



Drilling fluid

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OUTLINE

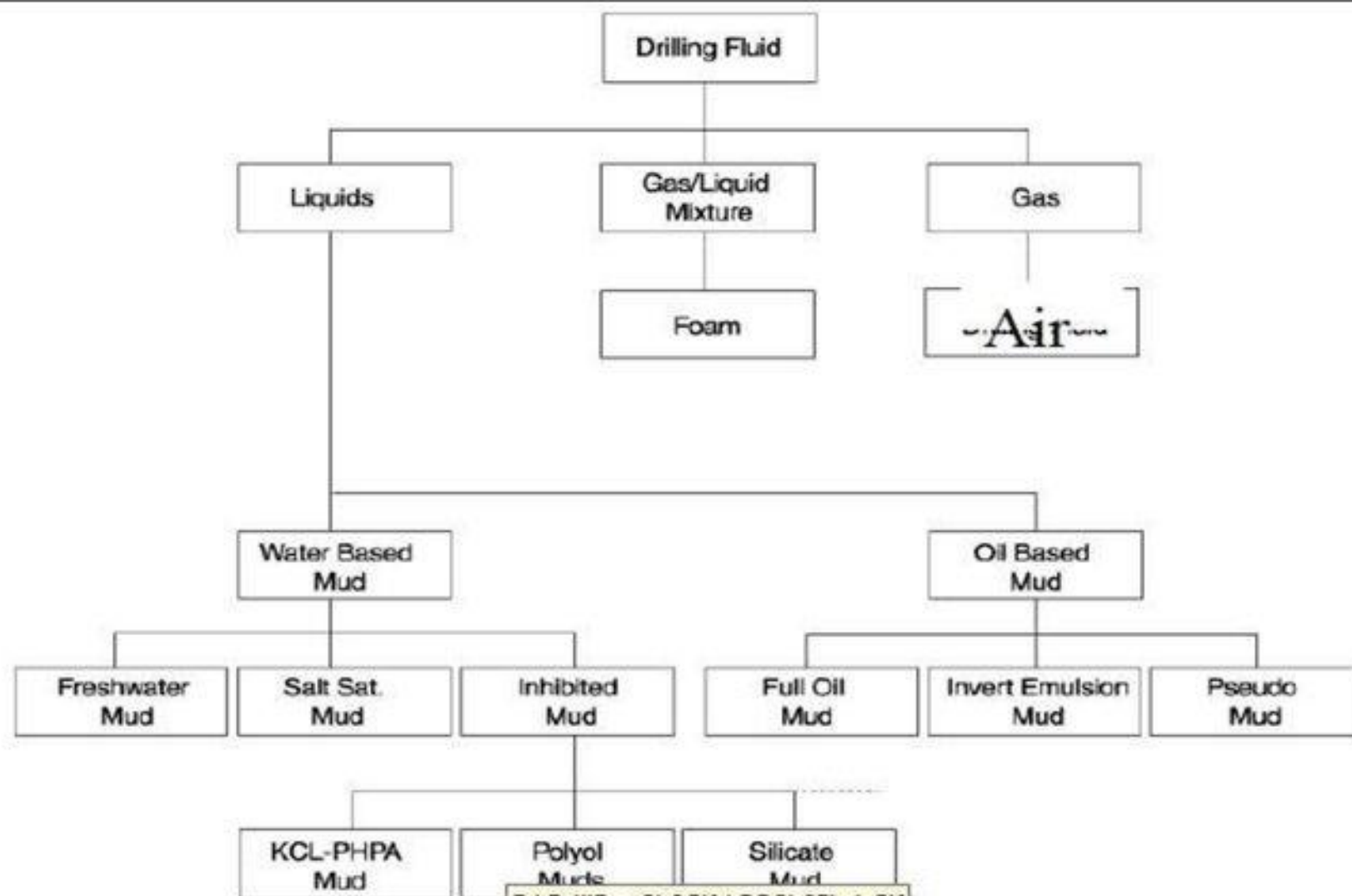
- Introduction
- Drilling fluid
- Drilling fluid types
- Conclusion

