WELL COMPLETION

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"WELL COMPLETION"

Informal definition:

The high time of the well when engineer and personnel comes to decide whether to install the production casing in order to initiate the production at the surface or it should be abandoned .

Technical Definition:

Well completion means to prepare the well for production by installing the necessary equipments into the well in order to allow the safe and controlled flow of HCS at the surface.

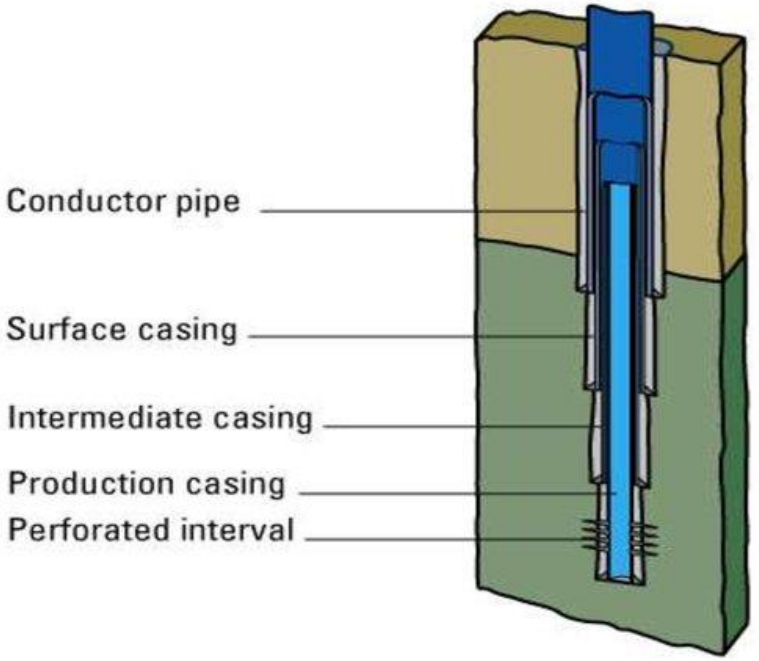
Well completion steps

(Source: http://www.rigzone.com/training/insight.asp?i_id=326)

- Casing
- Cementing
- Open hole completion
- Closed hole completion(Perforating)
- Gravel packing
- Production tree

Casing has 3 different sections

- Conductor pipe
- Surface casing (High diameter)
- Intermediate casing
- Production casing (Low diameter)



Source:
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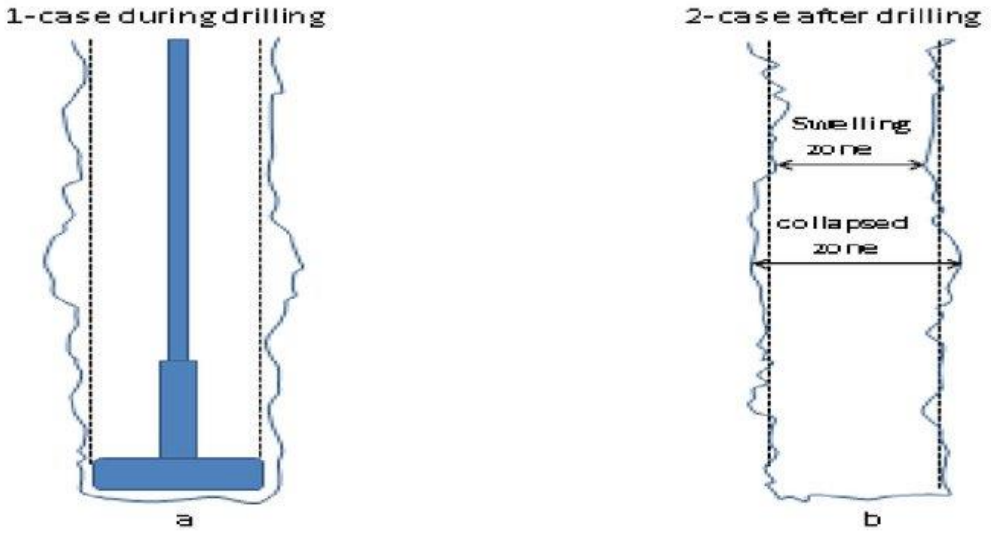
Question

