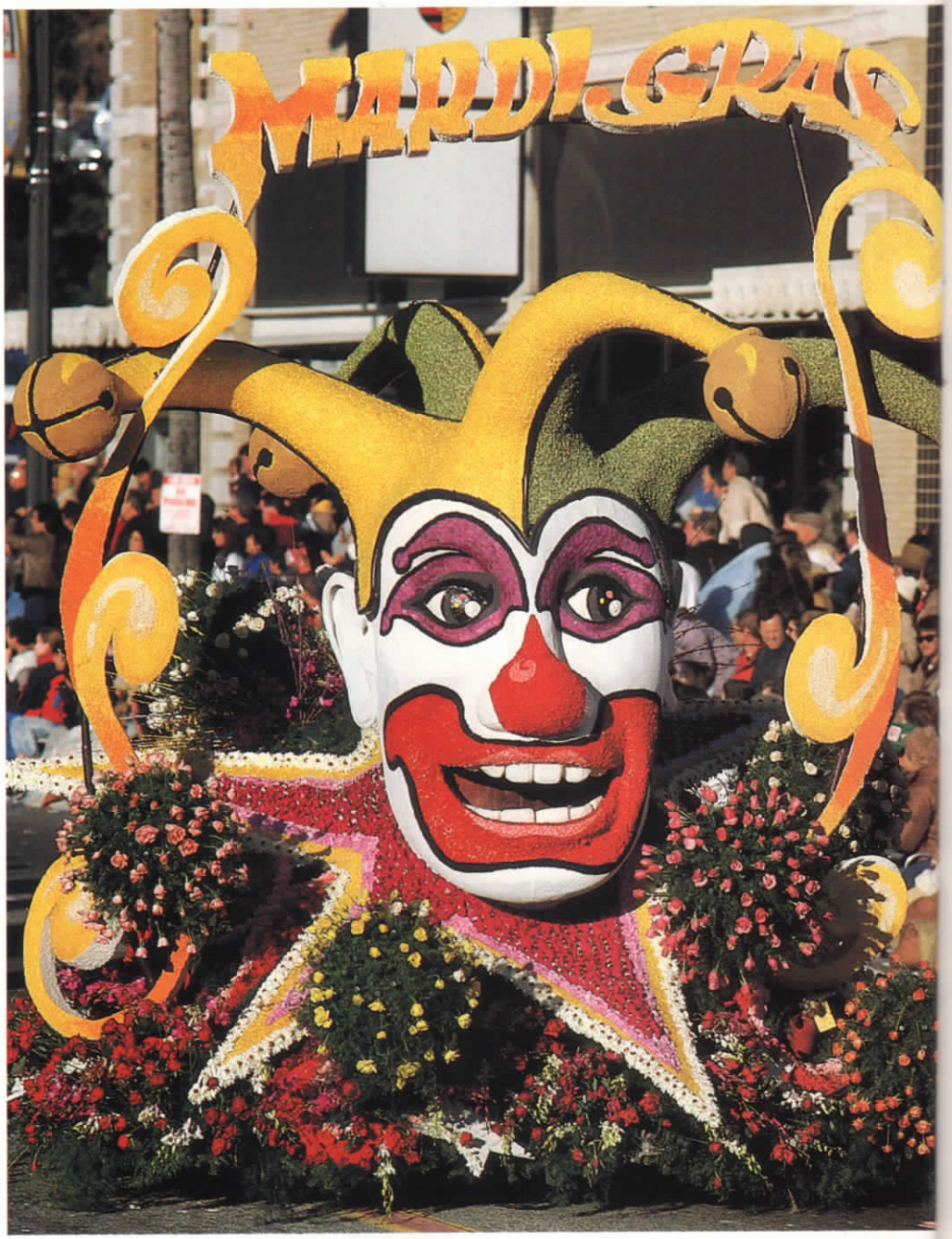
I knew the parade was finally about to start when a miniature car whizzed by, carrying Grand Marshal Shirley Temple Black to her horse-drawn carriage. It was shortly after 8 o'clock, and the sun was shining brightly, raising the temperature to a comfortable level. The rolling, chestnut brown hills of the San Gabriel mountain range were in clear view, providing a postcard-perfect background.

I was ready for the show to begin. Just as Andy Warhol had prophesized, I, like everyone else, would be famous for a time. My fleeting moment in the spotlight would come just after the Unocal float rounded the corner of Orange Grove Boulevard onto Colorado Boulevard—where the television cameras were situated. I would spend those moments doing my finest simulation of the Charleston, while wearing a gold Roman helmet with a huge blue feather.

The eyes of parade lovers throughout the world—an estimated audience of 350 million—would soon be riveted on Unocal's Mardi Gras float, the day's big winner. This was the second straight year Unocal had won the Sweepstakes Trophy. We were back-to-back champions—just like the Lakers.

I glanced over my shoulder at the float for last-minute inspiration. The massive masked reveler's rosy red lips were parted, revealing a cavernous mouth and full set of ivory white teeth. He was probably laughing at me, I concluded.

Some 225 volunteers—Unocal employees, their families and friends—helped decorate the Mardi Gras float. Among those pitching in were President and Chief Executive Officer Richard J. Stegemeier and his wife Marge. Bottom left, float designer Art Aguirre (left) and another performer stroll down the parade route.



Clockwise from above: one of the 22 marching bands that performed in the parade; a view of Unocal's jester float, which accompanied the larger masked reveler; the reveler's face; Grand Marshal Shirley Temple Black and her granddaughter; two of the Unocal float's street performers.

As we made our way down Orange Grove Boulevard, the paradegoers responded with cheers. Looking into the crowd, I was struck by its diversity. Every ethnic and age group seemed to be represented, illustrating the universal attraction of a parade.

"Happy New Year!" people kept yelling. "You look great, even in your Nikes!" one woman encouraged. Many of the spectators clapped and danced along to the live jazz numbers, and some made music of their own with party noisemakers. During the band's brief respites, paradegoers often began chanting, "Play! Play!"

Everywhere I looked was a sea of humanity, and nearly everyone was smiling. People were sitting in bleachers, peering out of office windows, sitting on the tops of buses and recreational vehicles. A few even darted into the street, asking to be photographed with one of the float's performers, who readily obliged.

The parade seemed to give the streets of Pasadena a sense of community pride and unity. There was no heavy message or burning issue at the core of this coming together, just a celebration of a century-old tradition. As I marched and danced on, I tried to establish eye contact with as many children in the audience as possible. They instantly broke out in smiles.

Art Aguirre, dressed in a white ruffled shirt, red sequin suit and gold top hat, was our leader. He had designed the parade's most gorgeous float, and now was reveling in this success—in high style. He strutted jovially up the boulevard, spinning a multi-colored parasol. He wore a constant grin beneath his thick, waterfall moustache.

Filing past the television cameras hardly raised my heart rate, as it turned out. The press box was so high above the street, I couldn't see any of the faces of the television hosts. Nor were there any monitors within view to indicate what was on camera.

When a member of the crowd suddenly played the opening notes to "When the Saints Come Marching In" on a trumpet, one band member stopped dead in his tracks and looked up into the crowd. The guest musician repeated the notes. After a quick conference, the band took the cue, delivering its own rousing version of the New Orleans standard. The audience responded with a thundering ovation.

About two hours after beginning our walk, a curbside spectator held up a sign that read, "One More Block." I felt both disappointed and relieved. I welcomed the chance to rest my feet and take off my headdress after the 5.5-mile hike. On the other hand, the biggest, most elaborate block party I had ever attended was drawing to a close.

When we finally reached the end of the parade route, we plopped down on the grass-covered street divider to watch the other floats come in. When a float featuring the "three little pigs" of childhood lore completed its run, the swine trio on board collapsed in mock exhaustion.

"I'll give anyone $5 for a glass of water!" screamed one of the pigs—which were all, in reality, teenage girls.

It took two people to help each girl shed her oversized porcine disguise—one to hold the girl, and one to pull the costume off. When they finally emerged, they were dripping with perspiration.

