



Figure 1. Fire at the Pryor Trust 0718 gas well.
Photo credit: Texas Fishing Forum.

August 16, 2018

On January 22, 2018, a blowout and fire occurred killing five people at Pryor Trust 0718 gas well number 1H-9, located in Pittsburg County, Oklahoma (Figure 1)¹. Red Mountain Energy, LLC was the lease holder, and Red Mountain Operating, LLC (RMO) was the operator of the well. Patterson-UTI Drilling Company, LLC (Patterson) was the drilling contractor, hired by RMO. Patterson Rig 219 drilled the well.

Well 1H-9 was a lateral well with a planned true vertical depth (TVD) of 7,615 feet and a planned measured depth (MD) of 17,799 feet. Well 1H-9 targeted and was drilled through the Woodford formation.

¹ <http://texasfishingforum.com/forums/ubbthreads.php/topics/12595965/1>

The pertinent parties and individuals discussed in this Factual Update include:

- **Patterson Drilling Crew.** There were two Patterson drilling crews for Rig 219 on each hitch,² working two different “tours” or shifts. Tour 1 worked daily from 6:00 am to 6:00 pm, and Tour 2 worked daily from 6:00 pm to 6:00 am. Each Patterson drilling crew included the driller, derrick hand, motor man, and floor hands. There was also one Rig Manager, working portions of each Tour. The two crews had been on-hitch since January 10, 2018.
- **Company Man.** There were two Company Men working each hitch, assigned to either Tour 1 or Tour 2. The Company Men were RMO’s representatives on the rig. Both Company Men were contracted by RMO.
- **Drilling Engineer.** The drilling engineer was contracted by RMO.

January 11, 2018

Patterson Rig 219 began drilling well 1H-9 on January 11, 2018. By Sunday January 21, 2018, the well had been drilled to 13,435 feet MD. A depiction of the wellbore is shown in Figure 2.

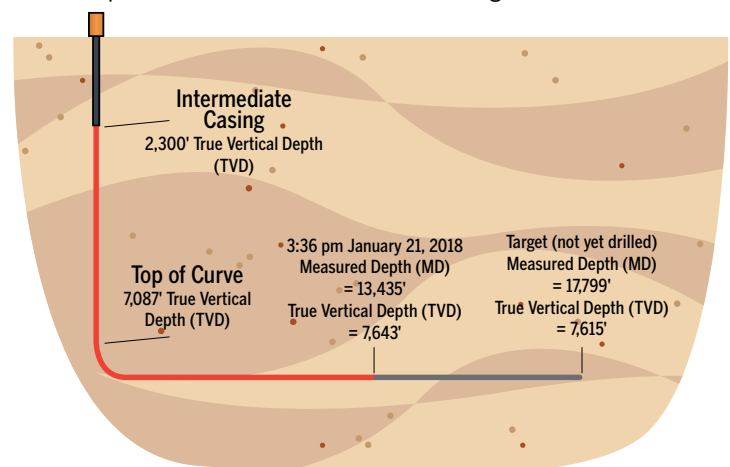


Figure 2. Pryor Trust 0718 1H-9 Well Schematic.

January 21, 2018

At 3:36 pm on January 21, 2018, the Patterson drilling crew stopped drilling (drill bit depth at 13,435 feet MD) so that they could remove the drill pipe from the wellbore to change the drill bit. Removing drill pipe from a wellbore is called “tripping.” The tripping operation began at 6:48 pm.

² Each working 14-day period is called a “hitch.” Patterson crews worked 14 days, then had 14 days off.

