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- HZ Well Design Workflow
- Halliburton Unconventional Completion systems
- Multistage Completions Solutions
- Halliburton RapidSuite™ sleeve Technologies
- Reliable Zonal Isolation
- Run History

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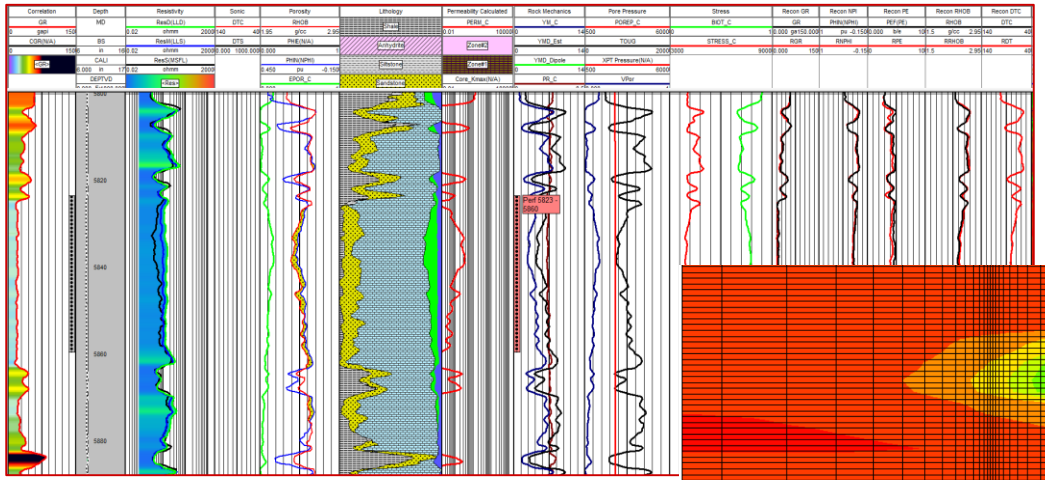
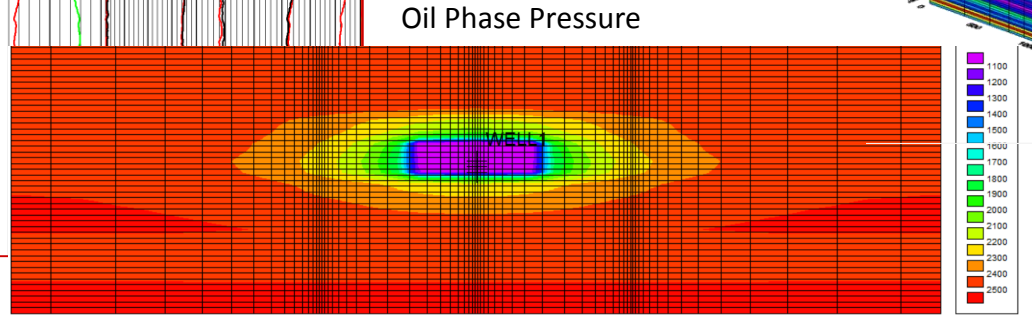
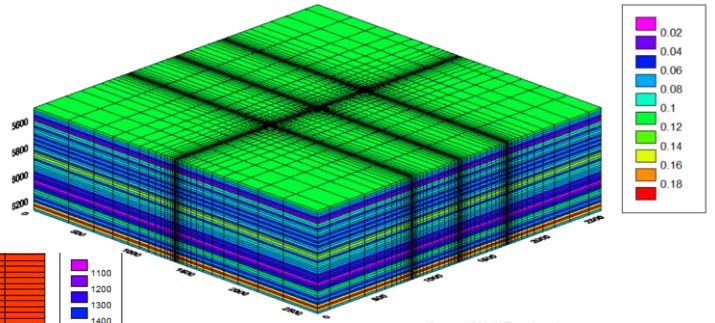
Well Design

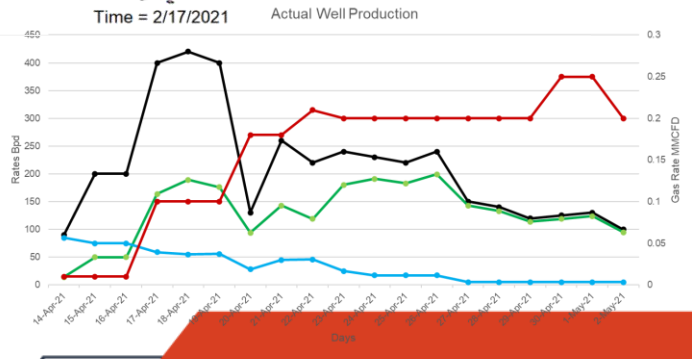
Vertical well evaluation

- Vertical well “Pilot hole” petrophysical/ geo-mechanical interpretation identifying sweet spots for stimulation.
- Production history matching through reservoir modeling “Quiklook” for performance evaluation.
- Stimulation design for vertical well & post job production matching.









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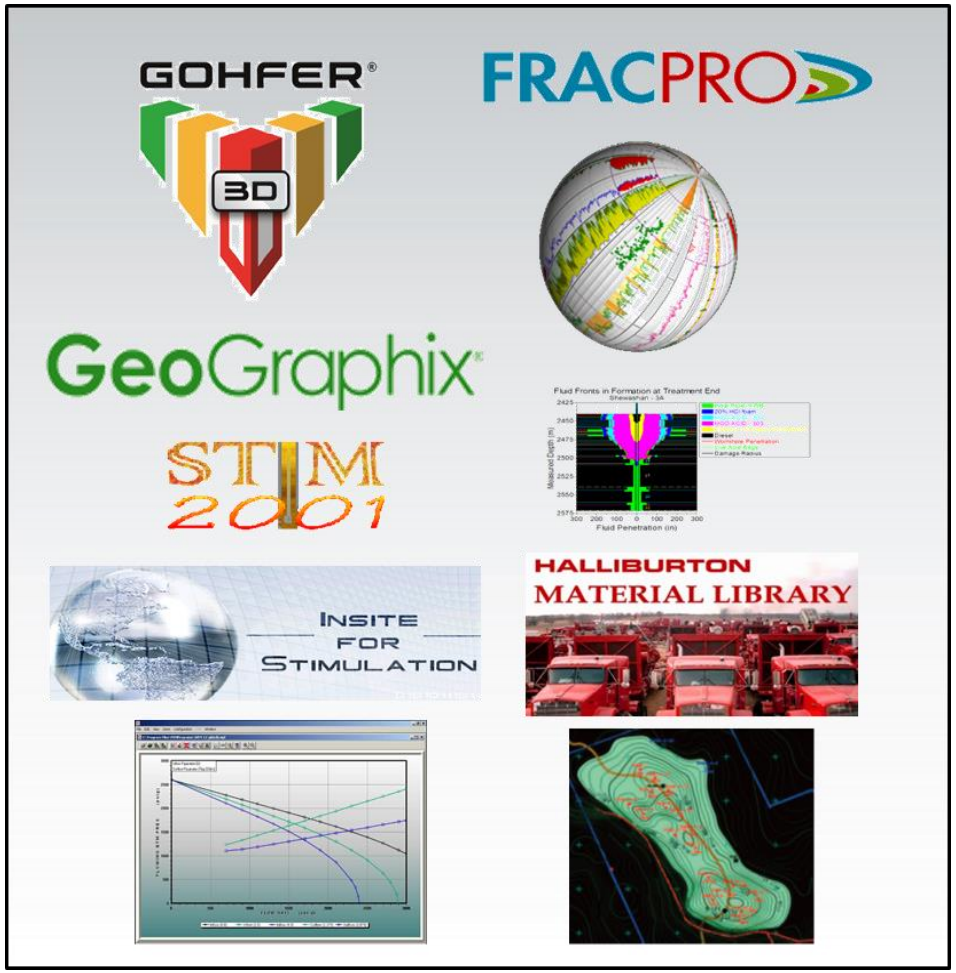
Well Design

HZ Well Design and Sensitivity

-
  - valuating vertical well based on:
    - » . logs
    - » roduction history
    - » \eservoir evaluation for . .
  - he process includes different software packages to get a

- ensitivity conducted for . well based on different parameters:
  - . umber of frac stages
  - . ateral length
  - pacing
  - erforation lusters



