



Multiple Barrier Deployment Techniques

TTS Multiple Barrier Deployment Techniques and Systems

Quite often during non-rig well intervention operations it is necessary or desired to install long sections of tubulars into the well, such as sand screens and similar tubular assemblies. This necessity creates many challenges for operators and service companies with regards to maintaining well control during these installations.

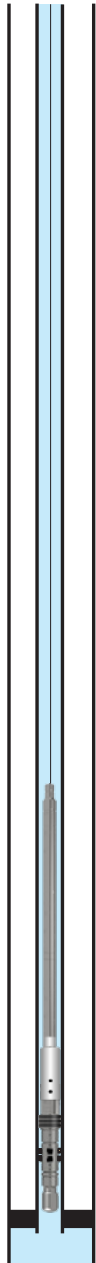
As most non-rig well interventions involve the use of coil tubing or wireline operations intervening through the existing production tubing on live wells, a means by which to install these long assemblies into the well while maintaining multiple barriers of well control becomes a necessity. Common practice has been to lubricate the assembly into the well by using either a wireline lubricator during wireline interventions or a riser assembly when coiled tubing is used for conveyance. Both systems limit the overall length of assembly that can be installed in the well. The limitation of overall lengths of these assemblies are relative to how much length of riser or lubricator that can be rigged up or installed on top of the well Christmas tree. Most well locations limit the total length of either lubricator or riser to < 100'.

During installation of TTS's Thru Tubing Gravel Pack Systems, it is a common requirement to install well tubular assemblies >200' in overall length, well outside the limits of conventional lubricator and riser systems used during coil tubing and wireline well interventions.

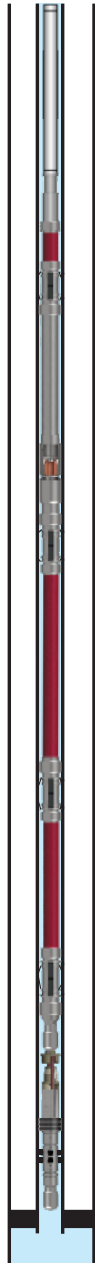
As a result, TTS has developed several systems/techniques along with proprietary tooling in order to accommodate this need. All these systems allow for the unlimited overall lengths of tubular assemblies to be installed into the well while maintaining multiple well control barriers. This is accomplished by breaking the assembly into short overall section lengths needed to accommodate the limits of common riser and lubricator systems. Once these short or fractional section lengths of subject tubular assemblies are installed or lubricated into the well one at a time, they are joined together either at the planned landing depth in the well or at an up-hole location of convenience and then lowered as one section to the planned landing depth. The following pages illustrate several of these Multiple Barrier Deployment Systems. For more information please contact any TTS representative or office.

Multiple Barrier Deployment Techniques

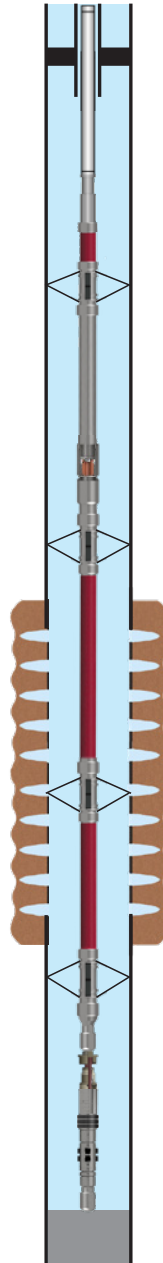
TTS Multiple Barrier Deployment Techniques *Retrievable Bridge Plug Deployment (Coiled Tubing)*



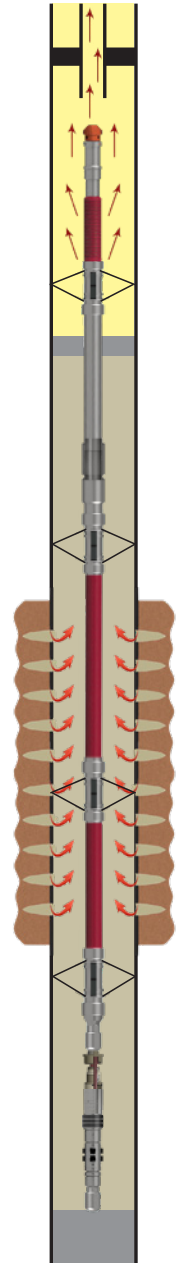
RIH with TTS Paragon Retrievable Bridge Plug on wireline. Set RBP near end of tubing. Once set, bleed well down to 0 psi.