We honored the girls' dedication and spirit with a hearty ovation. The parade's audience was right—this was a spectacle worth cheering. *C.S.*

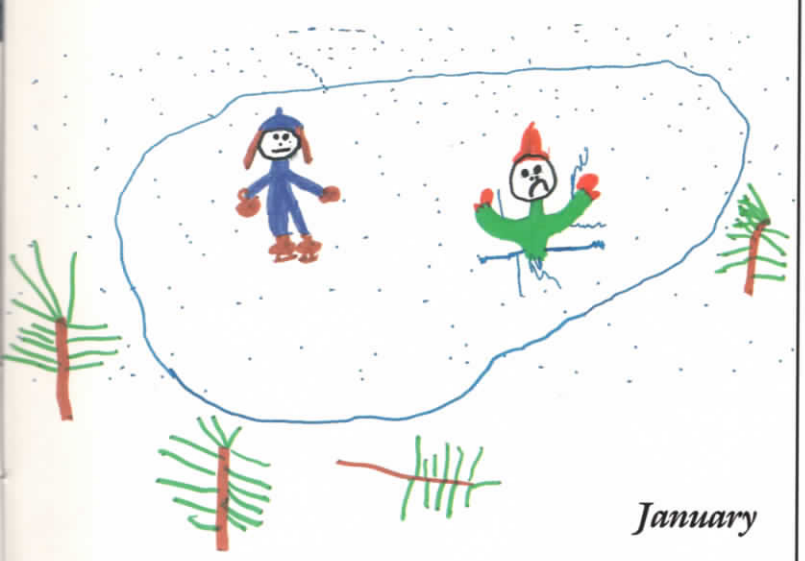
Cover

Cindy Tait, age 10
Father, Ken Tait
Purchasing Superintendent

Stressing Safety Day by Day

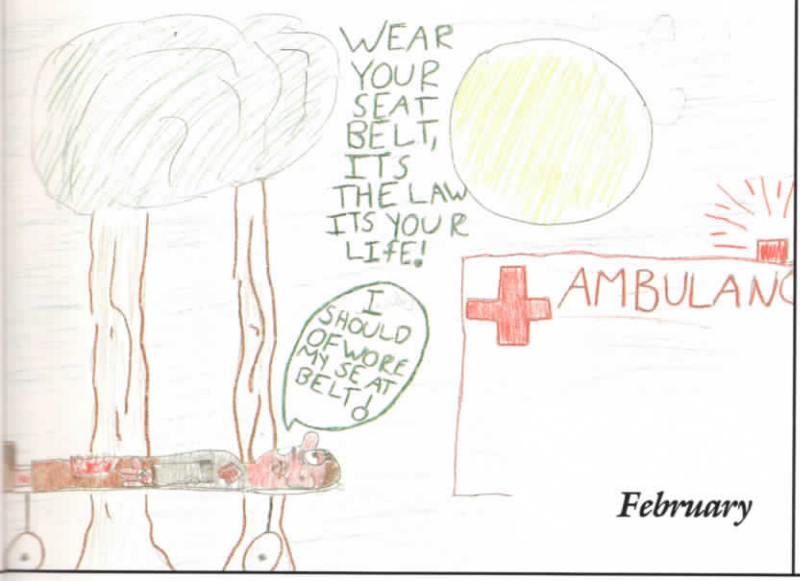
Safety has always been a top priority at Unocal Canada's Obed thermal coal mine, located in west central Alberta. Now in its fifth year of operation, the mine shipped 1.26 million tons of coal in 1988—and has sustained no lost-time accidents in the last three years.

Obed's 125 employees are well schooled in the methods and procedures of maintaining safe operations. All mine employees undergo first aid and fire-fighting training. "Our goal is to have an emergency response crew on every shift," says Paul Pflughaupt, Obed's loss prevention coordinator.



January

March



February

April

Joel Little, age 4
Father, Dave Little
Equipment Operator, Mine

Tyson Dobell, age 11
Father, Grant Dobell
Team Leader, Maintenance

Tara Nelson, age 14
Father, Keith Nelson
Heavy Duty Mechanic

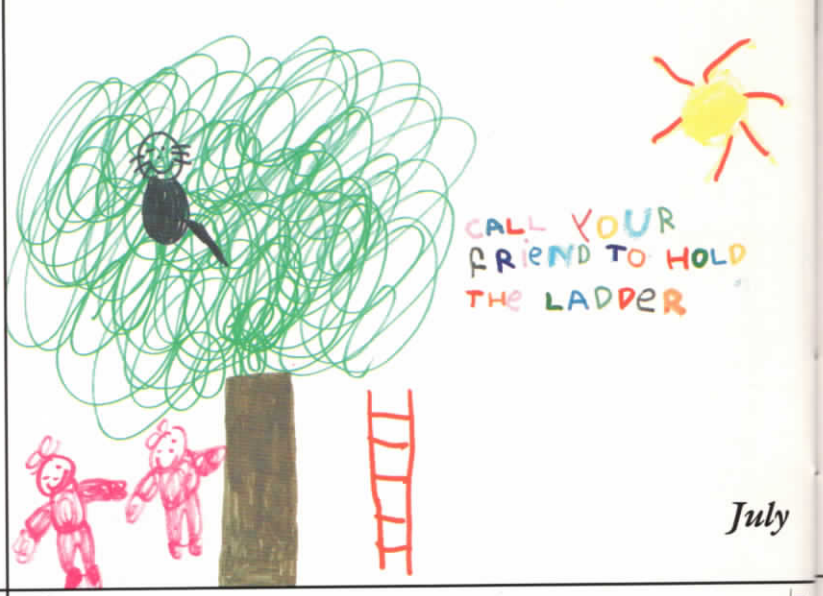
Claire McGowan, age 14
Father, Al McGowan
Maintenance Manager

The mine's safety program utilizes a team management approach, relying heavily on employee input. "Communication and teamwork are two of the best ways to maintain a focus on safety and pinpoint problem areas," Pflughaupt says. "At Obed we're about as team-oriented as you can get."

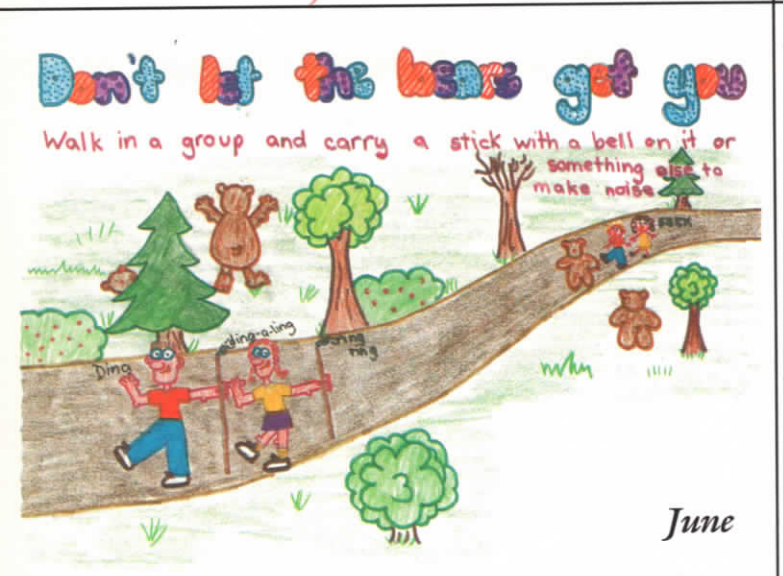
In keeping with this approach, the mine also has a special Emergency Response Team, consisting of seven employees. Team members must meet stringent qualifications for mine rescue training, and are examined and certified by the Occupational Health and Safety Branch of the Alberta provincial government.

"Emergency Response Team membership is strictly voluntary," says Pflughaupt. "It involves a lot of extra work and study on the employees' own time. They practice and drill on an ongoing basis."

May



July



June

August

Angela Lea, age 11
Father, Steve Lea
Mine Surveyor

Christina Dao, age 5
Father, Jimmy Dao
Wash Bay Attendant

Kristine Kerby, age 12
Father, Dave Kerby
Loss Control Technician

James Lea, age 8
Father, Steve Lea
Mine Surveyor

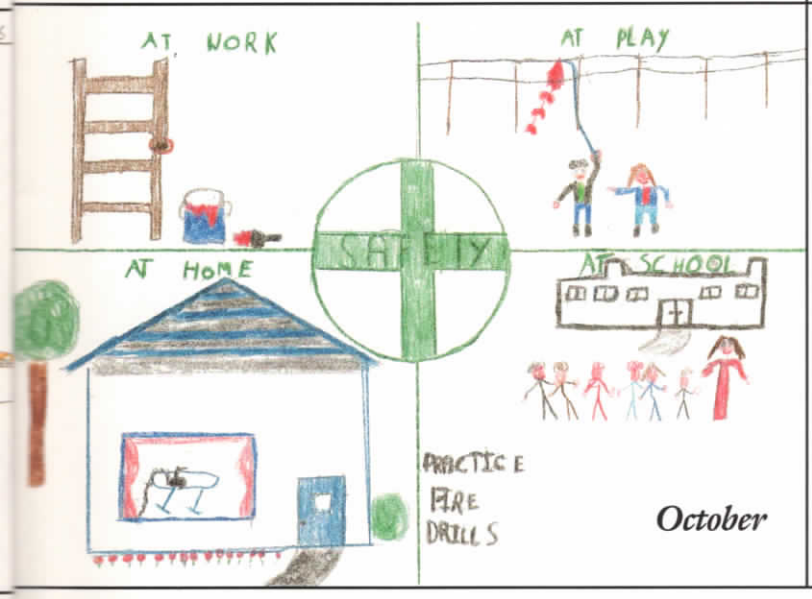
As one of its activities, the Obed team competes in the annual Alberta Surface Mine Rescue Competition, sponsored by the Alberta Mine Safety Association. At the summer events, teams representing different Alberta mining operations vie in responding to simulated emergencies. The Obed group took first place in 1987 out of 12 competing teams, and finished third in 1988.