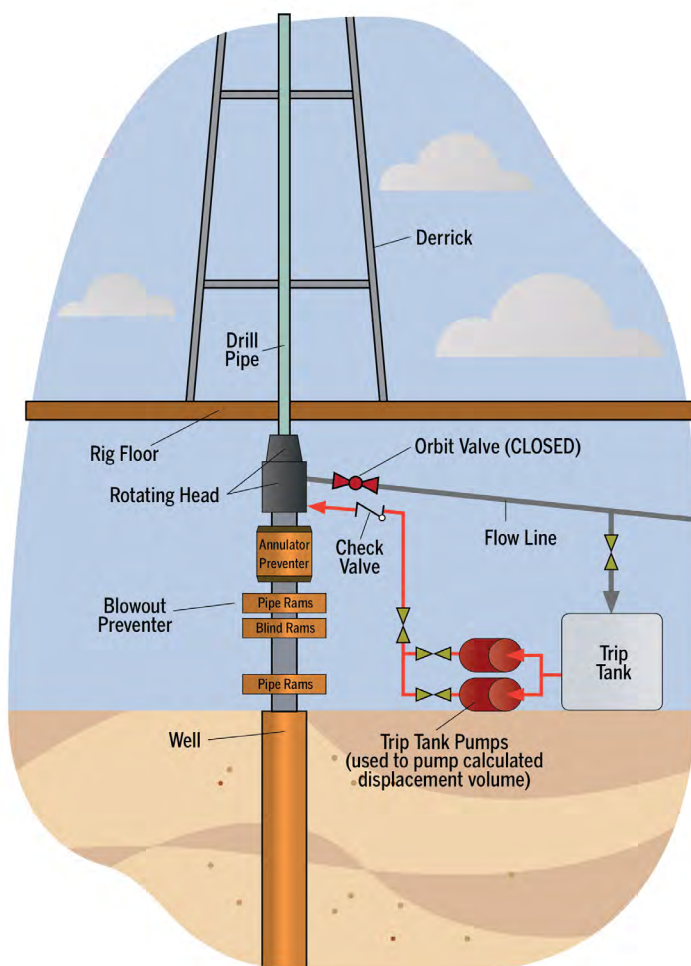


Figure 3. Equipment Configuration During Calculated Fill Tripping Method. Orbit valve was closed, and trip tank pumps were used to pump a calculated volume of mud into the well periodically as drill pipe was removed.

During the first portion of the trip, out of the lateral portion of the wellbore, the Patterson drilling crew performed a tripping method referred to by some Patterson personnel as a “Calculated Fill” method.³ Other Patterson and RMO personnel also referred to this method as a “Force Fill” or “Volumetric Fill” tripping method. The tripping method involved closing an isolation valve in the mud⁴ return Flow Line referred to as the “orbit valve,” and periodically pumping mud into the well intending to replace the calculated volume of the drill pipe removed from the well by turning on and off the Trip Tank pumps (Figure 3). The use of this particular

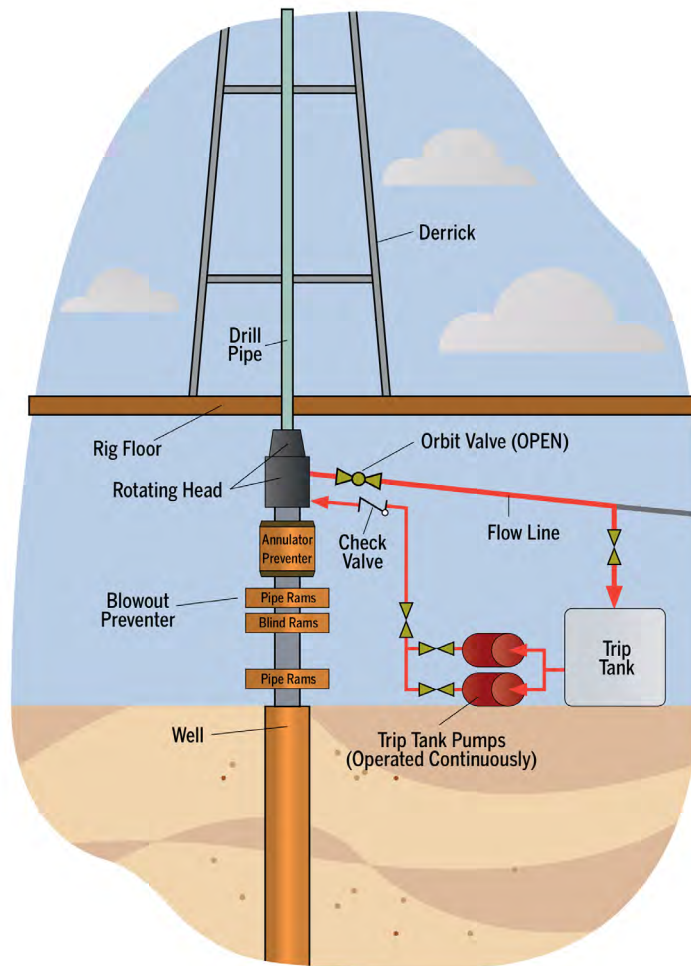


Figure 4. Equipment Configuration During Continuous Fill Tripping Method. Orbit valve was open, and trip tank pumps continuously operated.

tripping method was a group-decision by the drilling engineer, the Tour 1 Company Man, and the Tour 2 Company Man, and was consented to by the Patterson drilling crew and RMO.

At about 10:30 pm, the drill bit reached the top of the curve (Figure 2) during the tripping operation. The drilling crew then circulated the well by pumping mud down the drill pipe and letting the mud return to surface.