Deploy Screen in well and attach to Coil Tubing. RIH and latch RBP and set down to equalize. Pick up to release RBP.



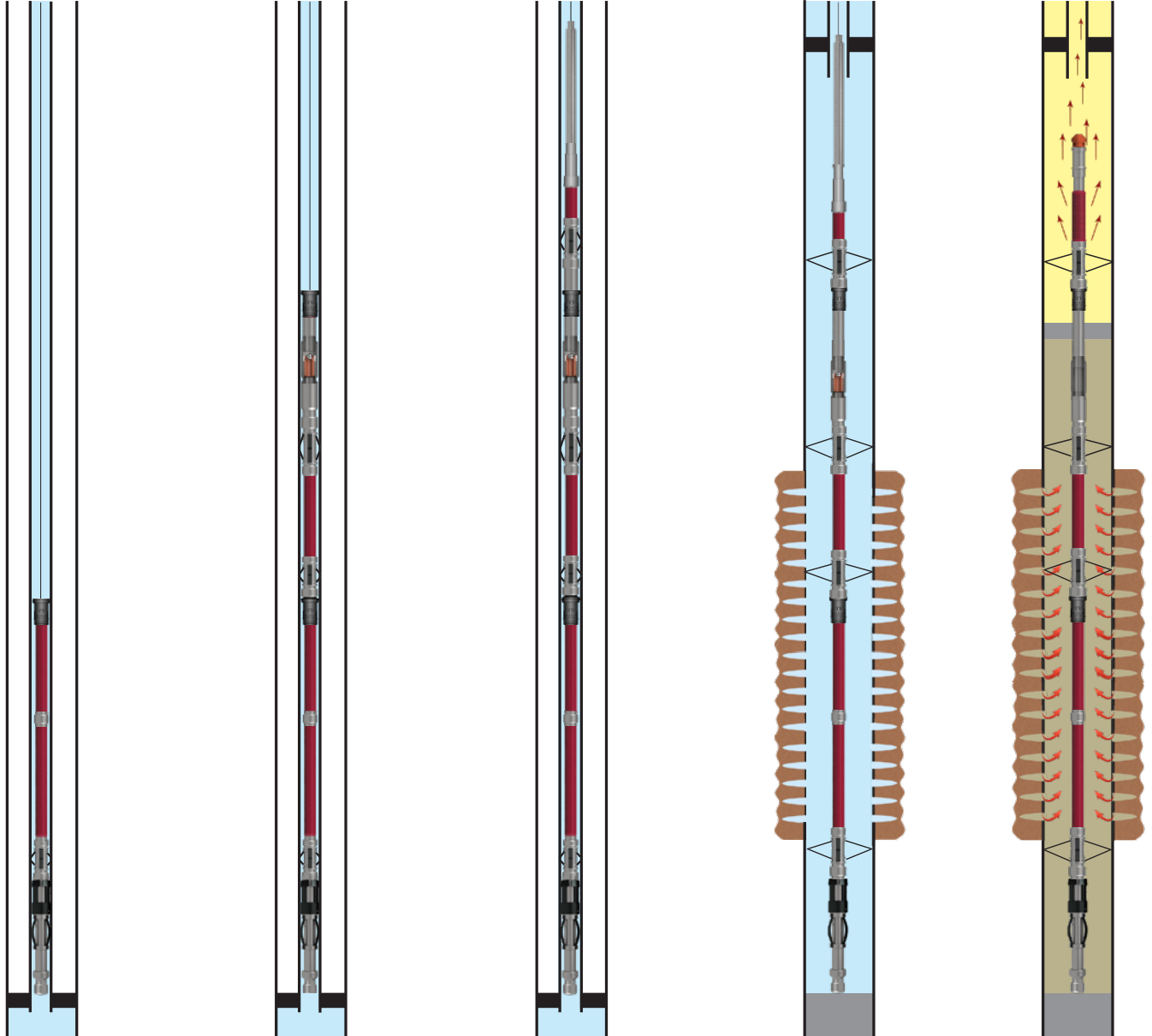
After unsetting RBP, RIH to PBTD with Coil. Release screen and perform gravel pack.