Obed's safety effort is not limited to on-the-job concerns, however. "It's a known fact that most accidents occur away from work," says Pflughaupt. "So we emphasize safety off-the-job as well as on." Last year, Pflughaupt and his staff hit upon a novel way to do this: they organized an art contest for a safety-themed calendar.

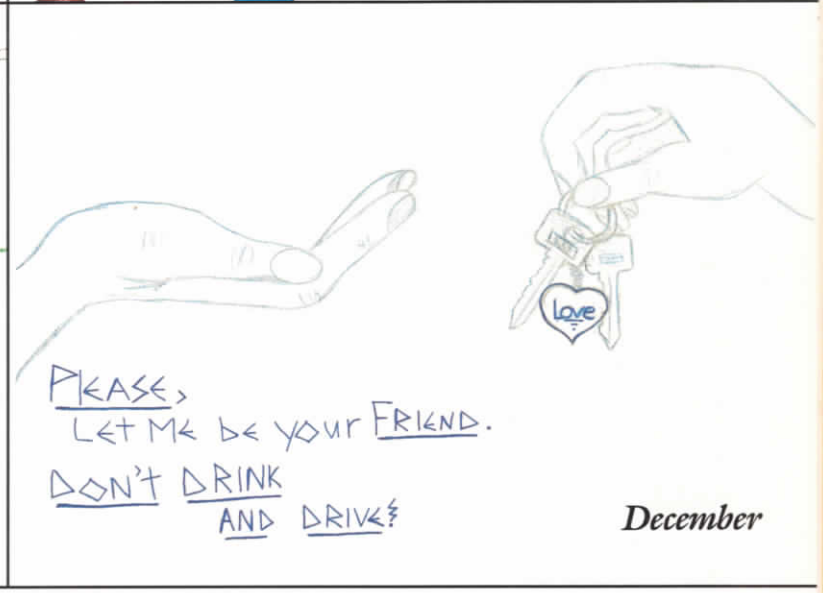
"We wanted to promote safety in a way that was meaningful, and would get our employees' families involved," he explains. "We'd kicked around the idea of printing a safety calendar, so we thought: why not let the kids provide the messages and the artwork?" Only children of Obed employees were eligible to submit drawings for the calendar. The entries could be any safety message or scene the children wanted to depict.

September

November



October



December

Bradley Strom, age 6
Father, Allan Strom
Team Leader, Maintenance

Kenny Kerby, age 8
Father, Dave Kerby
Loss Control Technician

Robin Pflughaupt, age 7
Father, Paul Pflughaupt
Loss Prevention Coordinator

Darlene Hebert, age 16
Father, Roger Hebert
Welder

The response was excellent, with 88 entries being received. A panel of judges (members of the Obed Social Club) selected 13 winning drawings, which are reprinted here. Every entry received a prize, with winners being awarded $50 and the cover selection $100. "I think the results were outstanding," Pflughaupt says. "We were all impressed by the quality of the artwork, and by the effort and thought the kids put into their entries.

The calendars were printed and distributed among mine employees and the local community of Hinton, Alberta. In addition, Unocal Canada distributed several hundred of the calendars to schools.

"The feedback we've gotten on the project has been excellent," Pflughaupt says. "We're thinking about making it an annual event." ⑯

The Obed mine has a limited number of the 1989 safety calendars on hand. Seventy Six *readers interested in obtaining one may contact Paul Pflughaupt by mail at Obed Mountain Coal Company Limited, Bag Service 7600, Hinton, Alberta, Canada T7V1V8.*

AN ANNIVERSARY TO SHOUT ABOUT

On a lovely autumn afternoon in California's San Joaquin Valley, nearly 300 Unocal employees and retirees gathered for a barbecue in a small park near the town of Coalinga. The event commemorated the 50th anniversary of the discovery of the Unocal-operated Coalinga oil field.

Covering over 3,200 acres, the honored oil field is notable for having been developed with some of the most innovative oil recovery methods in the industry. The field has produced more oil than any other Unocal-operated field in California—over 462 million barrels since the discovery well was completed on July 1, 1938. Production peaked in the late 1940s at over 50,000 barrels of oil per day and has averaged 25,000 barrels per day during the field's life span to date.

Among the celebrants was Unocal President and Chief Executive Officer Richard J. Stegemeier, who worked in Coalinga as the company's area superintendent in 1966. Many fellow employees from that period—and even earlier—made the trek back to Coalinga to attend the barbecue. Some journeyed from as far away as Georgia and Texas.

In brief remarks, Stegemeier noted that the Coalinga field has served as an excellent training ground for Unocal engineers and executives, including Harry Keegan, who recently retired as president of Unocal's Oil & Gas Division, and Francis Barker, the division's former vice president of operations. Gene Ward, president and resident manager of Unocal Indonesia, also worked in the Coalinga field, as did former Western Region Vice President Tom Stoy and current Unocal Canada President C.W. Dumett.

"The Coalinga field is an outstanding oil field," Stegemeier told the gathering. "It is one of the best engineered fields in the world."

District Production Superintendent Don Gluyas agrees. "There aren't many fields that have produced oil as efficiently as Coalinga," he says. "We've recovered more than 60 percent of the field's total oil in place. That figure is impressively high when you consider that most fields are abandoned before even 30 percent of the oil has been recovered."

The Coalinga field was able to reach this high recovery rate largely due to the early application of oil production innovations. The primary job of the unit's original engineers was to maintain reservoir pressure, says Brad Govreau, district engineer. To this end, the field's operators in the 1940s began exploring the potential of gravity drainage, the natural separation of gas from oil.

The operator, Los Nietos Company (purchased by Unocal in 1949), developed a plan to reinject the unit's produced gas to assist gravity drainage and subsequently maintain reservoir pressure. In April of 1950, after the formation of the Coalinga unit, gas reinjection commenced. By the time Unocal became operator of the field in 1951, company engineers had discovered an additional method to maximize oil recovery—limiting the natural water encroachment.

"Although other reservoirs used gravity drainage as a recovery method, Unocal made this project unique by also producing the excess water," says Mark Ivanowicz, area engineer.

The Coalinga field's northeast end is connected to an aquifer—a formation containing water. As oil and gas are produced from the field, water from the aquifer enters into the hydrocarbon-bearing zones. "This hinders the gravity drainage process, reducing the amount of recoverable oil," says Ivanowicz.

To prevent water from entering into the oil sands, Unocal initiated aquifer production early in the field's development. The company continues to withdraw about 35,000 barrels of water from the field daily.

At top, Coalinga in the 1940s. Center, some of the nearly 300 guests who attended the field's 50th anniversary celebration. Bottom center, District Operations Manager Bernie Brauer recalls the field's impressive history.


GRIGSBY'S
DRUGS


HARRIS
RANCH

"The Coalinga field is an engineering marvel," says Russell Hanscom, area production superintendent. "The oil recovery from this field is recognized as one of the industry's greatest successes."

"Those of us who worked in the field in the early days knew that we were part of something very special," says Laura Jeffrey, an engineering technician who worked for Unocal in Coalinga for 35 years before retiring in 1982. Jeffrey came to Coalinga as a young girl because her father worked for Petroleum Securities Company—the concern that drilled the Coalinga field's discovery well.

Jeffrey's father was one of many oil pioneers who came to Coalinga after oil was first discovered in the area in 1890. "I used to follow my father around on the job, and when I became old enough to work, it seemed natural that I'd go into the (oil) business," she adds.

Jeffrey has the distinction of being the first woman to work in the Coalinga field. "I liked getting dirty. I was never one to sit at home anyway," she says. "The oil business was pretty much a hands-on trade in those days, so I learned the business from the bottom up and have loved it ever since."

During these years, there was very little specialized schooling available for oil workers. Like Jeffrey, Unocal retiree Gerry Williamson was also lured to this part of the San Joaquin Valley to work in the oil business. "When I came to Coalinga in the '30s, it was basically an oil town with just a few stores here and there. Water had to be shipped in by train every day," recalls Williamson, who retired in 1967 as a compressor plant operator.

Coalinga got its name because it was one of the early railroad coaling stations—officially dubbed Coaling Station A, says Williamson. "Coalinga was pretty rough back then," he adds. "Most people lived on the outskirts of town. The guys who worked in the fields were a tough bunch.

"The one thing we all had in common, however, was the pride we took in working the Coalinga operations. To this day, those of us still around brag about the field's success."

Williamson, who attended the field's 50th anniversary celebration, enjoyed the opportunity to talk to some of the current engineers and operators. "Just because you've retired, that doesn't mean you don't have an interest in the company's operations," he says. "I enjoy keeping abreast of the field's latest developments."

As Williamson discovered, the 50-year-old field is keeping Unocal's 68 Coalinga-based employees busy. Today, there are 105 active wells in the field. The unit currently produces 3,300 barrels of oil per day, and innovative recovery methods continue to spur on production.

Last fall, Unocal drilled a horizontal well in the Coalinga field—the industry's first such well onshore in California. Horizontal drilling, a relatively new technique, was attempted at Coalinga to solve the problem of "gas coning"—a condition in which gas enters the well bore.

