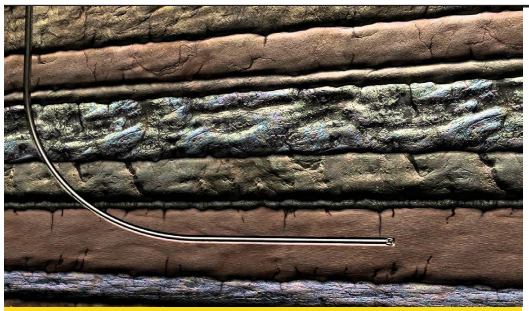
UTEX INDUSTRIES, INC.
CASE STUDY

Haynesville Pressure Pumping Company Improves Pump Reliability and Lowers Operating Costs

The use of Core-X® Tungsten Carbide Coated Plungers instead of Nickel Plungers helped improve operational efficiency while reducing downtime and total cost of ownership in the Haynesville Shale



CHALLENGE

- Improve pump reliability and operational efficiency for a Haynesville Pressure Pumping Company that stimulates in excess of 9,000 psi

SOLUTION

- Review proper packing installation procedures
- Utilize a more abrasive resistant packing and plunger combination (UTEX's XLH®/SuperGold® Packing assembly and Core-X® Tungsten Carbide Coated Plungers)

RESULTS

- Improved pump reliability from 4 stages to 22 stages with zero maintenance and downtime related to UTEX provided fluid end expendables
- Reduced total operating cost

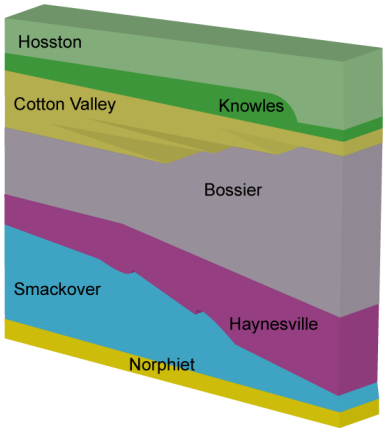
OVERVIEW

A Haynesville Pressure Pumping Company (PPC) out of Shreveport, Louisiana was unable to achieve more than 4 stages or approximately 15 hours of pumping time without fluid end expendable related failures/maintenance issues. Considering the high pressure, high volume pumping necessary for the Haynesville Shale, and the expendables utilized not designed for such extreme applications, UTEX was able to improve pump reliability to 22 stages or 82.50 accumulated hours.

CHALLENGE

The Haynesville Shale is an organic-rich shale that encompasses Southwestern Arkansas, Northwest Louisiana, and East Texas. At depths of 10,500 to 13,000[1] feet, the Haynesville is overlain by the Cotton Valley group made up of sandstone and underlain by the Smackover Formation made up of limestone (Figure 1). Due to the impenetrable rock layers capping the Haynesville, the breakdown of organic material into gas remains trapped in the source rock. This entrapment of gas creates abnormally high reservoir pressure and temperature[2].

Figure 1 Stratigraphy of the Haynesville Shale



As the deepest, hottest, and most pressurized shale among the four other big shale plays, the Haynesville will reach up to .72 - .90[2] psi/ft and temperatures greater than 300° F[2]. With this information in mind, most pressure pumping companies utilize wellhead treating pressures during stimulation that commonly exceed 10,000 psi. The PPC out of Shreveport was pumping at 11,250 psi with generic fluid end expendables — these generic expendables were breaking down, leading to fluid end maintenance every 15 hours.

SOLUTION

The source of the premature expendable failure was the use of general purpose packing and nickel chromium plungers — both unsuitable for such high pressure and volume applications. UTEX replaced these with premium XLH®/SuperGold® packing and Core-X® Tungsten Carbide Coated Plungers, both which have had proven success in operating pressures over 9,000 psi. UTEX also provided on-site expendable installation training, educating the equipment operators of the proper installation and maintenance methods to ensure maximum life and performance out of their pumps.