January 22, 2018

At 12:35 am on January 22, 2018, the Patterson drilling crew pumped a 46-barrel,⁵ 10-pound-per-gallon weighted pill⁶ above

³ The drilling crew typically performed the “Continuous Fill” tripping method described later in this Factual Update, where the “orbit valve” is left open.

⁴ “Mud” or “drilling mud” is the fluid pumped down the drill pipe during the drilling operation, which then returns to the surface up through the well annulus. The mud returning to the surface flows out of the well and into the “Flow Line” shown in Figure 3 and Figure 4. The mud used for this drilling operation was oil-based mud.

⁵ The volume of the pill pumped was calculated from the decrease in the rig’s Pill Tank volume.

⁶ A “pill” is a finite volume of fluid used for a specific application in the wellbore, for example plugging an area in the wellbore where losses are occurring (“lost circulation material pill”), or for adding hydrostatic pressure to the wellbore (“weighted pill”).

the top of the curve intended to create sufficient additional hydrostatic pressure in the wellbore below the pill to prevent gas influx into the well.

At 1:12 am, the Patterson drilling crew resumed tripping drill pipe out of the vertical portion of the wellbore. During this portion of the tripping operation, the crew used a “Continuous Fill” method, where they continuously circulated mud in the wellbore using the Trip Tank pumps to keep the well full, intending to replace the volume of drill pipe removed with drilling mud. The orbit valve was open for this operation (Figure 4).

Near the beginning of the tripping operation out of the vertical portion of the well, the drill pipe started pulling ‘wet’ (i.e., the drill pipe being removed had not drained and still contained mud). The Patterson drilling crew attempted to pump a weighted ‘slug’⁷ of mud into the drill pipe to push the mud out of the drill pipe and into the annulus. The crew, however, was unable to pump the slug into the drill pipe because the drill pipe was plugged. The crew therefore had to trip drill pipe the rest of the way out of the wellbore with the removed piping sections containing mud.

By 6:10 am, the Patterson drilling crew on the next shift (Tour 1) finished removing the drill string and bottom hole assembly⁸ components (e.g., drill bit) from the wellbore. The driller closed the blowout preventer blind rams. Blind rams are blocks of steel that shut in a well when there is no drill pipe in the wellbore.

At 7:57 am, the driller opened the blowout preventer blind rams.

At 7:58 am, the driller lowered a new bottom hole assembly into the wellbore. At 8:09 am, the Patterson drilling crew turned on the mud pumps, pumping mud through the bottom hole assembly to test the equipment.

7 A “slug” is a dense volume of mud that is used to push mud downward and out of the top part of a drill string. The use of a slug allows drill pipe that is being removed from the drill string during a tripping operation to be empty of mud. When, instead, the drill pipe segments being removed from a drill string contain mud, the mud from the removed drill pipe segment empties out once the segment is disconnected from the drill string. Rigs often use a “mud bucket” to collect mud from removed drill pipe segments for re-use.

8 The bottom hole assembly is the bottom part of the drill string consisting of various equipment including the drill bit.

Between 7:57 am and 8:35 am while testing the equipment, the mud pits gained 107 barrels of mud. Mud pit gains are an indication of a possible gas influx in the well. Pit gains can signal that gas may have entered or expanded inside of the wellbore, pushing mud out the top of the well, through the Flow Line, and into the rig’s mud pits.

At 8:35 am, with testing complete, the driller lifted the bottom hole assembly out of the wellbore. A Patterson drilling crew member observed mud flowing out of the open blowout preventer stack.

Rig data obtained by the CSB indicates that conditions existed that could have allowed a gas influx into the wellbore beginning during the tripping operation. The rig data and analysis will be explained in detail in the CSB final report on the incident.

At 8:36 am, after the bottom hole assembly was removed from the wellbore, mud blew upwards out of the well. The motor man and a floor hand, who were on the rig floor, entered the driller’s shack. The gas and oil-based mud from the well subsequently ignited creating a large fire.

It is unknown at this point if the driller attempted to activate the controls to close the blowout preventer after the blowout began. Shortly after the blowout began, at least two personnel reportedly attempted to operate the accumulator that functions the blowout preventer. The blowout preventer blind rams did not fully close.

A team of Boots & Coots responders (a well control services company) and RMO personnel manually closed the blowout preventer blind rams to shut in the well at about 4:00 pm on January 22, 2018. Shutting in the well stopped the fire.

All five personnel who were in the driller’s shack or ran into the driller’s shack during the blowout and fire were killed. Those personnel included the Company Man (contracted by RMO), directional driller (Skyline Directional Drilling), driller (Patterson), floorhand (Patterson), and motor man (Patterson).

The investigation is ongoing. The CSB is conducting a root cause analysis of this incident and will publish a detailed report of findings and recommendations at the conclusion of the investigation.