

Standardisation of Well Completion Designs for Statoil wells on the NCS

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Agenda

- -Why was this process started
- -Why is it important
- -What has transpired in the process
- -What has been defined as the standardized well designs
 - -Casing
 - -Upper completion
 - -Lower Completion
- -How has the implementation been executed
- -The service companies role
- -Where are we now and what do we strive to achieve
- -Q&A

Upper Completion Pre-standardisation snapshot – as was

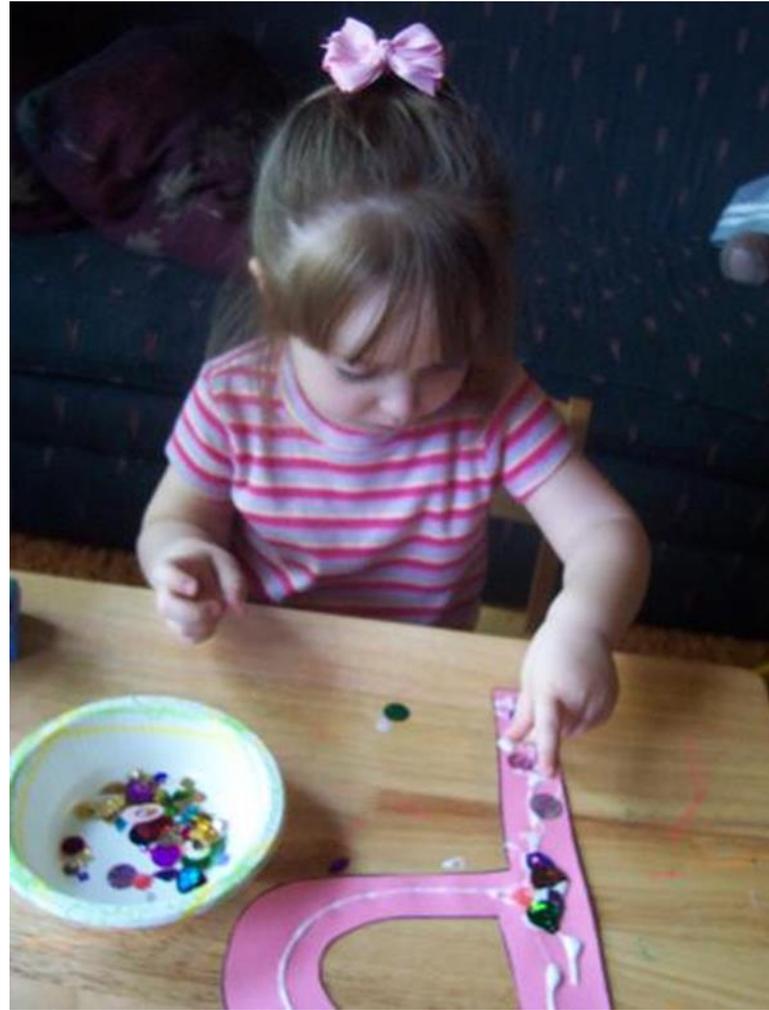
- Statoil was building of huge inventory of completion equipment at the end of 2013
- Delivery times were long
- Low degree of interchangeability between licences
- Had a huge number of items in SAP per main Contractor and very high numbers for the smaller contractors
- A large number of different well completion designs were used
- Very low degree of standardisation in upper, lower nor middle completions across licences
- Unsufficient control of items used or ordered
- Learnings from failures were not always easily translatable for use across the licences - Hence learning curves were sub-optimal

What was done?

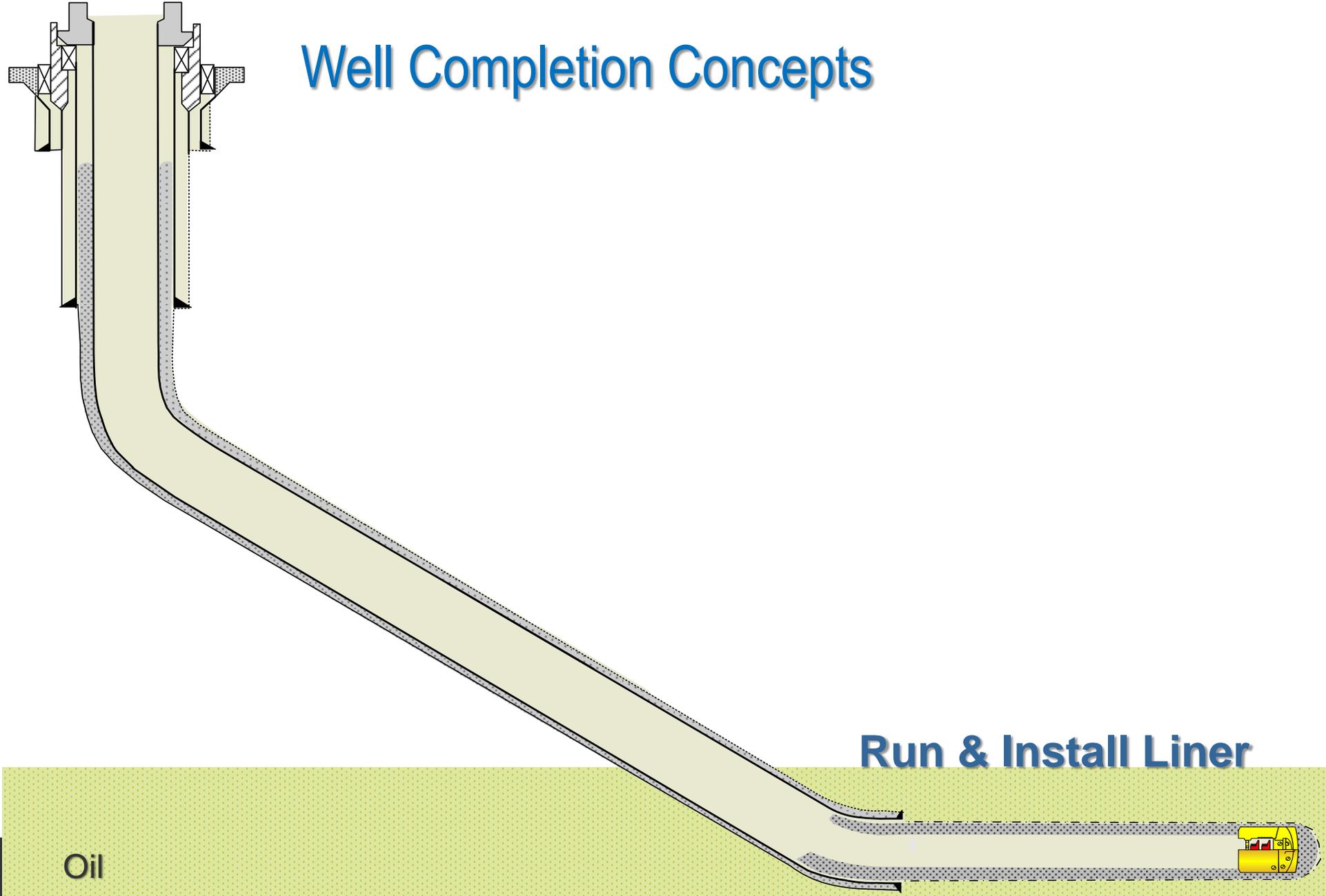
- The Contracts were re-tendered
- Made the back-up equipment the contractor responsibility to ensure alignment in the standardisation process
- Usable inventory has been and is being deployed in 2014 & 2015
- Introduced availability fee & installation fee
- Significantly improved lead times has been achieved
- The wireline insert valves, lock open manipulation tools, running and pulling tools will be retained and a model for maintenance is being set up

What is a completion?

