



UNIBEADS, delivered to the well in sacks, are added to fluid in a California multistage fracturing job.

## New "beads" help acidizing, fracturing

Wax-based pellets developed by Union Oil improve multiple fracture patterns in single operation and permit better control of acidizing, company says.

UNION OIL CO. has developed a new and highly effective method of improving fracturing and acidizing operations.

Using wax-based pellets called "Unibeads," Union is achieving multiple fracture patterns in a single operation and is controlling acid so that it works over the entire face of the exposed well bore.

The beads function as a temporary sealing agent, plugging any opening in the well bore through which fluid will pass.

In fracturing, they will plug the fracture as soon as it is created and propped open, permitting the operator to fracture a second or third, or even a fifth or sixth time during the same operation.

In acidizing, Unibeads plug any hole created preventing the acid from being drained off into the formation at a single point and forcing it to attack other areas of the well bore.

The beads are soluble in oil, and within hours after completion of the

fracturing or acidizing operation, they dissolve and reopen all of the passages which have been plugged.

**Now commercial.** J. E. Sherborne, Union's manager of exploration and production research, says the beads already have been thoroughly field tested.

Experience since then has been so promising that Union recently licensed Unibeads to five major service companies.

Roland F. Krueger, supervisor of Union's production and mechanics research, says Unibeads have been used to date in more than 35 wells—of other companies as well as Union—on the West Coast and in the Rocky Mountains. They have chalked up a technical success record in more than 90% of the wells, even though several were experimental projects.

**The beads.** What goes into Unibeads is still a Union secret. Company will say only that they have

a petroleum-wax base, with several unidentified polymers and a number of other chemical additives.

They are insoluble in water and slowly soluble in oil. The rate at which they dissolve depends upon the type of oil in the formation, the temperature, and the type of bead used. Normal shelf life is indefinite.

Union is producing three types of beads to cover a wide range of conditions. It can select beads for specific conditions to assure dissolution within 8 to 48 hours.

The beads are hard enough, Union says, that they will not break or powder during pumping operations, but under great pressure they can be crushed together to create a solid barrier.

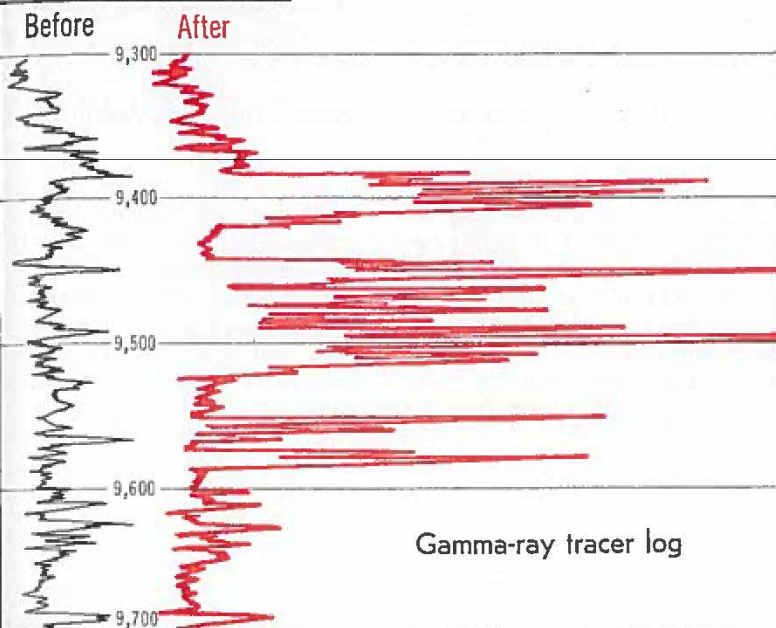
Using Unibeads and fracturing in stages, Union has achieved five or more large fractures in a single operation.

