

# WELL COMPLETION

SEMINÁRIO DE ENGENHARIA DE PETRÓLEOS

# WHAT IS COMPLETION?

***“COMPLETION BEGINS WITH THE  
FIRST TURN OF THE BIT”***

# WHAT IS COMPLETION?

Before we start drilling, we must design the completion, and after that, drill the well based on that assumptions.

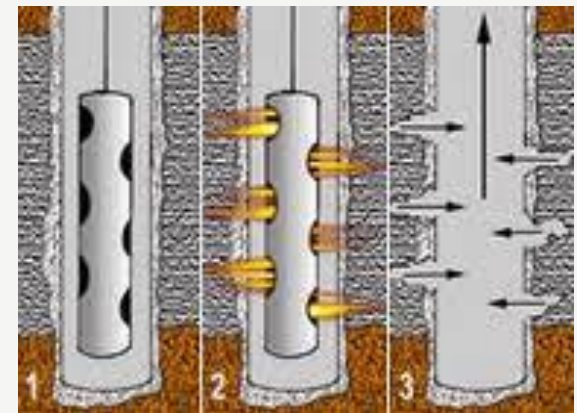
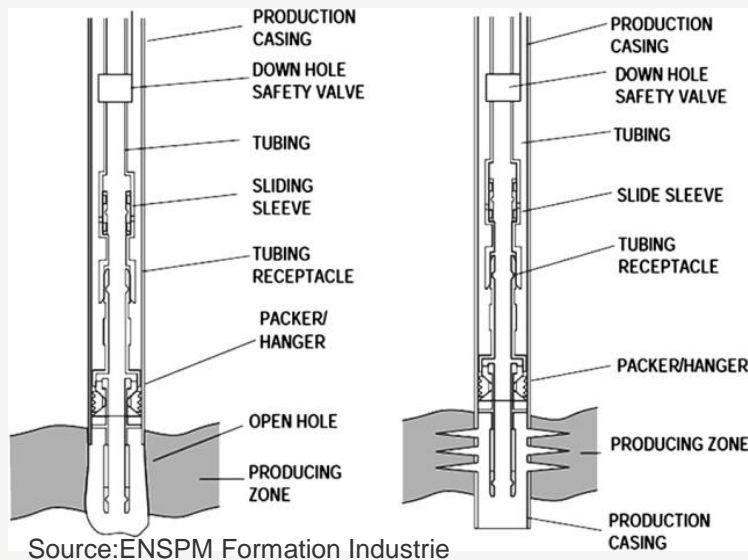
Once the well is drilled to the desired depth (reservoir), the formation is tested and evaluated to determinate, if the well is going to be completed for production, or plugged and abandoned.

# COMPLETION DESIGN

- **WELL PURPOSE:** Exploration, Appraisal or Development.
- **ENVIRONMENT:** Location, Onshore, Offshore.
- **DRILLING:** Drilling and Casing Program, Cementing and Well Profiles (Vertical, Horizontal)
- **RESERVOIR:** Pressures, Temperature, Productive Layers, Rock Properties and Fluid Type.
- **PRODUCTION:** Safety, Maintenance and Operations Conditions.
- **EQUIPMENT:** Surface Equipment, Downhole Equipment.

# COMPLETION DESIGN

The well completion modes are basically divided into two main categories: openhole completion and perforated completion.