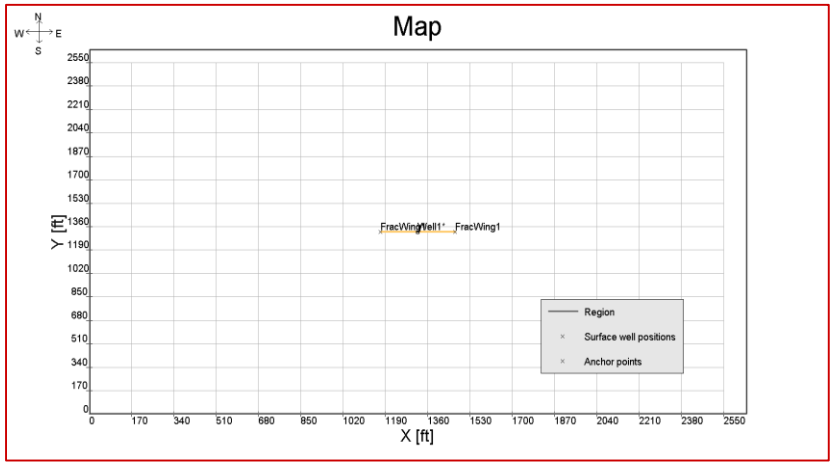
Well Design

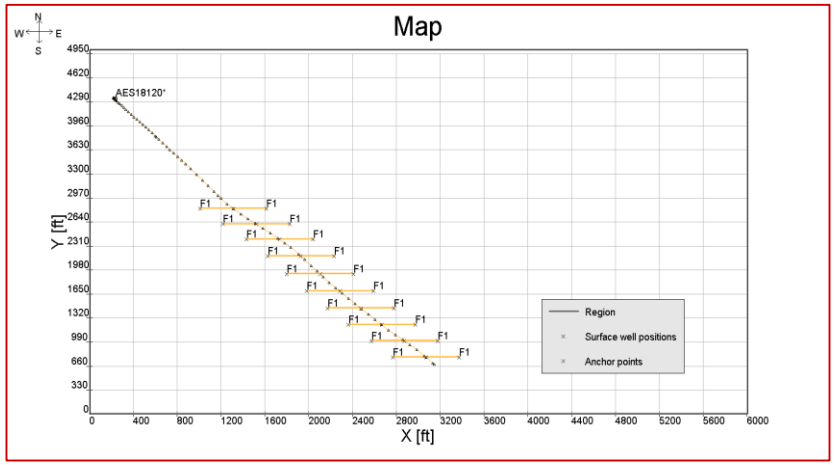
NPV For Vertical, HZ and Cluster Well

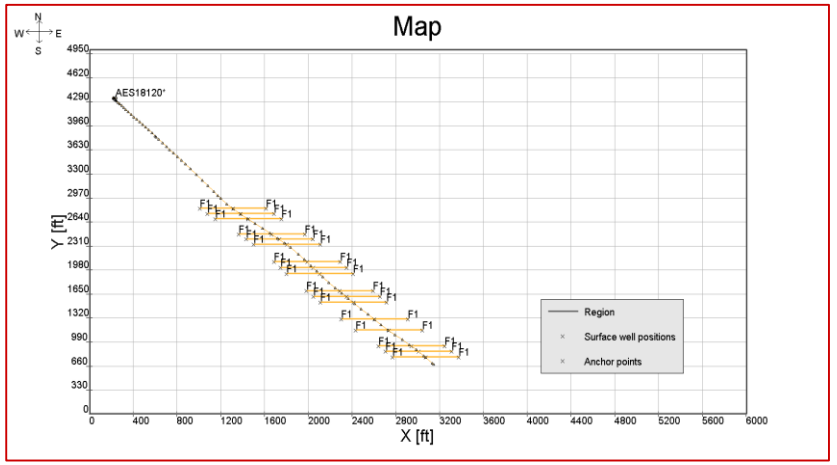
NPV	$17,102,624.9	
Oil Revenue ($)	17353275.47	0.63
Gas Revenue ($)	10024472.46	0.37
Total Reveue ($)	27377747.93	
Gas OPEX ($)	3330389.52	
Oil OPEX ($)	4072087.08	
Fixed Cost + CAPEX	246000.00	
Unit Gas Cost ($/Mscf)	1.03	
Unit Oil Cost ($/bbl)	16.30	
Gas Cumm	3330389.52	
Oil Cumm	259352.50	
BOE	814417.42	
$/BOE	0.30	

NPV	$22,047,546.3	
Oil Revenue ($)	30342569.61	0.97
Gas Revenue ($)	780651.01	0.03
Total Reveue ($)	31123220.62	
Gas OPEX ($)	259352.50	
Oil OPEX ($)	2483543.73	
Fixed Cost + CAPEX	1596000.00	
Unit Gas Cost ($/Mscf)	1.15	
Unit Oil Cost ($/bbl)	8.91	
Gas Cumm	259352.50	
Oil Cumm	453483.33	
BOE	496708.75	
$/BOE	3.21	

NPV	$183,078,351.3	
Oil Revenue ($)	240096699.23	0.98
Gas Revenue ($)	5045074.59	0.02
Total Reveue ($)	245141773.82	
Gas OPEX ($)	1676104.52	
Oil OPEX ($)	19338518.76	
Fixed Cost + CAPEX	2796000.00	
Unit Gas Cost ($/Mscf)	1.03	
Unit Oil Cost ($/bbl)	6.15	
Gas Cumm	1676104.52	
Oil Cumm	3588353.00	
BOE	3867703.75	
$/BOE	0.72	







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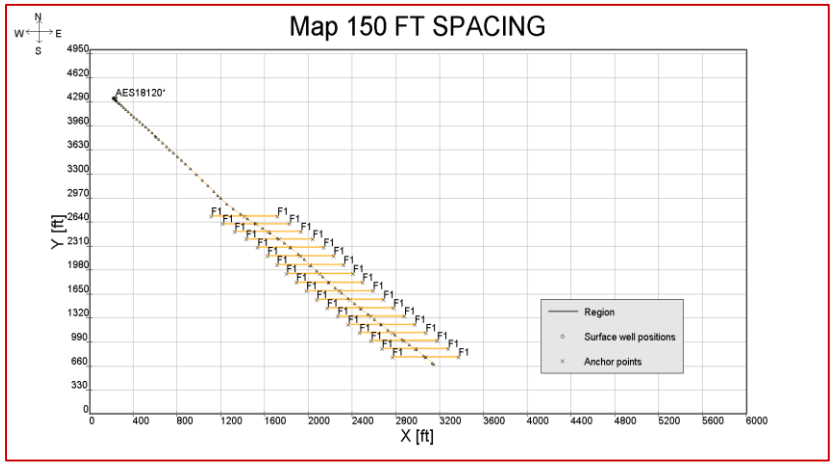
Well Design

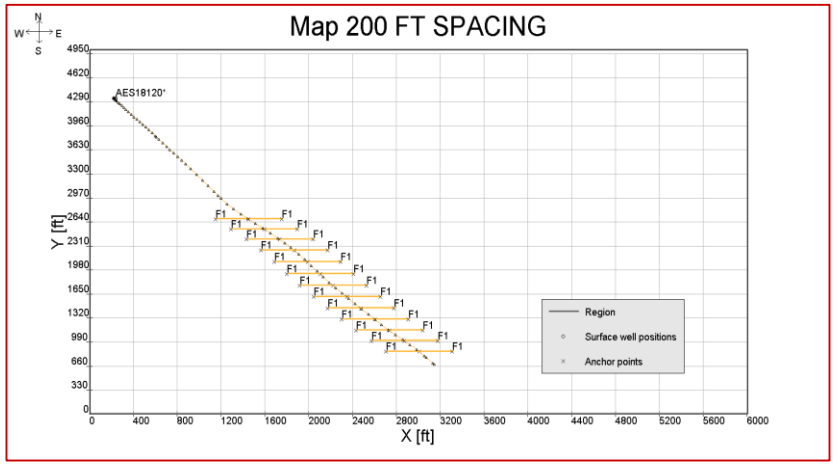
NPV For HZ Different Spacing 150,200 and 300 ft