- List common problems during casing

Answer

- Hole instability (Bore hole collapse & Well swelling)
- Formation kick

Effect of rock expansion on the hole size

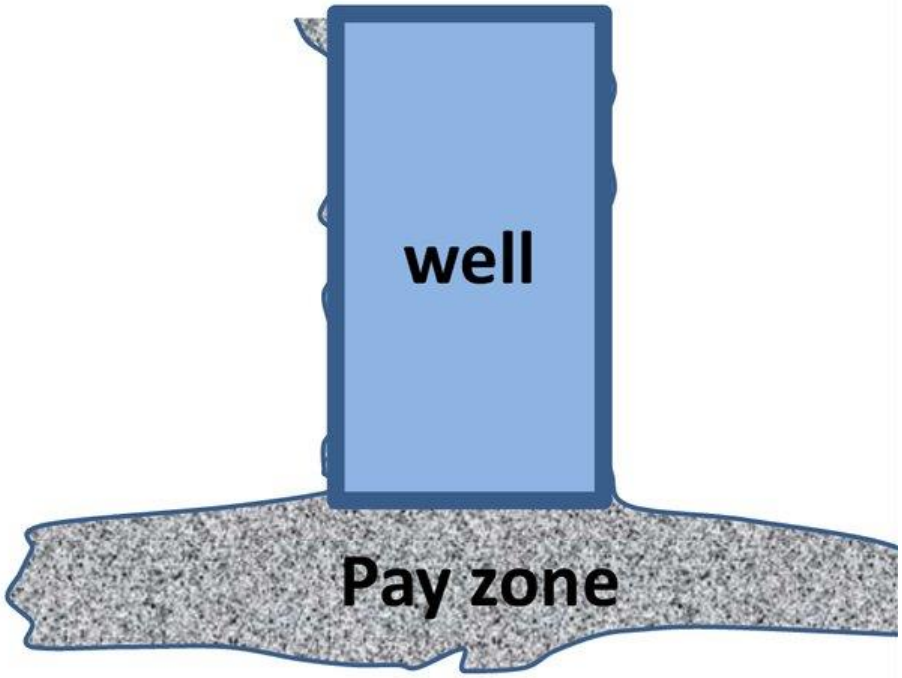


Cementing

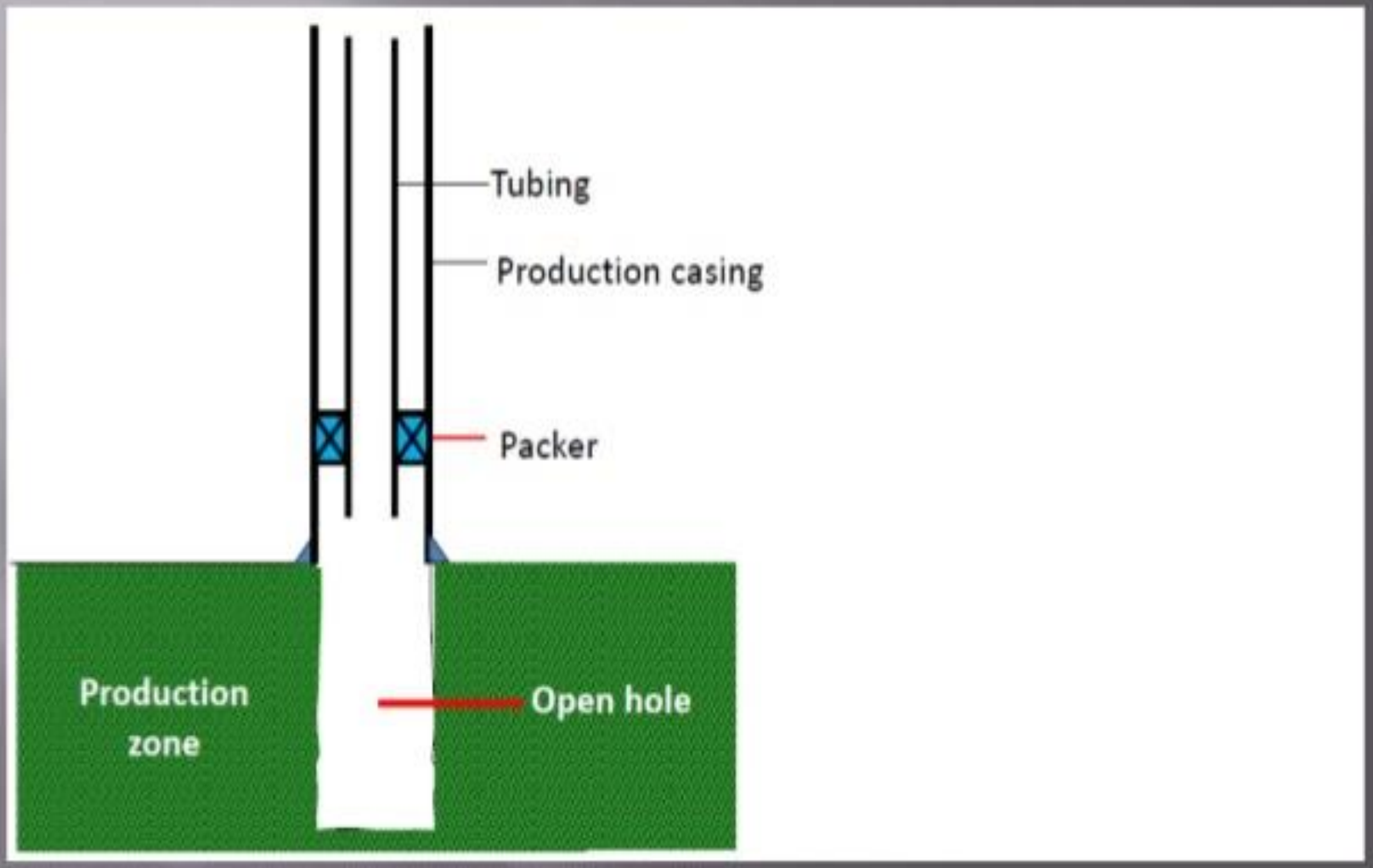
- Casings are cemented with the formation in order to be tight
- If cementing is incomplete, the well could have problems.
- Usually cement slurry is used

