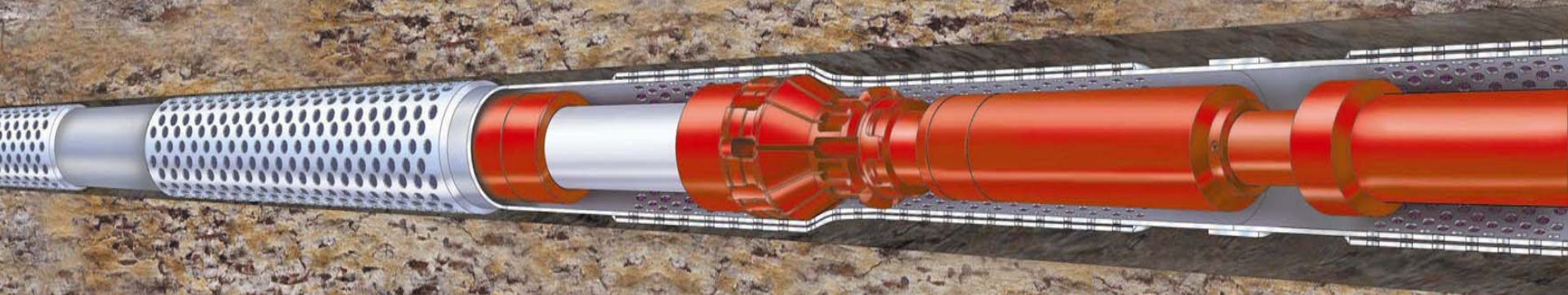


HALLIBURTON

Expandable Screen Completion Systems

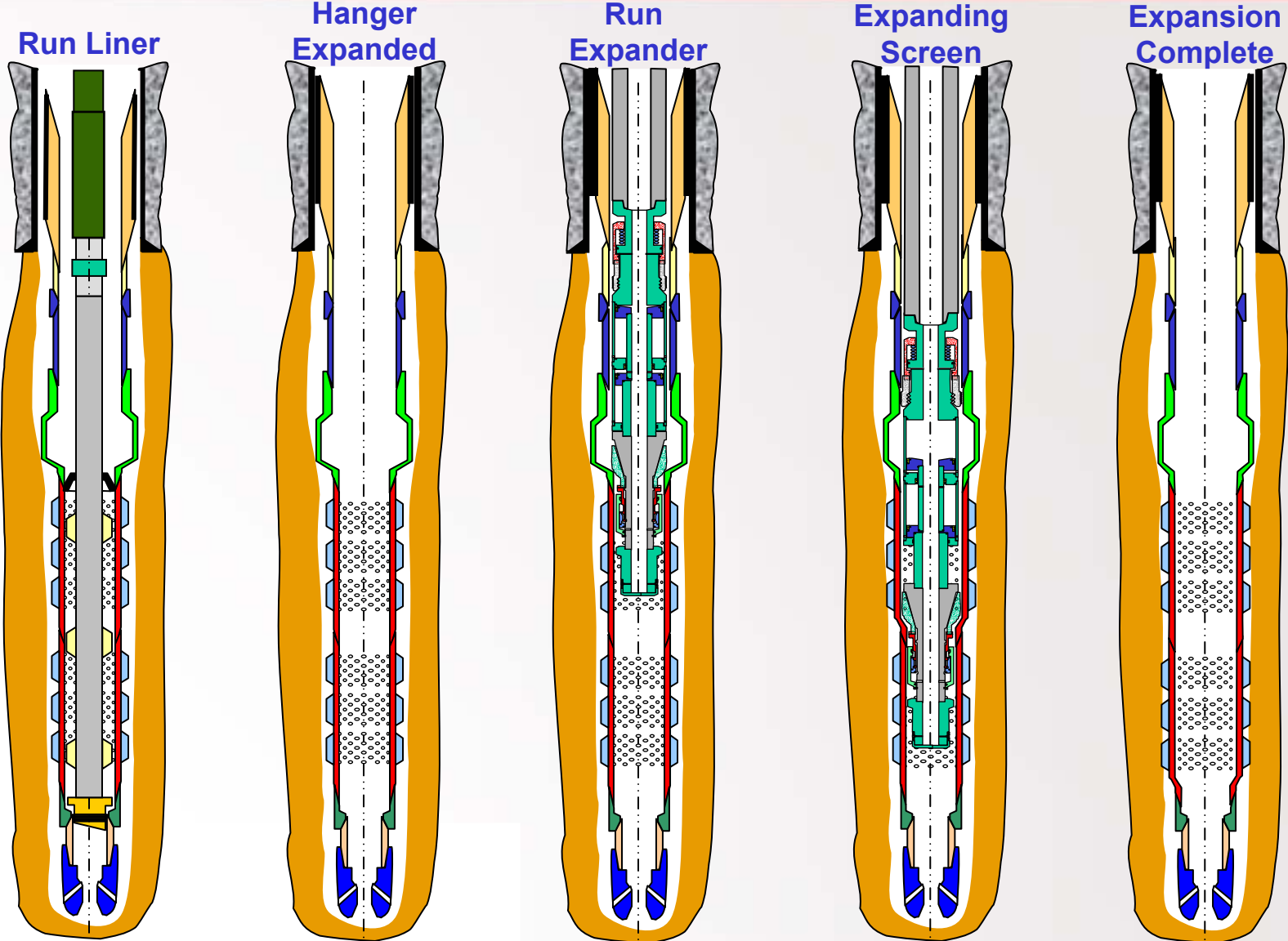


**Travis Hailey
Sand Control Product Manager**

Sand Control

SPE Italy, March 2004

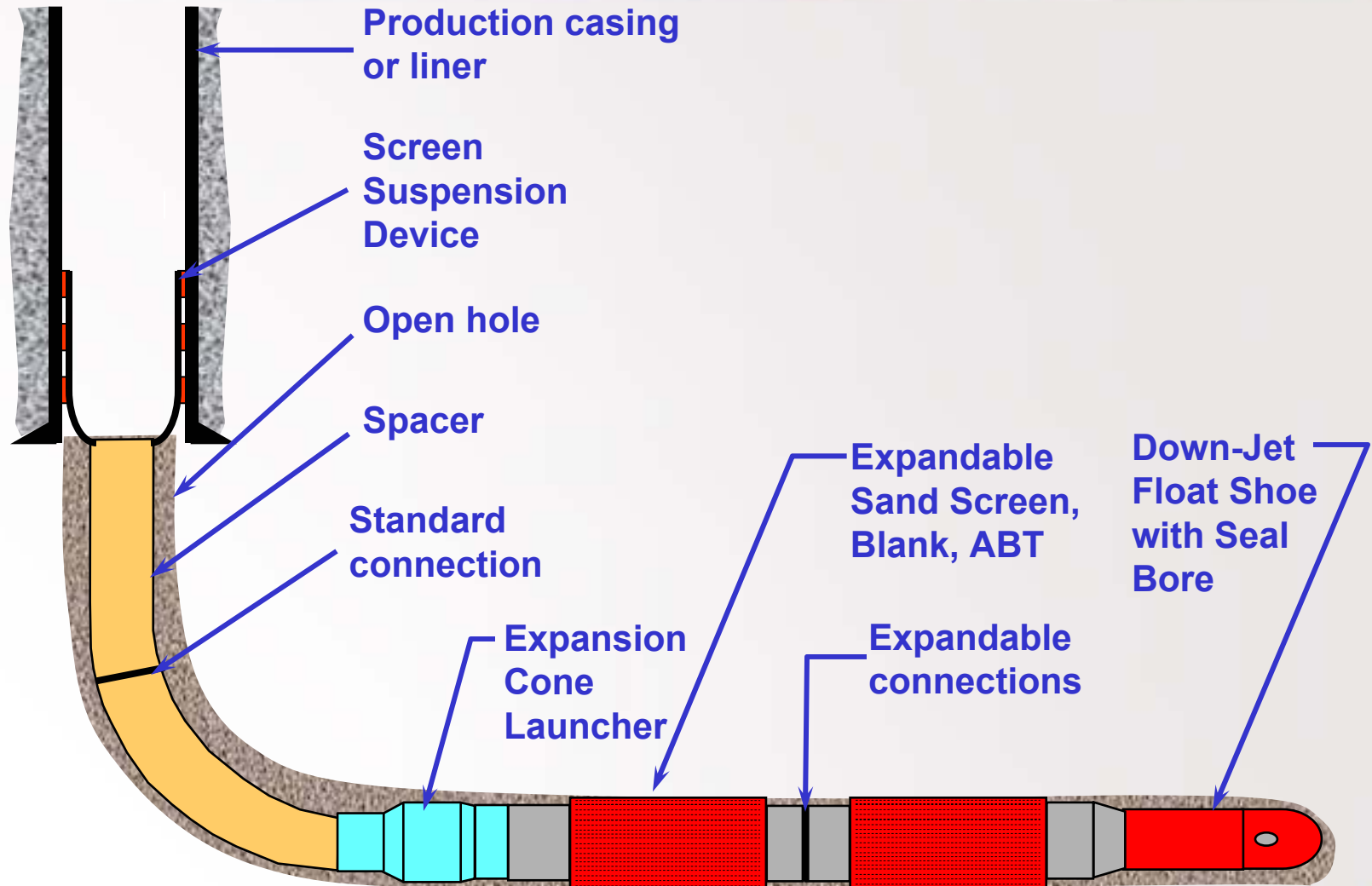
Installation Sequence



Expansion Sequence



System Components



Zonal Isolation in Expandables

Proposed:

- Open hole sand controlled completions fail (produce sand) most often because of the failure to adequately isolate reactive and pressurized shales from production or injection fluids and (for producing wells) from the pressure depletion of the producing reservoir.
- Subject of ongoing joint study between Halliburton and GMI

Zonal Isolation in Expandables

Solution:

- A reliable means of achieving isolation of shales within open hole intervals which has at least a moderate pressure differential capability.