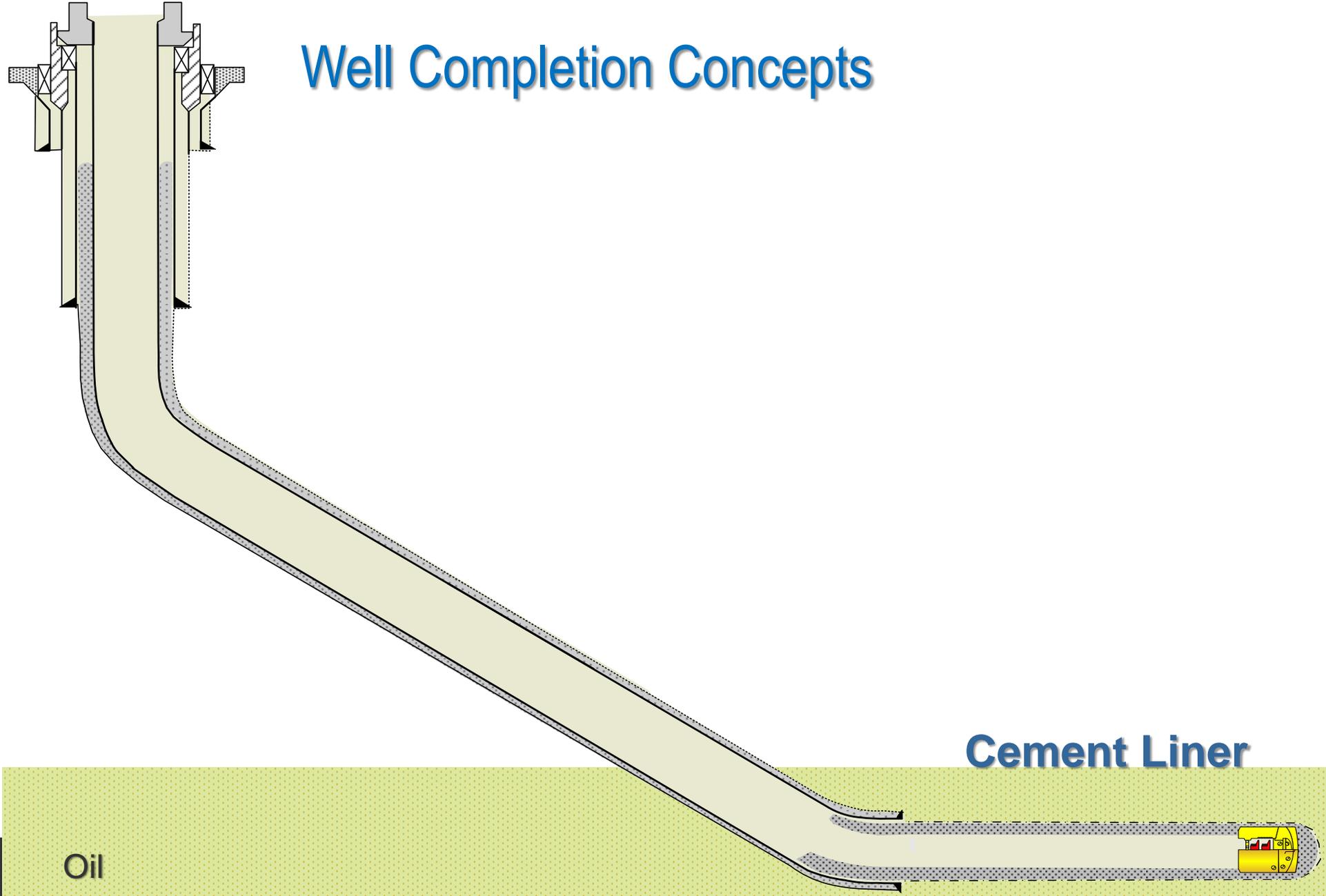
- A simplified approach



Well Completion Concepts



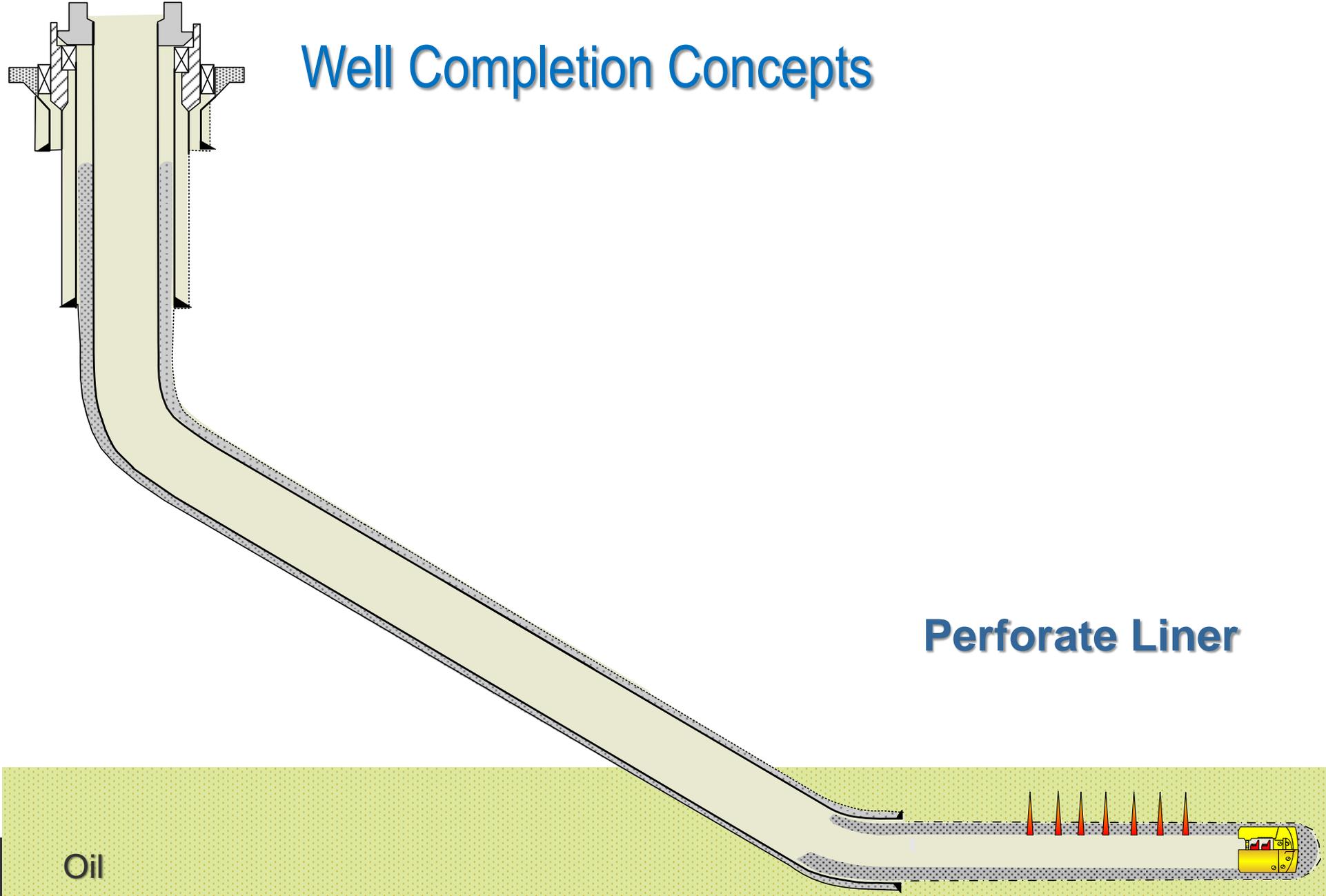
Well Completion Concepts



Oil

Cement Liner

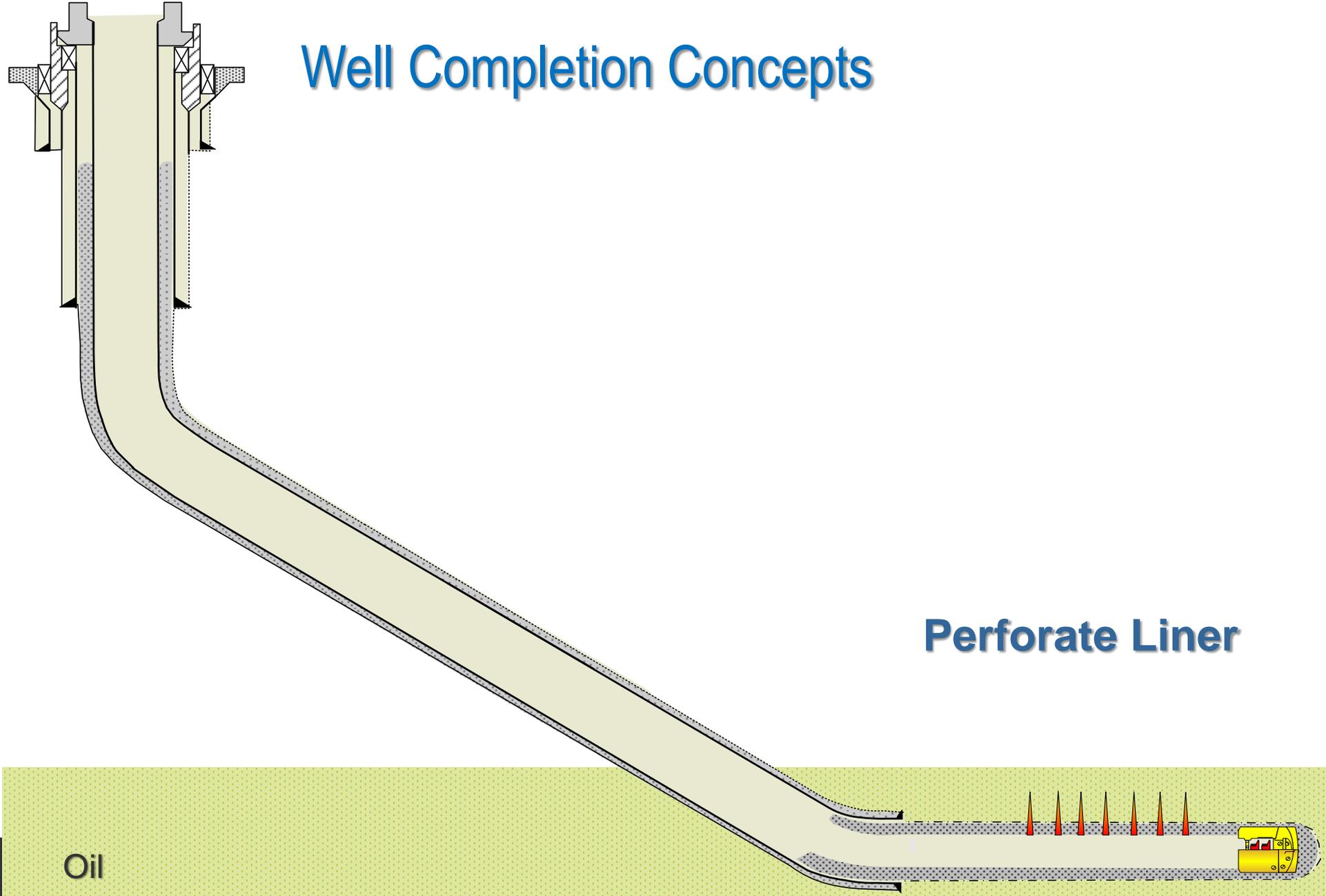