Open hole completion

- Well is cemented above the pay zone
- Saves the cost of casing
- Perforation is not performed



OPEN HOLE WELL COMPLETION



ADVANTAGES

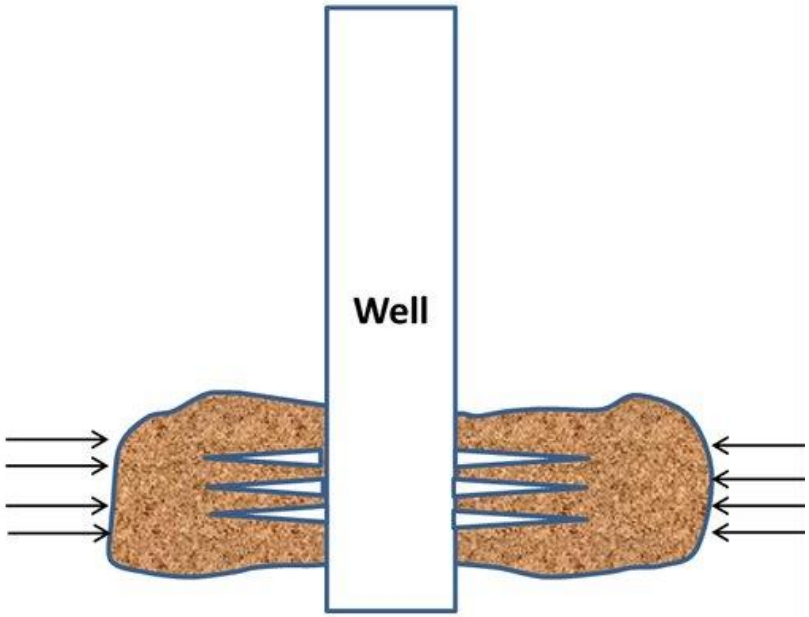
- Maximum exposure of pay zone
- Less pressure drawdown during flow
- No formation damage occurs due to cementing and perforation.
- Less formation damage

DISADVANTAGES

- Inability to plug off water or gas zones
- Inability to stimulate the separate zones within the productive zones

Closed hole completion (perforating)

- The well reaches to the bottom of the pay zone.
- Perforation is used to make sure that oil comes into the well directly.