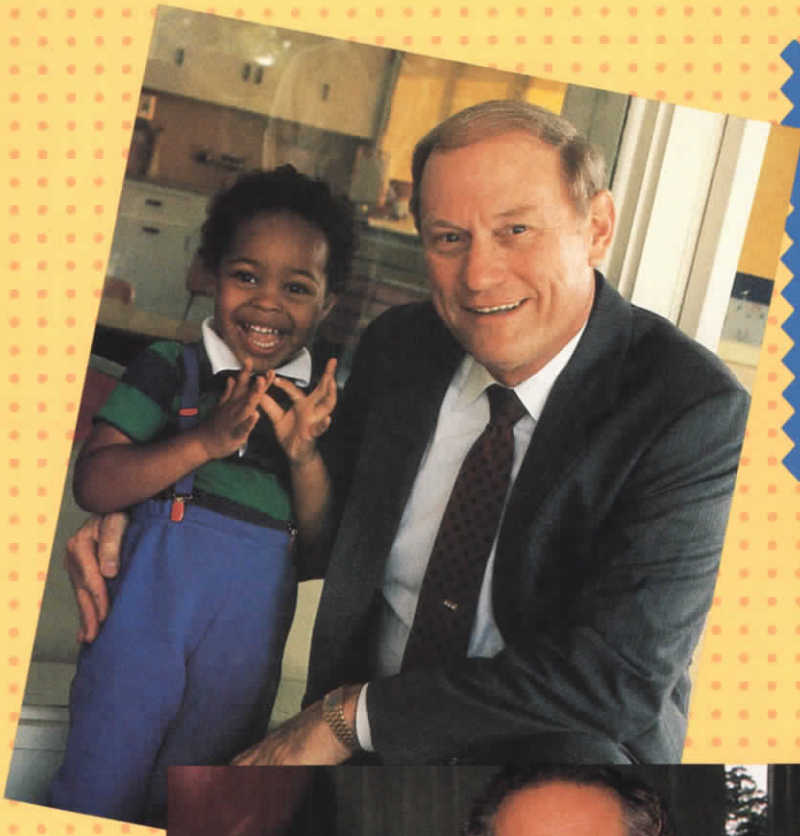
"We wanted to revive the field's oil production, so we decided to attempt this revolutionary drilling technique," says Govreau. "We recognize that we're nearing the end of oil production from this unit. But we're going to continue producing oil as long as we can do it profitably."

So far, the effort has paid off. Production from the original vertical well averaged 32 barrels of oil per day. After the horizontal recompletion, the well tested greater than 200 barrels per day. If this experimental well's success continues, Unocal plans to drill more horizontal wells in the field, says Govreau.

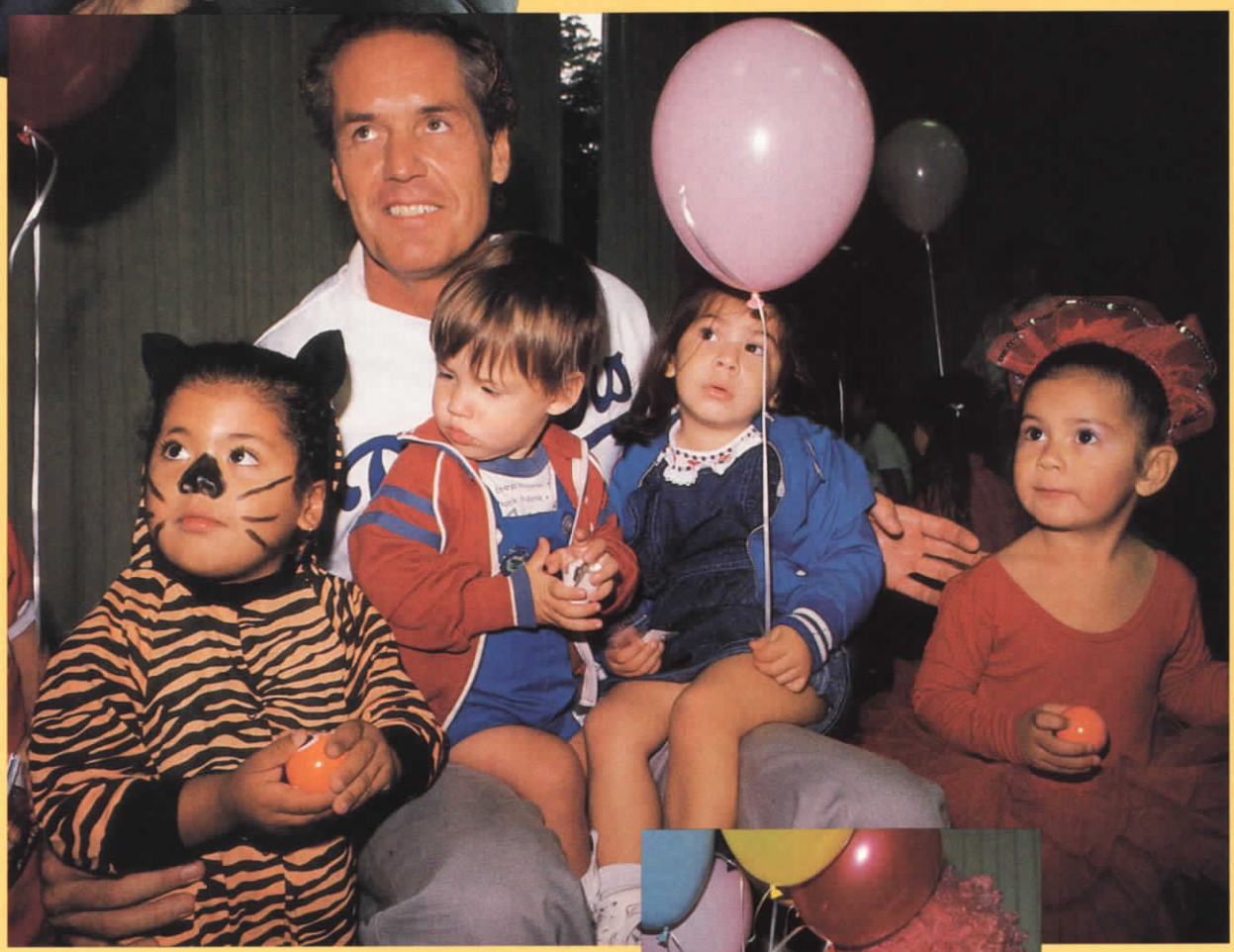
"Our goal is to produce the Coalinga field as efficiently today as we've produced it in the past," Govreau says. "After 50 years, this field is still keeping us on our toes."

"The lessons that we've learned here at Coalinga have been excellent," Stegemeier says. "And we'll be applying them to our other oil fields for years to come." *H.S.*

At top, an early photo of the historic oil field. Bottom left, District Production Superintendent Don Gluyas (center) and Bernie Brauer (left) share reminiscences with the celebrants. Center right, Unocal President and Chief Executive Officer Richard J. Stegemeier addresses the gathering.



Top, Unocal President and Chief Executive Officer Richard J. Stegemeier visits with a student during a tour of John Tracy Clinic. Below, former Dodger pitcher Joe Moeller entertains children attending the Unocal-sponsored hearing screening.



A BRIDGE TO THE HEARING WORLD

Four-year-old Lara Haddad's pink ballerina dress rustles as she turns to hand her fairy-princess wand to her mother. Jean Salisbury, who sits across from the mother and daughter, smiles approvingly. "Now I'm going to turn you into a ballerina helicopter pilot," Salisbury tells Lara, fitting a headphone set on the girl.

After some brief instructions, Lara is ready for the "listening game." Salisbury hands the girl several tiny plastic bears. Each time Lara hears a tone from the headset, she drops one of the bears into a cup. Before long, the cup is filled with the brightly colored toy animals.

"I can tell you've done this before. You're terrific!" says Salisbury, an audiologist with John Tracy Clinic, a Los Angeles-based educational center for hearing-impaired children and their parents.

Lara's test took place at a special hearing screening hosted by Unocal for the children of employees of downtown Los Angeles businesses. The free hearing tests, conducted at Unocal Center on a Saturday last fall, were given to 125 children ages three to six. Professionals from John Tracy Clinic administered all the hearing screenings.

In the weeks preceding the event, Unocal President and Chief Executive Officer Richard J. Stegemeier contacted a number of Los Angeles business leaders, urging their employees' participation. This preparation paid off with an impressive turnout for the event. A total of 15 companies participated, ranging from the Los Angeles Times to the Bank of America.

Stegemeier also toured John Tracy Clinic, witnessing first-hand the staff's dedication to bringing the gift of spoken language to hearing-impaired children. The visit proved to be very inspiring. Soon afterwards, the CEO accepted an invitation to serve on the organization's board of directors.

"Community spirit in downtown Los Angeles seems to be expanding as the city grows," Stegemeier says. "Unocal is happy to lend our efforts to increasing that spirit, and we're especially eager to help when children are involved."