Well Completion Concepts



Perforate Liner

Oil

Well Completion Concepts



Perforate Liner

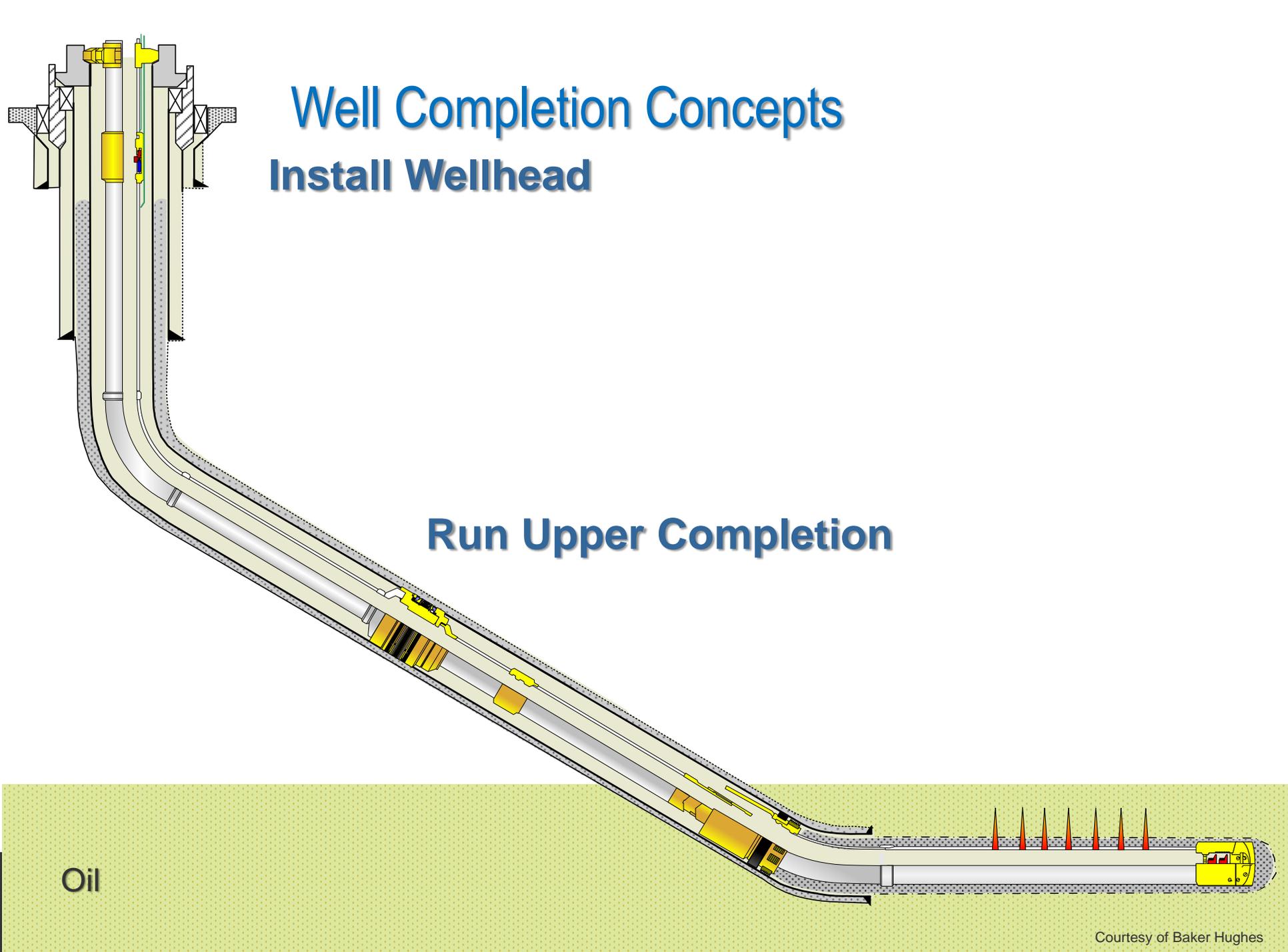
Oil

Well Completion Concepts

Install Wellhead

Run Upper Completion

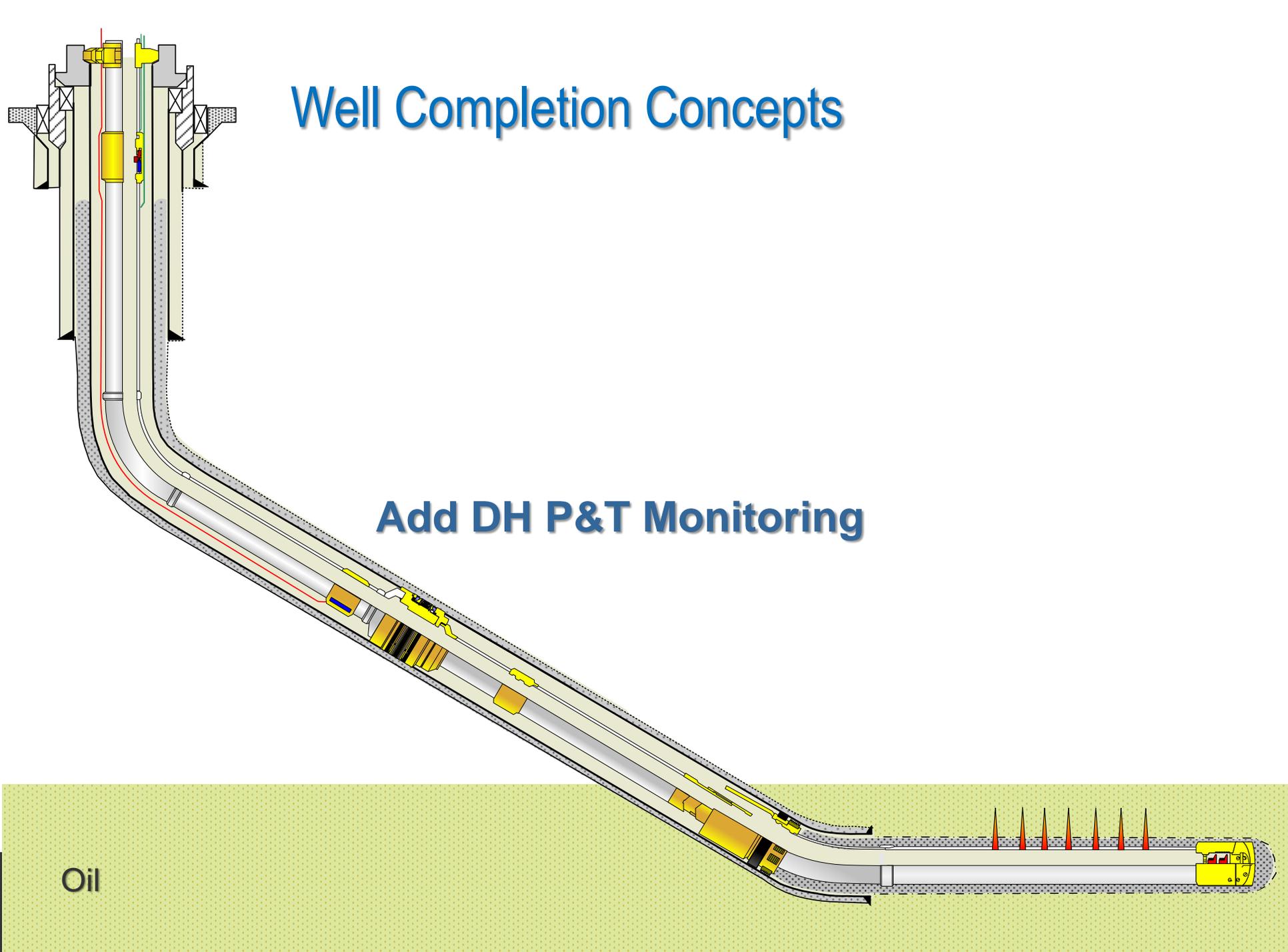