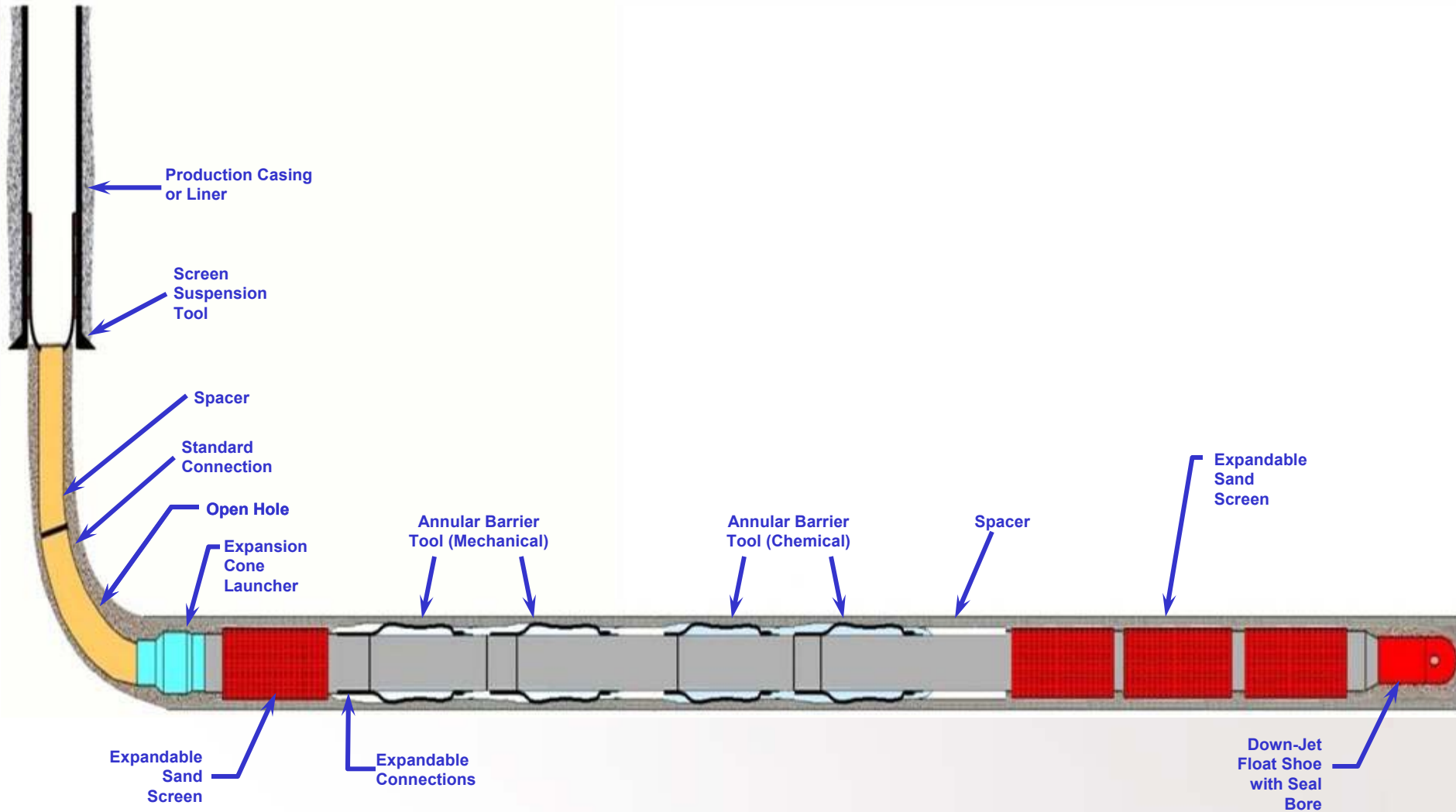
Annular Barrier Tool Development

**New concept in annular barrier tool
(like an open hole packer)
for expandable open hole completions**

- Chemical/Mechanical Barrier for Expandable Screens

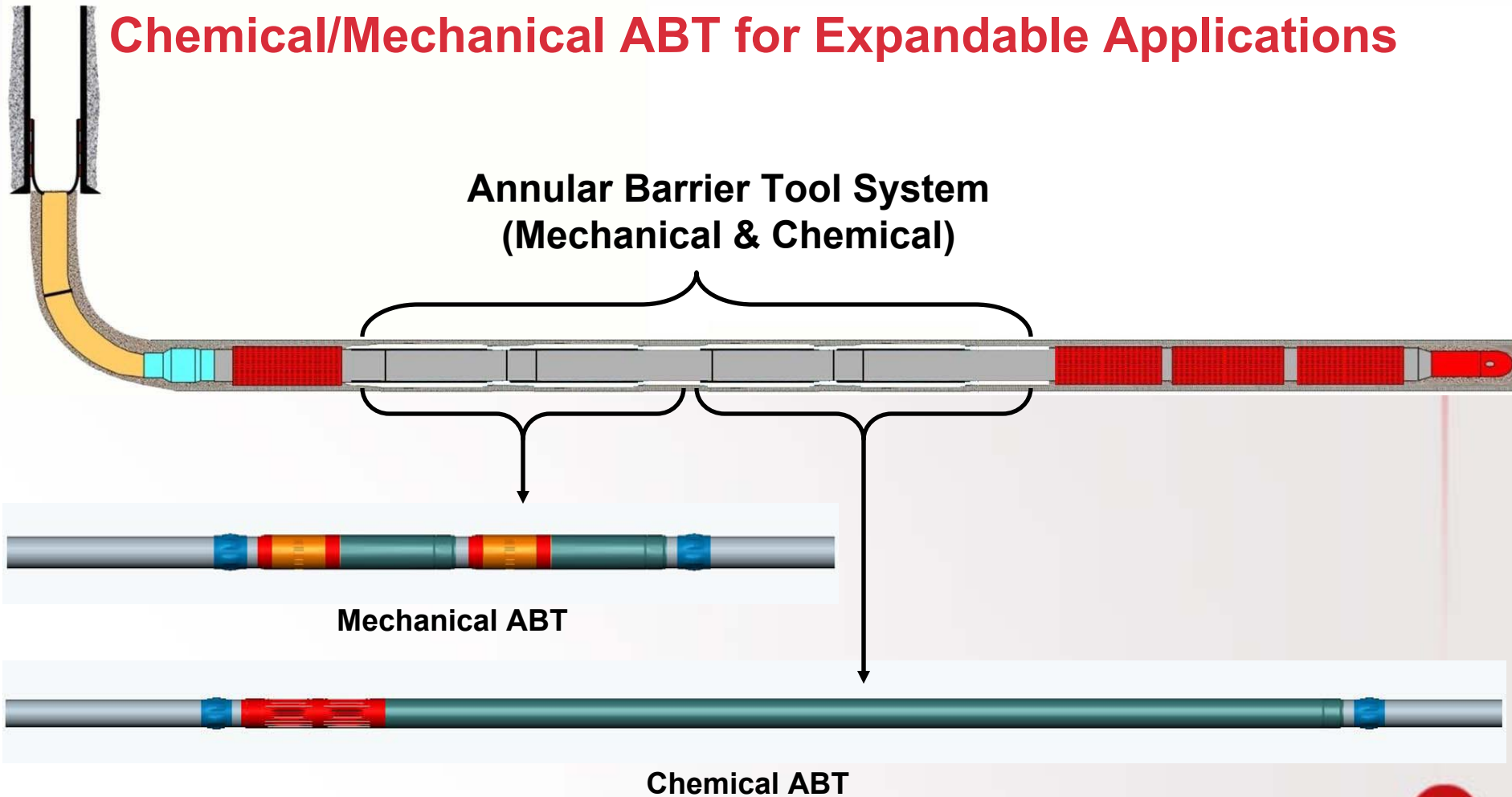


PoroFlex[®] – Completion



OH-ABT Breakdown