This thriving community spirit was clearly evident on the day of the Unocal-sponsored hearing screening. The atmosphere at Unocal Center was festive, helping to put the children at ease. A clown greeted each child with a helium-filled balloon, and cartoons were screened on video monitors. Former Los Angeles Dodgers pitcher Joe Moeller was also on hand, signing autographs and handing out Dodger pins.

The children themselves provided some of the entertainment. Since the event fell right before Halloween, organizers encouraged parents to dress their children in costumes. The children overwhelmingly obliged. Among those undergoing hearing tests were Minnie Mouse, a fanged devil, a tiger, a jack-o-lantern and, of course, a ballerina.

Of the 125 children tested, 15 showed a hearing deficit. These children were given another test to determine the nature of the hearing loss. Using a tympanometer—an instrument that measures ear drum movement—audiologists determined whether the deficit was permanent or temporary.

The absence of ear drum movement suggests that blockage behind the ear drum is responsible for the hearing loss—a condition that is generally temporary if treated medically. A hearing loss arising from damage to nerve endings in the inner ear, on the other hand, can be permanent.

Tympanometer test results indicated that all 15 children were experiencing a correctable hearing loss brought on by blockage in the Eustachian tube, which connects the middle ear to the throat. Allergies, head colds and other respiratory disorders—common in small children—can trigger such blockage.

"Typically, about 10 percent of the kids tested in a screening will have a problem with the Eustachian tube," Salisbury explains. "Common congestion can block the tube, which can lead to a fluid buildup behind the ear drum. This causes a hearing loss that, with medical attention, is only temporary."

Parents of children failing the screening were advised to have them examined by a pediatrician or an ear specialist. It's crucial to treat even a temporary hearing problem in a preschool child at once, Salisbury says, because the deficiency can hinder the child's ability to learn. And left untreated, ailments in the Eustachian tube can sometimes lead to a permanent hearing loss.

Although the tests used at the Unocal Center screenings were designed for children at least two-and-one-half years old, this doesn't mean that younger children can't be tested for hearing disorders. In fact, according to Salisbury, a child is never too young to take a hearing test.

"We can even test newborns," she says. "There are certain reflexive responses that even very premature babies will show to sound." As young as six months old, children can be tested based on their conscious responses to sound. At John Tracy Clinic headquarters in Los Angeles, audiologists routinely test children by training them to associate sound with a toy.

In the testing room, a sound is introduced through a stereo speaker. When the child turns in response to the sound, the audiologist activates a toy near the speaker—a drum-playing pink elephant. Soon the child learns that turning around after hearing a sound is worth the effort because the pink elephant is about to perform.

"We can get virtually an adult-quality hearing test using this method," Salisbury says. "At six months of age, this pink elephant is just the greatest thing going. And the kids continue to respond, allowing us to test for a variety of tones."

John Tracy Clinic offers support and education to the parents of preschool children diagnosed as having a permanent hearing loss. Immediately following the diagnosis, the clinic focuses its efforts on helping the parents come to grips with their child's disability.

"Parents need to have an arena in which they can learn and grow in light of their loss—the loss of the expectation that their baby is normal in every respect," says James Garrity, the clinic's director.

John Tracy Clinic was founded in 1942 by Louise Tracy, the wife of movie actor Spencer Tracy. A nonprofit organization, the clinic is based on the premise that parents are the primary teachers in a child's life. Consequently, a parent of a deaf child needs to learn how to help the child develop language skills.

Top, audiologist Jean Salisbury conducts a hearing test at Unocal Center. Bottom, a boy undergoes a tympanometer test, which measures ear drum movement.

Louise Tracy, whose son John was profoundly deaf, grew to view her son's hearing loss as a challenge, Garrity says. Rather than entrust him solely to the care of medical specialists, she chose to become a participant in John's learning experience.

Making the most of the child's residual hearing is a first step in helping a deaf child develop spoken language skills. Through testing, audiologists can customize a hearing aid that brings out the child's full hearing potential, sometimes even compensating for weaknesses in detecting specific tones.

"Amplification has made substantial strides in the past several decades," Garrity says. "We have very powerful behind-the-ear hearing aids now. And even in profoundly deaf children, there almost always is residual hearing that can be used to acquire language skills."

Naturally, gaining a grasp of language and speech is a slow and arduous process for children with hearing disabilities. But a hearing-impaired child can learn language essentially the same way a hearing child does. A hearing child learns speech by associating a particular sound with an object, action or idea over a long period of time.

Similarly, a hearing-impaired child learns to lip-read by associating lip movements—along with sounds amplified by a hearing aid—with an object, action or idea. To cultivate an understanding of language, parents must constantly expose a deaf child to speech.

At the clinic, several rooms are decorated to resemble rooms in a home. In these "demonstration homes," parents, with assistance from a staff member, practice how to seize learning opportunities that can be applied at home. Demonstration homes outside the clinic's headquarters are also maintained in Los Angeles and the neighboring cities of Long Beach and Costa Mesa. In addition, the clinic includes a nursery school program for children ages two to five years. Parents of these children spend one day a week at the school.

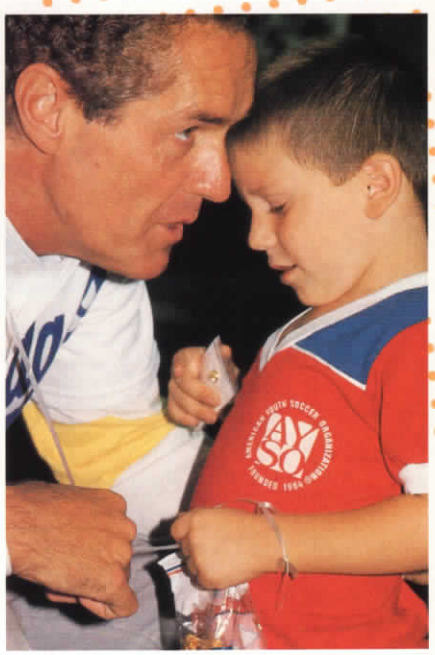
The clinic's educational services aren't restricted to Southern California, however. A clinic-sponsored correspondence course is currently serving about 3,500 families throughout the world, says Sandra Meyer, the facility's director of correspondence education. Some of these family members attend the clinic's intensive, three-week summer sessions as well.

In spite of the number of programs John Tracy Clinic sponsors, the educational center doesn't rely on government assistance. The organization continues to operate on private donations and corporate sponsorships. Unocal supports the clinic through designated donations to United Way.

When asked whether the clinic will ever charge for its services, Garrity responds with an emphatic no. "It was Mrs. Tracy's desire that nothing stand in the way of a family asking for help. Fortunately, Southern California has been very generous to us."

With the continuing help of its network of corporate supporters, John Tracy Clinic is making progress in the early detection of deafness in Los Angeles area children. Hearing screening events, such as the one Unocal sponsored, are being scheduled throughout Southern California.

"Early detection is vital to our mission," says Susan Rasich, the organization's community development specialist. "Once a hearing loss is identified, we can provide a running start to young hearing-impaired children who would otherwise be shut out of what most of us take for granted—a hearing world." *C.S.*



Joe Moeller gives a few pitching tips to a young fan waiting for a hearing test.

SERVICE AWARDS

UNOCAL 76

CORPORATE

35 YEARS **John H. Augustine,** Unocal Center
Claude S. Brinegar, Unocal Center
Frank X. Solis, Unocal Center

30 YEARS **May Tsang,** Unocal Center

25 YEARS **David E. Carpenter,** Schaumburg, Il.
Lloyd E. Erickson, Unocal Center
Frederick J. McCally, Schaumburg, Il.
Jesse E. Murph, Unocal Center
Ronald J. Schnell, Unocal Center

20 YEARS **Clyde W. Hines,** Unocal Center
Sally A. King, Unocal Center
John T. Rountree, Unocal Center
Alfonso Tejada, Unocal Center
Olivia Wong, Unocal Center

15 YEARS **Rainer Beck,** Unocal Center
Arthur J. Fitzgerald, Unocal Center
Nora Lira, Unocal Center
William E. Loper, Unocal Center

10 YEARS **Walter C. Aldrich,** Unocal Center
Linda J. Bell, Unocal Center
Dolores V. Brill, Unocal Center
Reginald A. Cyrus, Unocal Center
Ellen B. Morton, Unocal Center
Lupe R. Paniagua, Unocal Center
Londa S. Parks, Unocal Center
William T. Rush, Unocal Center

REAL ESTATE

10 YEARS **Mona D. Hebert,** Unocal Center
Aurora N. Legaspi, Unocal Center

ENERGY MINING

20 YEARS **Toru Arisawa,** Parachute, Co.

10 YEARS **Billie Sue Koch,** Parachute, Co.
Samuel J. Rucker, Parachute, Co.
Dave A. Snapp, Parachute, Co.
Wesley N. Spurlock, Jr., Parachute, Co.

