

What happened to California regulators' vows to make steam injections safer?

Julie Cart, LA Times, 11-28-15

In the morning of the day he died, David Taylor and his crew were looking for a "chimney" — a fissure in the earth where steam and oil periodically spurted into the air in an oil field west of Bakersfield.

Taylor, a construction supervisor for Chevron, had been battling a long-standing problem near a dormant well in the Midway-Sunset oil field. His job was to control leaks at Well 20 in a primordial tableau of sinkholes, small bubbling pools of scalding water and geysers that on occasion spewed 40-foot plumes of oil, water and rocks.

The conditions, known as "surface expressions," were in part the result of an oil extraction technique known as cyclic steaming. The process forces superheated water underground at high pressure to open pathways to siphon heavy oil.

An unintended consequence is that some fluids make their way to the surface through newly created ruptures or via old, broken, or unstable wells.

To mitigate the risk from the escaping liquids, state regulations require oil companies to perform an Area of Review, in which they must map and document every well — new, idle, plugged or abandoned — near an injection site and repair any potential problems. Companies must also analyze the site's geology and freshwater sources, and calibrate injection pressures to reduce the chance that oil or steam will push their way to the surface or out of the oil-bearing zone.

But state and federal authorities say in many cases oil companies are allowed to bypass those safety requirements or avoid them through a regulatory loophole.

Taylor, 54, and two co-workers were dispatched to Well 20 on June 21, 2011. Chevron had been trying to control the well since 1997, spending more than \$2 million. The company stopped injections near the area to try to ease the problem, but neighboring oil producers kept up high-pressure injections. More than 30 surface expressions existed within a mile of the well.

As the crew walked the site, surrounded by a landscape dense with new and old wells and miles of pipes and casings, the ground gave way beneath Taylor. He fell feet first into a cavity burbling with 190-degree water and hydrogen sulfide.

Co-workers rushed to the brink but could not reach him. As they extended a length of pipe for him to grasp, Taylor slid further into the 10-foot diameter crater. His wife stood vigil beside the sinkhole until rescuers could retrieve his body 17 hours later.

Chevron called Taylor's death a "tragic and isolated incident," and said it has a "long track record of safely conducting cyclic steaming in the Midway-Sunset Field."

Afterward, California's oil and gas regulators vowed to make urgent reforms. Taylor's death would mean something, they said. It would be the beginning of a major overhaul of the way the oil companies conduct steam injection.

Four years later, however, there has been little progress.

The state has not acted, either by revising regulations or enforcing existing rules. Cyclic steaming was specifically exempted from the state's new hydraulic fracking regulations.

The task of helping draft the outlines of those reforms was placed before the Conservation Committee of California Oil and Gas Producers, a group of oil industry officials in Bakersfield. The committee has an advisory role along with DOGGR, the state Department of Conservation's Division of Oil, Gas & Geothermal Resources, because the industry has expertise on extraction techniques that state regulators want to tap.

The industry group has not addressed the questions the state asked it to consider after Taylor's death: What rules should be put in place to prevent surface expressions and how can operators ensure oil and drilling fluids remain separate from clean water sources? What can the state — and producers — do to make steam injections safer?

Jerry Anderson, the group's executive director, declined to comment.

State oil regulators say they are writing new rules regarding steam operations but say the revisions are at least a year away.

Industry officials say they support the state's efforts to craft new rules.

Steam injection has been used for decades in California, growing in popularity as reserves of more easily recovered oil have been tapped. More than half the state's oil wells use cyclic steam or steam flooding.

By 2011, with oil fetching an average of \$110 a barrel, more than twice the current price, oil companies stepped up injection pressures to levels that brought near chaos to the oil fields. Engineers across the region engaged in a high-stakes version of whack-a-mole, rushing to plug one geyser while others broke through elsewhere. State regulators struggled to identify where surface expressions were sprouting.

Federal authorities began to take note. First, an Environmental Protection Agency 2011 review of California's underground injection program criticized the state for failing to enforce state and federal regulations.

Then the federal Government Accountability Office found last year that state officials routinely allowed cyclic steam operators to exceed approved fracture gradients — the amount of pressure required to crack open an oil-bearing formation. In fact, it is common practice in California to let companies set their own injection pressures.

The state agency responsible for oversight of steam injection, DOGGR, has dual and at times conflicting missions of both regulating the industry and helping it extract oil. It has failed on the regulatory side with regard to steaming, critics and even the agency itself say.

"Cyclic steaming has gone on in the state without a regulatory framework around those wells," DOGGR chief Steve Bohlen said in an interview. "That's been a historic problem. We are moving toward rule making — cyclic steaming is one of the first ones the list."