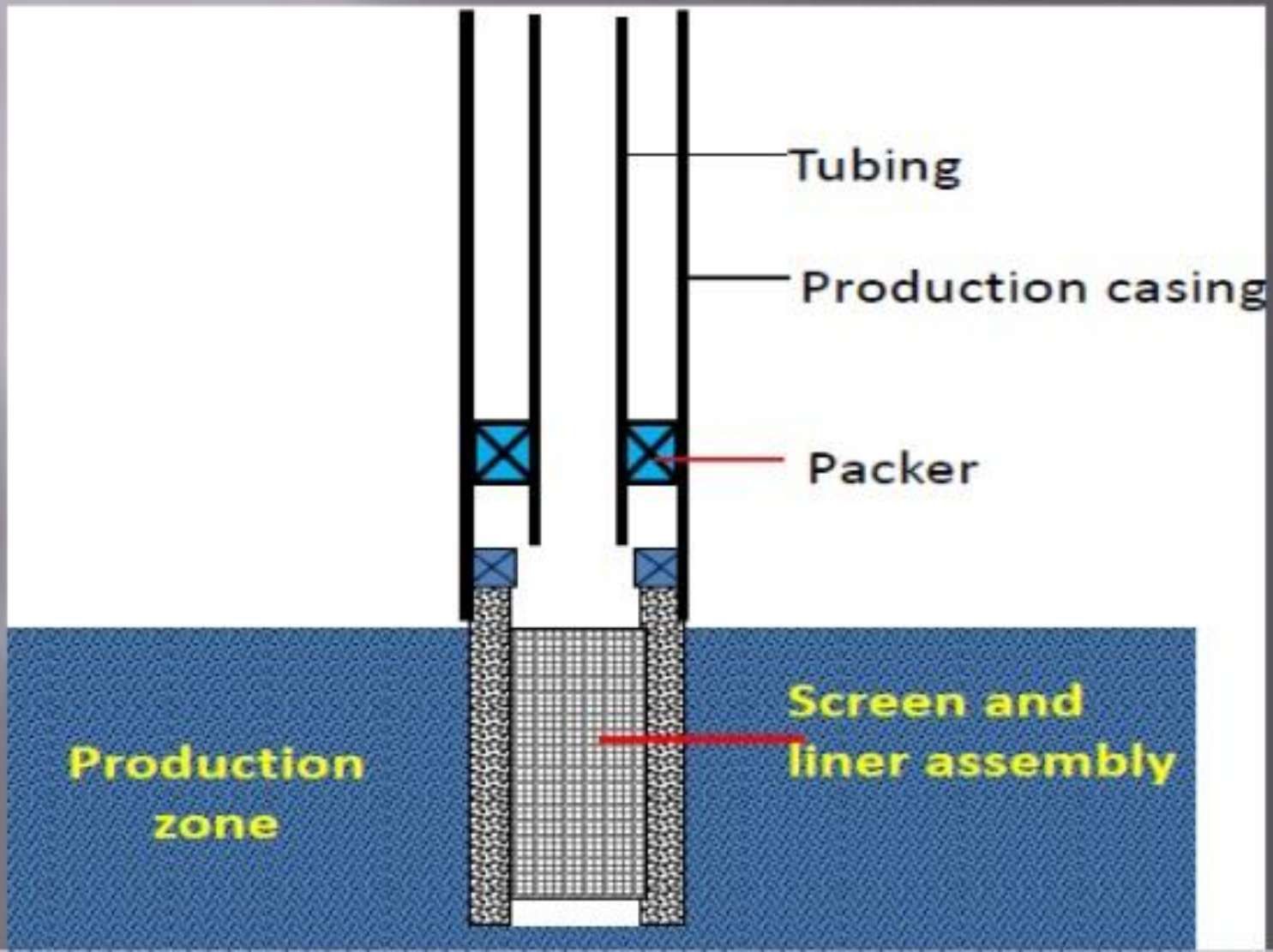


LINER COMPLETION

- A Liner is installed across the pay zone
- It can be divided into two: Screen Liner and perforated liner

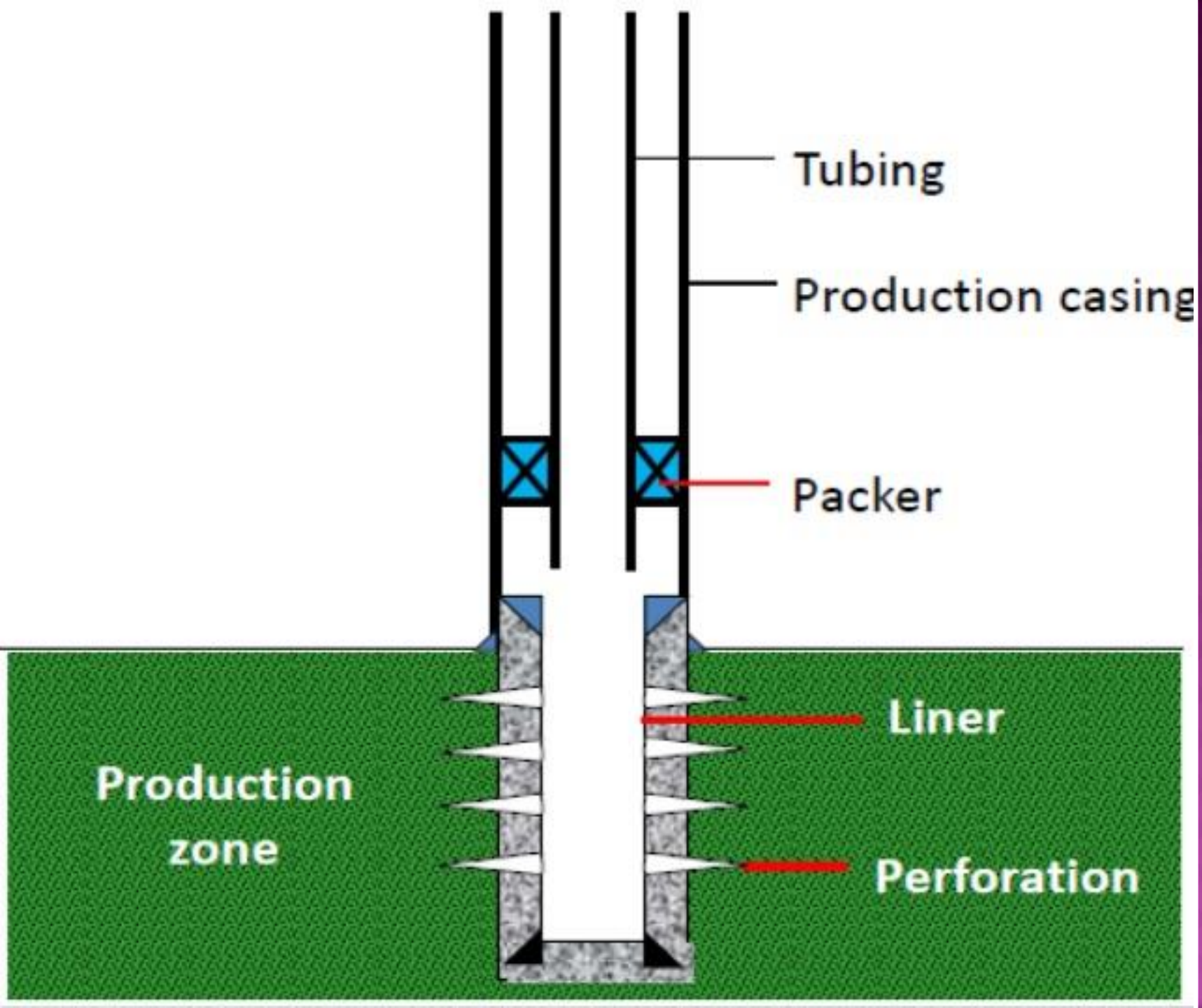
- Screen Liner : Casing is set above the producing zone and an uncemented screen and liner assembly is installed across the pay zone