Chemical/Mechanical ABT for Expandable Applications



Barrier Types

Mechanical

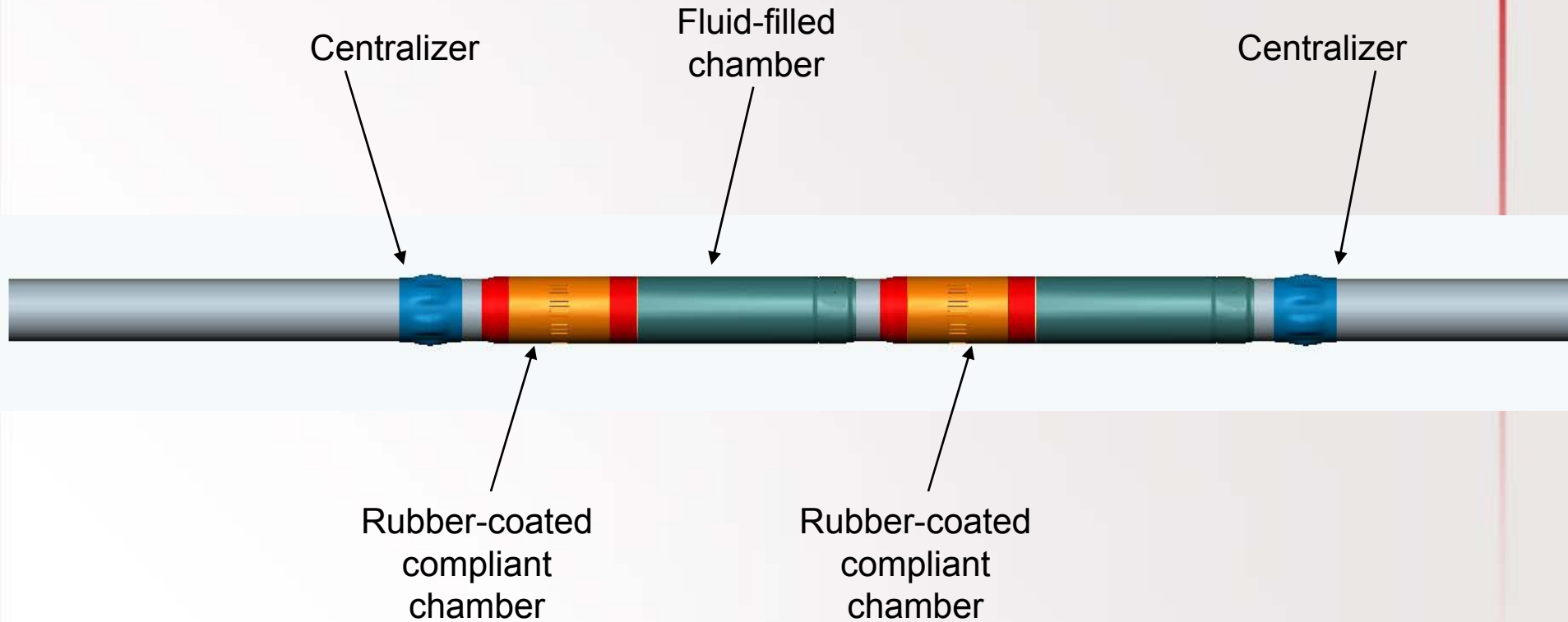
- Inflates due to internal fluid pressure buildup from expansion of basepipe. Fluid will exit chamber when pressure exceeds limit, but fluid is non-damaging. Barrier designed to stop annular flow of solids and provide low-pressure seal.

