THOMAS B. SHEA FOR MOFO TECH

Good Chemistry

Thanks to a merger, a poultry and produce wash is helping the oil industry extract resources more effectively

In 2008, Vic Keasler was performing molecular biology tests at a pharma, biotech, and academic research company. Keasler had studied hepatitis B and C's effect on liver cancer in graduate school; his career had primarily focused on human disease. However, after a friend in the oil and gas industry mentioned one day that water treatment company Nalco Champion wanted to expand its basic microbial program, Keasler bid illness study adieu.

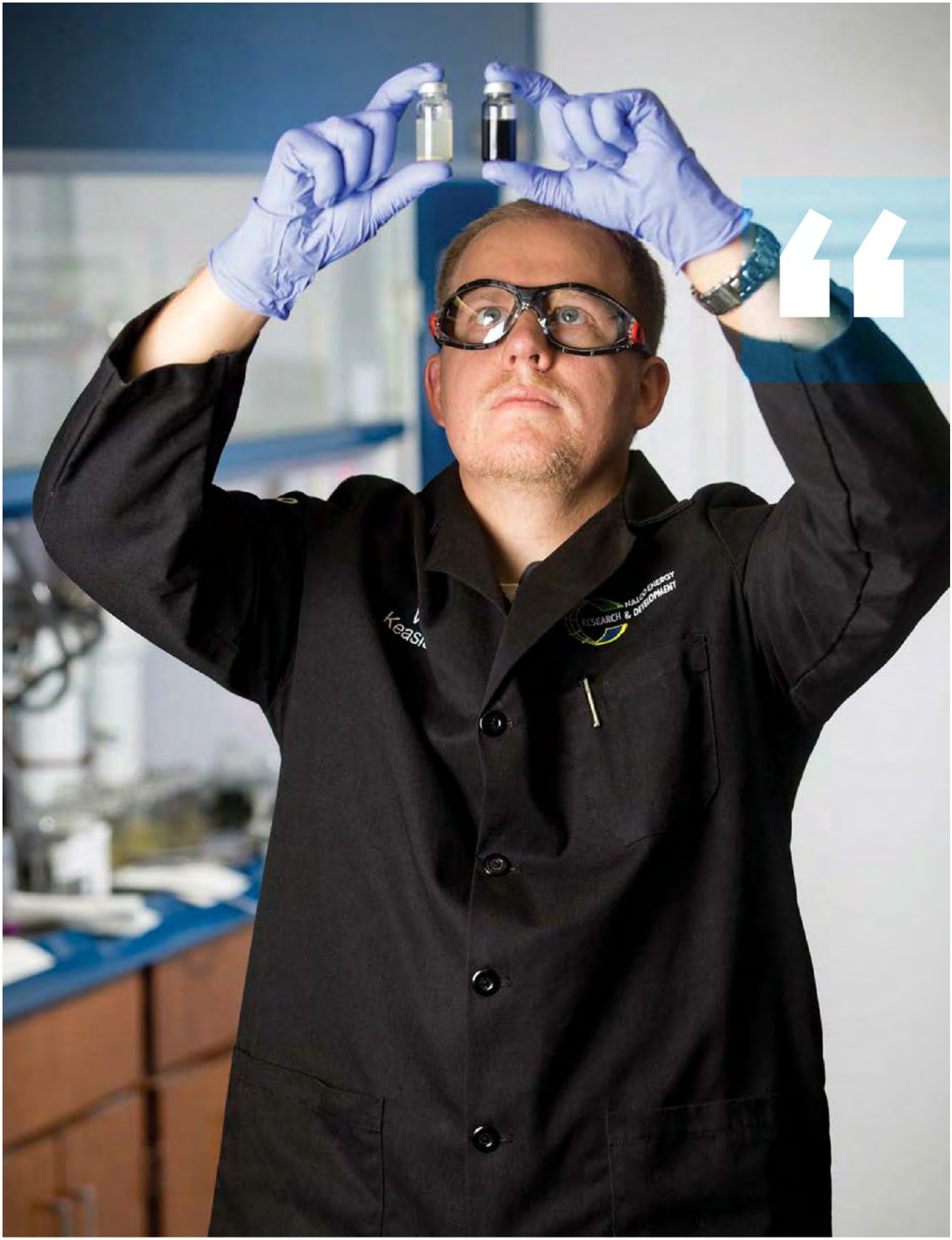
"I didn't even know at that point that there was such a thing as bacteria in oil fields," he says. "But it was an opportunity to take the research I'd learned on the medical side and build something from the ground up."