After gravel pack procedure, place well on production.

Multiple Barrier Deployment Techniques

TTS Multiple Barrier Deployment Techniques *J-Anchor Deployment/Stackable *Patent Pending (slickline/e-line)*



RIH with 1st section of screen with J-Anchor on bottom and PBR on slick line. Stop in tubing and pick up and slack off to set anchor then jar down to release PBR. POOH with SL

RIH with 2nd section of screen and blank on SL. Latch into PBR previously deployed and jar down to ensure latched. POOH with SL.

RIH with 3rd section of blank and vent screen on E-line. Latch into PBR previously deployed. Pickup to ensure latched with extra weight and unset J-anchor.

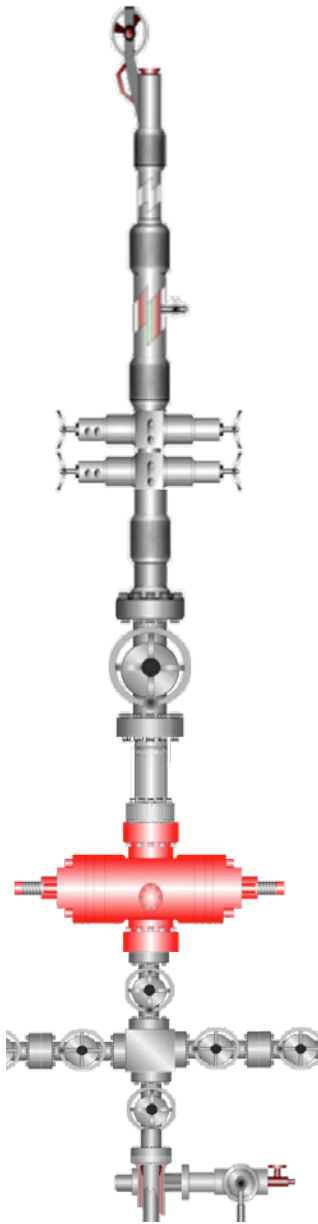
After picking up to unset J-anchor RIH with E-line and log screen on PBD. Release screen assembly and POOH. Perform gravel pack.

After gravel pack procedure place well on production.

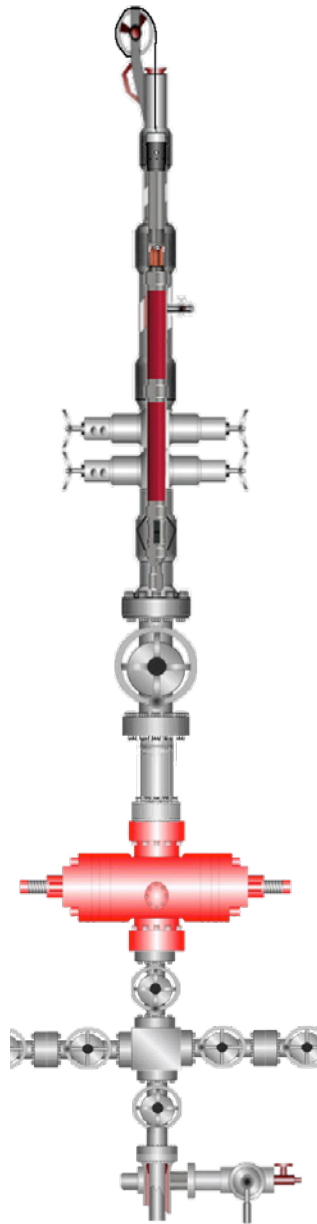
Multiple Barrier Deployment Techniques

TTS Multiple Barrier Deployment Techniques

Proprietary Surface Deployment (slick/e-line/specialized BOP systems)



Surface Rig up of tree, BOP slip rams for pipe, 4' spacer spool and gate valve. Rig up wire line BOP's and lubricator above gate valve.



Make up screen assembly and attach to wireline. Pick up assembly into lubricator and make up to gate valve. Pressure test lubricator and open gate valve.



Lower wireline and place blank pipe across BOP slip rams. Ensure PBR is located in 4' spacer spool. Close slip rams then jar up to release PBR running tool. Pick up wireline above gate valve and close valve. Bleed lubricator to 0 psi and break connection for next assembly.