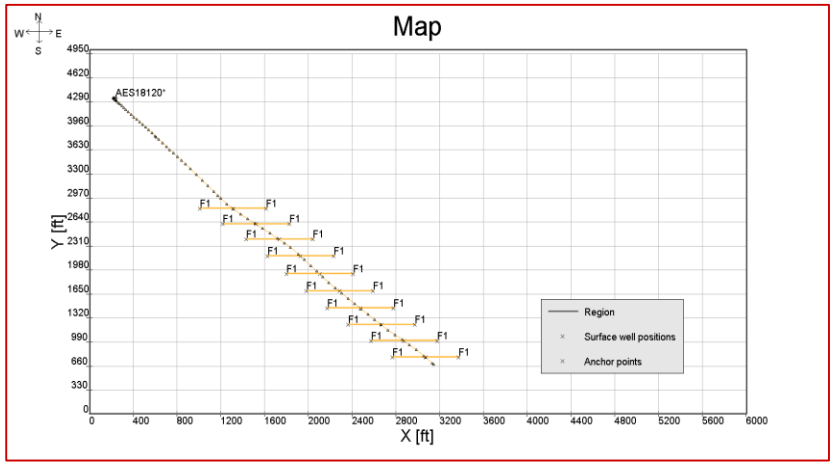
NPV	$185,322,105.2	
Oil Revenue ($)	242991944.44	0.98
Gas Revenue ($)	5174945.30	0.02
Total Reveue ($)	248166889.75	
Gas OPEX ($)	1719250.93	
Oil OPEX ($)	19590827.81	
Fixed Cost + CAPEX	2946000.00	
Unit Gas Cost ($/Mscf)	1.04	
Unit Oil Cost ($/bbl)	6.19	
Gas Cumm	1719250.93	
Oil Cumm	3631623.74	
BOE	3918165.56	
$/BOE	0.75	

NPV	$177,798,197.4	
Oil Revenue ($)	232407675.69	0.98
Gas Revenue ($)	4857825.83	0.02
Total Reveue ($)	237265501.52	
Gas OPEX ($)	1613895.62	
Oil OPEX ($)	18712098.47	
Fixed Cost + CAPEX	2046000.00	
Unit Gas Cost ($/Mscf)	1.03	
Unit Oil Cost ($/bbl)	5.96	
Gas Cumm	1613895.62	
Oil Cumm	3473437.09	
BOE	3742419.69	
$/BOE	0.55	

NPV	$173,358,321.0	
Oil Revenue ($)	226830906.51	0.98
Gas Revenue ($)	4580350.80	0.02
Total Reveue ($)	231411257.31	
Gas OPEX ($)	1521711.23	
Oil OPEX ($)	18218541.54	
Fixed Cost + CAPEX	1596000.00	
Unit Gas Cost ($/Mscf)	1.02	
Unit Oil Cost ($/bbl)	5.84	
Gas Cumm	1521711.23	
Oil Cumm	3390089.77	
BOE	3643708.31	
$/BOE	0.44	







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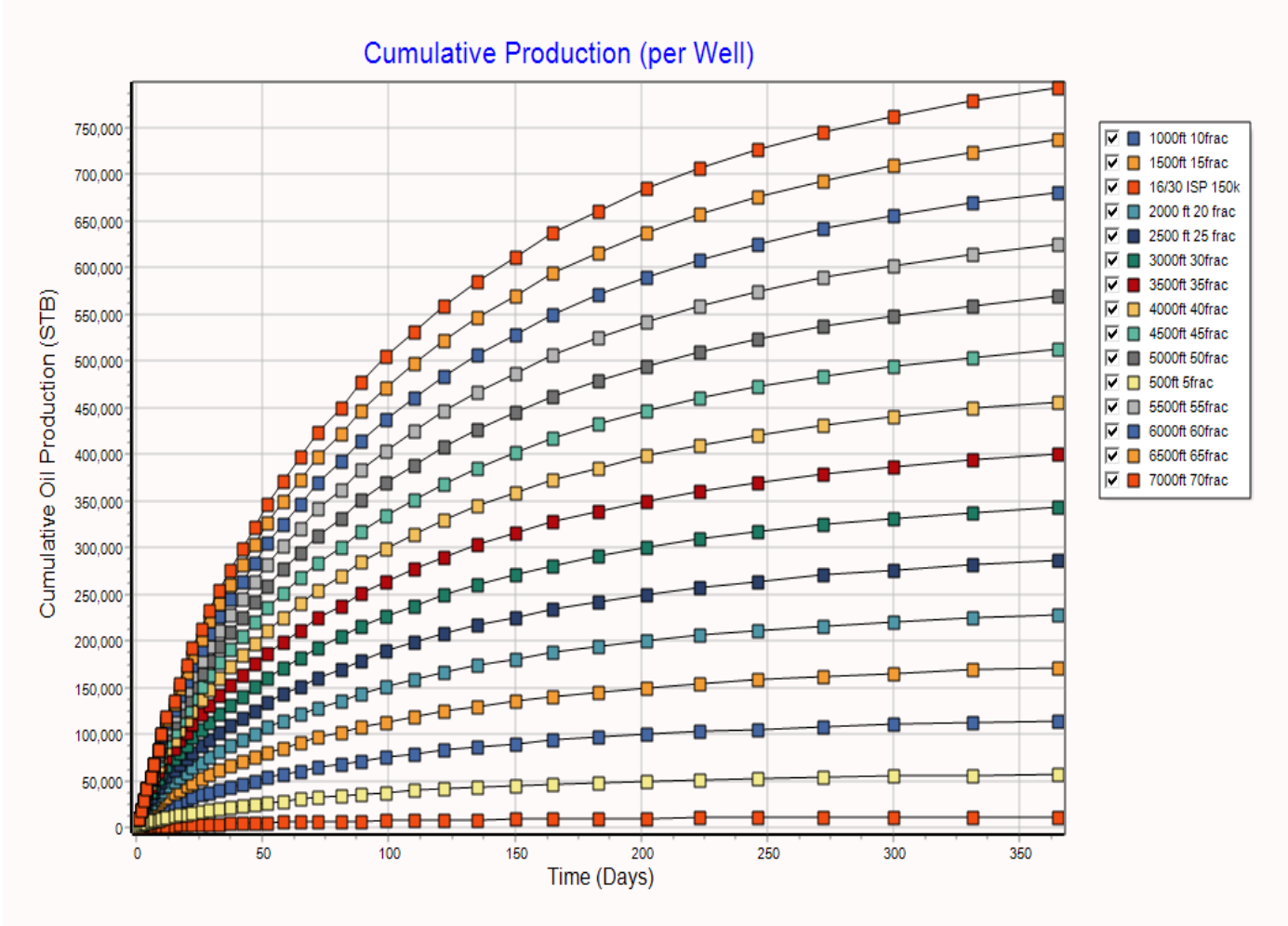
Well Design

Lateral Length Sensitivity

- Different Lateral Lengths are compared with constant frac Spacing.
- Drainage area is kept constant.
- Reservoir properties and PVT properties are kept constant based on actual well data.