SCIENCE & TECHNOLOGY

25 YEARS **Beverly J. Reinke,** Brea, Ca.
John W. Ward, Brea, Ca.

20 YEARS **Michael J. Block,** Brea, Ca.
Rodolfo T. Deocampo, Brea, Ca.
Leonard F. Lucas, Brea, Ca.

15 YEARS **David Butt,** Brea, Ca.
Robert C. Eads, Brea, Ca.
Barbara A. Ehrick, Brea, Ca.
Dean L. Johnson, Brea, Ca.
Gregory P. Ouellette, Brea, Ca.
Jose F. Padilla, Brea, Ca.
Jack P. Witte, Brea, Ca.

10 YEARS **Barry R. Bowman,** Brea, Ca.
Lorraine H. Carey, Brea, Ca.
Karen K. Keating, Brea, Ca.
Ronald D. Ohls, Brea, Ca.
Mark S. Schilling, Brea, Ca.
William H. Schlegel, Brea, Ca.
Allan G. Snyder, Brea, Ca.
Anthony T. Tran, Brea, Ca.
Gale S. Whitnell, Brea, Ca.

ENERGY RESOURCES

OIL & GAS

35 YEARS **Grace R. Oakley,** Unocal Center

30 YEARS **Emile J. Aucoin,** Houma, La.
Charles M. Cook, Houma, La.
Bobby J. Ragland, Lovington, N.M.
Inez D. Turner, Unocal Center

25 YEARS **Jay L. Axtell,** Moab, Ut.
Walter L. Barrett, Cisne, Il
Paul R. Boroff, Jr., Taft, Ca.
Stephen Broussard, Mobile, Al.
Timothy M. Creswell, Lafayette, La.
Samuel J. Cullen, Orcutt, Ca.
Daniel Ferguson, Orcutt, Ca.
Janice M. Locke, Pasadena, Ca.
Frank D. Malloch, Placentia, Ca.
Ann Mathis, Houston, Tx.
Jimmie D. Patterson, W. Liberty, Il.
Bernard G. Pottorff, Grayling, Mi.
Anthony J. Testa, Compton, Ca.
William E. Weiler, Cisne, Il.
Cleve W. Werner, Coalinga, Ca.

20 YEARS **Carleton S. Babb,** Casper, Wy.
Raymond L. Clark, Lafayette, La.
John M. Crawford, Hominy, Ok.
John O. Edwards, Houston, Tx.
Danny A. Hairston, Taft, Ca.
Mary L. McKew Harrison, Houston, Tx.
Jimmie L. Rose, Midland, Tx.
James M. Tabet, Bloomfield, N.M.
Donna S. Treadway, Houma, La.
Larry G. Vavra, Bakersfield, Ca.
Paul T. West, Midland, Tx.
John E. Wickham, Unocal Center
Sammy D. Williams, Pauls Valley, Ok.

15 YEARS **Joseph D. Badon,** Lafayette, La.
Francis D. Faulk, Lafayette, La.
Daniel R. Frederick, Lafayette, La.
David D. Goodrich, Beckenridge, Mi.
Delbert L. Hankins, Anchorage, Ak.
Steven M. Harman, Santa Fe Springs, Ca.
Larry D. Harper, Andrews, Tx.
Edward H. Harris, Ventura, Ca.
Jose S. Hernandez, Placentia, Ca.
Terrance L. Hildebrand, W. Liberty, Il.
Norris L. Laird, Clay City, Ok.
Michael T. Reblin, Midland, Tx.
Steven M. Smith, Lafayette, La.
Theophilus H. Thomas, III, Houma, La.
Ralph E. Yates, Cisne, Il.

10 YEARS **Joseph P. Aguilar,** Placentia, Ca.
Thomas M. Boepple, Jr., Houston, Tx.
Aubin P. Buquet, Lafayette, La.
Denese G. Burton, Casper, Wy.
Brian P. Choate, Lafayette, La.
John D. Collins, Houma, La.
Patrick F. Correll, W. Liberty, Il.
Charles D. Cox, Oklahoma City, Ok.
Michael J. K. Craig, Ventura, Ca.
Thomas W. Daniel, Jr., Jackson, Ms.
Robert L. Ellis, Orcutt, Ca.
Juan F. Gutierrez, Jr., Santa Fe Springs, Ca.
Bernard T. Landeis, Kenai, Ak.
John W. Larson, Anchorage, Ak.
Frank H. Lung, Unocal Center
Lloyd A. Morgan, Houma, La.
Steven D. Mitchel, Pasadena, Ca.
Richard K. Purcell, W. Liberty, Il.
Richard R. Rea, Lafayette, La.
Donna J. Schramm, Lafayette, La.
William A. Simas, Orcutt, Ca.
Daniel Simmons, Jr., Houma, La.
David A. Stangor, Bakersfield, Ca.
Robert H. Strong, W. Liberty, Il.
W. Vance Thompson, Los Angeles, Ca.
Dan R. Tucker, Orcutt, Ca.
Oscar Walker, Abbeville, La.

INTERNATIONAL OIL & GAS

35 YEARS **W. C. Barton, Jr.,** Unocal Center

30 YEARS **William B. Flint, Jr.,** Balikpapan, Indonesia

15 YEARS **Bernard W. Pace,** Sunbury, England
Daniel T. Tutak, Sunbury, England

10 YEARS **John T. Coleman,** Balikpapan, Indonesia
Rosemary Espinosa, Unocal Center
Jan M. Grzywacz, Netherlands

Unocal Thailand, Ltd.

25 YEARS **Somjitr Munkong**

Unocal Indonesia, Ltd.

15 YEARS **Darmansjah**
Soemarsono
Sunardjo
Sutrisno
Tarik
Win Azwir
Mochamad Bach
Hindartono Darsan Iroe
Yahaman Sinaga
Susanto Soepirman
Kakar Suratman

10 YEARS **Djamhari**
Rusmadi
Sudirman
Syamsudin
Anwar Ardi
Jabonggas Aritonang
Rusdi Barthelemy
Hendry Julius Dengah
Ansjah H. Durasid
Widyawan S. H.
Ilyas Harun
Asnam Ibrahim
Jetro Thamrin Munthe
Slamet Riyadi
Wayan Senang
Marodjahan Silalahi
Ferry Binzar Sinaga
Muchtar Sinambela
Abdul Hamid Syarifuddin
Thomas Tarigan

Unocal Netherlands, B.V.

10 YEARS **Ian Carmichael**

Unocal U.K., Ltd.

10 YEARS **Leonard Adamiak**
James Aikman
Stuart Alder
Robert Banks
Gordon Blair
Patrick Buckman
John Clark
Philip Coutts
Daniel Cowie
Ian Denst
Derrick Dimbleby
Martin England
James Ewing
Thomas Finnerty
James Gall
Robert Gillespie
Blair Heatley
Christopher Hewson-Smith
Alexander Junnier
Robert Kirkcaldy
Ronald Kydd
William McCrory
Kenneth McIver
Bruce McKenzie
Stirling McLagan
James McLaren
Allan Mitchell
David Moore
John Munro
Malcolm Nicoll
William Paisley
David Raitt
Stephen Robinson
Brian Smith
Raymond Taviner
Robert Walsh
David Watson
Peter Watts
Alistair Weir

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15 YEARS **John de Kuyper,** Calgary, Alberta
James F. Dunn, Calgary, Alberta

10 YEARS **Alison J. Barton,** Calgary, Alberta
Wendy L. Findlay, Calgary, Alberta
William T. Frew, Calgary, Alberta
Norman E. Seatter, Slave Lake, Alberta
Albert J. St. Martin, Slave Lake, Alberta
Brian J. Zacher, Calgary, Alberta

GEOTHERMAL

25 YEARS **Richard O. Engebretsen,** Philippines

15 YEARS **Larry D. Clark,** Santa Rosa, Ca.
Gregory A. Griffey, Unocal Center
Ronald W. McMahan, Santa Rosa, Ca.
Beth E. Shelton, Santa Rosa, Ca.
Dale L. Spelbring, Santa Rosa, Ca.

10 YEARS **Norman L. Johnson,** Santa Rosa, Ca.
Michael S. Martinez, Santa Rosa, Ca.
Perry P. Stroud, Santa Rosa, Ca.
Nickolas E. Voegtly, Santa Rosa, Ca.
John C. Ward, Santa Rosa, Ca.

Philippine Geothermal, Inc.

10 YEARS **Reynaldo T. Anoos,** Makati
Lovinio T. Caancan, Bulalo
Doroteo C. Climacosa, Tiwi
Salvador C. Combo, Tiwi
Danilo C. Conde, Tiwi
Oscar A. Custodio, Tiwi
Ma. Cecilia A. Limson, Makati

REFINING & MARKETING

40 YEARS **Stanley A. Arnold,** Schaumburg, Il.
Robert L. Carlson, Chicago Refinery
Harry C. Engelhardt, Los Angeles Refinery
Joseph Gombosi, Chicago Refinery
Raymond R. Woods, Chicago Refinery

35 YEARS **David L. Breitsprecher,** Schaumburg, Il.
Richard R. Catron, Brush, Co.
R. E. Colclasure, Los Angeles Refinery
Braine T. Grisco, Los Angeles, Ca.
Corine B. Jaudon, Savannah, Ga.
Raymond J. Jirsa, Chicago Refinery
Lionel J. Leclaire, Schaumburg, Il.
Frances M. McKee, Atlanta, Ga.