Chemical/Mechanical

- Inflates due to internal sealant fluid pressure buildup from expansion of basepipe. Barrier designed so sealant fluid exits chamber, fills annulus, and sets up like a resin. Barrier designed to prevent fluid and particulate flow across differentially pressurized zones.

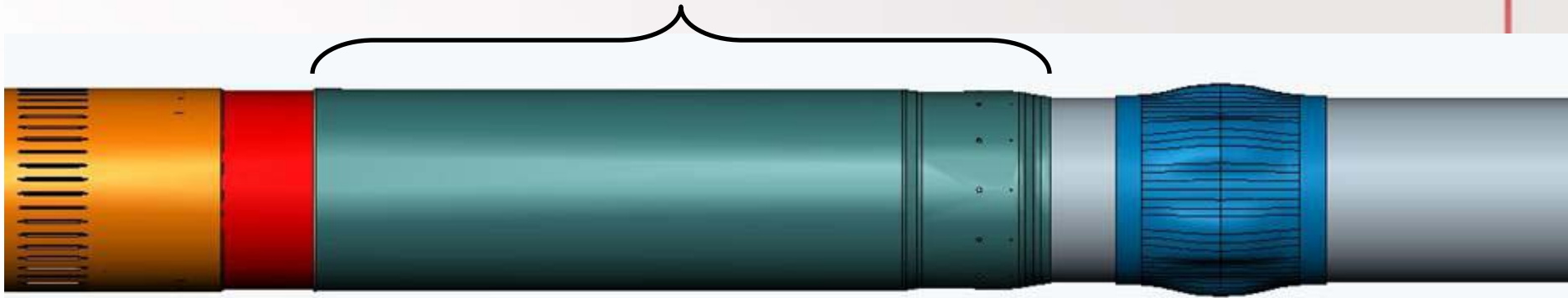


Mechanical ABT



Mechanical OH-ABT

Fluid-filled chamber for
hydraulic expansion of
mechanical seal



Mechanical ABT

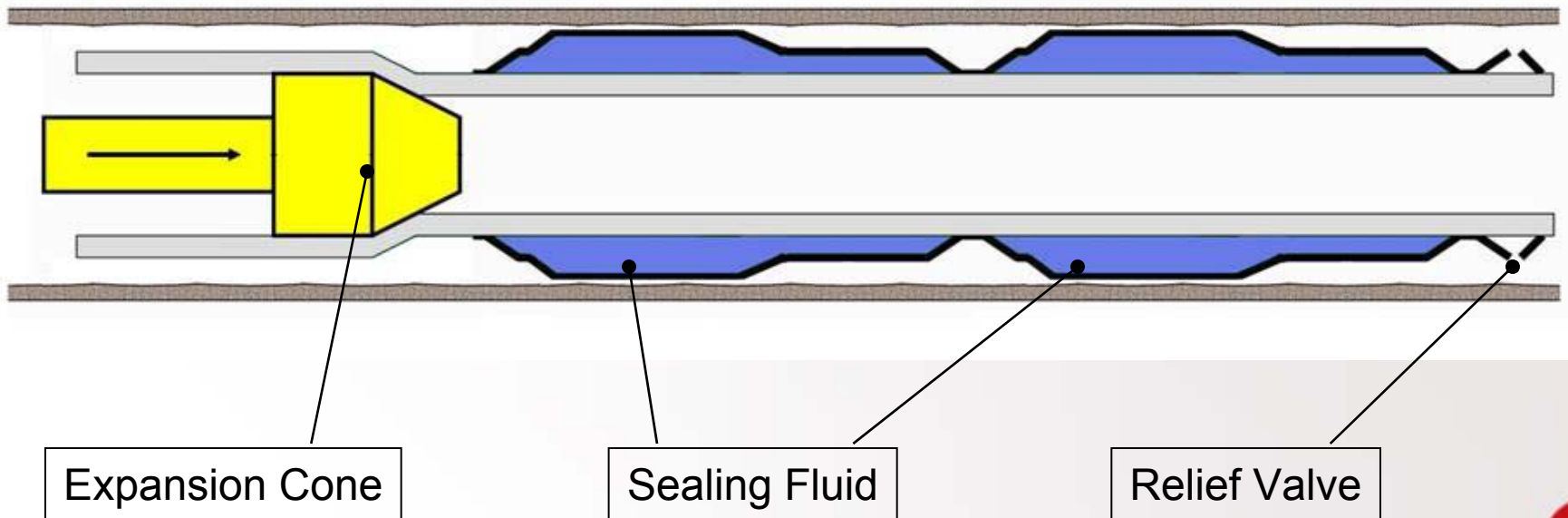
Relief Valve and Lower Centralizer



Mechanical OH-ABT Sequence

Actuate Mechanical OH-ABT

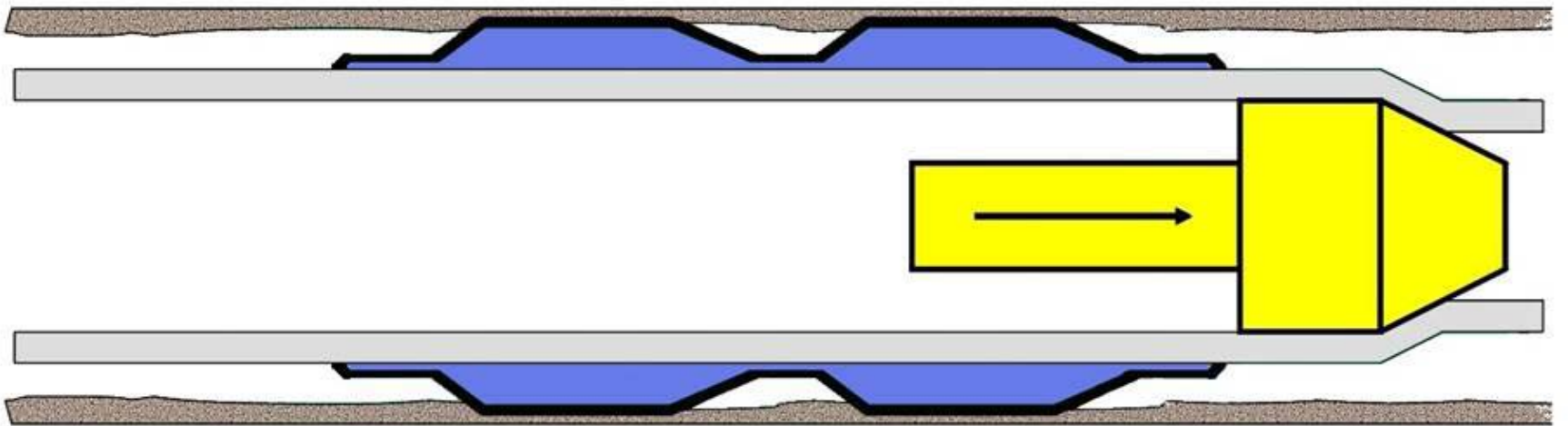
1. *Fluid compressed*
2. *Rubber-coated outer sheath seals open hole*
3. *Pressure builds at relief valve*



Mechanical OH-ABT Sequence

Final Stage

1. *Mechanical compliant chambers fully expand*
2. *Seals against open hole, outer sheath, and base pipe ahead of expansion cone*