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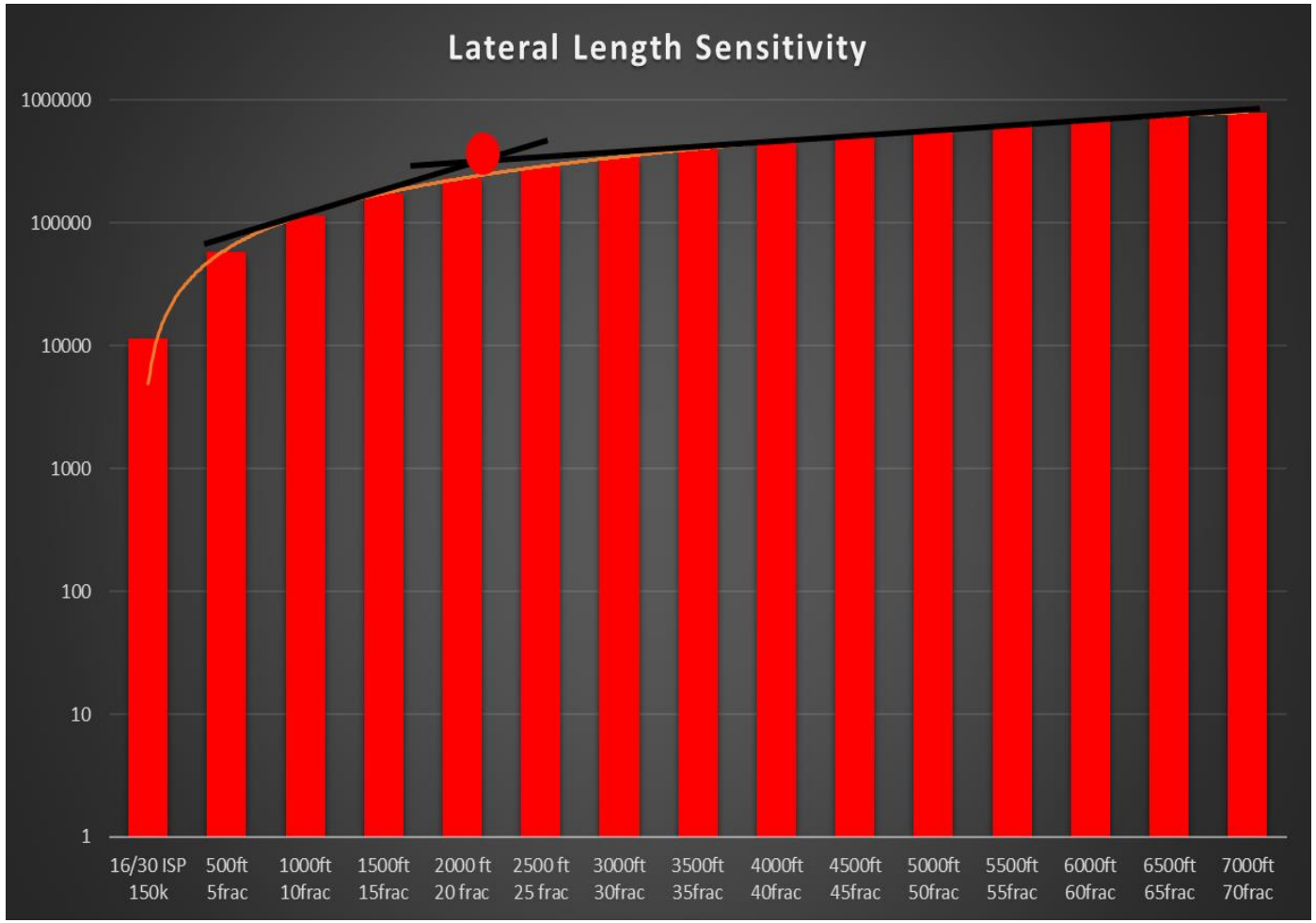
Well Design

ateral ength ensitivity

- Cumulative production for different scenarios are plotted in a logarithmic scale.
- Tangents are used to identify most economic option among the given scenarios.



alliburton nconventional ompletion

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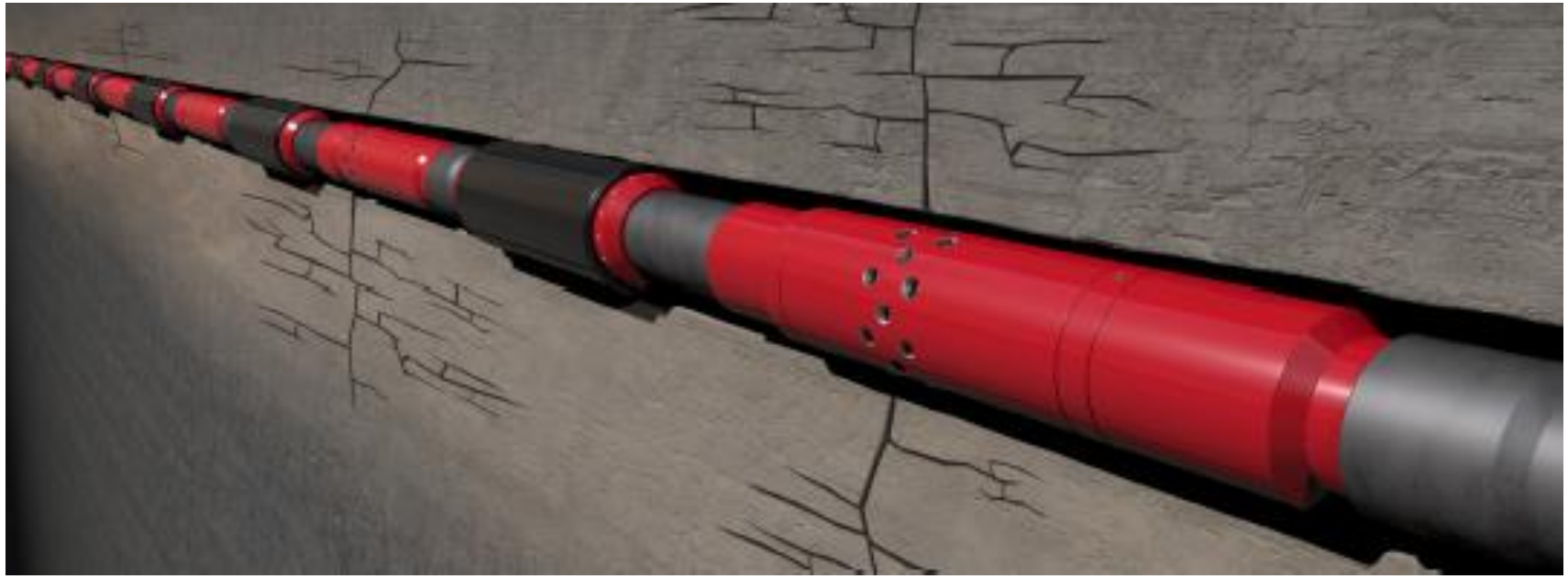
Halliburton Unconventional Completion systems

- alliburton nconventional ompletion systems provide a wide range of technologies to meet these challenges. rom as rill® \apidtage® sleeves, alliburton can tailor the completion to provide the best fit for your reservoir requirements.



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alliburton \apiduite™ sleeve echnologies

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Frac Sleeve Systems Make It Easy to Do More with Less

- alliburton \apiduite™

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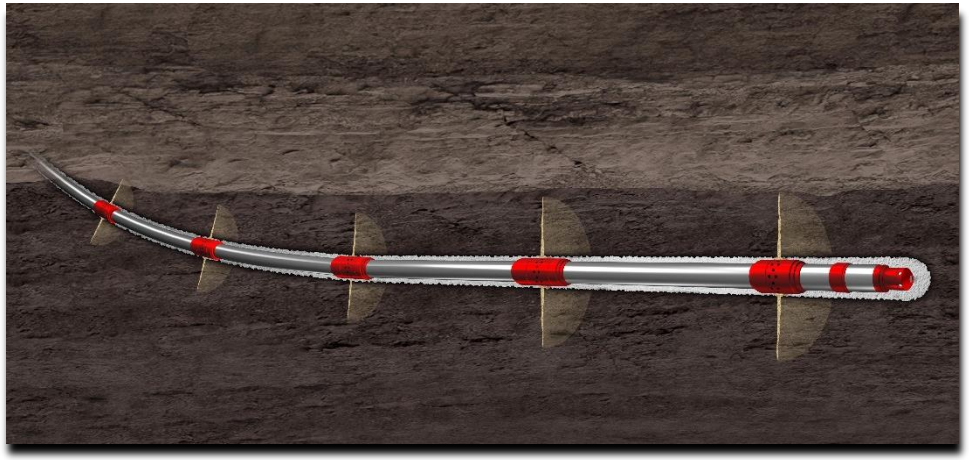
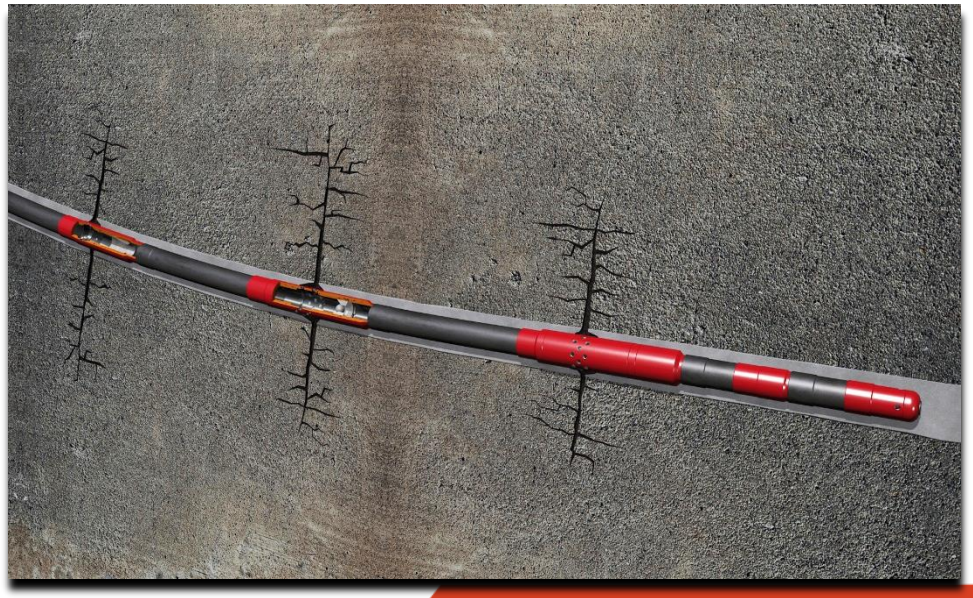
Halliburton Multistage Frac Sleeve Systems