30 YEARS **Jean H. Chung,** Los Angeles, Ca.
Donald E. Dzurilla, Los Angeles, Ca.
Robert C. Jones, Charlotte, N.C.
William J. Kirby, San Diego, Ca.
Anna A. Shishido, Los Angeles, Ca.

25 YEARS **Willis Baine,** North Hollywood, Ca.
Homer L. Ballard, Beaumont Refinery
William D. Carkhuff, Chicago Refinery
Portia M. Drawz, Schaumburg, Il.
David O. Gallop, Los Angeles, Ca.
Dennis W. Lamb, Los Angeles, Ca.
Kenneth R. Morgan, Beaumont Refinery
Frank J. Slivinski, Chicago Refinery
J. M. Sobolewski, Portland, Or.
James R. Truett, Birmingham, Al.
Donald H. Wall, Chicago Refinery

20 YEARS **William J. Brodrick,** Schaumburg, Il.
Earl W. Cagle, Bakersfield, Ca.
Charles E. Carey, San Francisco, Ca.
Catalina R. Cargado, San Francisco, Ca.
Patrick J. Cleary, Jr., Schaumburg, Il.
Jonathan Cole, Bloomington, Ca.
Joseph Digiovanni, San Francisco Refinery
Kenneth E. Donner, Schaumburg, Il.
John M. Hunter, Los Angeles, Ca.
Richard H. Jefferson, Schaumburg, Il.
Hearl S. Johnson, Los Angeles Refinery
Peter A. Kohler, Santa Fe Springs, Ca.
Edilberto P. Mandani, San Francisco, Ca.
Charles A. Mathis, Jr., Jacksonville, Fl.
Harrison E. McNally, Tampa, Fl.
Mae Bell Moss, Los Angeles, Ca.
Rufus C. Nelson, Los Angeles Refinery
Ralph M. Parker, Orlando, Fl.
Thomas J. Penners, St. Paul, Mn.
Kathleen S. Post, Los Angeles, Ca.
George R. Quam, Bay City, Mi.
Frank R. Regeski, Schaumburg, Il.
Lucinda A. Rooney, Louisville, Ky.
Jimmy Y. Sabino, Los Angeles, Ca.
Harry T. Thorn, Houston, Tx.
Rodolfo P. Tidalgo, Los Angeles, Ca.
Dennis T. Sasaki, Los Angeles, Ca.
Gilbert P. Walsh, Jr., Schaumburg, Il.

15 YEARS **Marilyn K. Abbink,** Schaumburg, Il.
James Baldonado, Los Angeles Refinery
Virginia L. Cannes, Schaumburg, Il.
Charles E. Clerkley, San Francisco, Ca.
Michael G. Colberg, Los Angeles Refinery
Ralph G. Covington, Portland, Or.
Emilio L. Diaz, Brea, Ca.
Carolyn A. Dushkin, San Francisco, Ca.
Michael A. Foust, San Francisco Refinery
Norma R. Frank, Schaumburg, Il.
Larry K. Friesen, San Francisco Refinery
Valdis V. Griswold, San Francisco, Ca.
Chester A. Gustafson, Los Angeles, Ca.
Nancy H. Heffernan, Schaumburg, Il.
Barbara G. Heppner, Schaumburg, Il.
Melvyn M. Hill, San Diego, Ca.
Jack J. Kenoyer, San Francisco Refinery
James A. Lamb, Los Angeles, Ca.
Iris L. Laudig, Walnut Creek, Ca.
Patricia Mack, Schaumburg, Il.
Virgil R. Magday, Los Angeles Refinery
William J. Martinez, Los Angeles Refinery
Erminio M. Orona, Los Angeles Refinery
Charlene J. Prentice, Schaumburg, Il.
Charlotte D. Rhodes, Schaumburg, Il.
John F. Ritter, Cincinnati, Oh.
Charles A. Salas, San Francisco Refinery
Lawrence J. Savaglio, Los Angeles, Ca.
Michael L. Schroeder, Schaumburg, Il.
Grace D. Smolen, Schaumburg, Il.
Nicholas M. Trotta, Cincinnati, Oh.
David JKL Young, Honolulu, Hi.

10 YEARS **Beverly Barker,** Schaumburg, Il.
Laurence D. Basler, Oregon, Oh.
Willis J. Body, Los Angeles Refinery
Ahmend D. Brooks, Portland, Or.
Christene Brown, San Francisco, Ca.
Chester W. Cepress, Los Angeles Refinery
Casey A. Conway, Los Angeles, Ca.
Eduardo de la Ossa, Los Angeles Refinery
Kerry J. Dougan, Chicago Refinery
Robert O. Duncan, Bloomington, Ca.
Dennis T. Durbin, Cincinnati, Oh.
Leo E. Escovedo, San Pedro, Ca.
Janet E. Farmer, Schaumburg, Il.
Kenneth R. Fuller, Santa Paula, Ca.
Arturo Guzman, Los Angeles Refinery
Donna J. Hall, Lemont, Il.
Becky E. Higgins, Schaumburg, Il.
Michael A. Jones, Los Angeles Refinery
Darlene A. Juda, Schaumburg, Il.
Thomas E. Larocque, Los Angeles, Ca.
Sandra L. Lemke, Schaumburg, Il.
Lloyd K. Matsumoto, Los Angeles Refinery
Rickey L. Maxey, Olney, Il.
Roger W. McGowne, Coos Bay, Or.
Carol A. Metroka, Tampa, Fl.
Joe F. Oliver, Santa Paula, Ca.
Carol H. Paterson, Walnut Creek, Ca.
Lillian F. Petersen, Schaumburg, Il.
David N. Price, Los Angeles Refinery
Lilia S. Reyes, Richmond, Ca.
Graydon B. Roberts, Los Angeles, Ca.
Thomas G. Rogerson, Edmonds, Wa.
Mark J. Shibe, Schaumburg, Il.
Thomas M. Sisk, San Diego, Ca.
Roberta H. Treviranus, Los Angeles, Ca.
Kenneth B. Walton, Chattanooga, Tn.
Stephen P. Whelan, Bloomington, Ca.
Francisco J. Ybarra, Los Angeles Refinery
Scott A. Yost, Honolulu, Hi.

MARKETERS & DISTRIBUTORS

40 YEARS **Hance Oil Co.,** West Stayton, Or.
Lawley Oil Co., Goodwater, Al.

35 YEARS **Mt. Hood Oil Co.,** Gresham, Or.
Taku Oil Sales, Inc., Juneau, Ak.

30 YEARS **Lincoln Petroleum Co., Inc.,** Chicago, Il.
Morson-Sterling Co., Leland, Ms.
Shankle Oil Co., Athens, Tn.

25 YEARS **Goco, Inc.,** Charlottesville, Va.
Haugabook Oil Co., Montezuma, Ga.
Kodiak Oil Sales, Inc., Kodiak, Ak.
Webbs Oil Corp., Roanoke, Va.

20 YEARS **J. Fred Schmelzla,** Willcox, Ar.
Suffolk Oil Co., Inc., Suffolk, Va.

15 YEARS **Campbell Oil Co.,** Massillon, Oh.
Cooper Oil, Inc., Woodland, Wa.

10 YEARS **Crenshaw Oil Co., Inc.,** Lancaster, S.C.

CHEMICALS

35 YEARS **Dave Tyler,** Bridgeview, Il.

30 YEARS **Ronald S. Krupa,** Carteret, N.J.
Philip J. Martinez, Arroyo Grande, Ca.
Jack D. Swanburg, Brea, Ca.
Joe M. Woolbright, Unocal Center

25 YEARS **Leandro N. Lewis,** Kenai, Ak.
Wilfred C. Mitchell, East Providence, R.I.

20 YEARS **David W. Allred,** Kenai, Ak.
Jane B. Armstrong, Charlotte, N.C.
Charles J. Barnes, Tucker, Ga.
William T. Dwyer, Atlanta, Ga.
Margaret T. Haggard, Charlotte, N.C.
Donald W. Hilliard, Baltimore, Md.
Frank J. Kelemen, Carteret, N.J.
Ralph Key, Newark, Ca.
Robert A. Marino, Carteret, N.J.
Lewis E. Patton, Charlotte, N.C.
Charles F. Ross, Kenai, Ak.
Roger G. Stanek, St. Clair Shores, Mi.