DRILLING FLUID

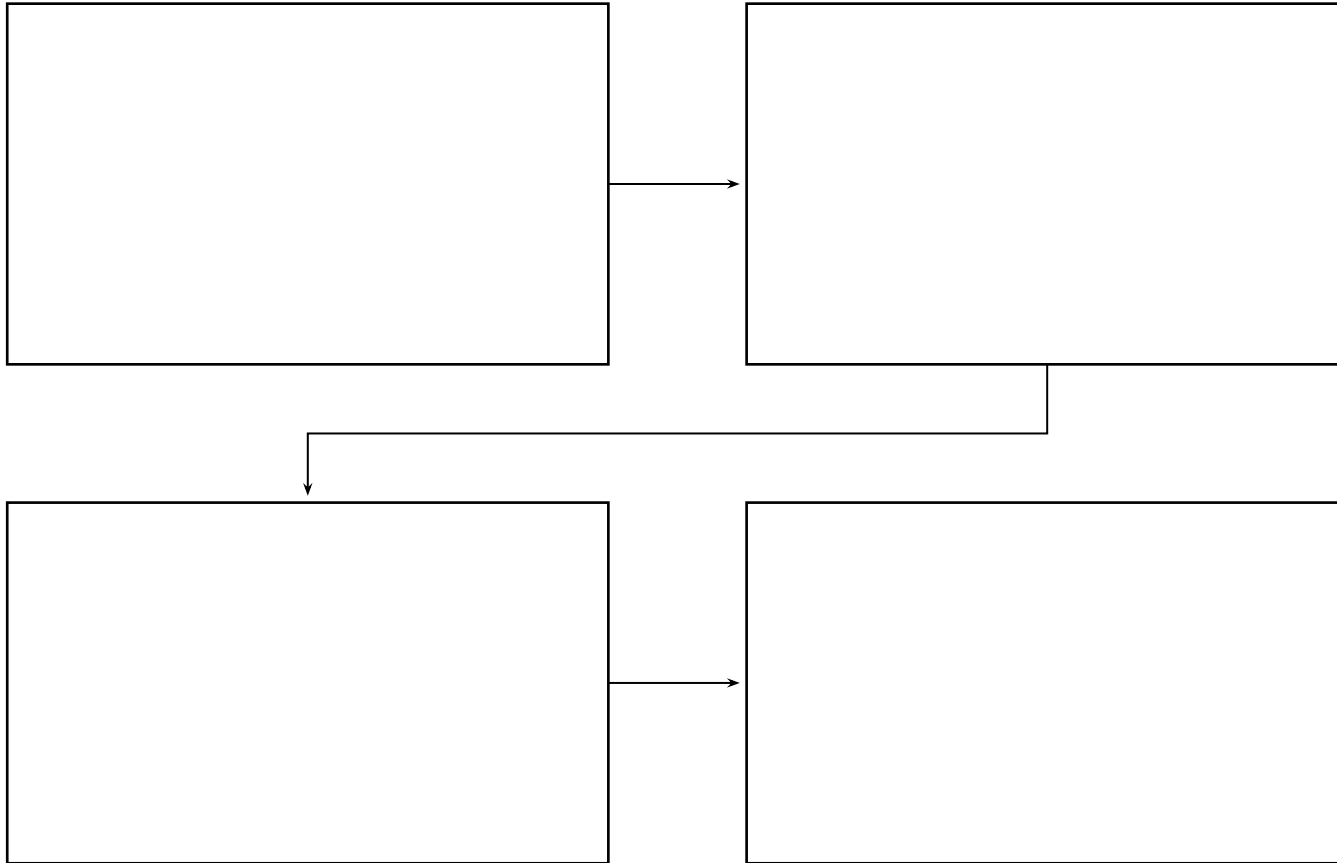
- In geotechnical engineering, **drilling fluid**, also called **drilling mud**, is used to aid the drilling of boreholes into the earth.
- Often used while drilling oil and natural gas wells and on exploration drilling rigs, drilling fluids are also used for much simpler boreholes, such as water wells.
- One of the functions of drilling mud is to carry cuttings out of the hole.



Types of Drilling Fluid



Classification of drilling fluids



DRILLING FLUID FUNCTIONS

The main functions of drilling fluids include

- providing hydrostatic pressure to prevent formation fluids from entering into the well bore,
- keeping the drill bit cool and clean during drilling, carrying out drill cuttings, and
- suspending the drill cuttings while drilling is paused and when the drilling assembly is brought in and out of the hole.

The drilling fluid used for a particular job is selected to avoid formation damage and to limit corrosion.

On a drilling rig, mud is pumped from the mud pits through the drill string, where it sprays out of nozzles on the drill bit, thus cleaning and cooling the drill bit in the process.