- Frac Sleeve Systems
  - **Ball-Drop Dependent Solutions**
    - RapidStage® Sleeve
    - BD RapidShift® Sleeve
  - **Pressure Actuated Toe Sleeves**
    - RapidStart® Initiator Sleeve
    - RapidStart® Initiator CT Sleeve
  - **Coiled Tubing Dependent Solutions**
    - Mech RapidShift® Sleeve



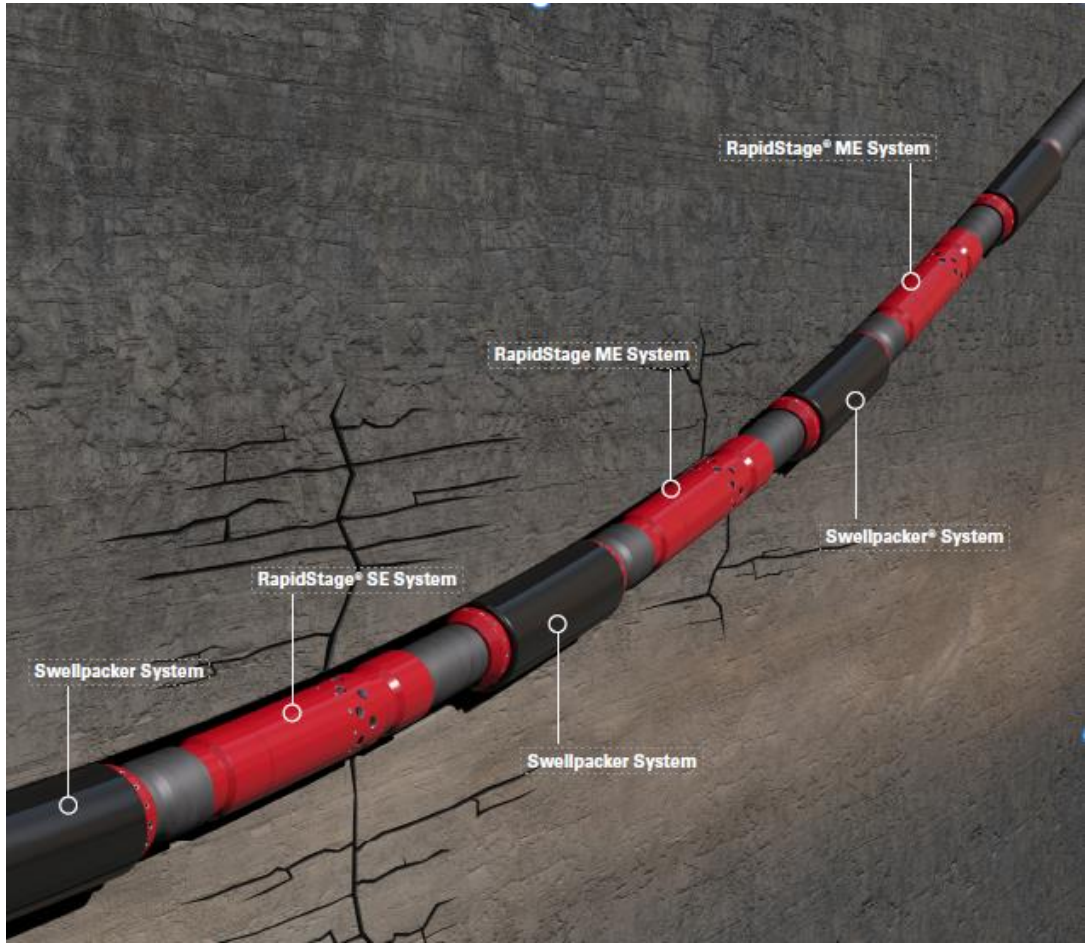


RapidStage® Frac Sleeve

- **RapidStage® (ingle ntry) ystem**
  The RapidStage SE sleeve is a ball-activated frac sleeve for independent stage fracturing through individual sleeves. This system enables 50 or more stages in a single completion.

- **RapidStage® (ulti ntry) ystem**
  The RapidStage ME sleeve is applied where a large number of transverse fractures are desired along a wellbore. Several RapidStage ME sleeves are opened together with a single ball launched from surface.

- **RapidStage emented ystem**
  Cementing RapidStage ME sleeves in a wellbore provides an efficient completion method by creating numerous frac treatment entry points with the dependability of cement isolation.



RapidShift® Multistage Stimulation and Production Sleeve System

- . or optional sleeve closure after a frac treatment, the \apidhift® sleeve is an ideal solution. his

RapidShift™ Ball-Drop Actuated, Mechanically Closed Stimulation Sleeve

RapidShift ™ Mechanically Shifted Stimulation/Production Sleeve

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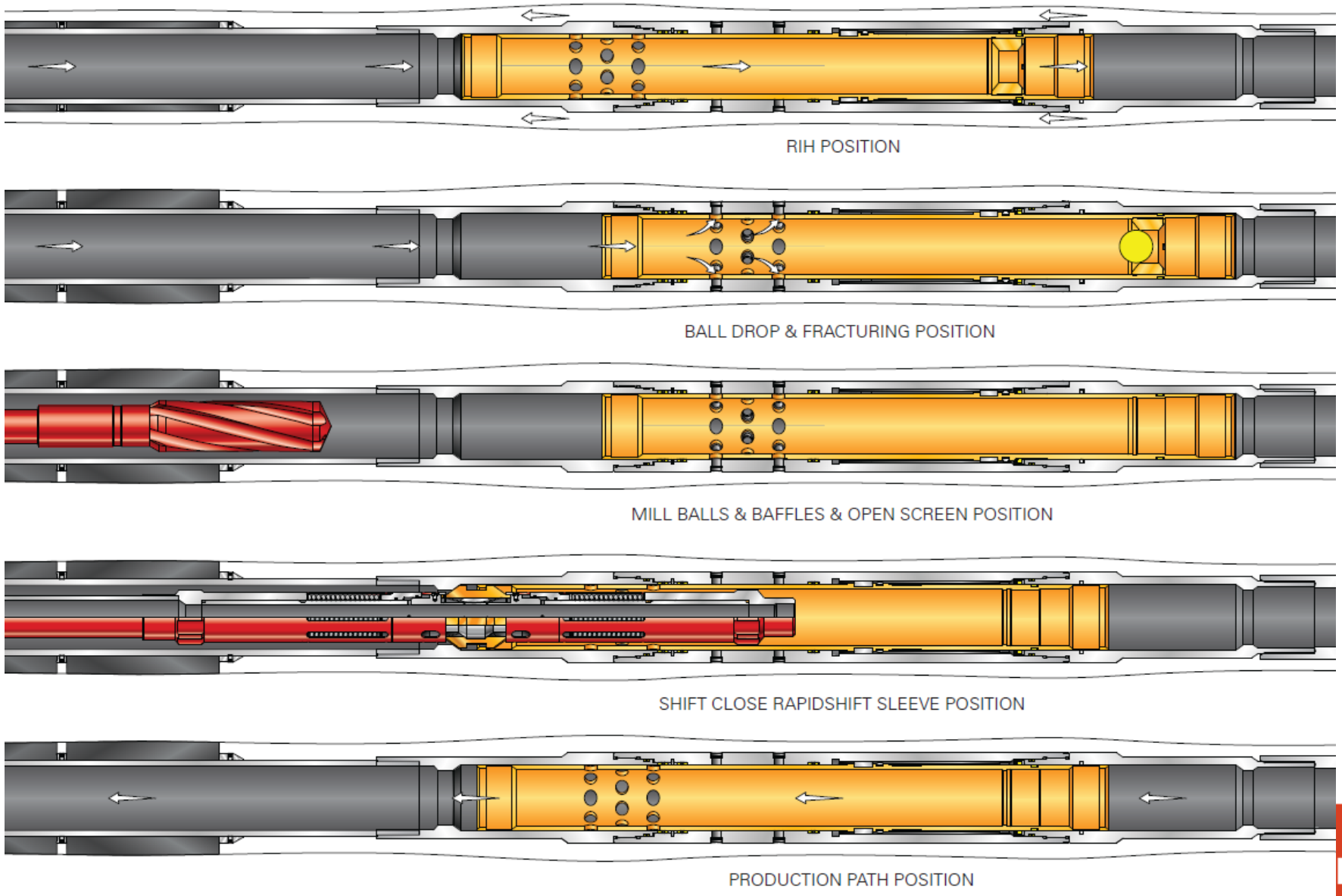
RapidShift® Frac Sleeve System