LINER COMPLETION



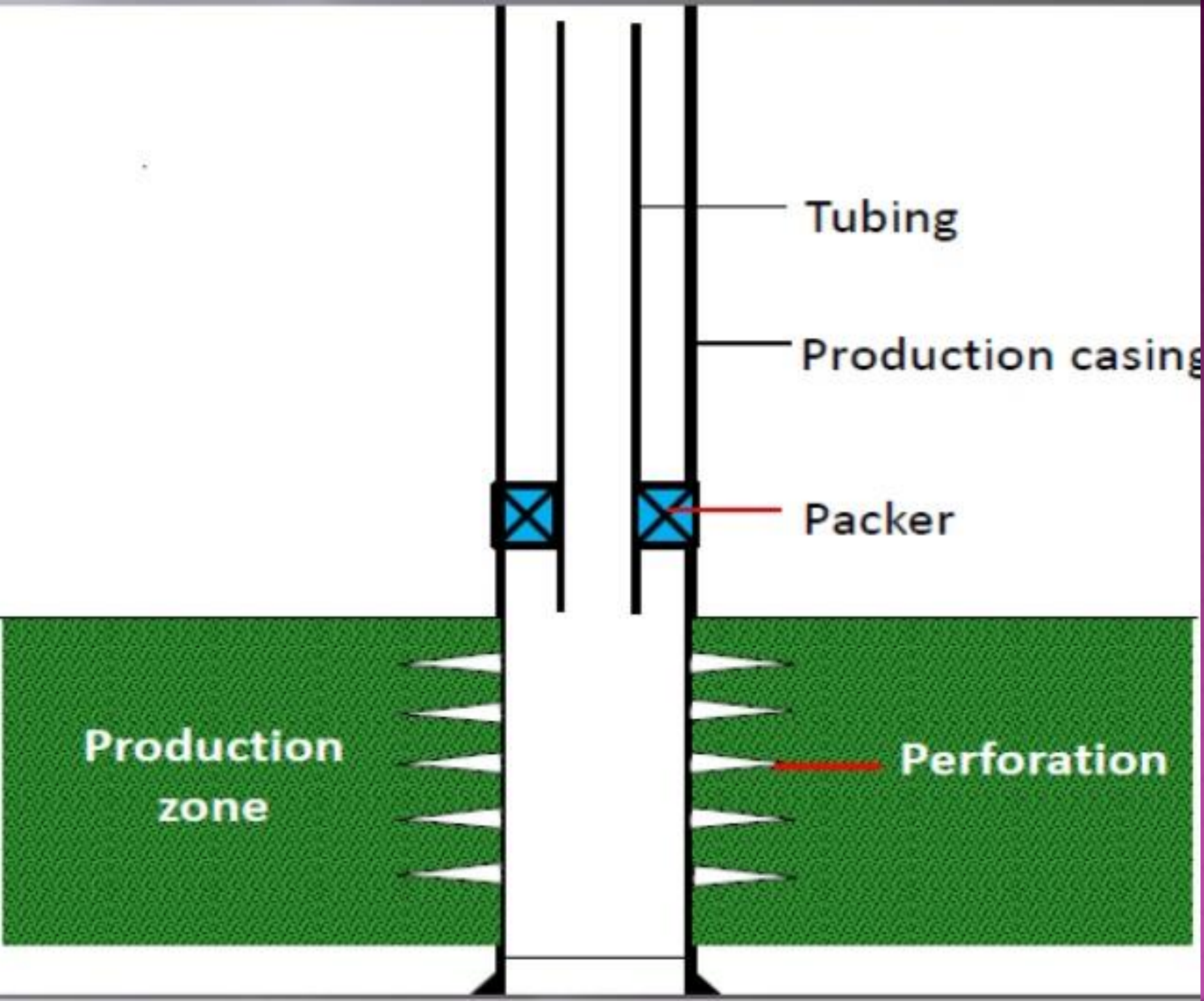
Perforated Liner completion

- Casing is set above the producing zone and a liner assembly is installed across the pay zone and cemented in place. The liner is then perforated selectively for production.