**Fly Ash Absorbent for
Fluids in Mud Pits**

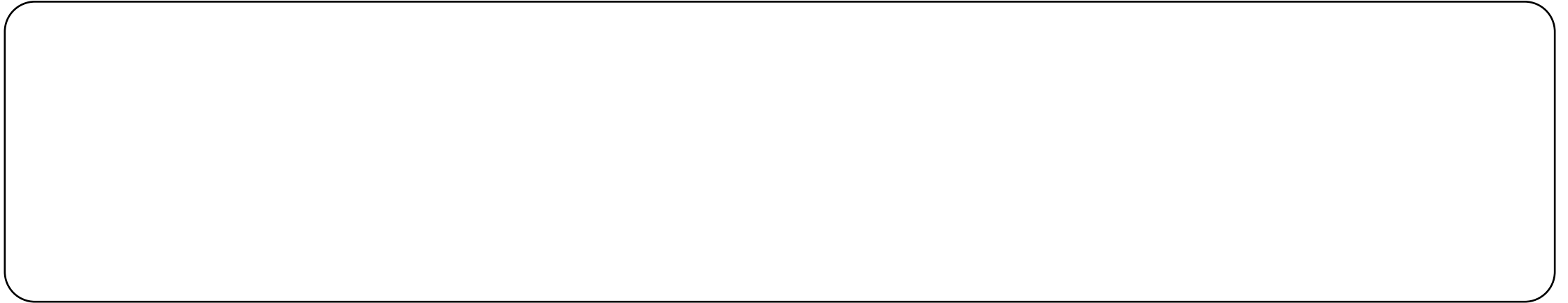
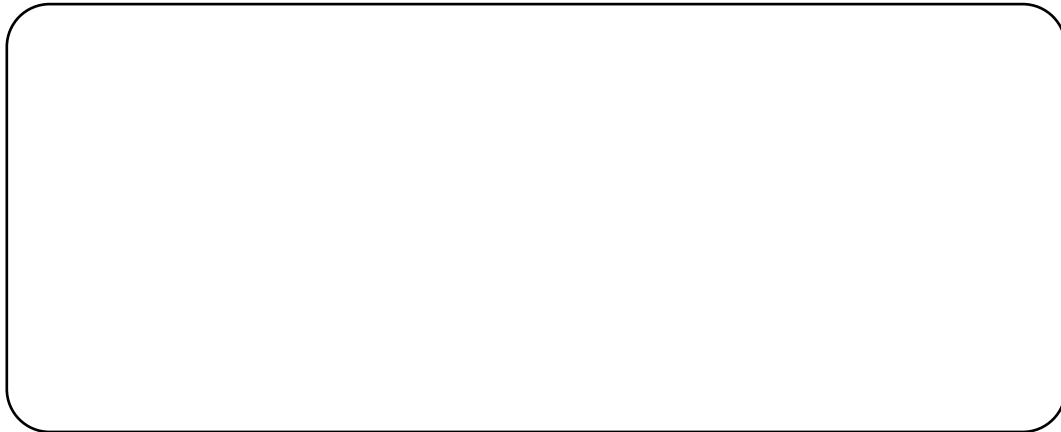
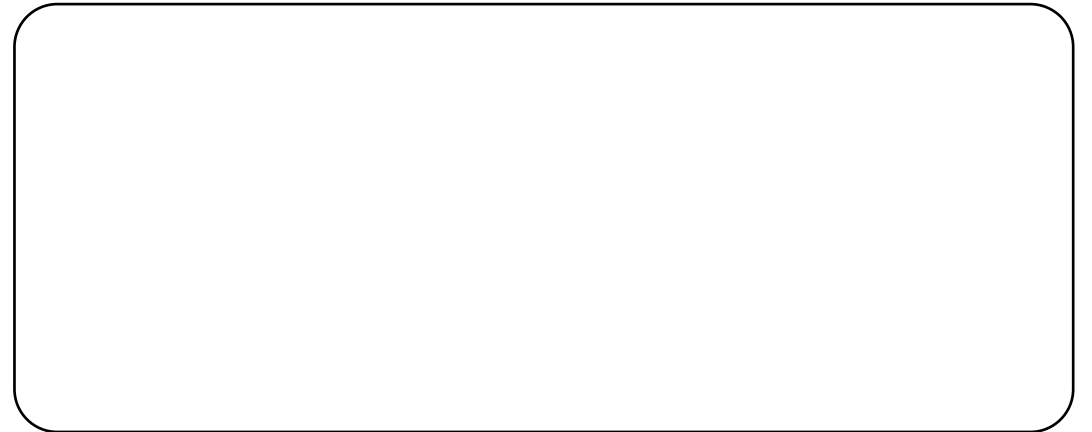


Mud Pit



Fluid Pit

Water-based fluids

A large, empty rounded rectangular box with a thin black border, intended for a detailed description or diagram.An empty rounded rectangular box with a thin black border, intended for a detailed description or diagram.An empty rounded rectangular box with a thin black border, intended for a detailed description or diagram.