RapidShift™ Ball-Drop Actuated, Mechanically Closed Stimulation Sleeve

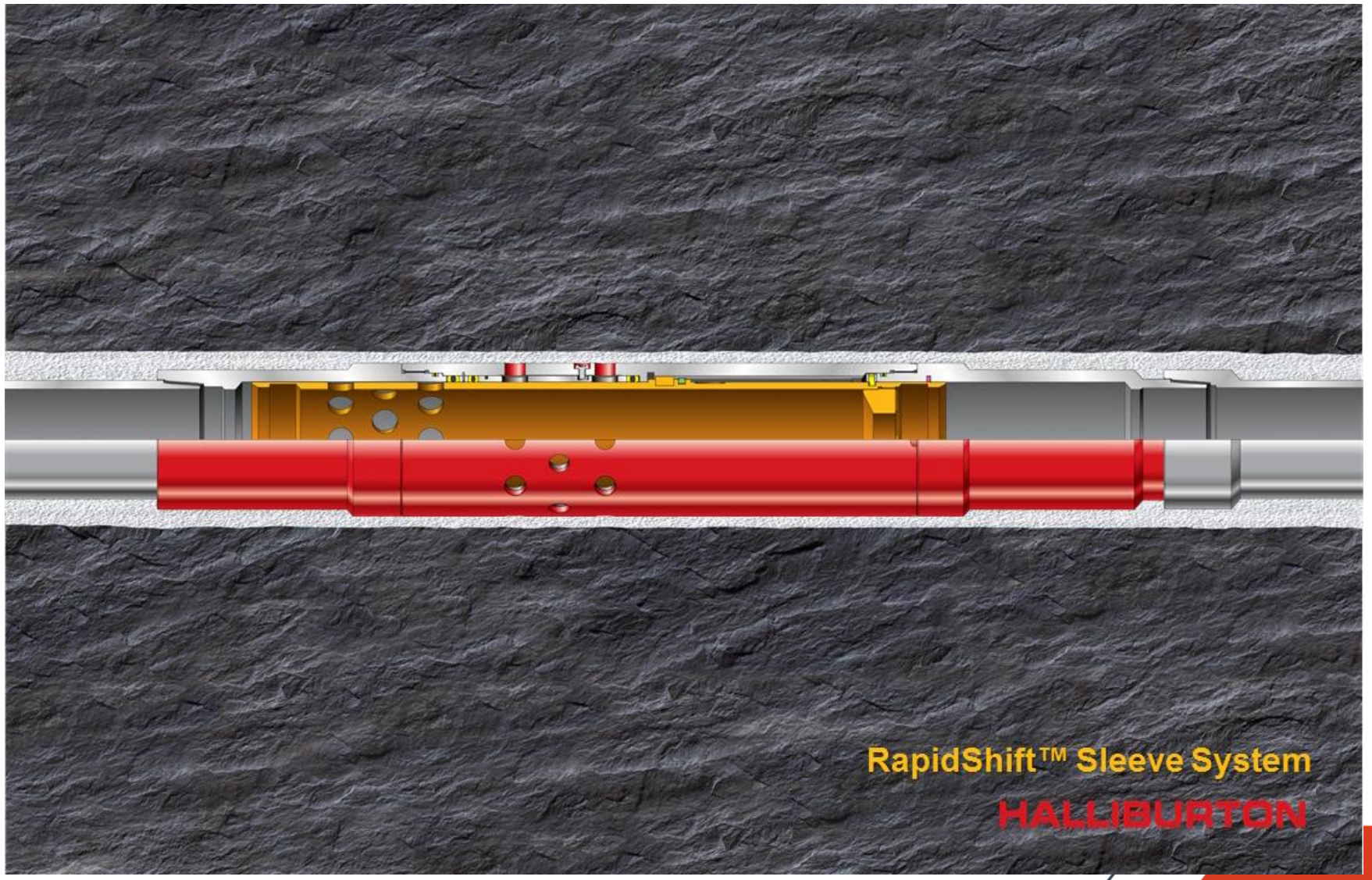
RapidShift ™ Mechanically Shifted Stimulation/Production Sleeve

Casing Size (in)	Tool OD (in)	Tool ID (in)	Max Temp °F (°C)	Pressure Rating (psi)	Max No. of Zones* (Ball-Drop Only)
3 1/2	4.40	2.818	350 (177)	10,000	25* (N/A Cemented)
4 1/2	5.70	3.75	350 (177)	10,000	48* (35 Cemented)
5 1/2	7.25	4.67	350 (177)	10,000	55* (36 Cemented)

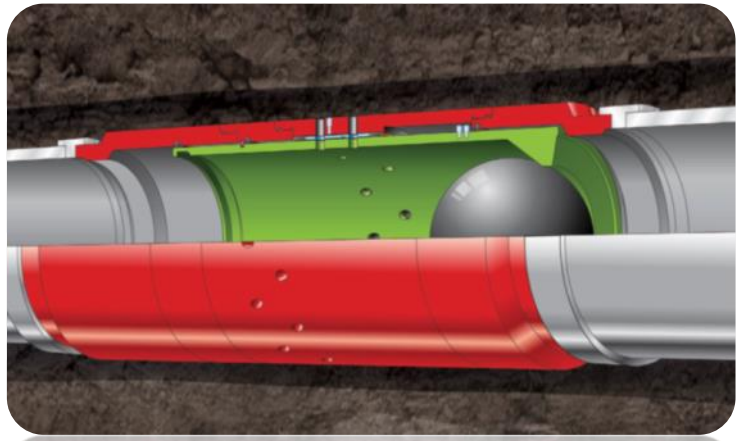
MultiStage Frac – RapidShift® System



How Does the RapidShift® Ball-Drop Sleeve Work?