Oil



Well Completion Concepts

Add DH P&T Monitoring

Oil

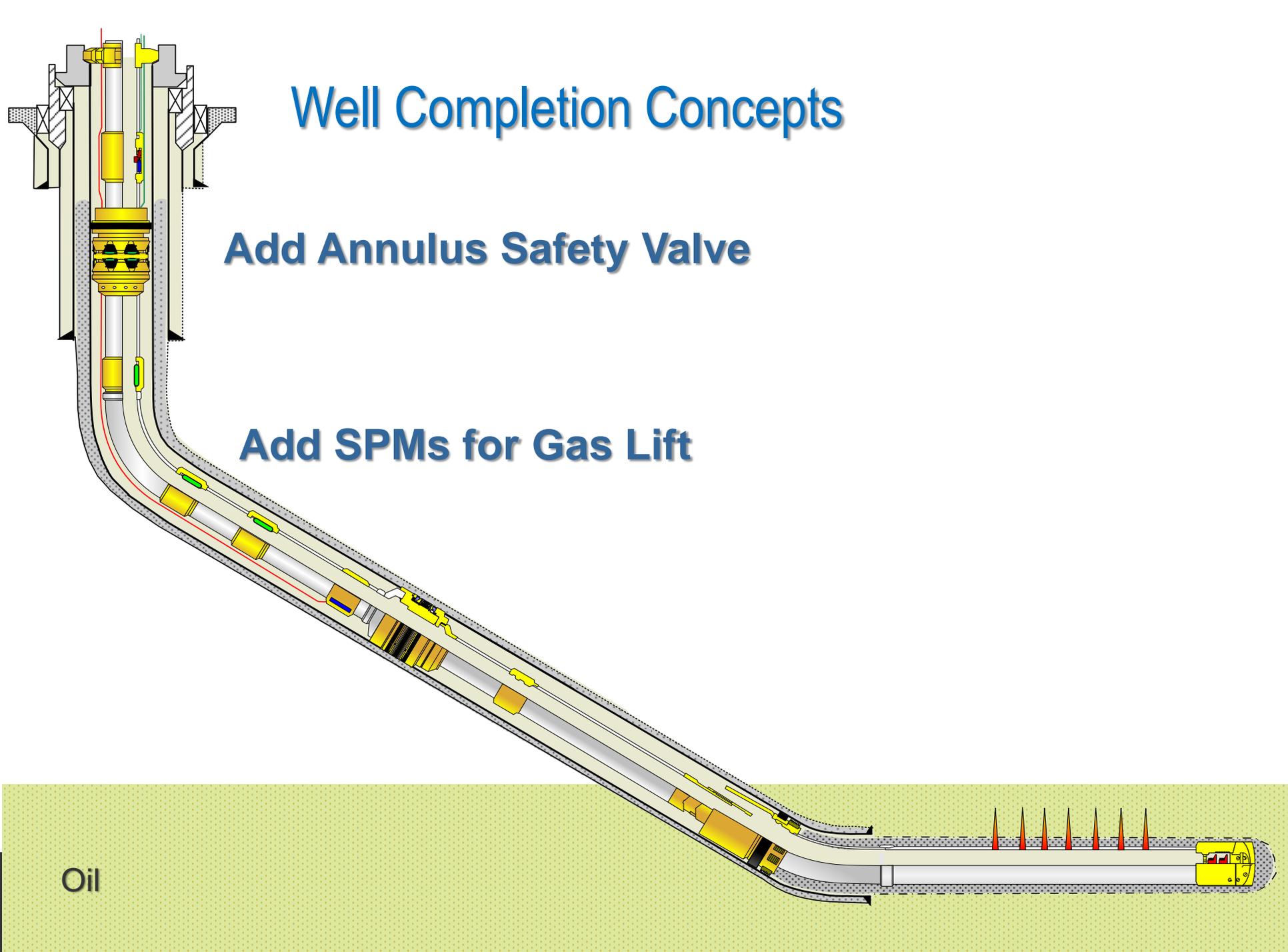


Well Completion Concepts

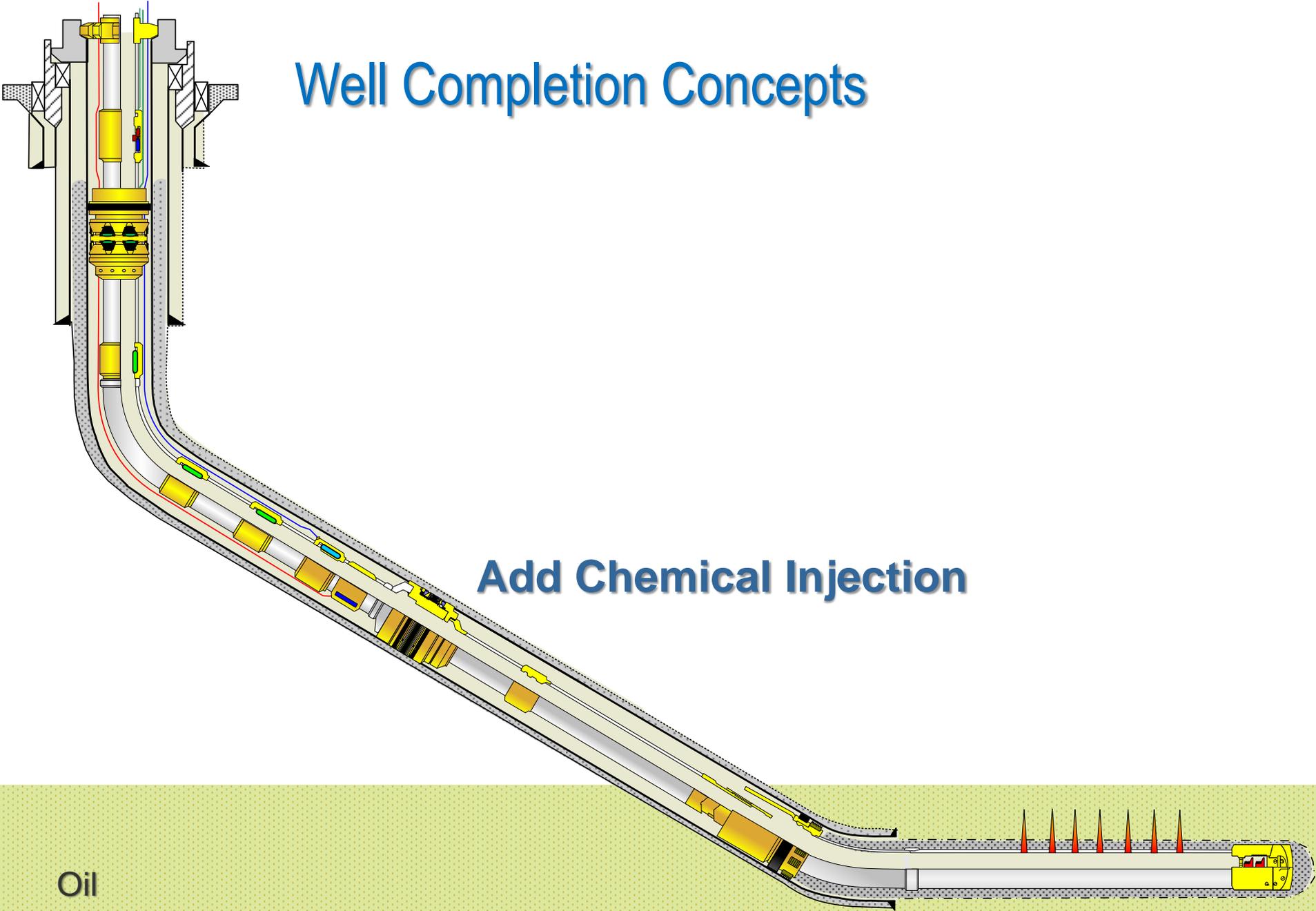
Add Annulus Safety Valve

Add SPMs for Gas Lift