Source: Schlumberger

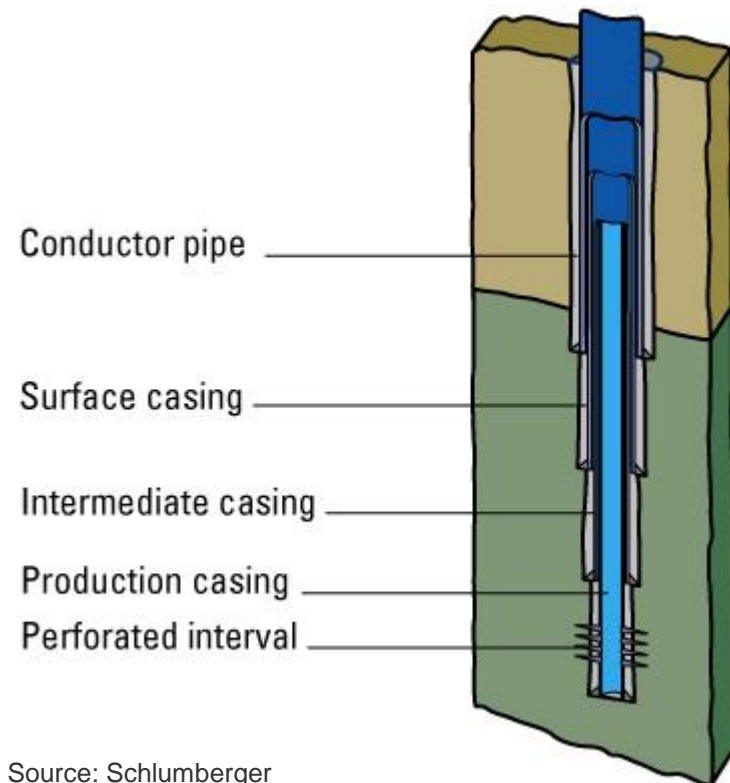
# COMPLETION START

Surface Casing is started in drilling to prevent the collapse of the well

Cementing is done most often between casings

The diameter of the well is smaller as we are going more deeper.

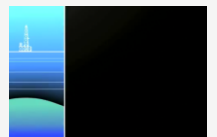
The production casing is the last to be installed, before the liner.



Source: Schlumberger

# COMPLETION PHASES

- CHECKING AND CONDITIONING THE BOREHOLE
- SETTING SURFACE AND INTERMEDIATE CASING
- CEMENTING
- INSTALL THE WELL HEAD, CHRISTMAS TREE
- SETTING PRODUCTION CASING
- PERFORATING
- INSTALL THE DOWNHOLE EQUIPMENT



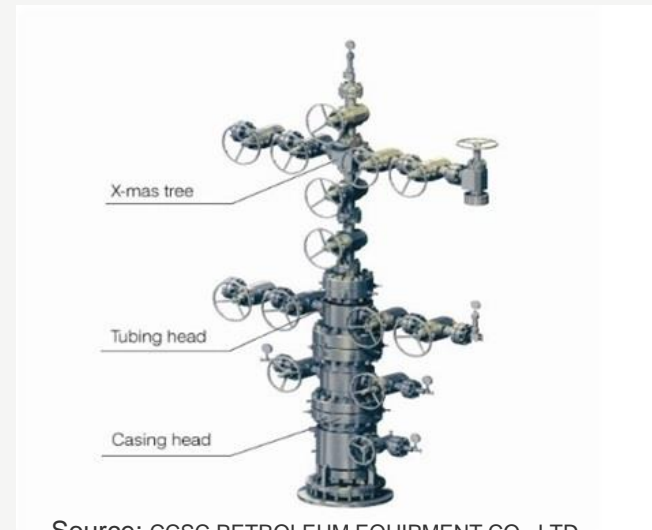
# COMPLETION EQUIPMENT

## SURFACE EQUIPMENT – WELL HEAD

- **CASING HEAD**
- **TUBING HEAD**
- **CHRISTMAS TREE**

The function of a christmas tree is to:

- Prevent the release of oil or gas into the environment (BOP)
- Direct and control the flow of the formation fluids from the well



Source: CCSC PETROLEUM EQUIPMENT CO., LTD



# COMPLETION EQUIPMENT

## DOWNHOLE EQUIPMENT

- **PACKER**
- **GAS LIFT VALVE**
- **SAFETY VALVE**
- **HYDRAULIC CONTROL LINE**
- **PUMPS (OIL LIFT, GAS LIFT)**
- **LINER**



Hydraulic Control Line

Safety Valve

Gas Lift Valve

Packer

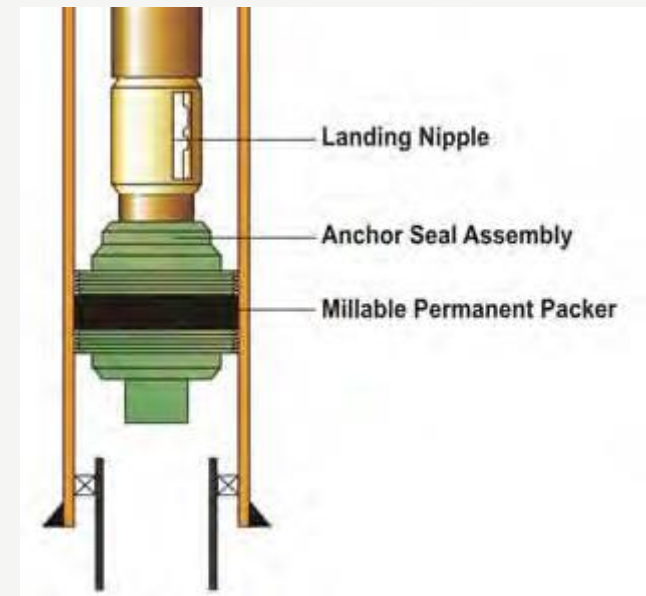
Pump

Liner

# COMPLETION EQUIPMENT

## PACKER

Packer is a sealing device. It expands externally to seal the well bore. It helps in blocking the fluids through the annular space between the pipe and the well bore wall.