Ball Activated Sleeve Stage Count



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- ntervention
- nables

Zone	BALL OD +0.000/-0.005 (IN)	BAFFLE ID ±0.002 (IN)
1	RapidStart Initiator Sleeve	
2	1.811	1.775
3	1.858	1.821
4	1.906	1.868
5	1.955	1.916
6	2.005	1.965
7	2.056	2.015
8	2.108	2.066
9	2.161	2.118
10	2.215	2.171
11	2.270	2.225
12	2.326	2.280
13	2.383	2.326
14	2.441	2.393
15	2.501	2.451
16	2.562	2.511
17	2.624	2.572
18	2.687	2.634
19	2.751	2.697
20	2.817	2.761
21	2.884	2.827
22	2.952	2.894
23	3.022	2.962
24	3.093	3.032
25	3.166	3.103
26	3.240	3.176
27	3.316	3.250
28	3.393	3.326
29	3.472	3.403
30	3.552	3.482

Sleeve Opening Event

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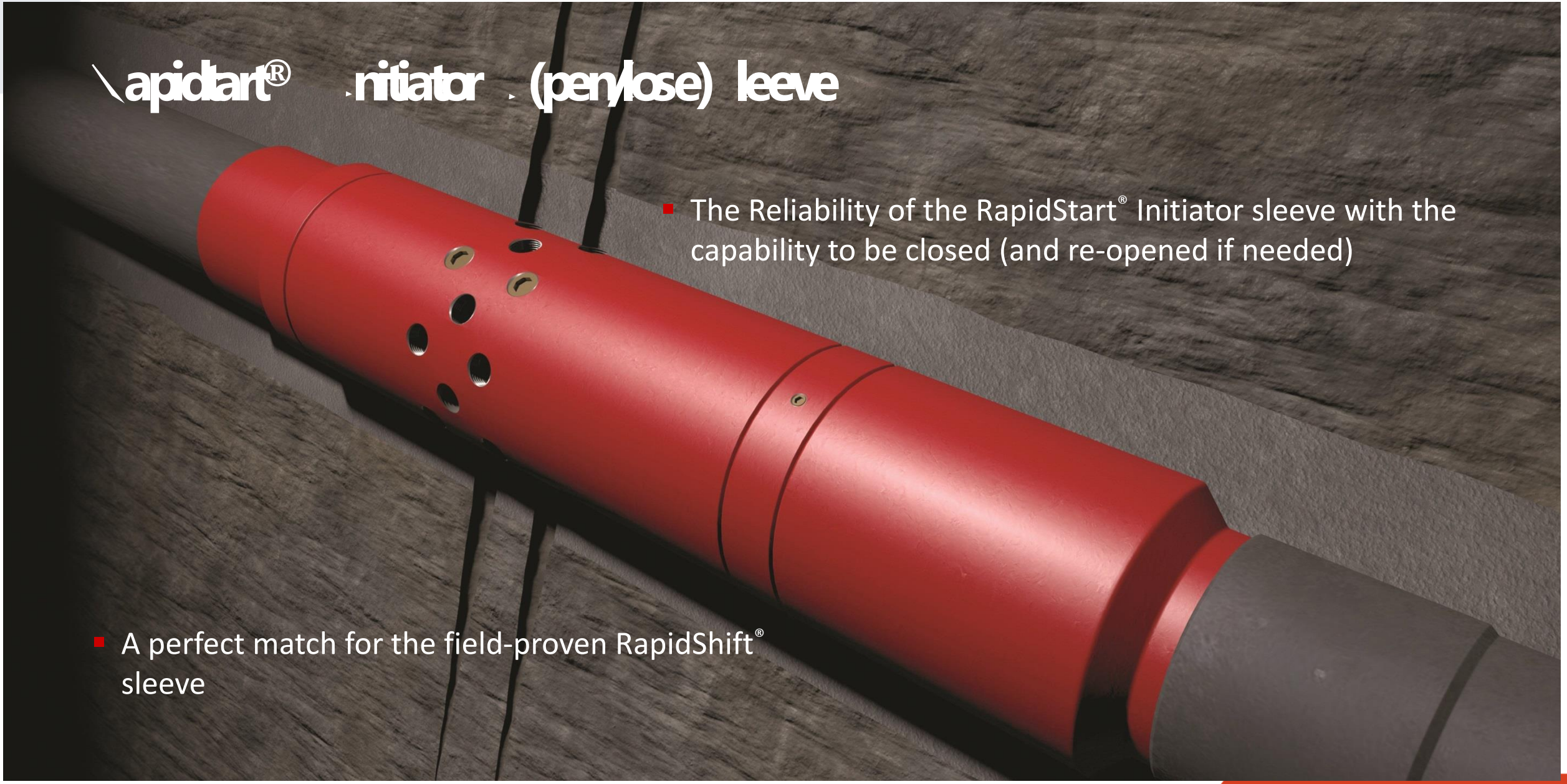
RapidBall™ Self-Removing Ball Technology

- alliburton \apidall™ . . ball technologies are self

- liminating the cost of post

- .mpact
  up to ,. psi and temperatures up to °. (°).

RapidStart® Initiator (penylose) Sleeve



- The Reliability of the RapidStart® Initiator sleeve with the capability to be closed (and re-opened if needed)
- A perfect match for the field-proven RapidShift® sleeve

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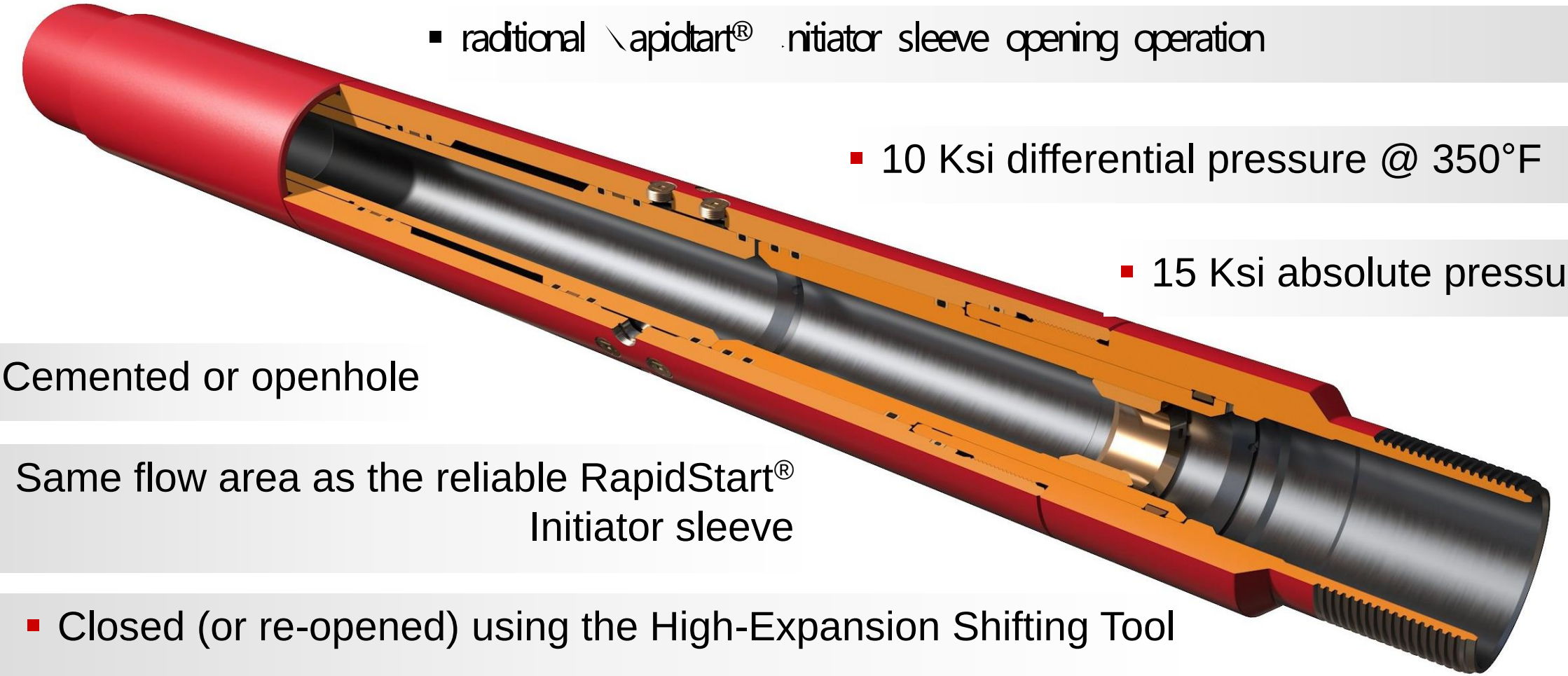
RapidStart® Initiator OC (Open/Close) Sleeve



- raditional \apidtart® .nitiator sleeve opening operation
- 10 Ksi differential pressure @ 350°F
- 15 Ksi absolute pressure
- Cemented or openhole
- Same flow area as the reliable RapidStart® Initiator sleeve
- Closed (or re-opened) using the High-Expansion Shifting Tool