Driller pouring anti-foaming agent down the drilling string on a drilling rig



Barite powder used for preparation of water-based mud

WBFs fall into two broad categories:

Nondispersed sytems

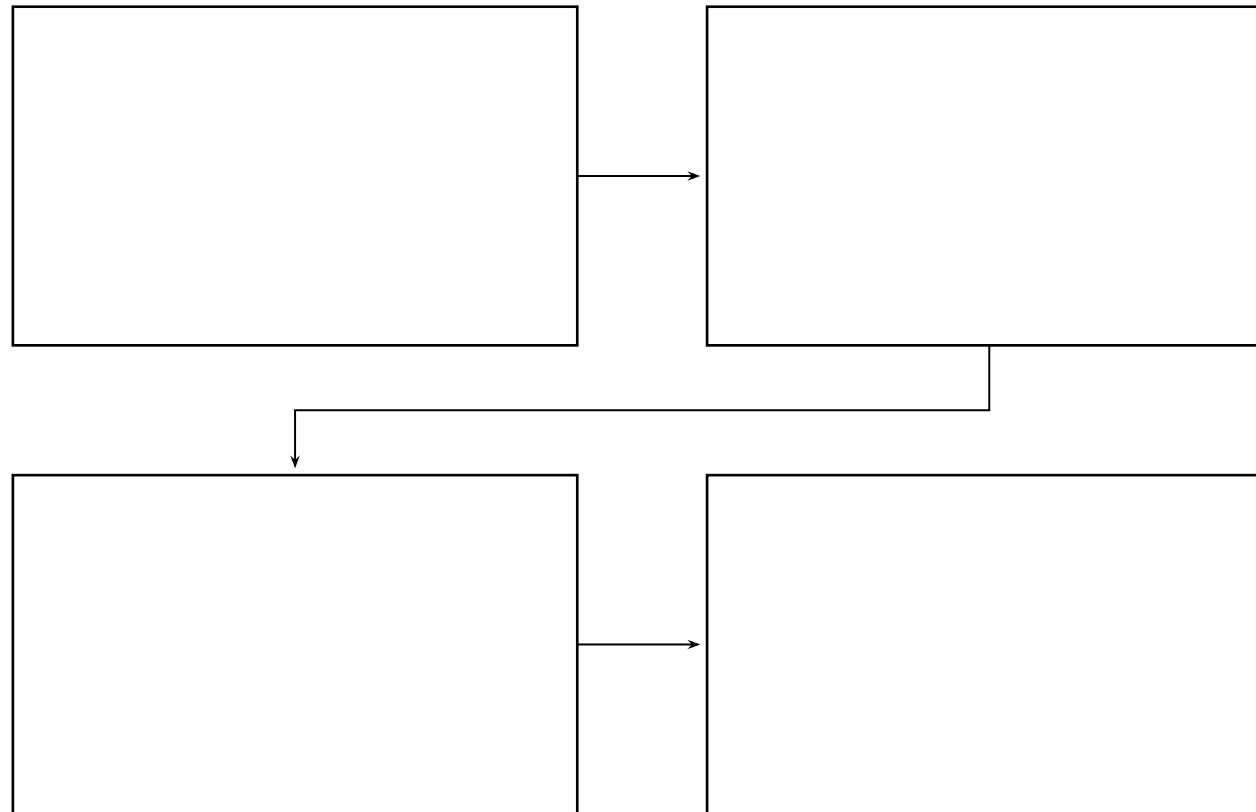
Simple gel-and-water systems used for tophole drilling are nondispersed, as are many of the advanced polymer systems that contain little or no bentonite.

Dispersed systems

Dispersed systems are treated with chemical dispersants that are designed to deflocculate clay particles to allow improved rheology control in higher-density muds.

Oil-based fluids

Oil-based systems were developed and introduced in the 1960s to help address several drilling problems:



Oil-based mud

- **Oil-based mud is a drilling fluid used in drilling engineering.**
- It is composed of oil as the continuous phase and water as the dispersed phase in conjunction with emulsifiers, wetting agents and gellants.
- *The oil base can be diesel, kerosene, fuel oil, selected crude oil or mineral oil.*



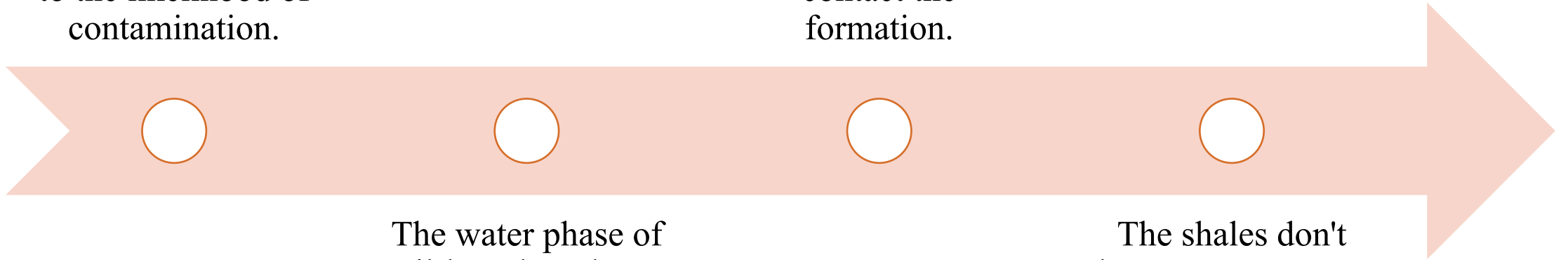
Oil-based mud

Emulsifiers are important to oil-based mud due to the likelihood of contamination.