Tubing
Production casing
Packer
Liner
Production zone
Perforation

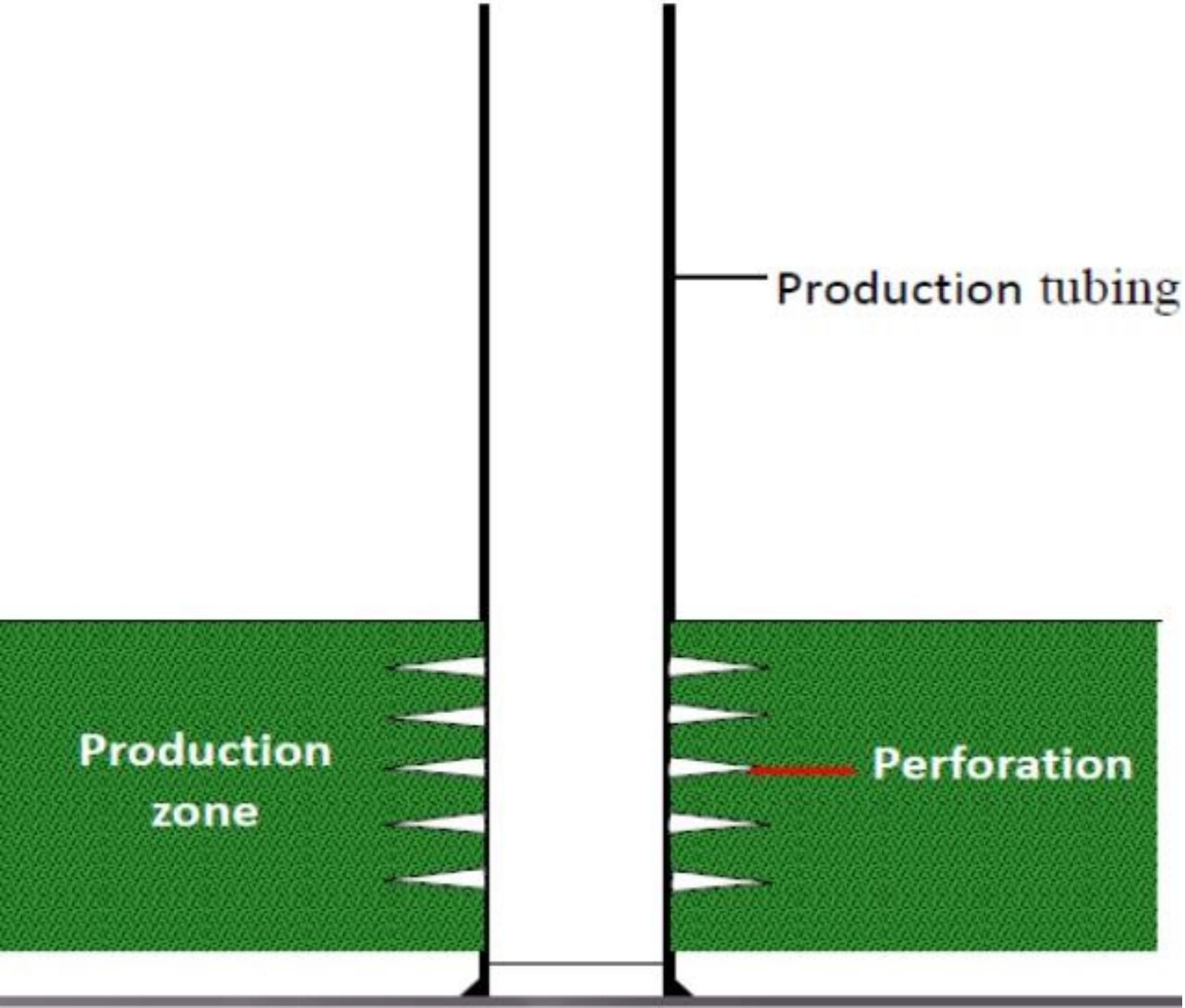
Perforated casing completion

- Production casing is cemented through the producing zone and pay section is selectively perforated


Tubing
Production casing
Packer
Production zone
Perforation

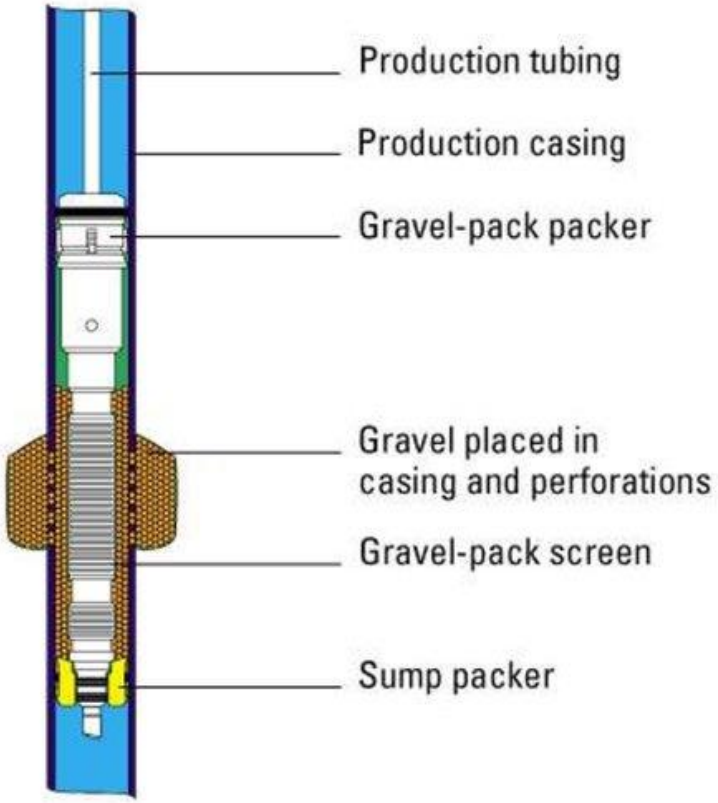
Tubingless or reduced diameter Completion