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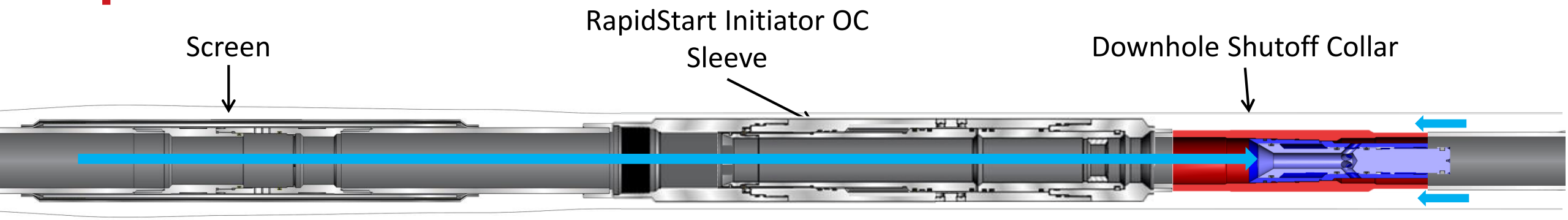
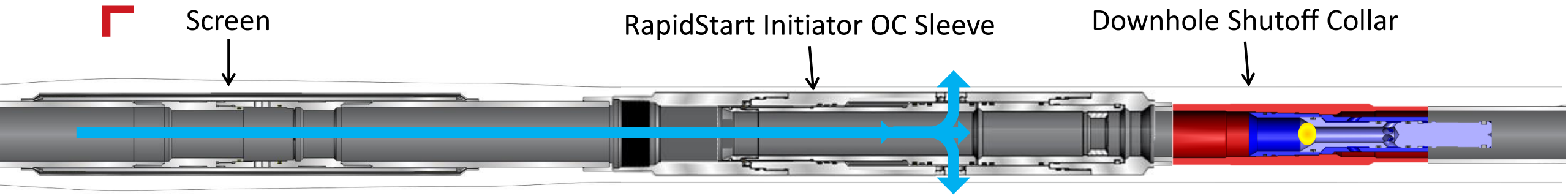
RapidStart® Initiator OC Sleeve – Tool Operation - Opening



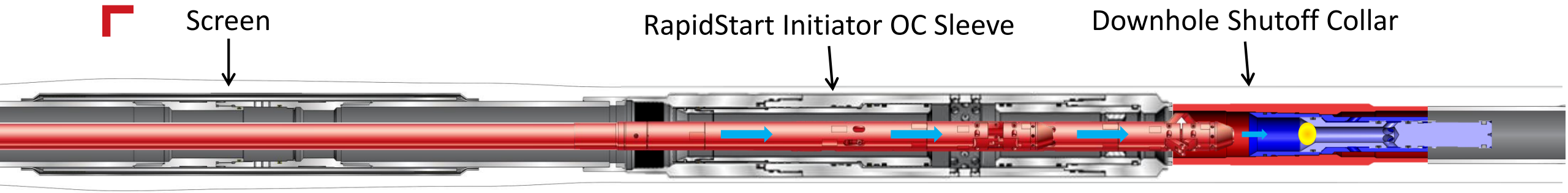
- and completion
- rop ball to close shut off collar & pressure up to close

RapidStart® Initiator OC Sleeve – Tool Operation - Opening



- ome back during rigless operations & pressure up to open \apidtart .nitiator . leeve
- erform st frac operation

RapidStart® Initiator OC Sleeve – Tool Operation - Closing



- \ . . with igh xpansion hifter to lose \apidtart .nitiator . sleeve
- ctivate hifter by pumping through tool then close sleeve while pumping
- verpull to pull lower inner sleeve upward, stop pumping to disengage shifting arms and . to urface to . /. \apidhift® sleeve hifting ool

eliable onal solation

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Reliable Zonal Isolation

- **wellpacker® ystems**

  wellpacker®

  issues. ith various elastomers available to

  wellpacker

ZoneGuard® Openhole Packers

- one . uard®

- he packer uses a uniquely designed element

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apidshift® ultistage rac leeve ystems

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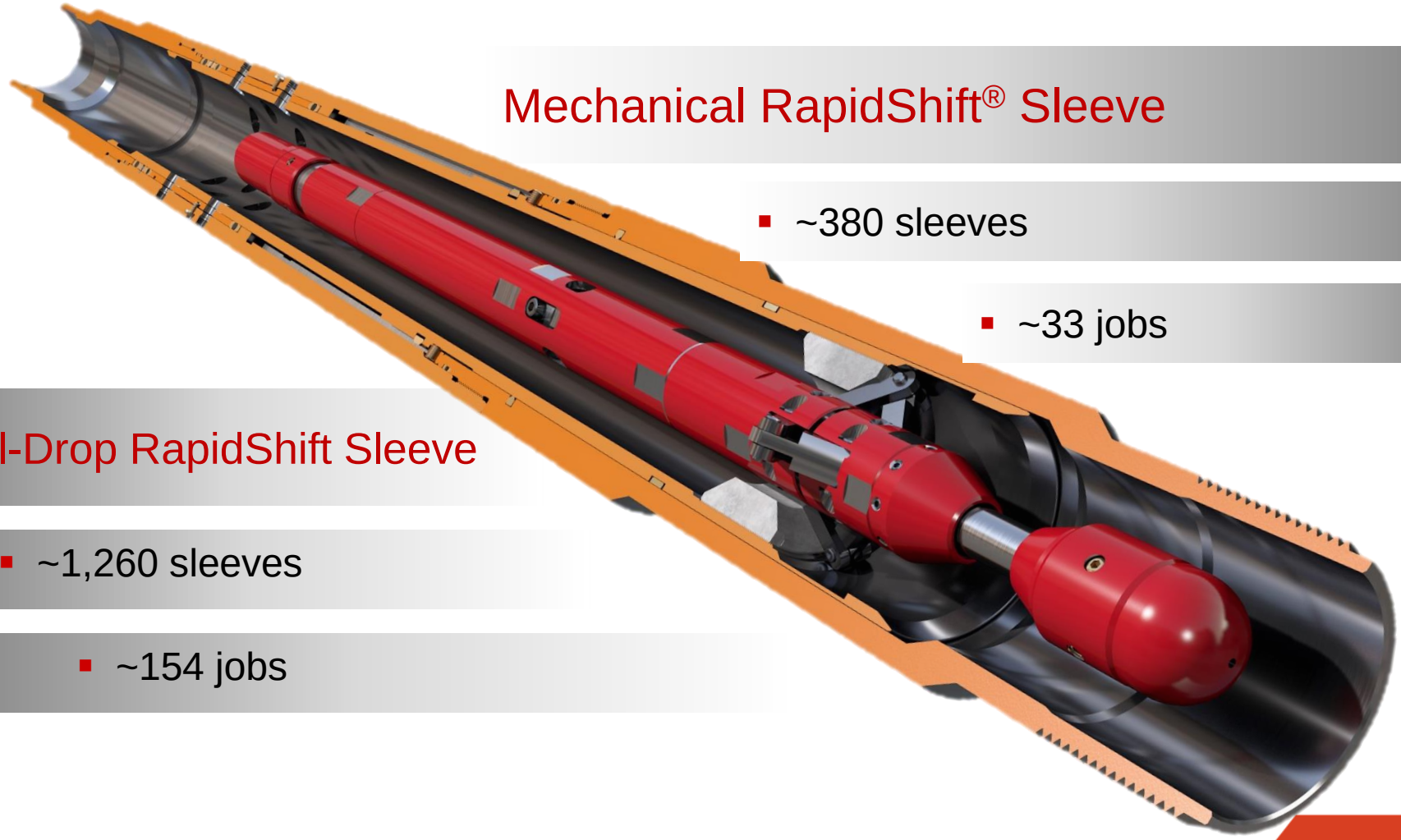
\un istory up to . . .



Mechanical RapidShift® Sleeve

- ~380 sleeves
- ~33 jobs

Ball-Drop RapidShift Sleeve

- ~1,260 sleeves
- ~154 jobs

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hank ou!

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