By: LINDSEY HEBERT, Associate Editor

Steam flooding technology producing oil to meet growing demand

Steam flooding, a technology that began 50 years ago to develop heavy oil reservoirs, is currently helping meet growing demand in the U.S. and around the world.

"Steam flooding is a part of the overall supply picture," said Dan Hill, department head, professor and noble chair at Texas A&M University's Harold Vance Department of Petroleum Engineering. "Hydraulic fracturing and steam flooding are two very different processes. Hydraulic fracturing is applied in very low permeability reservoirs, which means the pore sizes in the rocks are tiny. Therefore, it's hard for oil or gas to move around easily. You have to fracture the rock to make easier pathways for the oil and gas to flow to the well. With the steam flooding technology, the permeability is actually quite high but the oil is very viscous; it's very thick. Oil doesn't flow easily because it's almost like molasses."

Because of these differences, hydraulic fracturing and steam flooding require two vastly different technologies to solve their individual challenges.

"With the steam flooding process, the viscosity of the oil decreases a lot as the temperature goes up," Hill said. "The analogy to molasses works the same way. If you heat molasses or syrup, it becomes a lot thinner and flows easier than when it's cold."

Over the course of Hill's career, which spans 35-plus years, steam flooding has been quite common. "It's especially common in California," he said. "Canada is also a big province for heavy oil recovery. It's being utilized in places like Venezuela and Indonesia as well."

With the constant increase in demand for oil products and decrease in domestic reserves, the need to develop secondary methods of oil recovery in existing fields continues to be increasingly important. Many depleted or partially depleted fields have been brought back into production by steam flooding. And although the technology was once considered somewhat exotic, steam flooding is now responsible for a substantial increase in oil recovery from fields once considered exhausted.

However, as with other oil production methods, certain problems are involved. Of paramount importance is the proper treatment and control of injection fluids to minimize equipment and formation damage. In general, water in oil recovery areas is not the best quality, so when steam or hot water flooding is employed as a secondary method of oil recovery, treatment of the water can be of significant importance. Such treatment must be engineered for each flood to ensure freedom from scale and corrosion problems in the steam or hot water generators and piping, as well as plugging in the flood. Boilers employed in this type of operation are frequently of high heat exchange design, requiring high-quality feed water.

Ultimately, thermal methods, specifically steam flooding, remain the preferred enhanced oil recovery method for heavy oil reservoirs. And the use of the steam flooding has only gained momentum in recent years. It is estimated 90 percent of existing steam flooding projects began in the past three years. However, like everything in the business, it's sensitive to price, according to Hill.

"Steam flooding is a pretty expensive operation," he said. "It's very energy intensive to create that steam. But the resource is huge. There are huge amounts of heavy oil around the world, so where it economically makes sense, it will continue to be done."

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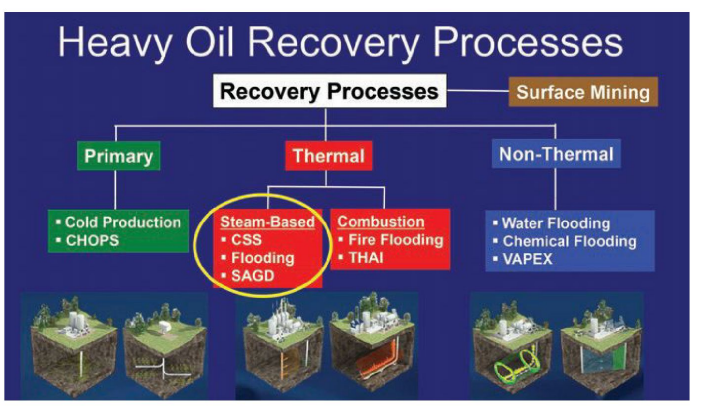

Source: Society of Petroleum Engineers.