Testing



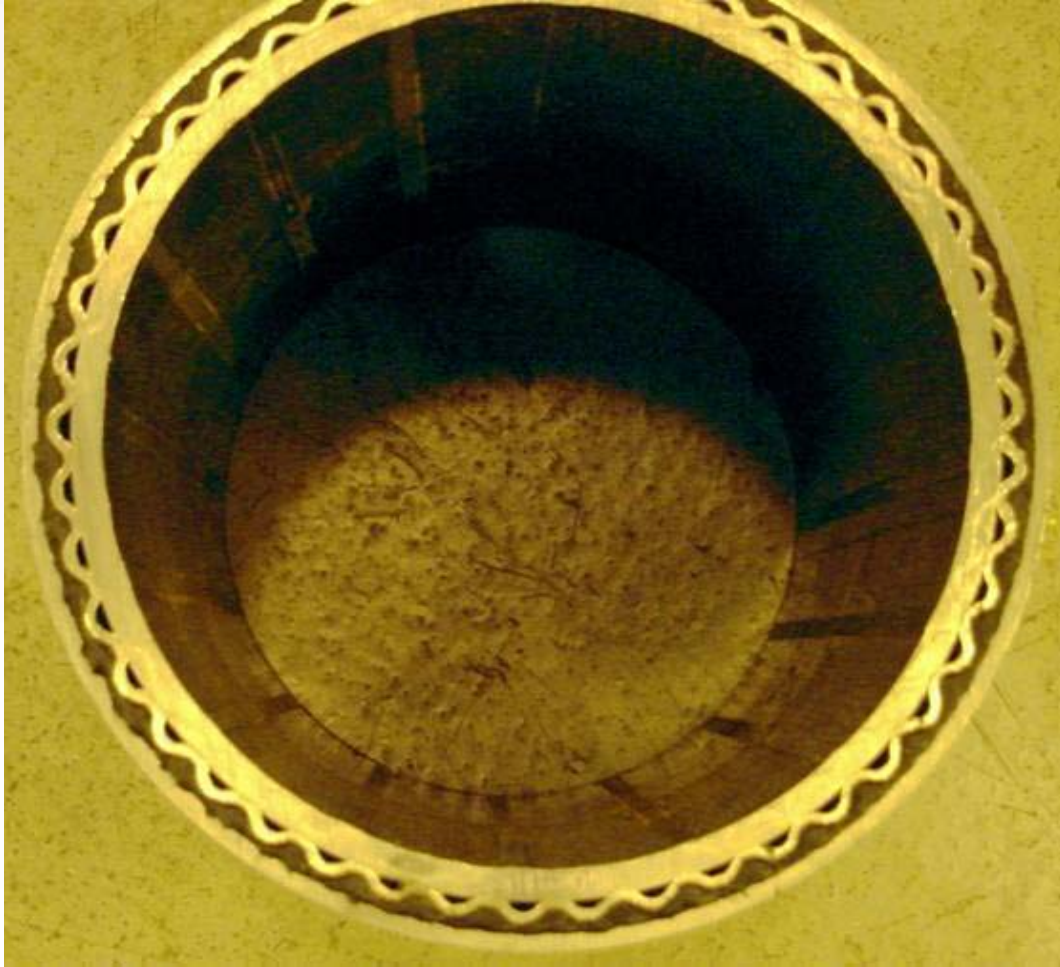
Compliant chamber prior to expansion

Testing



Compliant chamber after expansion

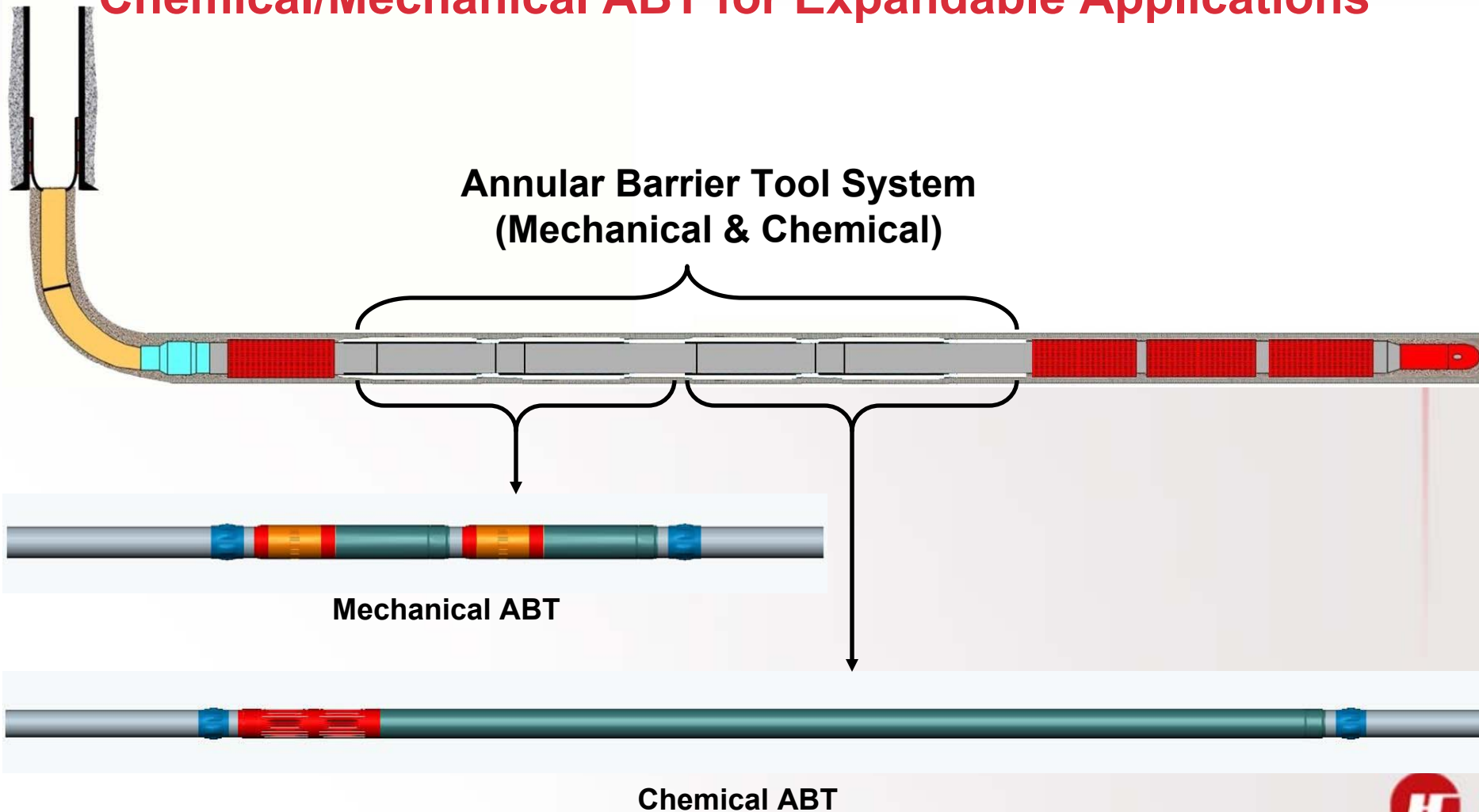
Testing



Cut-away view of expanded, rubber-coated compliant chamber (simulated gauge hole)

OH-ABT Breakdown

Chemical/Mechanical ABT for Expandable Applications



Poroflex[®] – Zone Isolation

- Expanded solid basepipe
- Advanced annular barrier technology
 - Variable reach to 10.5” for 8.5” expanded screen
 - Conforms to any hole shape
 - Innovative sealant technology



What is the Sealant?

What is it?

- It is a composite material with both ceramic and polymeric properties, a “CERAMER.”

What downhole conditions will the unpolymerized and polymerized matrix tolerate?

- Up to 400°F; strongly acidic and alkaline conditions; insoluble in organics and water (organophobic and hydrophobic) — both polymerized and unpolymerized

How is it activated?