The external phase is oil and does not allow the water to contact the formation.

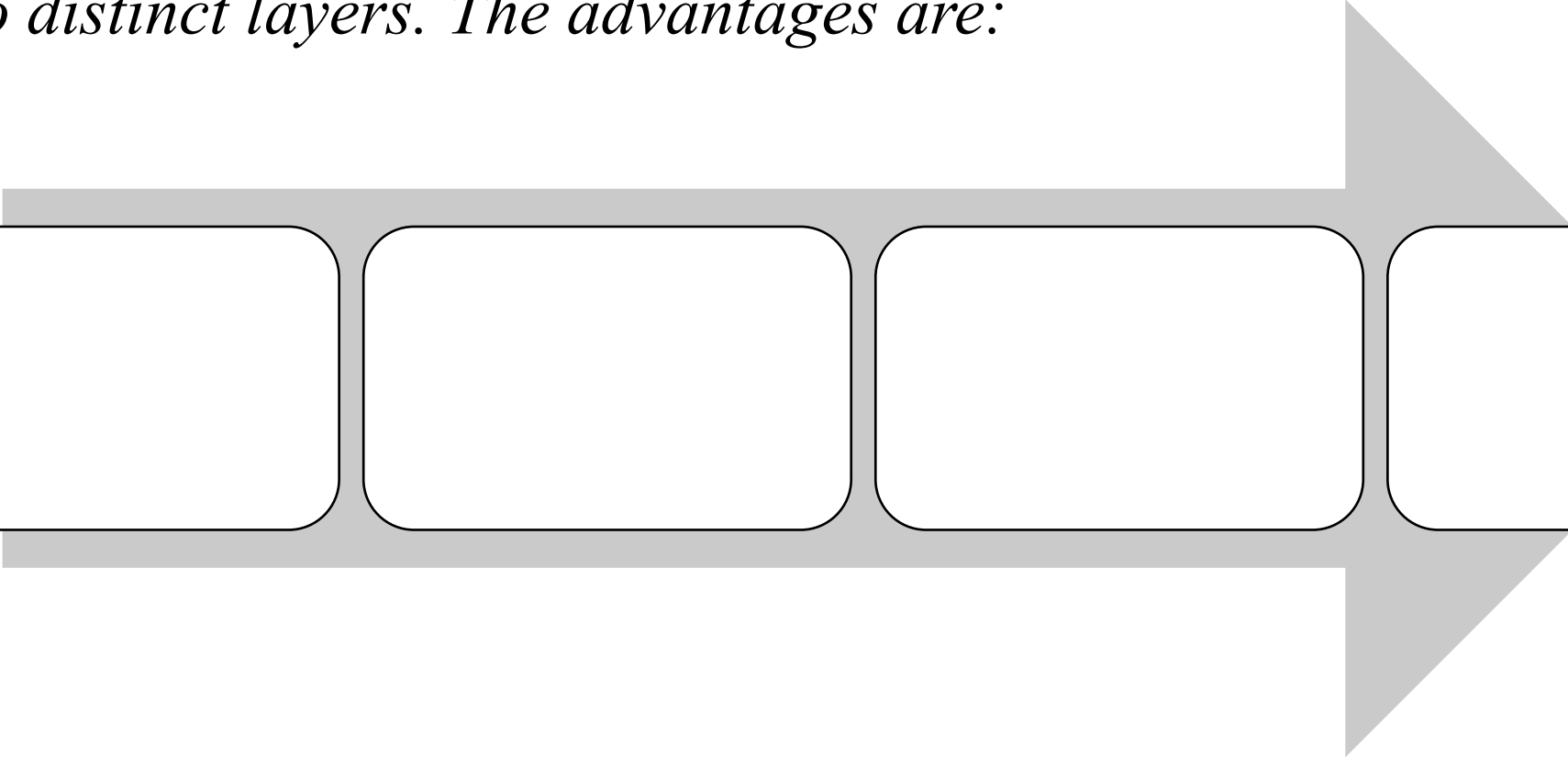
The water phase of oil-based mud can be freshwater, or a solution of sodium or calcium chloride.

The shales don't become water wet.