As one fracture is created and held open with propping agents, it is plugged with Unibeads. Union then injects a new spearhead fluid,

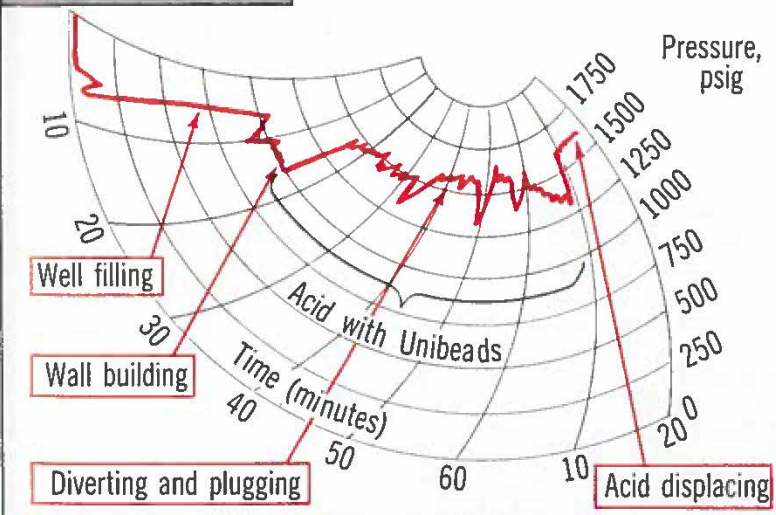


## How Unibeads work . . .

### in fracturing



### in acidizing



followed by propping agents, followed by Unibeads. It can repeat the process to achieve five or more fractures.

**Acidizing.** A major use of Unibeads is likely to be in acidizing and other solvent treating, particularly for well-bore cleanup.

This is especially true in Cali-

fornia, where slotted liners often are run through as much as 3,000 ft of productive sand. As reservoir pressure drops, scale often is deposited in the well bore, clogging the liners, and in the formation near the well bore.

The problem in acidizing a thick formation often is that the acid will break down the formation at a

## Three case histories

HERE are results of three uses of Unibeads in Union Oil wells.

### Case 1

This was a poor well completed with 557 ft of slotted liner in a Miocene fractured chert. It was stimulated with a three-stage fracturing job using lease crude, sand, and walnut hulls. Unibeads were used both as a sealing agent and as spacers for the propping agents.

Production before treatment was 3 b/d of oil and 2 b/d water. After treatment the well produced 112 b/d oil and 9 b/d water. At the end of 1 month it was producing 29 b/d oil and 12 b/d water. Production later leveled off to 14 b/d oil and 11 b/d water.

### Case 2

This was a more productive well, completed with 500 ft of slotted liner in the same type of formation. Union stimulated with a three-stage frac treatment using water, glass beads, walnut hulls, and Unibeads.

Production before treatment was 35 b/d oil and 40 b/d water. After treatment production during the first month was 76 b/d oil and 60 b/d water. Settled production later was 78 b/d oil and 38 b/d water.

### Case 3

This well was completed with 540 ft of slotted liner in a southern California Miocene sandstone.

It was treated for scaling and other problems with hydrochloric acid and Unibeads.

Before treatment the well produced 8 b/d oil and 12 b/d water. After treatment it produced 50 b/d oil and 220 b/d water. Fluid level was 4,000 ft above the pump, indicating a higher producing rate with a pump of greater capacity.

single point in the well bore, and the bulk of the acid will channel into the formation, leaving much of the well bore untreated.

Union mixes Unibeads with the acid being injected. As the acid opens one area in the well bore and begins to flow into the formation, Unibeads quickly plug the channel, forcing the acid to attack other

areas of the exposed formation.

The beads, says Union, give an operator the ability to distribute the acid over the entire face of the formation.

**Spacers, too.** Aside from serving as plugging and sealing agents to improve fracturing and acidizing, the Unibeads have another important function.

They can be mixed with propping agents to guarantee a partial monolayer when forced into the created fracture. A frequent problem in fracturing is that the propping agents will congregate to produce a solid mass which blocks fluid entry into the well bore.