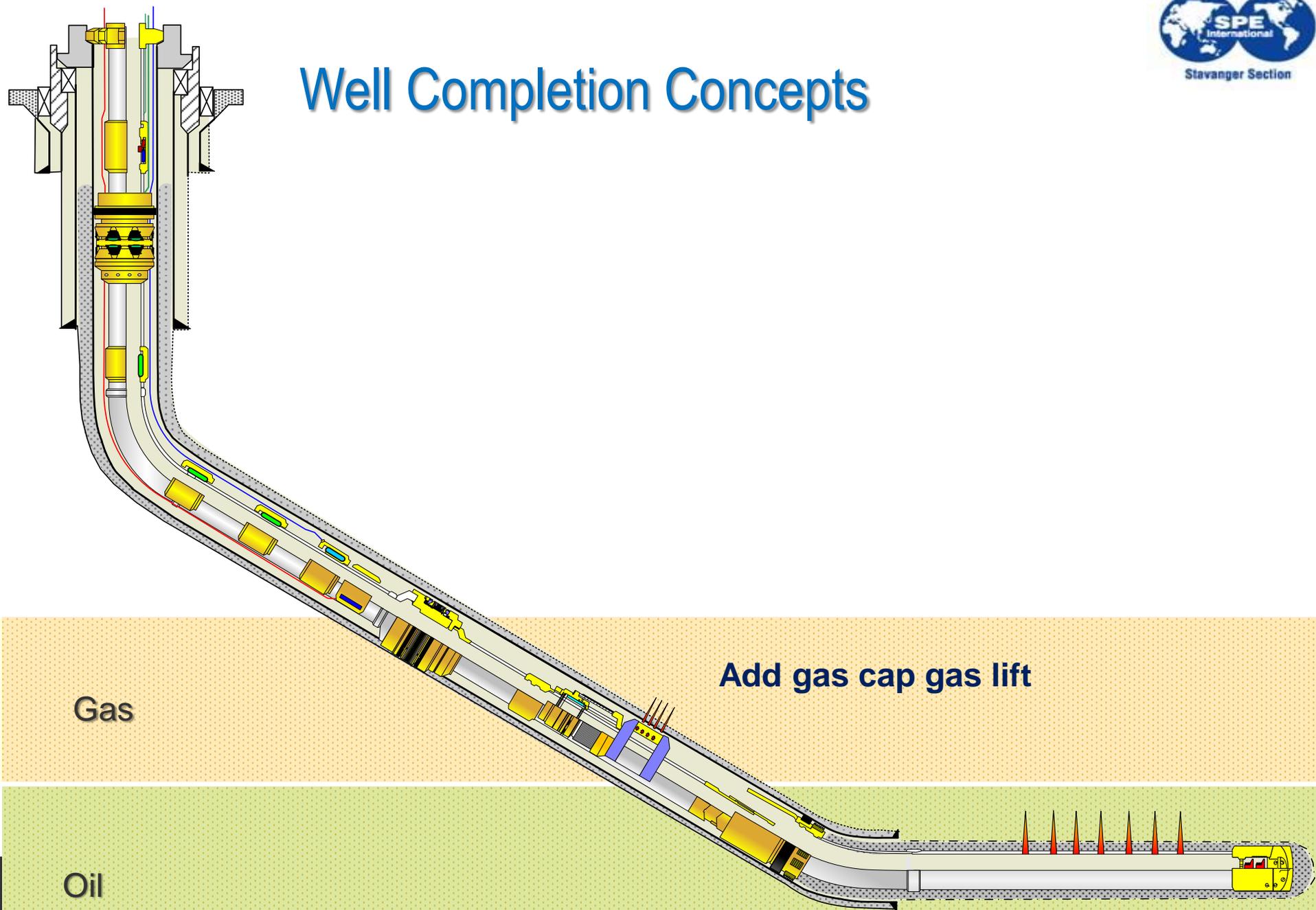
Oil



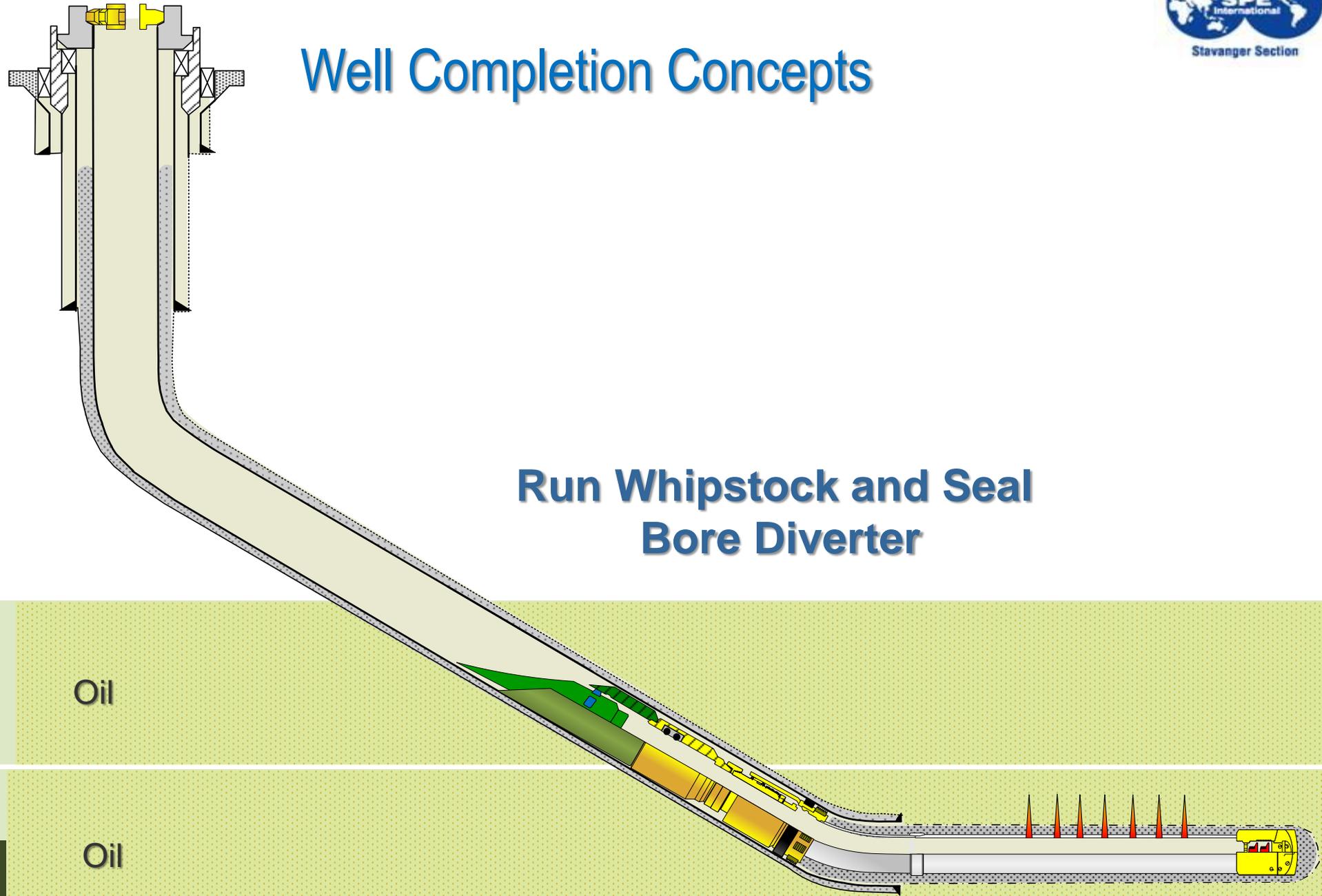
Well Completion Concepts



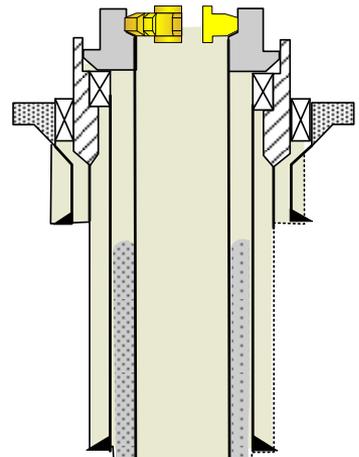
Well Completion Concepts



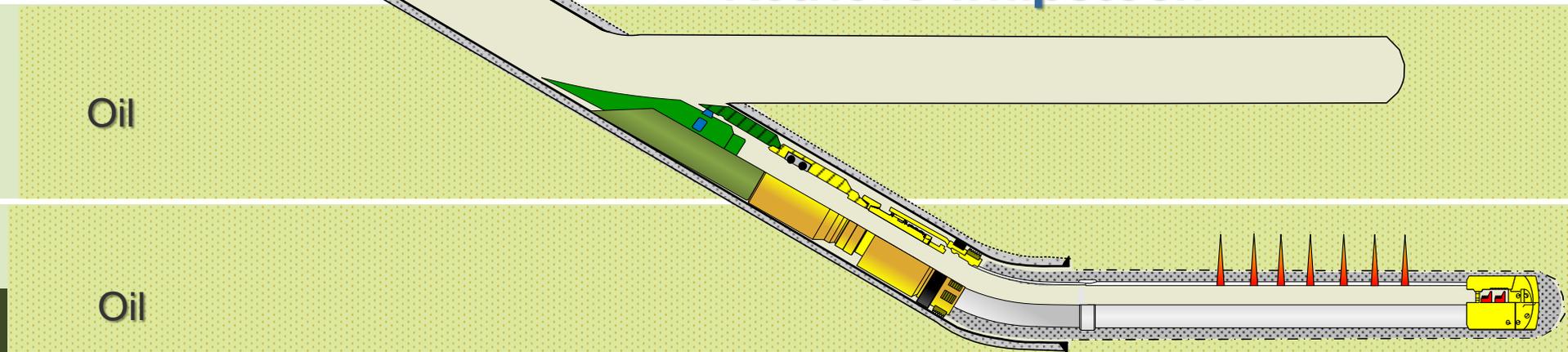
Well Completion Concepts