Source: Concept 2 Completion PTE LT

# SMART WELLS

Offer the possibility to respond to changing conditions in the Reservoir.

Combine existing state-of-the-art technologies such as wireless technologies, remote sensing capabilities, remote control mechanism and robotic tools.

Remote sensors can immediately show what is going on in the down hole.

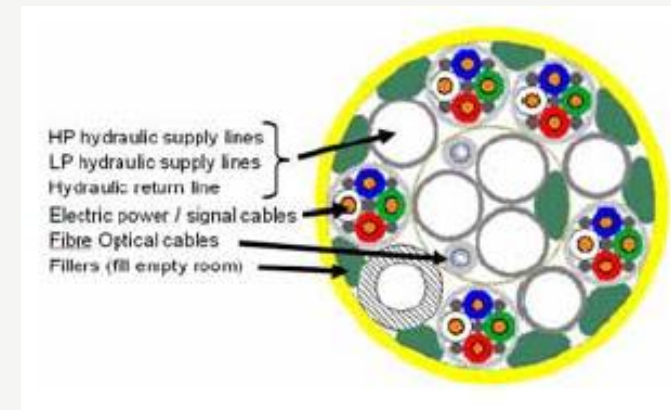
Valves down the hole can be adjusted, controlling flow or shutting off production at one level and increasing it from another.

# SMART WELLS - ADVANTAGES

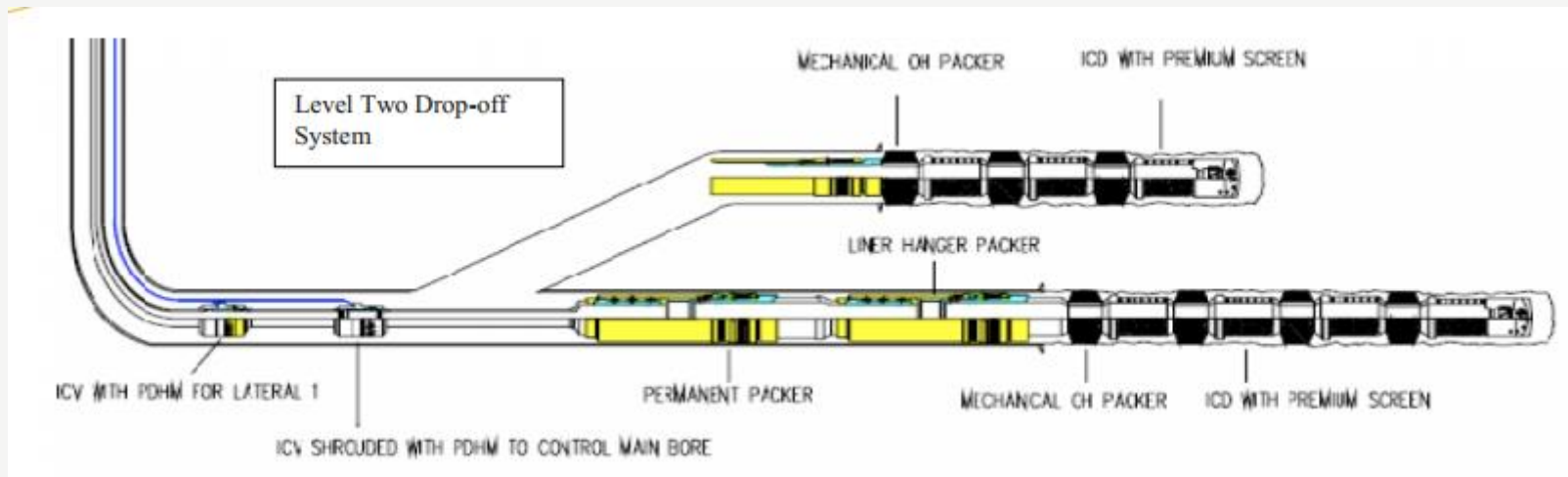
- Accelerate Production
- Increase Ultimate Recovery
- Reduction in Capital Expenditure
- Reduction in Operation Time
- Reduce Risk

