Pumpdown Wiper Technology Reduces Water Consumption, Increases RIH Speeds, and Minimizes Operational Risk

Overview

Operators in the Bakken and Rockies regions face increasing pressure to improve completion efficiency while reducing water usage and minimizing nonproductive time. Water costs in these areas can range from $2 to $4 per barrel, making fluid consumption during plug deployment a significant expense. To address these challenges, KES incorporated improved pumpdown wiper technology into the sKDP frac plug lineup. The design enhancement reduces fluid bypass around the plug, enabling lower water consumption, higher run-in-hole speeds, and reduced risk of pre-setting plugs. Field results have demonstrated substantial savings in water costs and completion time while providing operators with greater confidence during plug deployment.

Challenges

- Frac plug deployments in 4 to 5 mile laterals often require large fluid volumes due to the long pumpdown distances involved.
- Operators often encounter unknown downhole conditions during the first stage of each well. Factors such as severe doglegs, casing ovality, leaks, and wellbore tortuosity can negatively impact wireline run-in-hole performance. Excessive fluid bypass during slow pumpdown conditions can increase element swabbing and, in severe cases, lead to premature plug setting, resulting in nonproductive time and potential fishing operations.
- Many operators performing zipper-frac operations also experience delays while waiting for wireline to complete plug deployments before frac stimulation can resume. These delays increase overall completion costs.

Solution

KES introduced pumpdown wiper technology to the sKDP degradable frac plug lineup to improve pumpdown efficiency during plug deployment. The pumpdown wiper reduces fluid bypass around the plug, allowing more hydraulic energy to be transferred to the bottom-hole assembly. This enables operators to:

- Reduce water consumption.
- Increase RIH speeds.
- Reduce wireline-related delays.
- Minimize the risk of pre-setting.
- Improve overall completion efficiency.

sKDP Features

- PGA based plug
- Traditional Frac Plug Design
  - Dual Slips
  - Large Sealing Element
  - Bottom Set Plug
- Max differential pressure of 10,000 psi
- Optimized pumpdown speeds
- BHT range of 150F – 450F
- Ball-in-place and pumpdown ball options

CASE STUDY DATA

PLUG LOCATION
Full Wellbore

WATER TYPE
Fresh Water

OPERATOR 1 PAD DATA

REGION
Bakken

CASING SIZE
4.5'' 13.5#

STAGE COUNT
142 Stages

LATERAL LENGTH
4 MILE LATERAL

BOTTOM HOLE TEMPERATURE
220 F

Run-in-Hole Speeds
17 bpm, 900 ft/min

OPERATOR 2 PAD DATA

REGION
Rockies

CASING SIZE
5.5'' 20#

STAGE COUNT
86 Stages

BOTTOM HOLE TEMPERATURE
290 F

Run-in-Hole Speeds
36 bpm, 1,500 ft/min

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Field Results

Approximately 40% Reduction in Water Consumption

- A Bakken operator compared toe-stage deployments with and without pumpdown wipers. Without a pumpdown wiper, approximately 750 bbl of water were required to pump the plug to target depth. After incorporating the pumpdown wiper, water requirements decreased to approximately 400 bbl. This represented a reduction of nearly 350 bbl, or approximately 40%. With water costs ranging from $2 to $4 per barrel, the reduction translated into savings of approximately $700 to $1,400 during toe-stage operations. In many applications, these savings effectively offset the cost of the frac plug itself.

Increased sKDP Run-In-Hole Speeds

- Several operators in the Bakken routinely deploy 3.62-in. sKDP frac plugs at pump rates of 17-18 bpm while achieving RIH speeds between 900 and 1,200 ft/min. A separate operator in the Rockies previously established record deployment performance for KES using the 4.37-in. sKDP plug by pumping at 36 bpm and achieving RIH speeds of 1,500 ft/min+. The addition of pumpdown wiper technology further improves pumpdown efficiency, allowing operators to maximize pumpdown performance while reducing fluid consumption.

Reduced Frac Downtime

- In zipper-frac operations, delays in wireline operations can prevent frac crews from beginning the next stage, resulting in costly idle time. One Bakken operator reported that increased RIH speeds achieved with the pumpdown wiper reduced wireline-related delays by approximately 45 minutes per stage. Considering the high daily cost of frac day rates, these time savings can significantly reduce overall completion costs.

Reduced Risk of Pre-setting the Plug

- Unknown wellbore conditions during the first stage of a well can force wireline operations outside the recommended pumpdown envelope. Excessive fluid bypass around the plug may increase element swabbing and elevate the risk of pre-setting. By reducing fluid bypass, the pumpdown wiper helps maintain favorable pumpdown conditions and provides operators with greater confidence when deploying plugs in challenging well conditions.

Economic Impact

Field experience with pumpdown wiper technology has demonstrated measurable benefits, including:

Benefit	Impact
Water Consumption	Approximately 350 bbl per toe-stage run
Water Cost Savings	$700-$1,400 per stage (toe section)
Run-in-Hole Speeds	Up to 1,500 ft/min
Frac Downtime Reduction	Up to approximately 45 minutes per stage
Operational Risk	Lower likelihood of plug presets due to harsh pumpdown conditions
Overall Efficiency	Reduced completion costs

Value Delivered

By incorporating pumpdown wiper technology into the sKDP degradable frac plug, operators in the Bakken and Rockies have been able to reduce water consumption, increase deployment speeds, minimize frac downtime, and lower operational risk. The combination of lower fluid requirements and improved pumpdown performance provides operators with a practical method of reducing total well costs while improving completion efficiency.

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