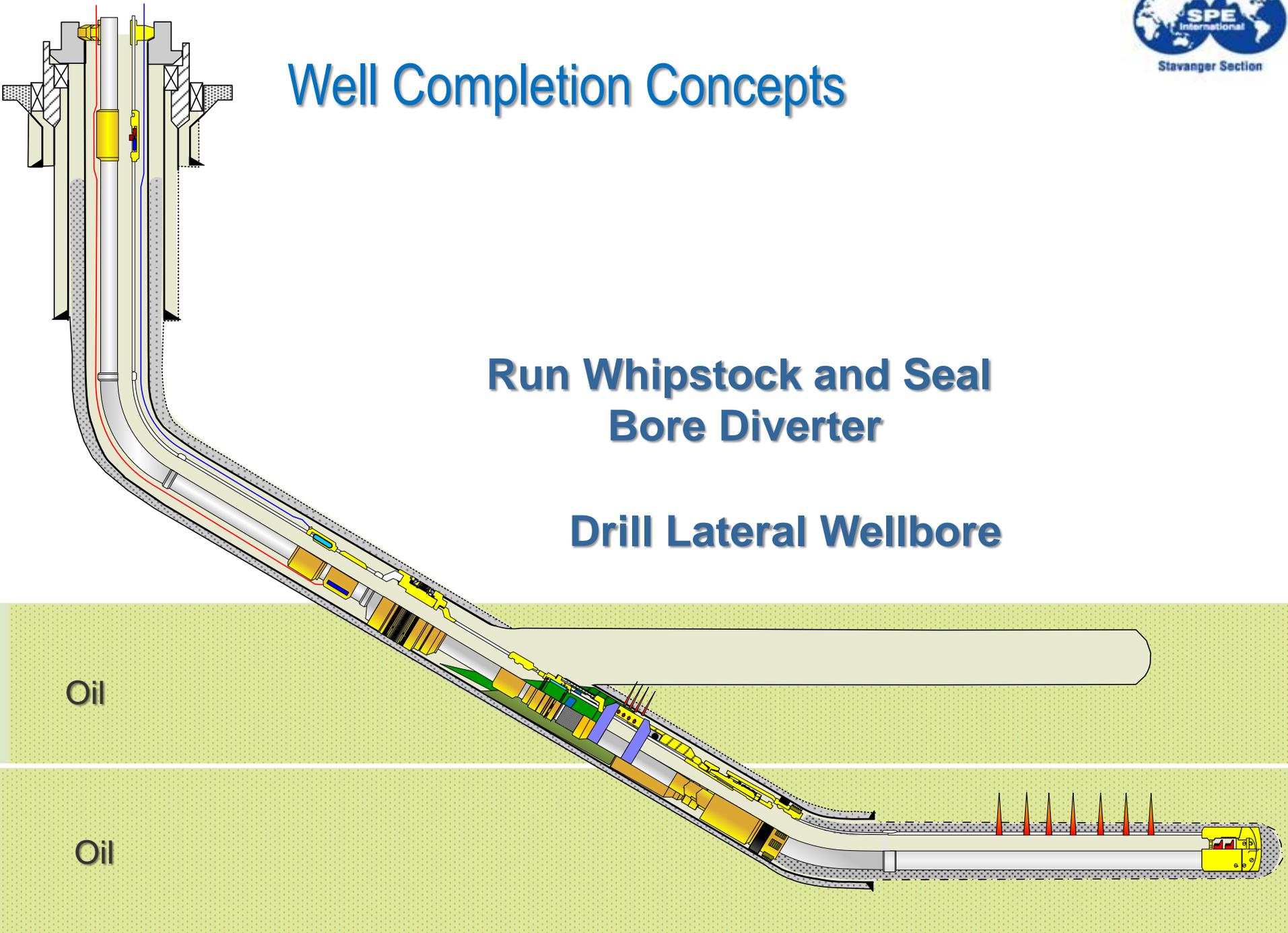
Well Completion Concepts



Drill Lateral Wellbore Retrieve whipstock



Well Completion Concepts



**Run Whipstock and Seal
Bore Diverter**

Drill Lateral Wellbore

