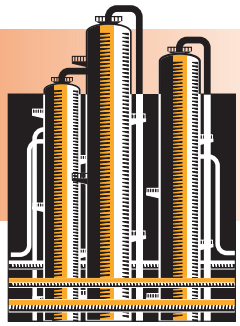
# PETROLEUM

Project Fact Sheet



## Self-Agitating Soap Stick

### Benefits

- Revives and/or increases production in water-logged gas wells
- Reduces environmental and financial problems associated with drilling new wells to replace low-producing or plugged and abandoned wells
- Reduces energy and cost of well treatment relative to other treatment methods
- Prevents loss of hydrocarbons in plugged and abandoned wells
- Introduces cost-effective treatment for marginally producing wells

### Applications

The Self-Agitating Soap Stick has been developed as a treatment for the tens of thousands of water-logged gas wells worldwide (approximately 10 percent in the United States) that have been or will be abandoned because of the poor economics associated with current water-removal methods. It's difficult to estimate how much gas remains, and further recovery is based on economics. This technology depletes the reservoir in a more complete manner and avoids additional waste of hydrocarbons. Assuming an additional 1 percent of U.S. gas recovery would be added, that would equal 80,000 million cubic feet. The technology will allow most marginal gas wells to continue producing much longer than with conventional soap sticks.

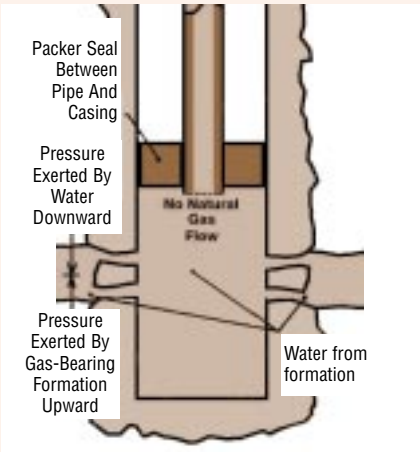
## Proven technology removes accumulated water from water-logged natural gas wells

Nearly all wells produce unwanted water. In the early life of a well, high gas pressure and velocity facilitate moving water up the well. As a well ages, reservoir pressure and velocity in the wellbore decline, allowing water to begin accumulating at the bottom of the well. This accumulation exerts downward hydrostatic pressure on the gas formation. Eventually, the water's weight or hydrostatic pressure in the wellbore balances the bottomhole pressure attempting to force the gas upward, completely plugging the well and ceasing gas production.

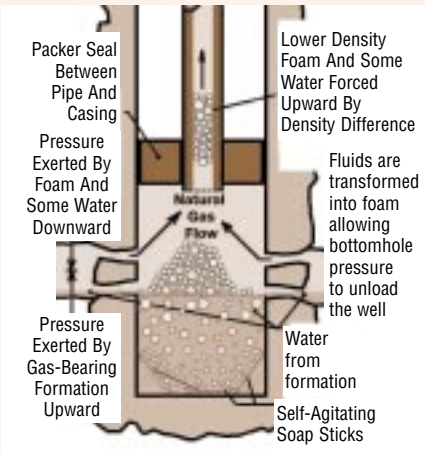
To keep the well functional, the water must be removed to allow gas production to resume. Otherwise, the well will be plugged and ultimately abandoned. There are a number of ways to eliminate water in the well, but most methods come with disadvantages such as high cost or significantly greater energy requirements. One way the water can be removed is by using surfactants that rely on residual gas pressure and migration to produce agitation and foam to lift the unwanted fluids out of the well. A pumping unit would cost $25,000 to install and require electricity or gas to operate. Swabbing operations require a work rig at $750 per day to bail out the water.

The new Self-Agitating Soap Stick has been developed to revive non-producing and marginally producing gas wells. By delivering both surfactant and agitation into the well, the Self-Agitating Soap Stick is capable of transforming the column of unwanted water into foam without help from pressure in the well. This highly cost-effective approach removes the unwanted bottomhole fluids that restrict gas flow. The treatment is not only less expensive than other options, but it has been demonstrated to equal the success of swabbing operations at less than 10 percent the cost.

### Self-Agitating Soap Stick




Water-Logged Well




Producing Well

**Maverick Petroleum's Self-Agitating Soap Stick successfully revives many water-logged gas wells that might otherwise be abandoned as unproductive.**

## Project Description

**Goal**: Commercialize technology capable of reviving dead and low-production gas wells and extending their commercial life.

Conventional surfactant-injection treatments of gas wells rely on the availability of formation gas within the well to provide the agitation that transforms unwanted downhole fluids into foam. In wells that are completely water logged, however, there is no formation gas present, so the agitation must be produced by some other means. The Self-Agitating Soap Stick delivers both the surfactant and the agitation to the bottomhole fluids, thereby transforming the unwanted column into foam and allowing the bottomhole pressure to clear the well of water and increase or resume production.

The gas-producing chemical reacts with the bottomhole fluids and surfactant to produce foam. As the fluids foam, their density is reduced, allowing bottomhole pressure to drive the foam out of the well. When the hydrostatic pressure has been sufficiently lowered, gas flows again. Some wells require multiple treatments before gas production revives. Typically, wells with water influx rates of less than five barrels per day can be successfully treated with this technology.

Maverick Petroleum developed this new technology with the help of a $70,000 grant funded by the Inventions and Innovation Program in the Department of Energy's Office of Industrial Technologies.

## Progress and Milestones

- Completed treatment of a sampling of test wells with the Self-Agitating Soap Stick under field conditions to determine technical and commercial validity. Roughly 60 percent of those wells showed a positive response.
- Analyzed the number and location of dead and near-dead gas wells as possible candidates for this new treatment method.
- Completed a cost analysis of treatment.
- Protected by U.S. patent 5,515,924.

## Economics and Commercial Potential

The Self-Agitating Soap Stick offers the potential for substantial energy savings by retrieving hydrocarbons that would otherwise be lost when wells are plugged and abandoned. Postponing the plugging of the well temporarily avoids the time value of the plugging costs. Because of its low cost compared to other treatment options or new exploration, the Self-Agitating Soap Stick can economically revive dead wells and increase production from marginal, low-producing wells. The marginal cost of drilling a new well includes tremendous up-front costs, associated environmental damage, and probability of failure versus the marginal cost of reviving an existing well with all infrastructure already in place, with no additional environmental impact, and a lower probability of failure. Overall, it is estimated that this treatment method may be applied to 80 to 90 percent of all gas wells worldwide, given that most gas wells are plugged as a result of increased water influx.

Materials for an average well treatment with the Self-Agitating Soap Stick are estimated to cost between $10 to $20. Average monthly costs to sustain commercial production will vary depending on factors such as sales-line pressure and initial hydrostatic pressure versus bottomhole pressure. Labor costs and customized applications will increase this cost.

Maverick Petroleum's short-term commercialization strategy is to develop mutually beneficial relationships between either private or public entities on a service or joint-venture basis. As an example, the federal government alone owns the mineral rights to thousands of suitable candidate wells on the more than 27 million acres of publicly owned land and offshore waters.

## *Industry of the Future—Petroleum*

*Petroleum is one of nine energy- and waste-intensive industries that is participating with the U.S. Department of Energy's (DOE) Office of Industrial Technologies' Industries of the Future initiative. Using an industry-defined Vision of the petroleum industry in the year 2020, the industry and DOE are using this strategy to build collaborations to develop and deploy technologies crucial to the industry's future.*

**OIT Petroleum Industry Team Leader: Jim Quinn (202) 586-5725.**

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

### Project Partners

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