
Multizone Frack Case Study

Eliminated all NPT associated with a close ABOP on 8 wells.



High Point Challenges



Challenges (degradation of the annular elastomer)

- 1. Thermal Expansion and Contraction** - Prior to a Fracking job, max weight (Approximately 60K-80Klbs) must be set down on the service tool before closing the annular to prevent the service tool from being pumped out of the packer. As the cooler fluid is pumped down the workstring and into the formation, the workstring begins to thermally contract or shrink. The contraction of the pipe reduces the set down weight on the packer and will result in the service tool being hydraulically pumped out. To avoid the pump out, more weight must be added. The closed annular hinders the attempt to add more weight increasing the chances for a pump out. This is more critical on 7-3/4 jobs as the inner work string cannot support compression very well, so when adding weight to service tool, is important to know the weight transfer is accurate so not to buckle the inner work string. XACT data has also proved it is possible to set down 50K at surface with 0 weight transfer to service tool.
- 2. Mini-Frack Challenges** – After a mini-Frack, the formation maybe charge preventing operations from going into the main Frack. This is because of the inability to move the pipe due to the annular friction on the workstring. It can take several hours for the formation pressure to bleed off.
- 3. Tool Positioning Challenges** –
 - a. Weight Indications** - Tool position is key during a Frack job. Tool positioning must be accurately maintained throughout the Frack job and at many different stages. The main indication of tool positioning is weight changes or indications seen on the weight indicator. Since the annular is closed on the workstring, the weight indicator becomes masked and very difficult to get an accurate weight due to the friction between the pipe and the annular. During pipe movement, the graph or hand (depending on style) jumps from one extreme to another making it hard to pinpoint an indication. This often leads to wrong tool positioning.
 - b. Pipe Movement** – Once the annular is closed for the Frack job, the annular friction will negate the pipe movement below a closed annular. Meaning the pipe is moving at surface but not below a closed annular. This can cause wrong tool positioning, parted, and buckled pipe. When enough force is applied, the workstring can overcome the friction and slide causing a multitude of problems. If the BHA becomes stuck, it is not possible to pinpoint the exact location of the stuck pipe.
- 4. Tool Joint Issues** – Some intervals of pipe movement (*Picking up to reverse*) are becoming longer because the depths of the wells are getting deeper and higher pump rates require more set down weight. Therefore, it is getting much more difficult to space out a tool joint such it does not encounter a closed annular. After accounting the footage for stretching, weight down on the service tool length, length added for thermal contraction, and effective pick up, there is very little length left of range 3 drill pipe before the tool joint. Accompanied by the limited space out pup lengths and meshing with 3-6 other zones that must be spaced out at the same time, the tool joint encounters have an increase potential.
- 5. Pressure** – The workstring is not able to be moved with high pressure. Stripping down with any pressure is a challenge. In many cases the pressure must relieve itself to formation or the rig will have to slowly bleed the pressure down before pipe movement can take place. There are cases where the annular closing pressure was relaxed to move the pipe ending with wellbore fluid in the riser.

Solutions Only Possible with APT

Solution (degradation to the annular elastomer is eliminated)

To deploy the Deltascope APT System to eliminate all challenges associated with a closed annular. The system includes an isolation sleeve in which the annular is closed on and an inner mandrel that replaces the workstring that would have otherwise been stripping in the annular. This method eliminates all tool joints encounters with the closed annular and all friction due to the closed annular. The results below come from a solid 10 Frack job history with 6 consisting of a multizone Frack system. The added benefit to this solution is there is no added wear to the annular elastomer.

1. Thermal Expansion and Contraction

Existing Solutions – There are no other known solutions. Range 3 drill pipe and Lube would not be considered a solution for this challenge even though they may have been utilized for the Frack Job and located in the annular.

How is the Existing Solution Working? – N/A

Solution – Deltascope APT

Results – XACT telemetry tools have proven, when using the APT, the weight set down at surface vs downhole closely matches the WellCat modeling to the point telemetry is not required going forward as the results are now proven with the APT in place.

2. Mini Frack Challenges

Existing Solutions - There are no other known solutions. Range 3 drill pipe and Lube would not be considered a solution for this challenge even though they may have been utilized for the Frack Job.

How is the exiting Solution Working? - N/A

Solution – Deltascope APT

Results – With the formation charged after the mini Frack, operations were able to continue to the main Frack. This is because the Deltascope can stroke up or down friction free with extreme pressures on the backside. Something only possible with the Deltascope APT.

RealTime Answers

3. Tool Positioning Challenges

a. Weight Indications

Existing Solutions – There are no other known solutions. Range 3 drill pipe and Lube would not be considered a solution for this challenge even though they may have been utilized for the Frack Job.

How is the exiting Solution Working? – N/A

Solution – Deltascope APT

Results – Tool position indicators are noticed in real time with great accuracy. With the backside pressurized, snap in and snap out can be observed on the weight indicator. The seals have been observed engaging on the mandrel of the Frack BHA downhole at 2000lbs. Something only possible with the Deltascope APT.

b. Pipe Movement

Existing Solutions – 1. To lubricate the workstring area in which the annular will be closed prior to entering the wellbore.
2. Range 3 Drill Pipe

How is the exiting Solution Working? – The same challenges exist while utilizing lube and range 3 drill pipe.

Solution – Deltascope APT

Results – Pipe movement is not affected utilizing the Deltascope APT. It has been recorded that pick up and slack off weights change very little with the annular closed vs open. This is in part due to the lost weight of the housing once located in the annular(2200lbs). With 10,000 psi differential, the workstring can easily be worked the entire length of the derrick. Once a service tool became stuck, within less than 10 minutes it was verified and successfully pulled free with max overpull.

Completely Eliminate Challenges

4. Tool Joint Issues

Existing Solutions – Range 3 drill pipe

How is the existing Solution Working? – Range 3 drill pipes used to be effective in limiting the number of tool joint encounters. Since the length of pick up needed has increased, the number of tool joint encounters has increased.

Solution – Deltascope APT

Results – Tool joint encounters have been eliminated when deploying the Deltascope APT System. Since the system does not have tool joints, the workstring can be run in and out the wellbore for thousands of feet with the annular closed and never have a tool joint encounter.

5. Pressure

Existing Solutions – There are no other known solutions. Range 3 drill pipe and Lube would not be considered a solution for this challenge even though they may have been utilized for the Frack Job and located in the annular.

How is the Existing Solution Working? – N/A

Solution – Deltascope APT

Results – The workstring has been picked up with 7000 psi to reverse position and lowered with 2500 psi on previous jobs. The BHA was run in the wellbore 256' to shift MSV sleeve with 600 psi on the annulus while saving losses with the annular closed. Only possible with the Deltascope APT.