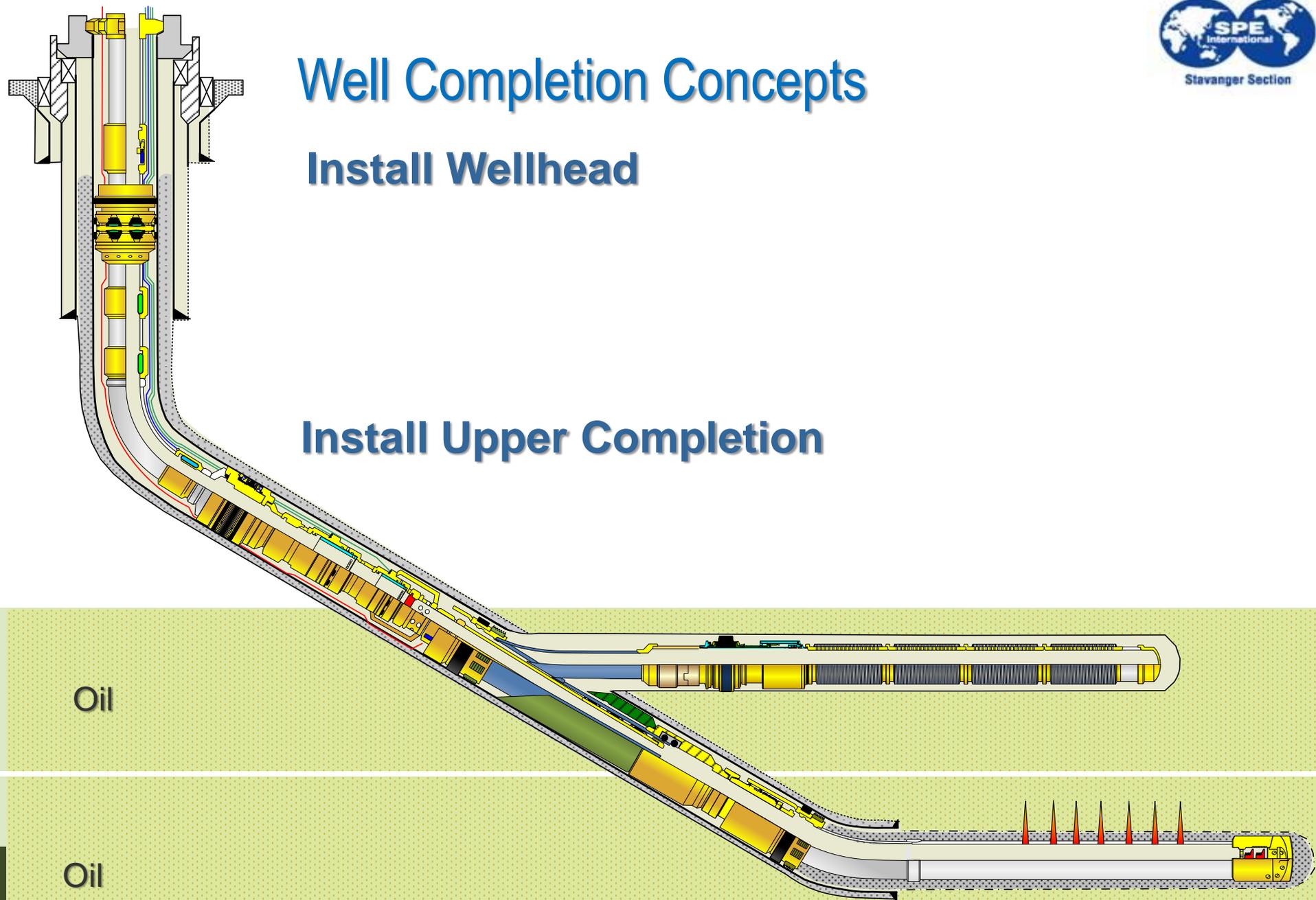
Oil

Oil

Well Completion Concepts

Install Wellhead

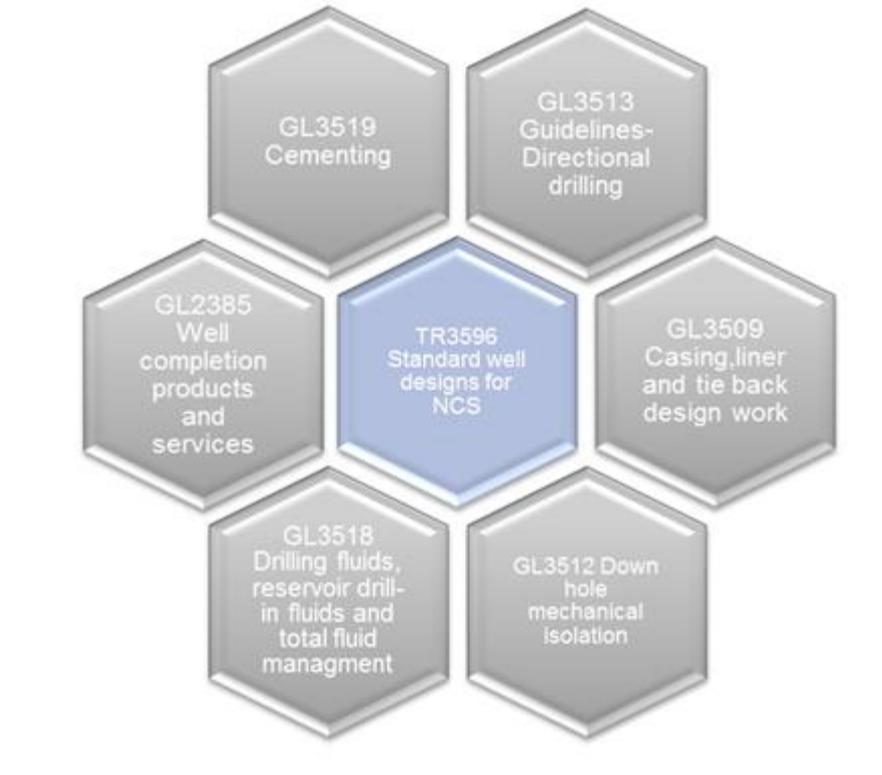
Install Upper Completion



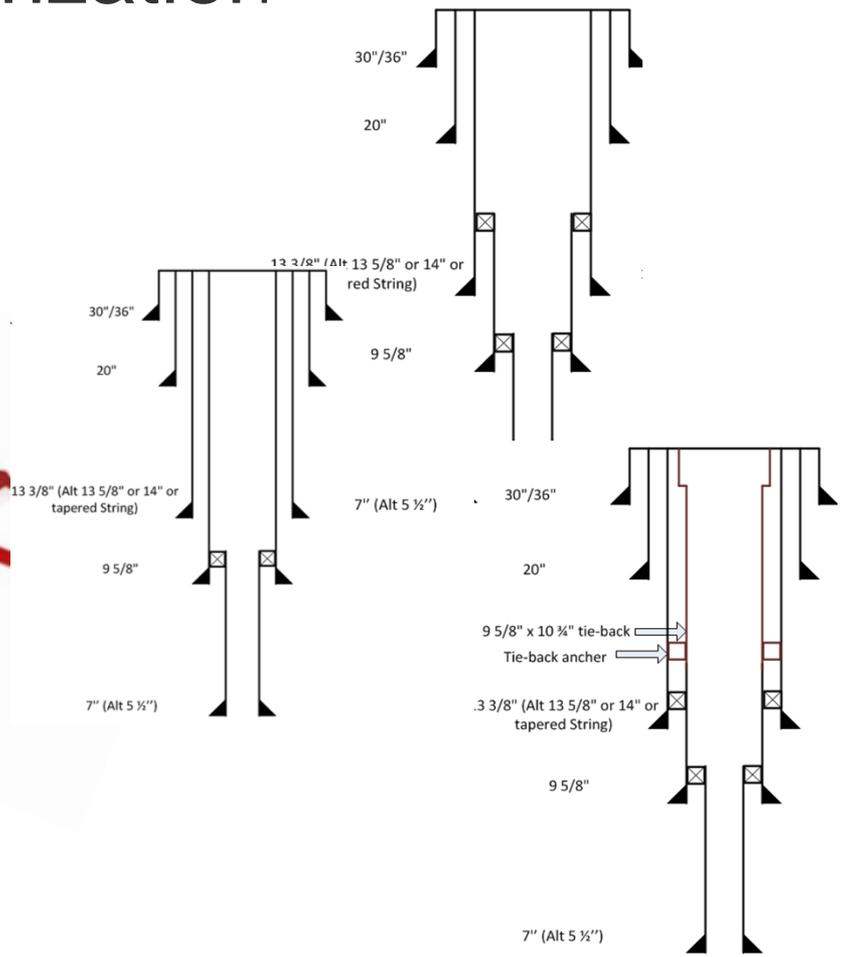
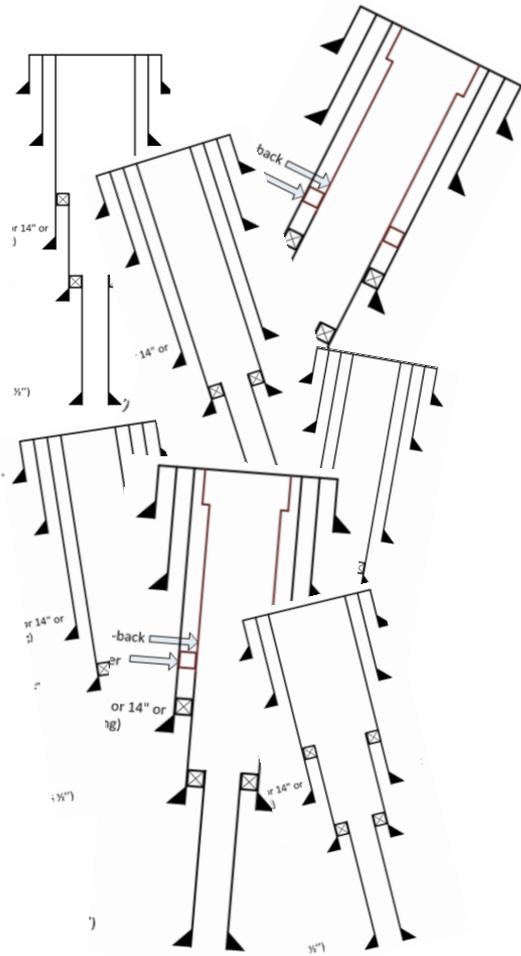
Oil