- Production tubing is perforated and cemented


Production tubing
Production zone
Perforation

Gravel packing

- Prevents from the production of sand
- It is allowed to use at the perforated zone
- The reason is that sand may cause the metallic corrosion
- Sand increases oil salinity



Source: http://www.rigzone.com/training/insight.asp?i_id=326

Type of Flow

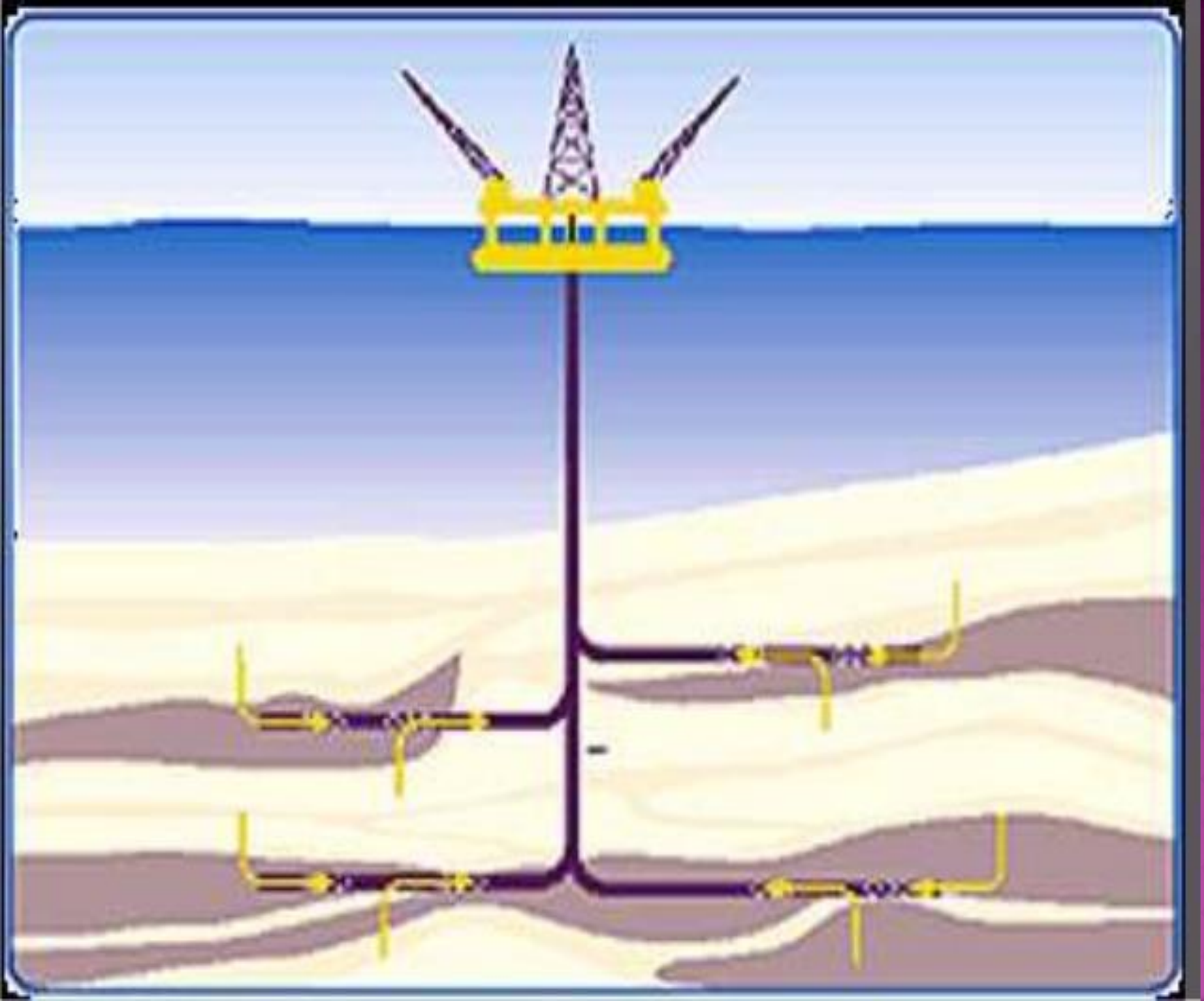
- Casing flow: large flow rate no tubing is required, used in middle east.
- Tubing and Annulus flow: large flow rate flow segregation.
- Tubing flow: Used widely in Malaysia due to safety, may use one more tubing strings.