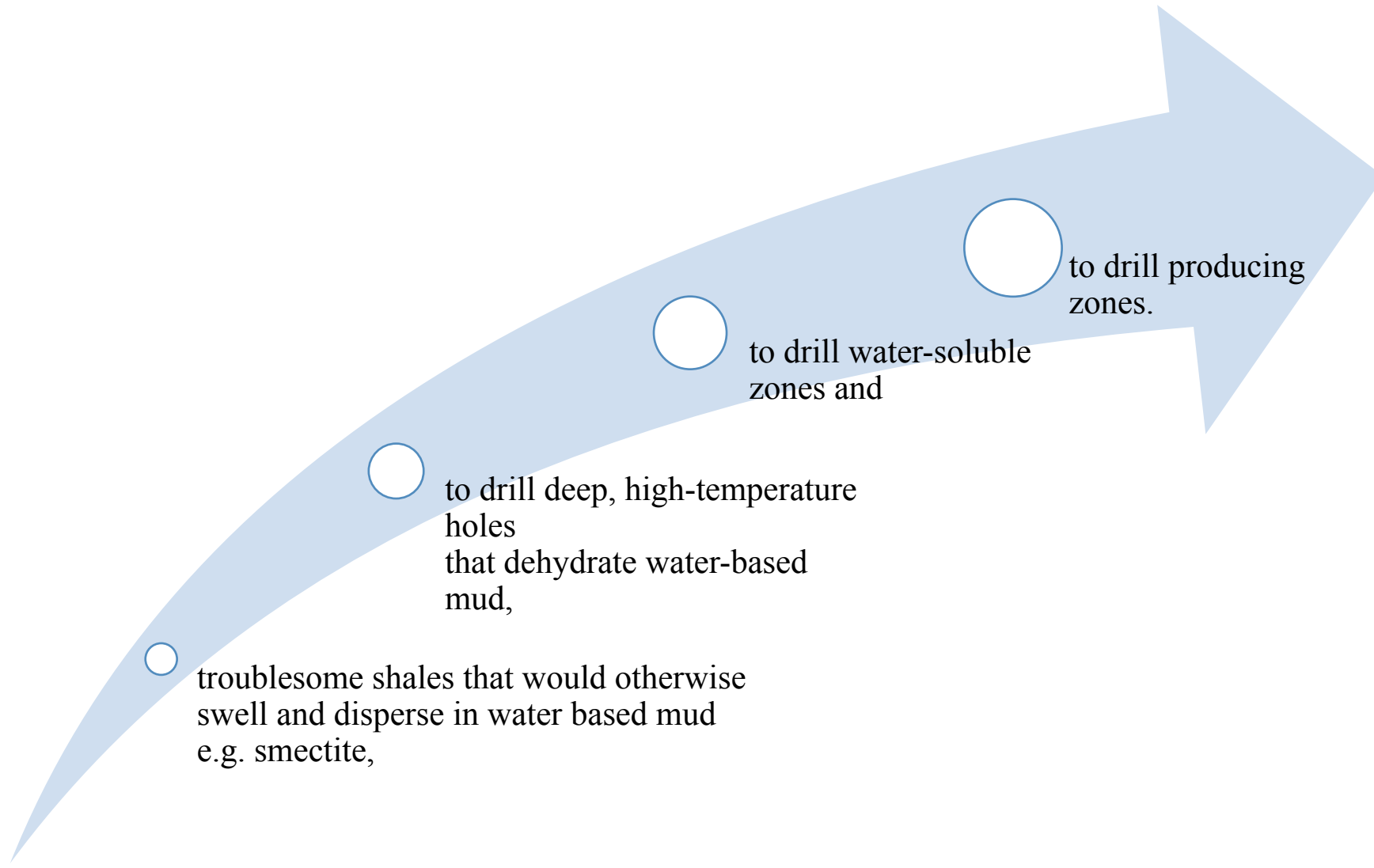
Oil-based mud

- *Poor stability of the emulsion results in the two layers separating into two distinct layers. The advantages are:*



Four empty rounded rectangular boxes arranged horizontally, likely for listing advantages.

Oil-based muds are expensive, but are worth the cost when drilling through:



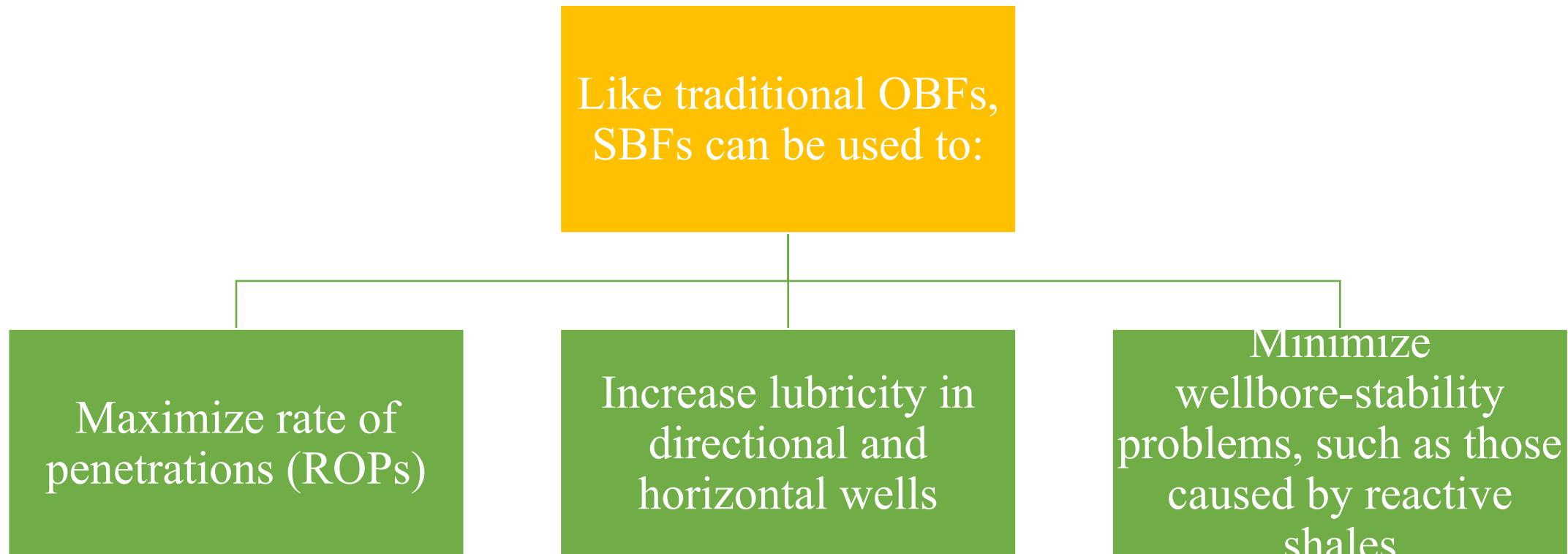
The disadvantages of using oil-based mud, especially in wildcat wells are:

- ❑ Inability to analyze oil shows in cuttings, because the oil-based mud has fluorescence confusing with the original oil formation.
- ❑ Contamination samples of cuttings, cores, sidewall cores for geochemical analysis of TOC and masks the real determination of API gravity due to this contamination.
- ❑ Contaminate areas of freshwater aquifers causing environmental damage.
- ❑ Disposal of cuttings in an appropriate place to isolate possible environmental contamination.

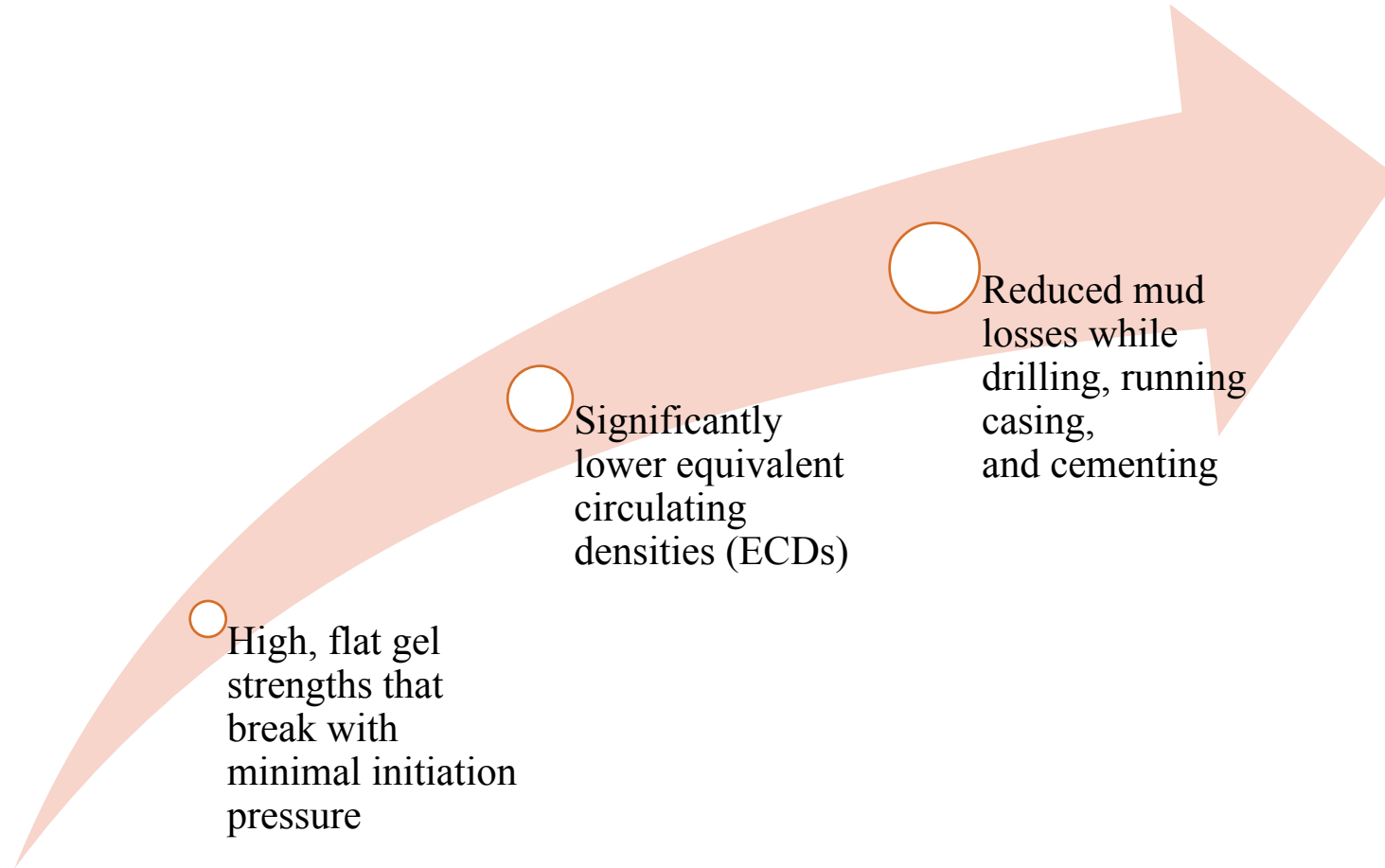
- https://www.youtube.com/watch?v=Qk_O0mw2yZw&ab_channel=JoseColombia