- It activates during the expansion process



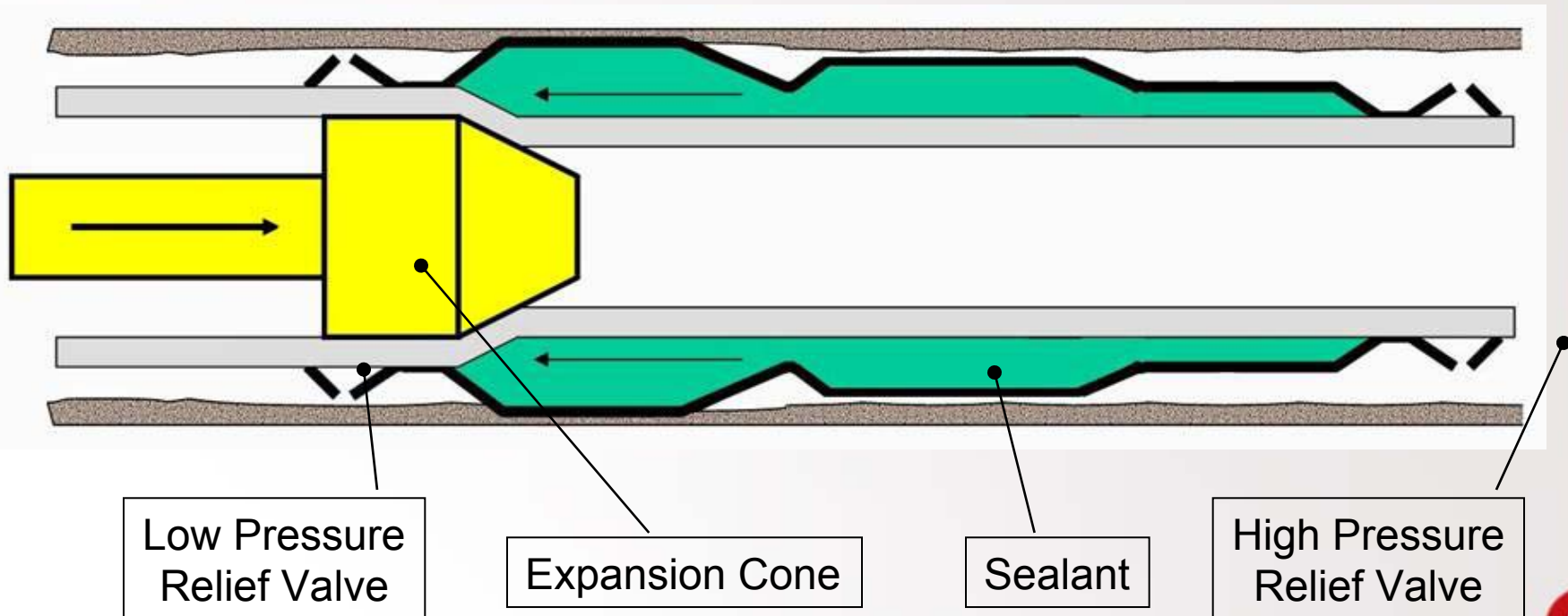
Chemical Annular Barrier Tool



OH-ABT Sequence

Actuate OH-ABT

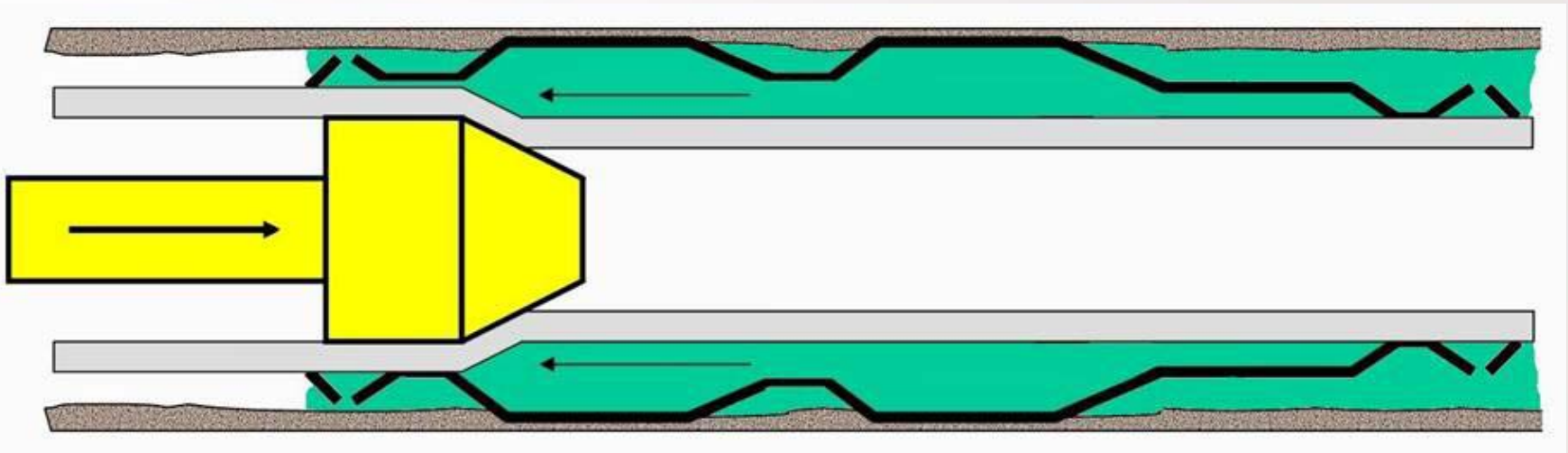
1. Fluid compressed
2. Outer sheath seals open hole
3. Pressure builds at relief valve



OH-ABT Sequence

Final Stage

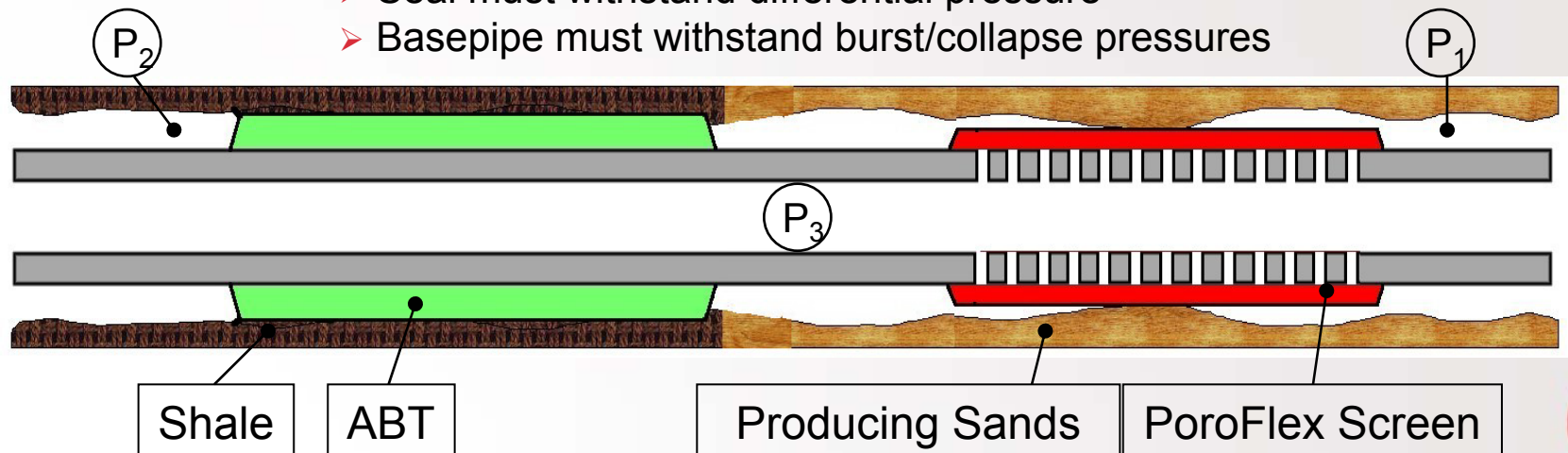
1. *Fluid exits vent*
2. *Seals against open hole, outer sheath, and base pipe ahead of expansion cone*



Annular Barrier Tool Sealing

Three requirements