Single Tubing Completion

- Simplest way of completing the well
- In this method well is completed by single zone with single tubing

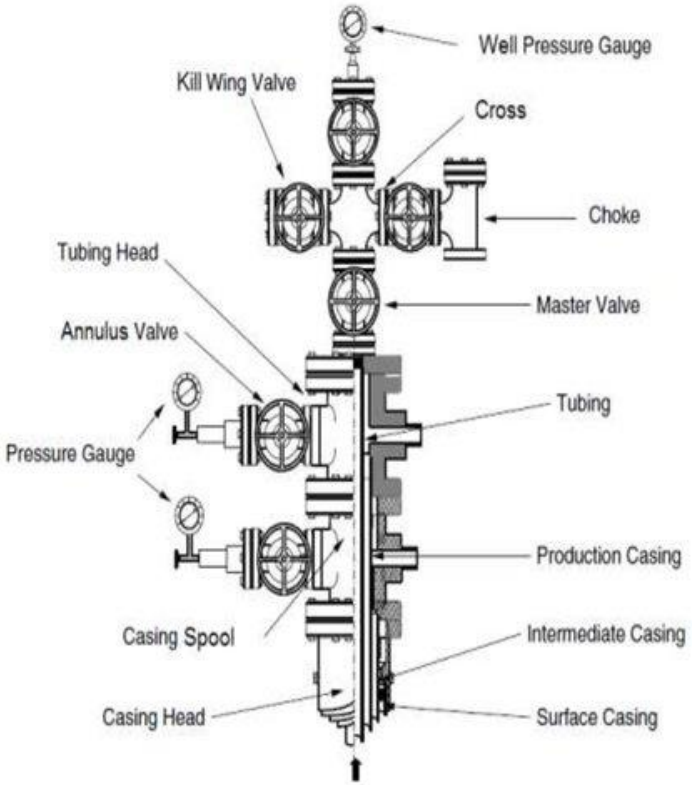
Multilateral Completion

- In this multiple branches are drilled from a single zone
- It is used to improve productivity from closely spaced target zones.



Production tree

- The production tree is the last step of well completion.
- It is installed at the top of the well
- The production tree controls the production of oil and gas.
- The production tree prevents from the formation kick as soon as the preventors are present



Source: https://oilandgastechnologies.wordpress.com/page/6/

Formation damage
Causes of skin (M. Čikeš, 2008)

1 Shale reservoir

2. Well completion

3 Solid particles

Causes of skin (M. Čikeš, 2008)

1 Shale reservoir

- Low permeability (k=10^(-8) md ~ 10^(-2)md)
- Swelled smectite does not allow the fluid movement

Figure 1. Shale [14]

Causes of skin (M. Čikeš, 2008)

2 Well completion

- Trapped cement particles near well bore
- Cement particles become solid depending on time

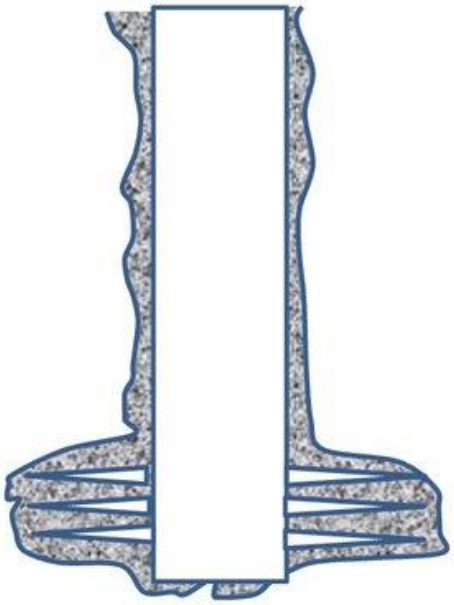


Figure 2.

Causes of skin (M. Čikeš, 2008)

3 Solid particles from reservoir

- Wax and parafines are collected in a diameter of 1-1.5m near well bore
- High reservoir pressure

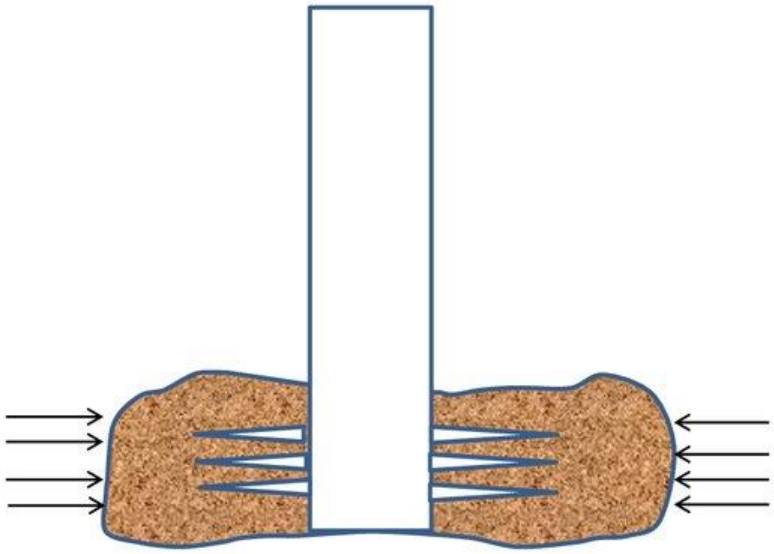


Figure 3.