Oil

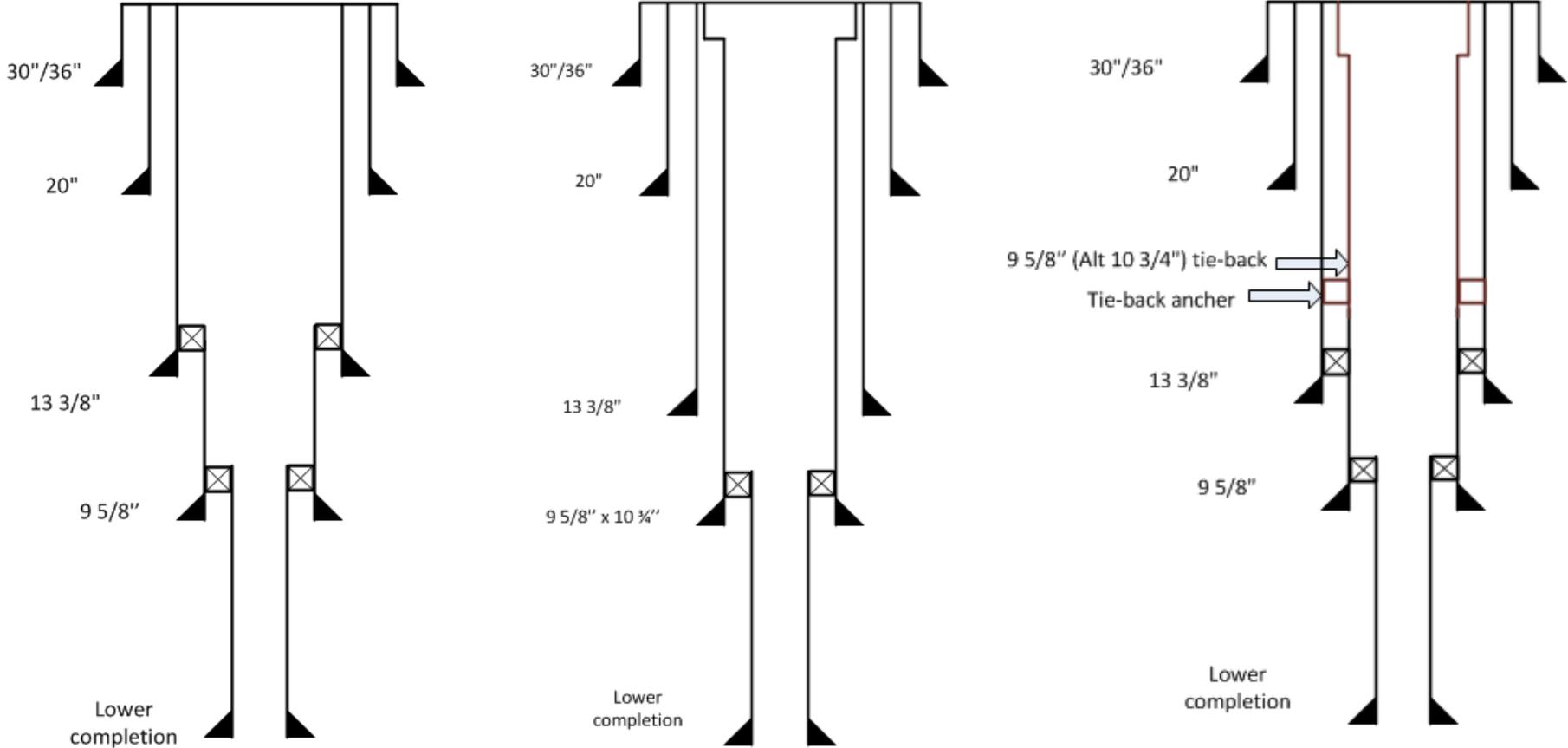
Well concept standardisation



Simplification and Standardization



Recommended standard casing design



What is new with Casing/Tubing Standard list?

- The new standard list is mainly focused on
 - cost and time efficiency program initiated by STEP
- New standard list contains:
 - Low cost and high cost material
 - More standardized choice of intermediate and production casings
- Start design with low cost and weight materials
 - Business case will be needed for upgrading to high cost materials

How do we utilize Standard list?



- How can we be cost efficient with all regulations and requirements?
 - We need to focus on
 - Are we designing our wells based on realistic well life period?
 - Are all requirements applicable to my well?
 - Are casing wear simulations realistic?
 - Do we need all completion jewelries' (7" GLV or Chemical injection valve)?
 - Design of wells vs verification of wells?
 - Over design wells? Pressure testing with higher MW?
- Result
 - Significant positive impact on financial cost for casing and tubing (stock turn over approximately 1.8 per year)

Lower & Middle Completion Standardisation

- Lower completions have been standardised by;
 - Use of standardised liner hanger selections
 - Standardising sand screen selections available (From 60 to 11)
 - Open hole screen solutions (with swell packers/ICDs/AICDs)
 - Expandable screen solution qualified and field implemented
 - Gravel packed screen solutions (with swell packers/ICDs/AICDs)
 - Cemented and perforated casing solutions
- Middle completions, work have commenced to try to negate these, by:
 - Investigating solutions which allows circulation whilst RIH and leaving a barrier plug intact in the lower completion – need sleeves & communication solutions
 - Use of disappearing barrier plugs – but ensure the well is cleaned out properly and avoid fill!

Completion snapshot – as is

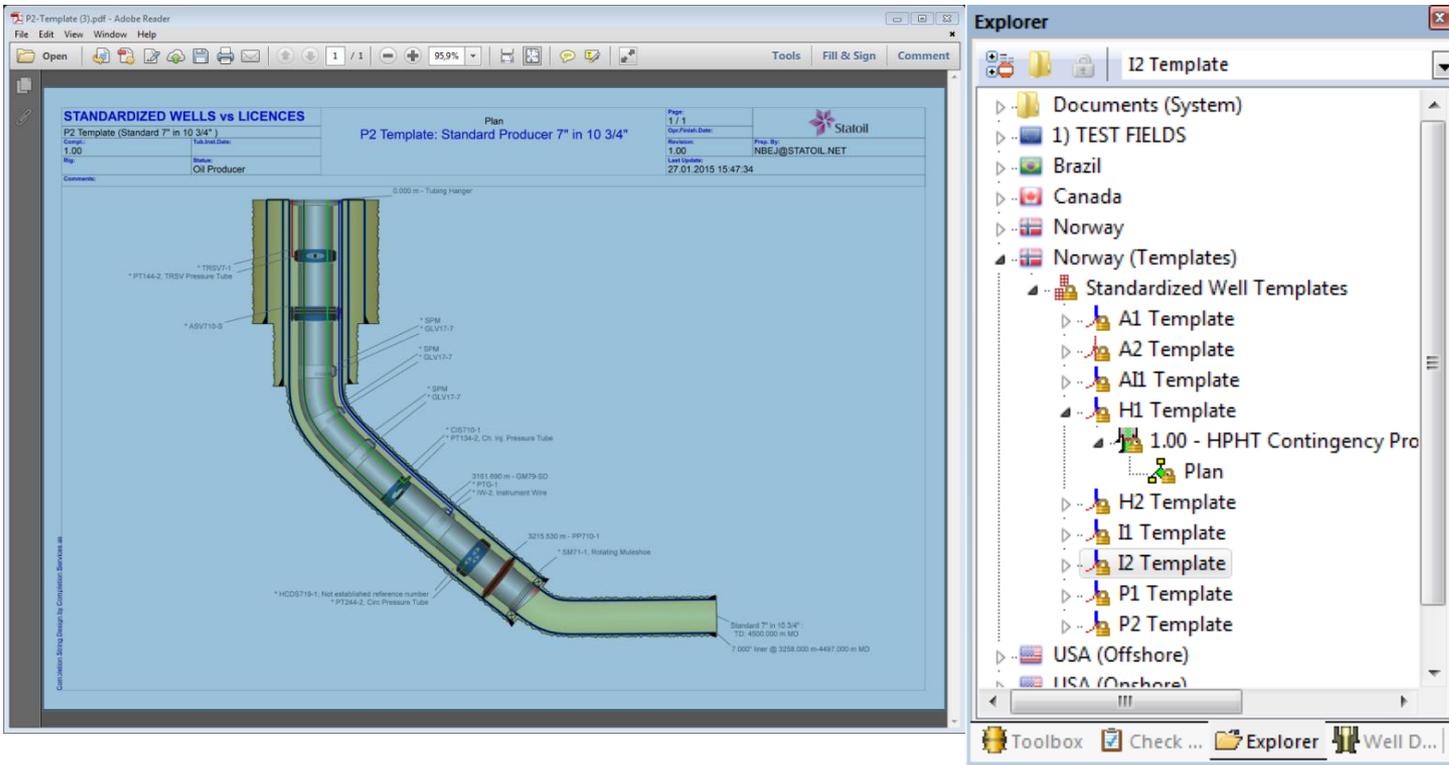
- Now - New contracts

- Standardised equipment lists per licence, only the needed 20-80 items per licence is available dependant on well designs used
- Reduced cost for all
- Stock turn-over is greatly increased
- Only +/-200 items active in SAP for each of the main completion equipment providers
- All licences have a standardised list of available equipment controlled through Contracts Team and Senior Vice President D&W approval of any change

Upper Completion Standardisation

CSD library have been created of the 9 standardised well designs

- The total alternatives are now 6 for the Statoil concept bare-bone approach
- The schematics was implemented in GL2385 issued 03.07.15
- The designs have been verified against intervention and revised casing designs
- Can be pre-viewed in computer program CSD under test fields on Statoil computers



Materials

- TR3596 which describes casing and material standards - challenge materials used, but
 - Completion equipment shall remain standardised on 13% chrome (producers) or high alloy (injectors/HPHT)

Defined exceptions to Standardisation

- Deep set TRSV for Aasta Hansteen
- WRSVs (wireline retrievable valves) for Statfjord
- Special TLP related equipment (Hang off devices, expansion joints, etc)
- ESP (Electrical submersible pump) wells
 - TRSV as production wells, all other equipment is specialised (packer, fluid loss valves, Y-tool, ESP system)
- IGLS (Inverted gas lift) is highly specialised at the wellhead and TRSV

Wrap up

- It is important to both the vendors and Statoil that all are loyal to the standardisation process
- Keep the targets in mind at all times
- Control purchases outside dedicated SAP lists

• Questions?