- Full, continuous contact with the bore
 - Polymer provides best coverage possible
- Contact stress of ABT exceeds pore pressure
 - Hydrostatic pressure
 - Circulating pressure during installation
 - Pore Pressure
 - Mechanical contact pressure from cylinder
 - Servo effect of polymer
- Annular Barrier must be sufficiently strong
 - Seal must withstand differential pressure
 - Basepipe must withstand burst/collapse pressures



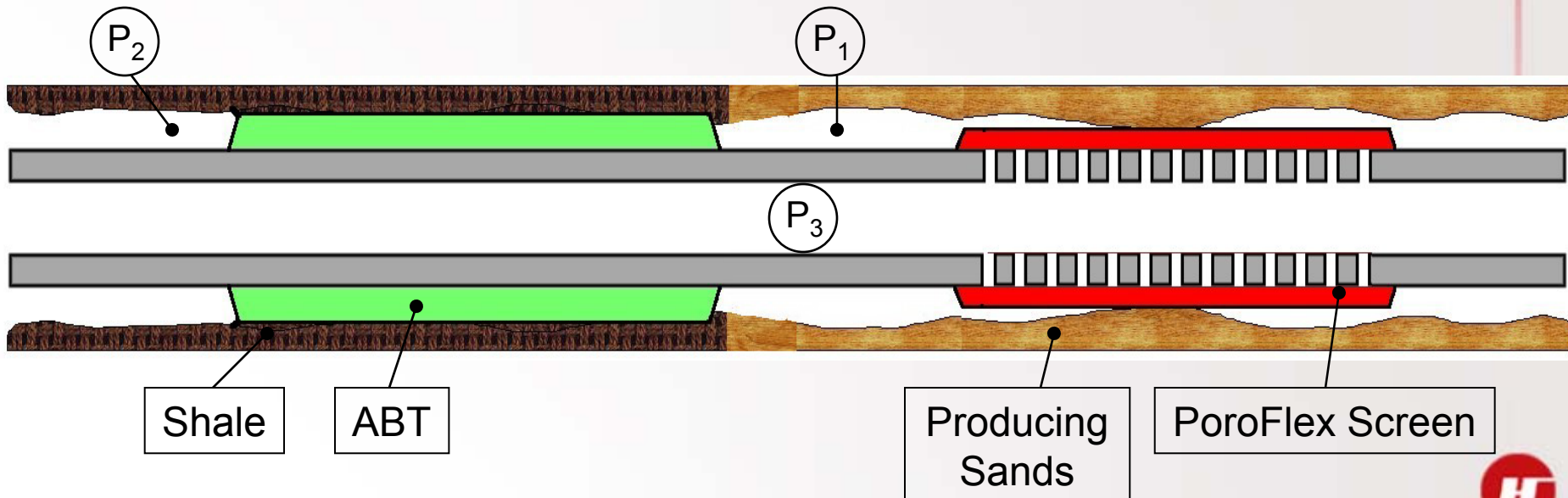
Annular Barrier Tool Sealing

Maximum ABT Hydraulic Pressure Rating:

