In Search of Bigger, Stronger, and Lighter: Ways to Open Paths for Oil Production
Stephen Rassenfoss, JPT Emerging Technology Editor

A Proppant Pill for Ailing Wells
In the 1980s Claude Cooke had an idea for a low-cost way to improve the output of underperforming wells.

But it took decades to find the materials he needed to turn that idea into a treatment, called SqueezeFrac, being produced by a startup company called EnerPol.

While doing hydraulic fracturing research for what is now Exxon Mobil Corp. he noticed there were a lot of fracture treatments where pressure tests showed much larger than expected results, suggesting a high-pressure shot of sand likely cleared out damage near the wellbore.

It strongly suggested there is a reward for fracturing older wells, but the cost of doing that would exceed the likely gains at many of those wells. Cooke said he saw “a need for a much less aggressive and expensive method to remove near wellbore damage.”

The job could be done with a lot less sand, fluid, and horsepower to pump the job, if it were possible to squeeze in a small amount of very viscous fluid and proppant.

His idea was to do that by delivering the sand and proppant in the form of pellets about the size of an M&M that would be pumped into a vertical well. These pellets would dissolve as they warmed after reaching the area in need of treatment. It would be a targeted delivery system reducing the materials and pumping power required.

The concept of a small fracturing job, like a squeeze job for cement repairs, sounded simple enough for Cooke, who was honored by SPE as one of the “Legends of Hydraulic Fracturing” for his role in developing bauxite ceramic proppant.

But the project remained on hold for many years because he lacked a low-cost source of a polymer that would degrade as needed—first going from a solid into a thickener for the fluids in the well, and after the job is done breaking down into its component chemicals without leaving a residue. “It had to have a degradable polymer. I knew such things existed but they sold at too high a price,” he said.
That changed when environmental concerns persuaded fast-food chains and others to begin to make clamshell hamburger containers using materials that would biodegrade in a landfill.

It took a while longer to find a company willing to supply what he needed in the amounts required by EnerPol to begin making the pellets and testing the concept. Recently it received a second round of support from the Research Partnership to Secure Energy for America to pay for testing, with a budget of USD 3.4 million.

The treatment has been tried on one well, which became significantly more productive, but unfortunately most of what was produced by that dead well was water rather than oil, Cooke said.

SqueezeFrac is a multistep process. Polymer pellets without proppant are pumped in first, followed by pellets with the proppant. They accumulate over perforations at the bottom of the casing and a gel forms. Then the mixture of gel and sand is squeezed through perforations by pressure at the surface, much like a squeeze cementing operation. Afterwards the polymer degrades in the fracture into an organic acid.

The equipment used is no different than what would be found on a typical fracturing job. It works perfectly well, but Cooke pointed out it is built for jobs many times larger than his, which can be done with a 300-horsepower engine, or less, and would cost about 20% of what a typical fracturing job would. In the future he’d like the see the job pumped using equipment mounted on the back of a pickup truck.

Enerpol has combined proppant and a biodegradable polymer to reduce the water, sand, and pumping power needed for fracture to repair near-wellbore damage in old wells.