Synthetic-based drilling fluids

Synthetic-based fluids were developed out of an increasing desire to reduce the environmental impact of offshore drilling operations, but without sacrificing the cost-effectiveness of oil-based systems.



Synthetic-based drilling fluids

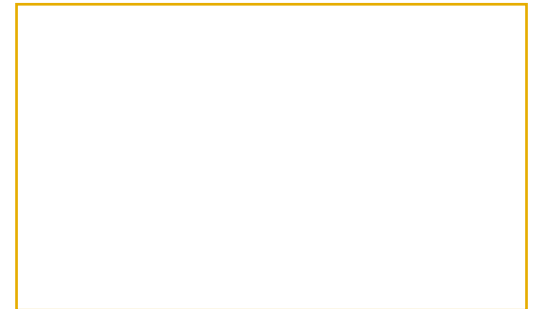
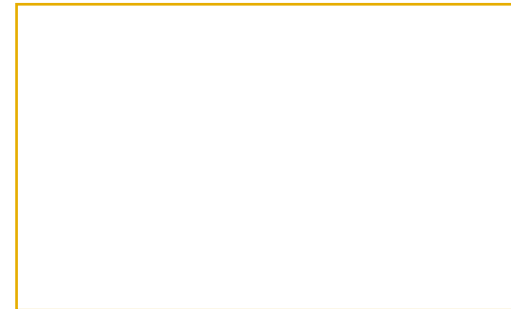


	Water-Based			Oil-based	Synthetic-Based
Application worldwide	60% of wells			20%	20% (Mostly deep offshore)
Types / Base	HPWM	Nondispersed systems	Dispersed systems	Diesel or Mineral low toxic oil	Ester, olefins, paraffins
Key reasons for selection	1. Improved rheology 2. Well / Hole stability 3. Moderate temperature	1. Inhibition issues 2. High salinity 3. Logistical challenges	1. Tophole drilling 2. Low cost & simple 3. Spud mud	1. High temperature 2. Well / Hole stability 3. Torque and drag 4. Better lubrication 5. Increased ROP	1. High temperature 2. Well stability 3. Torque and drag 4. Better lubrication 5. Increase ROP 6. Offshore disposal challenges
Cost	Medium to High	Low	Low	High	High
Drilling Efficiency	Medium to High	Low to Medium	Low to Medium	High	High
Rate of penetration	Medium to High	Low	Low	High	High
Wellbore stability	Medium to High	Low to medium	Low	High	High
Environmental concerns	Low to Medium	Low	Low	High	Medium to High
Disposal costs	Low to Medium	Low	Low	Very High	Medium to High

Pneumatic-drilling fluids

Compressed air or gas can be used in place of drilling fluid to circulate cuttings out of the wellbore. Pneumatic fluids fall into one of three categories:

- ✓ Air or gas only
- ✓ Aerated fluid
- ✓ Foam



**THANK YOU
FOR YOUR
ATTENTION**



- [https://www.youtube.com/watch?v=ILC0CORxPxg&ab_channel=Jose Colombia](https://www.youtube.com/watch?v=ILC0CORxPxg&ab_channel=JoseColombia)

- https://www.youtube.com/watch?v=MRyth2hdPhk&ab_channel=JoseColombia

- https://www.youtube.com/watch?v=9rnYK7cQ6wA&ab_channel=kishorenair
- Mud test
- https://www.youtube.com/watch?v=4Fva7LFz4UI&t=4s&ab_channel=JoseColombia