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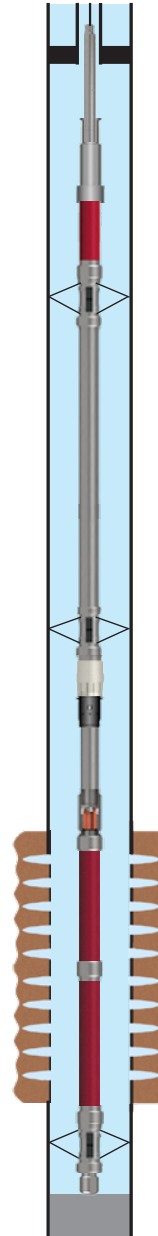
Proprietary Surface Deployment (slick/e-line/specialized BOP systems)



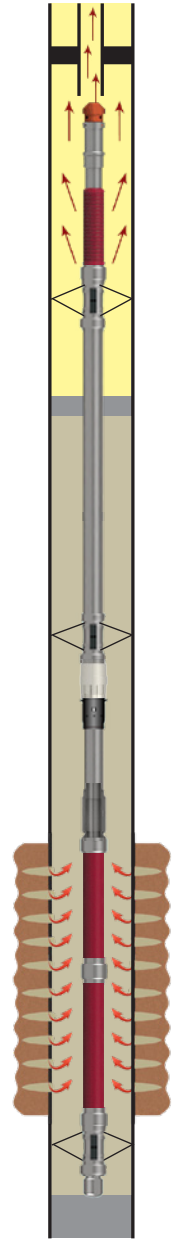
Make up screen assembly and attach to wireline. Pick up assembly into lubricator and make up to gate valve. Pressure test lubricator and open gate valve.



Lower screen assembly and latch anchor to PBR left in 4' spacer spool. Pick up to ensure latched. Once confirmed, open BOP rams. Once open, RIH with wireline.



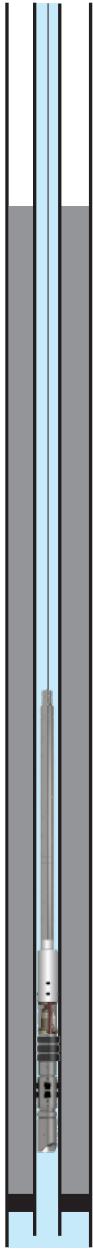
Continue to RIH and log screen on PBTD. Release screen and POOH with wireline. Perform gravel pack.



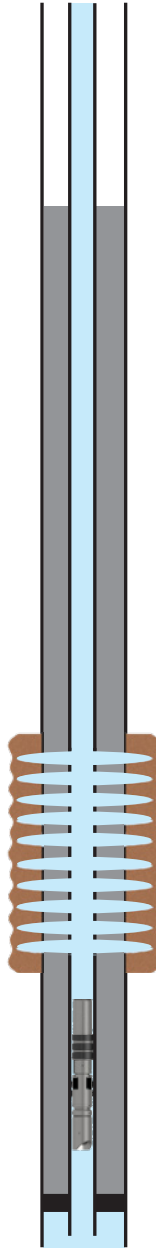
After gravel pack procedure, place well on production.

Multiple Barrier Deployment Techniques

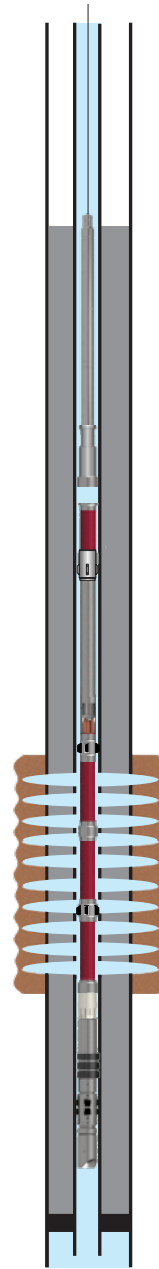
TTS Multiple Barrier Deployment Techniques *Stackable Systems for Mono-bore Wells (slickline/e-line)*



RIH with wireline and set TTS Paragon II Sump Packer. After set POOH with wireline.