Assume $P_1 = P_3$

- $\Delta P_{\max} = P_2 - P_3$

- $\Delta P_{\max} = \text{Collapse Rating of Base Pipe}$

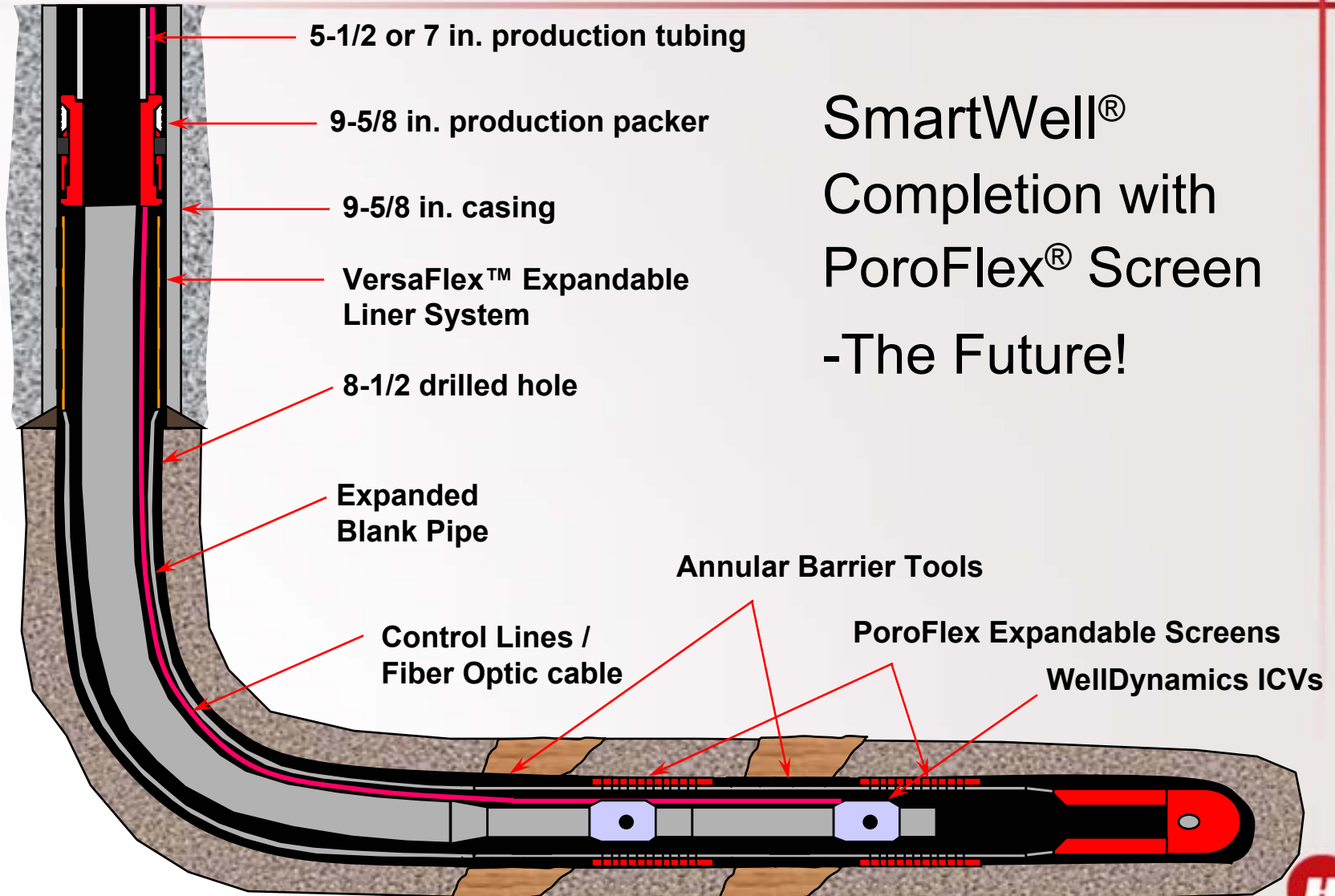


Zonal Isolation in Expandables

By using expandable screens and solid tubulars, along with new sealant development, a reliable means for achieving isolation of shales within open hole intervals with at least a moderate pressure differential capability (2000-3000 psi) should be possible in 2004.



The Future

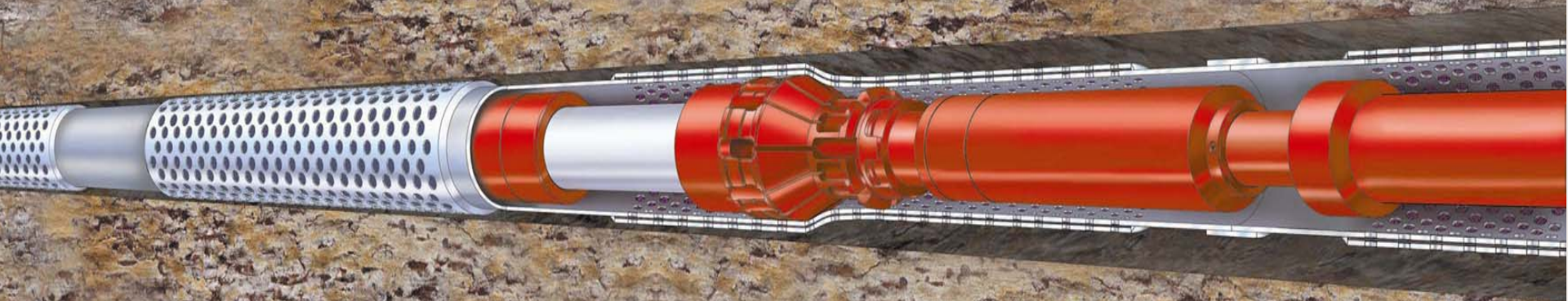


SmartWell®
Completion with
PoroFlex® Screen
-The Future!



HALLIBURTON

Expandable Screen Completion Systems



Travis Hailey
Sand Control Product Manager

Sand Control

SPE Italy, March 2004

Poroflex[®] Screens

Questions?

