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Making every drop count

Houston startup joins others in trying to get more oil from existing wells

By KRISTEN HAYS Copyright 2008 Houston Chronicle

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Michael Smallwood looks more like a roadie than a scientist, sporting a shoulder-length silver mane, and jeans and a T-shirt rather than a white lab coat.

But he's spent nearly two decades tinkering with a gel-like chemical compound that squeezes oil from rock, sand, dirt and whatever else it clings to. That could pay off now that his boss and benefactor, Kurt Neubauer, saw enough promise to found a company to make the substance and market it.



"Discovery is the most important part of science," said Smallwood, chief science officer for Neubauer's startup, Planet Resource Recovery.

With Smallwood's creation in hand, the company is jumping into the heady realm of enhanced oil recovery, a well-established industry now offering a potential boon to innovators who find ways to squeeze more crude from mature wells as well as those long since capped and left idle.

Jim Steidtmann, director of the Enhanced Oil Recovery Institute at the University of Wyoming, was unfamiliar with the Houston startup, but he said it has plenty of company. High oil prices have inspired a vast flurry of efforts to develop new technologies that can better extract more oil from existing wells.

"There's a lot of oil that's stranded, stuck in reservoirs that geologists know is there. It's not that they're out there with a lot of risk trying to find oil," he said. "The issue is trying to figure out how to free it from the pore space and get it out of the ground."

Gary Pope, director of the Center for Petroleum and Geosystems Engineering at the University of Texas at Austin and an expert in enhanced oil recovery, said companies big and small are researching ways to get more out of what's already been tapped.

The main push now is unlocking safe uses of chemicals and chemical compounds that can take up where existing enhanced oil recovery methods leave off, he said.

"We need the oil," Pope said. "The U.S. is importing 60 percent of its oil at great cost. It would be a huge advantage for us to produce more of our own oil, especially where we already have the infrastructure, wells, pipelines, facilities and so on."

'Waterflooding'

Enhanced oil recovery isn't new. Traditional pumping generally nets up to 20 percent of oil in a reservoir depending on the geology of the formation and thickness of the crude.

After all, reservoirs aren't open underground caverns. They're rocks with oil and gas in tiny pores, Pope said.

When traditional pumping no longer makes the grade, operators "waterflood," or inject, water in adjacent wells to force stubborn oil through rock to a primary well. Some West Texas oil fields have been continuously waterflooded for 40 years, Pope said.

"Almost all the onshore U.S. oil fields have been waterflooded, are being waterflooded or will be waterflooded," he said.

Operators also inject steam or carbon dioxide, a byproduct of burning fossil fuels.

But the majority of oil in a reservoir can still remain untapped. Basic chemicals can draw out more, but chemical compounds that also contain detergents are "the hottest thing going," Pope said.

"It requires a lot of expertise, chemistry and engineering. Some are out there doing it. Some are gearing up to do it," he said.

Established credentials

Smallwood, 50, has worked with chemicals throughout his career, both as an engineer and consultant, for Lyondell Chemical subsidiary Equistar, El Paso Energy and Valero Energy.

Neubauer, president and chief executive of Planet Resource Recovery, heard about Smallwood's tinkering in late 2004 as he was scouting for enhanced oil recovery opportunities in the early days of the run-up in crude prices.

The pair e-mailed back and forth and later met. Neubauer bought the rights to Smallwood's chemical, hired Smallwood to develop it further, and founded the company to help it leap from the lab into the marketplace.

Within two years, the startup — which is publicly traded on the Over-the-Counter Bulletin Board market — started making the silicone-based compound called PetroLuxus in large quantities. This fall the company will start building a new laboratory for Smallwood in Pearland.

"It's a lot more than what I can do on my own," Smallwood said. "It's real. It's fun."

The compound needs water to work. In a demonstration at the company's west Houston offices, Frank Crane, production and process manager, poured a drop of the silvery gel into a cup of water.

Then he poured the diluted chemical into a jar containing chunks of oil-soaked sand from Asphalt Ridge in Utah, much like Alberta, Canada's tar sands where crude production is booming.

Within minutes, thick crude started flowing to the top, above the water, while sand that looked like ground pepper settled at the bottom.

"It will free the oil," Crane explained. "The loose stuff has already been extracted. When we come to oil attached to sand, dirt or rock, this causes it to just let go."

He said the compound has other possible uses. When mixed with water it becomes slick, and testing has shown it creates a barrier on metal, indicating it can protect against corrosion. Other tests indicate it could be used to clean oil pipelines, tanker trucks and barges, Crane said.

They also hope it could catch on at oil sands operations in Canada, where most operators inject superheated steam underground to melt rock-hard bitumen so it can be transported and upgraded into refined products.

The energy-intensive process requires much natural gas to heat the water into steam and produces heavy emissions, which have generated concerns from environmental groups.

But Crane, Neubauer and Smallwood recognize that their find must prove itself in a vast industry open to technology, yet skeptical of anything that hasn't been rigorously tested on a large scale.

"It's not going to happen tomorrow," Crane said. "It needs a process."

Veteran player

Houston's Lucas Energy is an old hand at using technology to step up oil recovery. The independent producer acquires capped and abandoned wells — mostly in Gonzales, Wilson and Karnes counties near San Antonio.

Brad Holmes, director of investor relations for Lucas Energy, said the company has used water injections and drilled lateral wells to unleash stubborn oil from old wells. The company is now testing and evaluating performance of Smallwood's compound.

Pope said chemicals are much more critical to current and future oil production because so much of the world's crude left to tap is thick — heavy in industry terminology — unlike the light, easy-to-pump crude in the Middle East or Nigeria. Canada's crude is heavy, as is Venezuela's.

But what looks dramatic in a laboratory could lay an egg in a reservoir.

"It's very complicated in the field. You get reactions with rock and brine, or the saline in reservoirs. It takes a lot of lab work and engineering work to try to predict what will happen in the field," Pope said. kristen.hays@chron.com