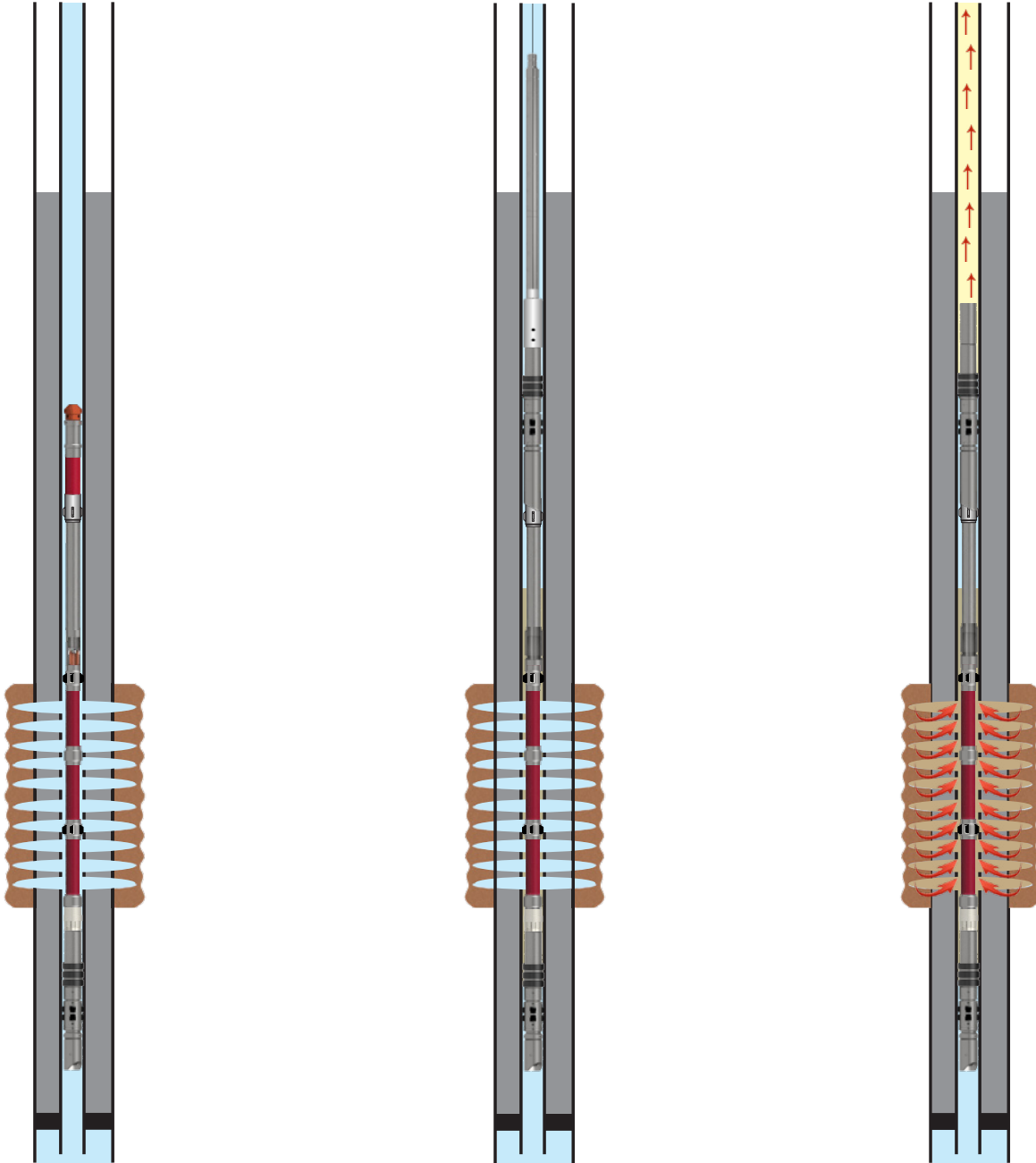
RIH with wireline and set TTS Paragon II Sump Packer. After set POOH with wireline. Perforate well for production.



Pick up and RIH with screen sections using TTS Anchor latches and PBR's. Latching each anchor latch to each PBR and taking overpull to ensure latched.

Multiple Barrier Deployment Techniques

TTS Multiple Barrier Deployment Techniques *Stackable Systems for Mono-bore Wells (slickline/e-line)*



Once required screen and blank sections deployed, perform gravel pack. After gravel pack, pull plug from top of assembly.

After removing vent plug RIH with TTS Paragon II Packer and overshoot to seal on polished nipple for gravel pack isolation. POOH with wire line.

After gravel pack procedure place well on production.