Michael Stettner, who retired in 2010 as supervisor of the state's underground injection control program, said that because of the dual mandates, field staff is reluctant to interfere too broadly with oil operators.

"I always had an issue telling someone in the oil industry who's been there for 30 years, what to do," Stettner said. "I kept my eyes open and learned from them."

An analysis the agency released last month found that 78% of the oil projects audited did not undergo the required Area of Review to find and address potential problems surrounding a proposed new well. In addition, 47% of the well records did not contain information about well casing construction — data vital to understanding the integrity of wells.

Maintaining well integrity requires the careful calibration of injection pressure and volume in keeping with state and federal guidelines for fracture gradients. These tolerances are particularly sensitive because the geologic formation in this part of the San Joaquin Valley — diatomite — is prone to subsidence and sinkholes.

Even marginal errors can trigger a catastrophic cascade: Ground movement can create unintended fractures or cracks in brittle formations near old wells that have been improperly abandoned or push fluids into new poorly engineered wells that can shear casings.

Jan Gillespie, a professor at Cal State Bakersfield and geologist with long experience in the oil industry, had her first encounter with a blown well in 1985, when steaming a field packed with old wells. Gillespie was injecting steam when it hit an abandoned well bore.

"It blew it sky high," she said. "We had no idea [the old well] was there. It appeared as a dot on the map, but the well wasn't where the dot was."

Toxic chemicals in drilling fluids pose a potential threat to the public should the fluids migrate to water supplies.

The U.S. Geological Survey warned the state water board earlier this year that well integrity is a serious threat to freshwater aquifers. "Even a small percentage of compromised well bores could correspond to a large number of transport pathways," the agency concluded in a 2014 paper.

A scientific study of oil operations in California, produced earlier this year at the behest of the Legislature, raised red flags about potential aquifer contamination. To determine if freshwater supplies have been tainted, the California Council on Science and Technology said the state and water districts should engage in widespread testing of water sources.

Nothing of the kind has occurred.

Oil operators say they have expertise to inject safely even if they use higher pressure and volume than guidelines allow.

Rick Fortnum, Chevron's operations superintendent at the Midway-Sunset field, said that the company injects above the fracture gradient by carefully calibrating pressures and volumes. He said the company has precise geological and engineering data that reduces risk.

Oil companies often avoid the few regulations governing steam injection: Cyclic steaming wells operate as injection wells part of the time and as oil producing wells the rest, making them difficult to define. Many oil operators classify their wells as production wells, which fall outside injection regulations.

DOGGR records show that at least 40,000 steam wells across California escape regulation via those conflicting definitions.

Seven weeks after Taylor's death, state Oil and Gas Supervisor Elena Miller ordered the oil company TRC to halt a steaming operation it operated near Well 20. The order noted: "A volatile eruption" near Well 20 was "expelling rocks, other material, and emitting fluid and steam."

Days later, Chevron reported that the ground trembled and a geyser spewed liquid 100 feet into the air.

Chevron and TRC operated on neighboring leases in the Midway-Sunset field. The companies are in litigation, each claiming the other's injections and operations have created problems on their land.

On Aug. 26 Miller issued another emergency order, banning steam injection within 800 feet of the sinkhole. The situation in the field had become "unpredictable, unstable and dangerous," according to the agency order.

Oil companies complied but the surface expressions remained, perhaps the result of steam injection at other wells in the field.

Miller's orders regarding Well 20 were to be among her last.

Alarmed by the number of blowouts and concerned about the integrity of wells, Miller cracked down. She sent an email to all DOGGR employees, saying the agency would begin abiding by the regulations: Producers would be required to provide geological and engineering studies.

Industry backlash was immediate.

Oil company representatives and lobbyists complained to Gov. Jerry Brown, saying the studies were expensive and slowed the issuance of drilling permits, hamstringing an industry vital to the economy of the region and state.

Within months, Brown fired Miller and her boss, Derek Chernow, the acting director of the state Department of Conservation. The governor replaced them with regulators who promised a "flexible approach." By 2014, the average time required to issue permits was cut in half.

Bohlen, who now has Miller's job, said DOGGR is concerned about the lax regulation of steam injection.

"The reason we are worried about safety is that when you have oil coming to the surface you don't know whether the ground is stable," he said. "That is at least part, if not all, of the issue around the David Taylor incident."

Barred by state law from suing the employer, the Taylor family has filed a wrongful-death suit against a contractor who constructed a subsurface drain. The lawsuit calls cyclic steaming an "abnormally dangerous and ultra hazardous activity."