# SMART WELLS - EQUIPMENTS

- PACKER
- HYDRAULIC OR ELECTRICAL CONTROL LINES
- SENSORS
- INFLOW CONTROL DEVICES (ICD)
- INFLOW CONTROL VALVER (ICV)
- INTELLIGENT LINER

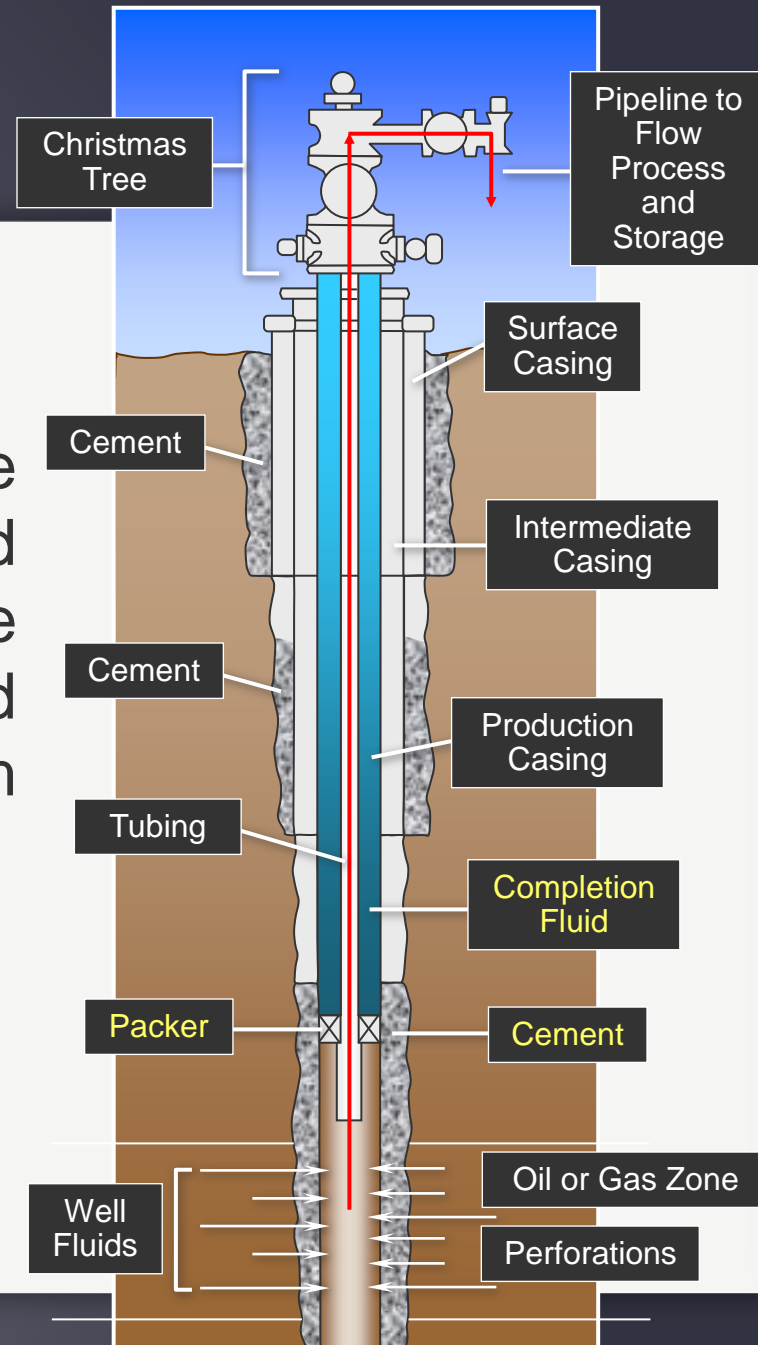


# SMART WELLS - EXAMPLES



The term '**completion**' describes the assembly of down hole tubulars and other safety equipments, that are required to enable the **safe** and **efficient production** of oil & gas from the well after it has been drilled.

THANK YOU



# BIBLIOGRAPHY

- Perrin D, “*Well Completion and Servicing*”, Editions Technip, Paris, 1999.
- Renpu W, “*Advanced Well Completion Engineering*”, Gulf Professional Publishing, 3rd edition, 2008
- “Introduction to Well Testing”, Schlumberger, 1998.
- Devold H, “*Oil and gas production handbook: an introduction to oil and gas production, transport, refining and petrochemical industry*”, ABB, 3rd edition 2013.
- Jannise R, “*Completion Process*”, Halliburton, 2009.