About five years ago, Keasler, who currently serves as Nalco's research, development, and engineering microbiology and industrial biotechnology manager, started developing Nalco's program to better understand microbes' effect on oil collection. Bacteria in oil fields can pose several costly problems, including erosion that can lead to pipeline and vessel failures and the production of hydrogen sulfide gas, which can be lethal even in relatively low doses.

Bacteria can also wreak havoc on the hydraulic fracturing process. Water—mixed with chemicals, then pumped under pressure to create cracks in rock that let drilling companies remove oil or gas—is a key component in hydraulic fracturing, also known as fracking.

Creeks, rivers, and other channels can sometimes provide the large amounts of water fracturing requires, but the water frequently requires treatment to remove bacteria. Because fluid brought to the surface during the fracturing process often contains bacteria and rock-rupturing chemicals, the water needs to be treated if it is to be reused.

Disposal can be an issue as well. Hydraulic


RESEARCH & DEVELOPMENT

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fracturing has made headlines in recent months due to fears the harsh chemical compounds typically used to cleanse fracturing water could add toxins to the environment.

"There's a concern that to get water underground and take it out, there may be contamination in both directions," says Morrison & Foerster partner Peng Chen, who, as a patent attorney, has worked with Nalco and water, hygiene, and energy services provider Ecolab. "The industry is very aware of that."

To eliminate the cost and waste of importing water for each fracturing effort, the oil industry needed a way to safely treat available and recyclable water. "We were looking to find chemistries that were as environmentally friendly as possible," Keasler says.

The solution came from a Nalco marketer during a January 2011 brainstorming session to identify a fracturing-friendly biocide. "The company he'd worked for previously had used peracetic acid for treating ballast water in ships," Keasler says. "He mentioned that if it was green enough to treat water that goes right into the ocean, perhaps it could also work in an oil field."

The team started looking into using the acid—but faced a learning curve. "This chemical is not like other chemicals," Keasler says.

Enter Ecolab, which merged with Nalco in December 2011. While reviewing Ecolab's website after the merger announcement, Keasler's team realized that the company marketed peracetic acid as a poultry and produce wash. After performing its pathogen-killing job, the wash "breaks down to vinegar and water—no different than what you put on salad," Keasler says.

The team didn't waste any time. In a meeting at Nalco's Sugar Land, Texas, office just minutes after the merger was approved, Keasler's team began asking Ecolab officials about bringing its product to the oil sector.

"Ecolab had used its peracetic acid as a poultry and vegetable wash treatment for 20 years," Keasler explains. "It made a lot of sense with our goal being to kill bacteria in an environmentally friendly way."

Trials began in June 2012. "One of our first and probably biggest successes was a customer in Fayetteville," Keasler says. "For every well they'd fracture, they needed 1 to 2 million gallons of water." With Nalco and Ecolab's help, the company recycled 80 million gallons of water in 2012.

Nalco also found that customers can use the product to remove potentially lethal, naturally occurring hydrogen sulfide gas and H2S produced by microbes. "It can take the levels almost to zero," Keasler says. "That helps oil companies minimize the risk operators and other personnel will be exposed to."

"Nalco [provided] an expansion into business lines that Ecolab hadn't necessarily been deeply involved with before," says Morrison & Foerster partner Bryan Wilson. The firm had handled cases involving compounds similar to peracetic acid and understood the chemistry involved, Wilson adds. It had expedited a patent application prior to a pilot program and has filed for several patents as new uses have been found. The product has since been successfully utilized in northwest Texas, Colorado, and Arkansas.

TRACKING PROBLEMATIC PESTS

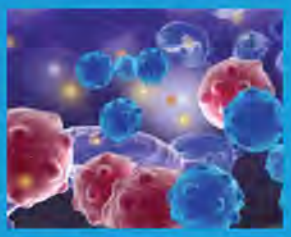
Water, hygiene, and energy technology provider Ecolab has been able to reposition a seemingly simple peracetic acid product to help oil companies control pipeline erosion, water treatment, and hydrogen sulfide gas production. Microbiology manager Vic Keasler's next big project: building a bug map.

"In simplest terms, it's a global map of micro-organisms identified from all over the world, based on where our customers are," Keasler says.

The team has collected more than 4,000 samples in recent years in every continent but Antarctica. The interactive program, apparently the first of its kind, lets team members click on a region to see what samples were collected and what organisms are present.

"Say we're working in the Gulf of Mexico," he says. "The program allows us to pull up all samples from the Gulf—what's there, what risks they have. It's exciting because we can be more predictive about what we're going to run into."

Keasler says the technology can help identify potential problems that oil and gas producers might face. "Certain bacteria produce hydrogen sulfide, certain bacteria cause corrosion, some secrete slime," he says. "You need to understand what the challenge is so you can monitor it and estimate the risk it can cause."



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