UTEX's premium packing set (style 2108) consists of the patented fabric reinforced XLH® X-Tended Life Header Ring made to have higher resistance to 100 mesh sand, ceramic proppant, CO_2, cementing, and hydrocarbon based fluids. The set also includes two SSF double stacked SuperGold® pressure rings. The Core-X® Tungsten Carbide Coated Plungers were utilized instead of regular nickel chromium plungers due to the alloy's increased hardness with the W_c Tungsten Matrix which allows for increased abrasion resistance and high erosion resistance.

CONCLUSION

The pump outfitted with UTEX 2108 packing and Core-X® tungsten carbide plungers completed 22 stages / 82.50 pumping hours at 11,250 psi with a total of 12.6 million pounds (average of 575,000 pounds per stage) with zero downtime for expendable maintenance (Table 1). Comprehensive knowledge of the Haynesville Shale/pumping environment, the usage of high performance UTEX expendables, and thorough education on expendable installation and maintenance resulted in a significant improvement of the PPC's pump reliability, lowering the total cost of ownership.

Table 1 Pump's overall performance analyzed per stage

STAGE NO	POUNDS OF SAND PER STAGE	AVG PUMPING PRESSURE	ACCUMULATED PUMPING TIME
1	524,841.00 lbs	11,250 PSI	3.75 Hours
2	554,800.00 lbs	11,250 PSI	7.50 Hours
3	565,000.00 lbs	11,250 PSI	11.25 Hours
4	625,710.00 lbs	11,250 PSI	15.00 Hours
5	565,214.00 lbs	11,250 PSI	18.75 Hours
6	542,000.00 lbs	11,250 PSI	22.50 Hours
7	533,928.00 lbs	11,250 PSI	26.25 Hours
8	545,780.00 lbs	11,250 PSI	30.00 Hours
9	657,142.00 lbs	11,250 PSI	33.75 Hours
10	575,000.00 lbs	11,250 PSI	37.50 Hours
11	575,571.00 lbs	11,250 PSI	41.25 Hours
12	616,071.00 lbs	11,250 PSI	45.00 Hours
13	574,850.00 lbs	11,250 PSI	48.75 Hours
14	575,800.00 lbs	11,250 PSI	52.50 Hours
15	569,750.00 lbs	11,250 PSI	56.25 Hours
16	645,712.00 lbs	11,250 PSI	60.00 Hours
17	535,560.00 lbs	11,250 PSI	63.75 Hours
18	575,428.00 lbs	11,250 PSI	67.50 Hours
19	535,046.00 lbs	11,250 PSI	71.25 Hours
20	645,712.00 lbs	11,250 PSI	75.00 Hours
21	535,285.00 lbs	11,250 PSI	78.75 Hours
22	575,800.00 lbs	11,250 PSI	82.50 Hours
TOTAL	**12,650,000 lbs**		

Application Details

- 22 Total Stages Completed
- 11,250 psi Average Pumping Pressure
- 75 BPM (Barrels Per Minute) Flow Rate
- 20% 100 Mesh Proppant
  80% 40/70 Proppant
- 12.6 Million Pounds of Proppant Down hole

Inspection Details

- After 22.50 hours plungers showed minimal to no wear (Figures 2 & 3)
- Figure 4 illustrates a nickel plunger that was operated with UTEX's patented XLH®/Super-Gold® packing. Although the XLH® Header Ring was able to withstand the higher pumping pressure in the Haynesville shale much longer than a regular header ring, the nickel plunger started to score and eventually lead to premature pump maintenance. It is highly recommended that the XLH®/Supergold® packing is used in conjunction with the Core-X® Tungsten Carbide Coated Plungers for high pressure/ severe applications.

Figure 2

Figure 3

Figure 4

Endnotes
[1] United States, Congress, Office of Fossil Energy and National Energy Technology Laboratory, et al. Apr. 2009. www.dnr.louisiana.gov/assets/docs/mineral/haynesvilleshale/ShaleGasPrimer2009.pdf.
[2] Kaiser, Mark J., and Yunke Yu. "LOUISIANA HAYNESVILLE SHALE—1: Characteristics, Production Potential of Haynesville Shale Wells Described." Oil & Gas Journal, www.ogj.com/articles/print/volume-109/issue-49/exploration-development/louisiana-haynesville-shale-p1.html.

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