15 YEARS **Ernestine W. Allen,** Kansas City, Mo.
Ronald R. Brown, Charlotte, N.C.
Robert T. Burkes, Brea, Ca.
Tommy H. Burleyson, Charlotte, N.C.
Carl M. Davis, Charlotte, N.C.
Gregory A. Ehlinger, La Mirada, Ca.
Sally J. Hartnett, Clark, N.J.
Patricia A. Jervis, Clark, N.J.
Ronald J. Johnson, Tampa, Fl.
Ted J. Nyman, La Mirada, Ca.
James V. Rodriguez, Arroyo Grande, Ca.
David R. Sloan, Charlotte, N.C.
Stanley J. Yost, Unocal Center

10 YEARS **William E. Bunch,** Kenai, Ak.
Kenneth J. Cissell, Kenai, Ak.
James B. Crosby, Charlotte, N.C.
Duane C. Ellis, Fresno, Ca.
Richard M. Gredler, Houston, Tx.
Diana Heckethorn, Unocal Center
Howard R. Jackson, Kenai, Ak.
Robert K. Jackson, Arroyo Grande, Ca.
Gere L. Loudon, Atlanta, Ga.
Earl J. McConnell, Charlotte, N.C.
Leonard A. Mortimer, Brea, Ca.
Glen R. Moses, Charlotte, N.C.
Kenneth M. Newton, Kennewick, Wa.
Patricia J. Rankin, Schaumburg, Il.
Bruce L. Schenk, Brea, Ca.
Mary J. Sedlak, Bridgeview, Il.

MOLYCORP, INC.

20 YEARS **Fernando E. Martinez,** Questa, N.M.
Patricio A. Mondragon, Questa, N.M.
Delbert D. Westfall, Louviers, Co.

15 YEARS **Roland Herrera,** Mountain Pass, Ca.
Joseph P. Zapolski, Mountain Pass, Ca.

10 YEARS **Donald F. Dunmire,** Mountain Pass, Ca.
Phil A. Howard, Mountain Pass, Ca.
Robert Mankowski, Mountain Pass, Ca.

POCO GRAPHITE, INC.

15 YEARS **Louis J. Bible,** Decatur, Tx.
Ted L. Bradshaw, Decatur, Tx.

10 YEARS **Bobby D. Ward,** Decatur, Tx.

RETIREMENTS

Energy Resources

Ray A. Burke, February 7, 1951

Oil & Gas

Fernando F. Garcia, May 15, 1957
Phil Hyatt, July 18, 1956
Robert F. Kast, March 9, 1983
Harry E. Keegan, September 21, 1948
Dale F. Stoddard, February 19, 1952
William C. Thayer, February 13, 1951

Science & Technology

Lorraine A. Bell, September 2, 1980
Ruth H. Bernatzke, September 25, 1978

Refining & Marketing

Frank B. Board, March 27, 1946
Edward C. Brasher, November 27, 1967
Kenneth E. Burns, July 23, 1956
Robert L. Carlson, January 18, 1949
Quentin F. Cron, August 11, 1947
Ramon F. Dechant, April 11, 1966
Joseph Gombosi, January 20, 1949
Richard A. Hall, August 22, 1948
Jerry L. Harris, March 10, 1969
Wilson N. Hatton, May 24, 1954
Carlos M. Hopper, July 14, 1948
LeRoy K. Kalash, October 1, 1961
Ellanore Lettich, December 20, 1967
Harrison E. McNally, December 16, 1948
June M. McNett, September 16, 1963
Clarence R. Mostyn, Jr., October 1, 1948
Robert Osornio, September 18, 1978
Stanley J. Pinta, March 31, 1948
Martin J. Sheil, September 8, 1953

Chemicals

Thomas J. Houston, May 26, 1953

IN MEMORIAM

EMPLOYEES

Corporate

Charmaine L. Croy, October 5, 1988

Chemicals

Mickey M. Pappas, September 15, 1988

Refining & Marketing

John W. Mullen, December 16, 1988

RETIREES

Corporate

Charlie S. Perkins, September 16, 1988
Cleo Bean, December 17, 1988
Thomas R. Jones, Jr., November 19, 1988

Refining & Marketing

Jesse O. Adkins, November 16, 1988
Gourlay B. Anderson, September 25, 1988
Sidney Andrews, August 23, 1988
James H. Barclay, August 24, 1988
Branson B. Barron, September 16, 1988
Charlie E. Baysinger, October 18, 1988
Fred M. Braun, October 16, 1988
Audrey Steel Box, December 9, 1988
Chandie R. Breedlove, October 9, 1988
Clarence E. Caldwell, September 19, 1988
Raymond Camper, September 9, 1988
John R. Carr, August 30, 1988
Walter E. Clark, September 26, 1988
Harris T. Clabaugh, December 1, 1988
Robert L. Cooper, September 19, 1988
Chester B. Cormier, November 5, 1988
Ermine J. Cullen, September 27, 1988
Arden L. Cunningham, August 26, 1988
Aaron E. Dube, October 4, 1988
John S. Dugan, October 18, 1988
Harvey P. Eye, November 25, 1988
William H. Galentine, September 23, 1988
Frank L. Gerry, November 14, 1988
Cecil R. Groff, October 21, 1988
Lanthus O. Hayes, August 20, 1988
Patrick F. Hennebry, October 9, 1988
Robert J. Hester, October 30, 1988
John E. Hnetkovsky, August 22, 1988
Margaret H. Holben, May 31, 1988
Alvin B. Irwin, Jr., August 28, 1988
William F. Isabell, October 30, 1988
Alexander Kaminski, August 27, 1988
Charles E. Keeler, September 17, 1988
Edward Keightley, September 6, 1988
Edward L. Kleinwaechter, November 29, 1988
Peter J. Krol, October 7, 1988
Jessie B. Lindsay, September 12, 1988
Luther W. Marbury, November 6, 1988
Arthur G. Marshall, October 24, 1988
Joseph D. McCall, September 13, 1988
Eugene G. McLaughlin, November 6, 1988
Nicholas McMullen, November 9, 1988
Yuill R. Moore, September 16, 1988
Ralph M. Morris, September 21, 1988

SERVICE AWARDS

Elmyra Nelson, November 4, 1988
Arthur Olsen, October 23, 1988
Gordon F. Ottewell, August 18, 1988
Constantine F. Raczko, August 21, 1988
Homer W. Robertson, November 17, 1988
Viola P. Roger, July 14, 1988
Alfred F. Roseberry, October 27, 1988
Alice E. Russell, December 1, 1988
William T. Sanna, December 16, 1988
Walter B. Sartori, October 7, 1988
Peter G. Schorr, November 19, 1988
Lina E. Schrieber, October 27, 1988
Simon S. Seifert, December 16, 1988
Robert Sheppard, Jr., November 28, 1988
Henry A. Shreve, October 6, 1988
Earl D. Simkins, October 21, 1988
Robert N. Slaughter, September 11, 1988
Hulbert Smith, October 1, 1988
Ralph L. Smith, August 19, 1988
Herman L. Snyder, August 29, 1988
Richard E. Sorg, November 7, 1988
J. Richard Speicher, December 8, 1988
Grover C. Stark, Jr., October 25, 1988
Charles Tarte, October 24, 1988
Elizabeth S. Vallia, October 10, 1988
Merville W. Veatch, November 10, 1988
Marion L. Wanlass, December 20, 1988
Gertrude W. Wegner, August 26, 1988
George Sam Willcox, Jr., October 6, 1988
James Ralph Young, September 25, 1988

Oil & Gas

Emma L. Bland, October 12, 1988
Nelson C. Breaux, September 7, 1988
Severin L. Broussard, August 29, 1988
Pearl Coulter, December 3, 1988
Loy L. Cox, September 23, 1988
Ivy Lawrence Crim, September 18, 1988
William R. Deese, September 21, 1988
Arthur L. Dittrick, November 28, 1988
Samuel M. Dyer, September 10, 1988
Ira J. Dyson, October 15, 1988
John J. Eikenberg, December 10, 1988
Okey V. Gillenwaters, October 1, 1988
Paul M. Hoegger, December 19, 1988
Joe A. Houser, November 25, 1988
Mart W. Hudnall, October 8, 1988
James G. Manning, Jr., September 22, 1988
Howard James Mays, December 12, 1988
Otto Pedro, November 11, 1988
Thelma F. Scutt, November 17, 1988
Fred F. Small, Jr., September 7, 1988
Fred A. Stockton, November 19, 1988
Irene M. Upton, October 30, 1988
Michael J. Ward, October 8, 1988
Clifford C. Ware, November 18, 1988
Orville F. Wheeler, October 18, 1988
Wann L. Wilks, December 10, 1988

Molycorp, Inc.

Theodore A. Havens, July 16, 1988
Robert E. McDowell, September 3, 1988

UNOCAL 76
Unocal Corporation
P.O. Box 7600
Los Angeles, California 90051

GARY L FOY
16823 LIGGETT STREET
SEPULVEDA CA 91343

CONTENTS

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Cover: A worker removes a tray of purified gadolinium oxide from a furnace at Molycorp's Mountain Pass, California mine. Gadolinium, used to intensify X-ray images, is one of several lanthanide elements produced at the mine. *Seventy Six* recently paid a visit to this one-of-a-kind facility. Story on page 10. **Photo by Bob Thomason.**

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