The spacers, mixed with propping agents, dissolve in a matter of hours, leaving a pattern of open spaces between the sand grains, glass beads or other propping agents, to guarantee free passage to reservoir fluids.

Unibeads are variable in size and can be matched to the size of the conventional propping agents. Or they can be supplied as a mixture having large particle-size distribution.

**Water shut off.** An important future application for Unibeads will be in shutting off water, Union feels.

At this point Union has not done as much work in this area as it has in fracturing and acidizing, but its early field work has proved successful.

In shutting off water, the beads would function as they do in other operations, plugging the openings in the well bore through which fluids flow. Since they are oil soluble, they will dissolve in oil channels but remain as plugs at points of water entry.

**California outlook.** Union is quick to suggest that Unibeads are no panacea for fracturing problems, and they offer no cure for the California problem of fracturing thick, shallow formations.

These generally are soft and tend to mash down around the propping agents, closing any fractures created.

With the pickup in deep drilling, however, Union feels Unibeads will have an increasing application in fracturing deep Sespe sands, fractured cherts, and the silicified sands of the Santa Maria Valley.

## Oil's new retail target: Farm fertilizer market

Single outlet for plant foods, plus full line of other farm products and services, catches on in initial marketing tests, says Kermac, American, and Mobil.

OIL COMPANIES are looking at ways to move deeper into the direct retailing of agricultural fertilizers, a business they agree can't go anywhere but up.

One concept under serious study is the one-stop service center where a farmer can buy fertilizers, insecticides, weed killers, and a variety of other items he needs for his home, equipment, and vehicles.

At these centers, the farmer and his wife can buy nearly everything needed for operating today's farm. They also can get technical advice from an oil-company-paid expert. Conference rooms are available for farm organizations.

The farm stores frankly are labeled as experiments by the companies. The first was tried nearly 2 years ago. Tests in other areas, however, were started late last year and this spring.

Naturally, not enough results are in for a full evaluation, but oil marketers are enthusiastic about the early reception given the centers.

Some industry sources say it's only natural for oil companies to want to be in fertilizer retailing.

As one executive puts it: "The big companies can't be in this business safely without selling right to the customers. They found that out in the service-station business. And most oil companies think of integration right down to the consumer. It would seem unnatural for them to do it any other way."

Examples of the market tests under way are efforts by Kerr-McGee Oil Industries, Inc., a relative newcomer to plant-foods retailing, and by American Oil Co. and Socony Mobil Oil Co., Inc.

Kerr-McGee Pres. D. A. McGee says the company held off setting up its marketing organization until it was sure of its raw-materials position.

Late in 1963 it moved into manufacturing and retailing, first by buying Baugh Chemical Co., then by building its own outlets.

It now has about 70 retail fertilizer establishments, ranging from large granulated plants to small bulk-blending plants. Some of the plants are leased to local farm-supply companies, others are owned by Kerr-McGee and staffed by company personnel.

W. E. Jaqua, plant-foods vice-president, says more than a dozen of Kerr-McGee's outlets offer the service-center approach where a farmer can buy a variety of merchandise, and get advice on what fertilizers and other chemicals and products to use on his farm.

Kerr-McGee tries to line up specialists to manage these outlets. Many of its managers hold college degrees in agronomy, soil science, or business administration with emphasis on farming.

The manager is also the key salesman for this type of outlet, Jaqua says. "At one of our smaller outlets the dealer covers an area of perhaps 8 to 10 miles in radius from his store. He calls on the farmers themselves and tries to convince them he's the one to do business with."

The personal approach is the secret in fertilizer retailing, Jaqua says. "You can develop brand identification through advertising, but it takes personal contact to really build sales."

Jaqua says service-centers so far have been accepted well, and the company is pleased with their operation. It plans to use such an approach in expanding its plant-foods marketing, but on a selective basis.

In areas of larger farms, where farmers are more specialized, the service-center idea isn't necessarily