



Drilling Fluids- Related Problems

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An event that causes the drilling operation to stop is described as a **Non-Productive Time (NPT)** event

1. Stuck pipe
2. Shale sloughing
3. Lost circulation

Stuck Pipe

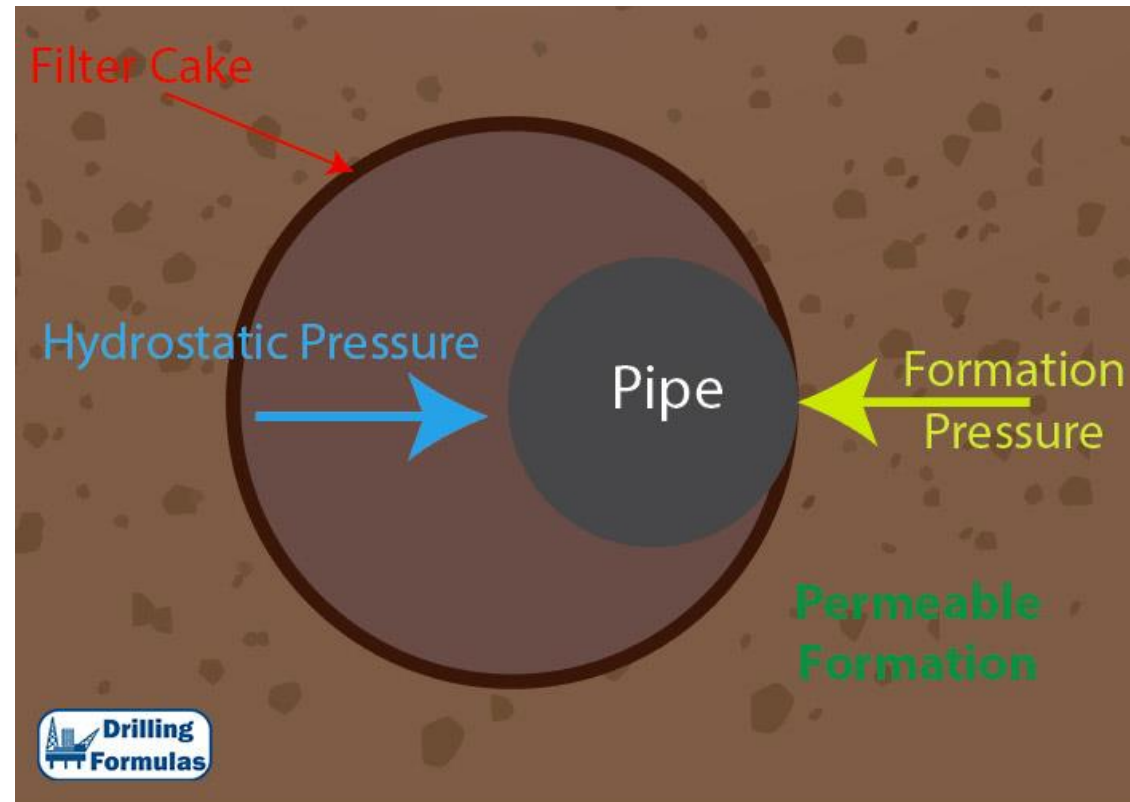
Stuck pipe is a situation when the drill string cannot be moved from the well.

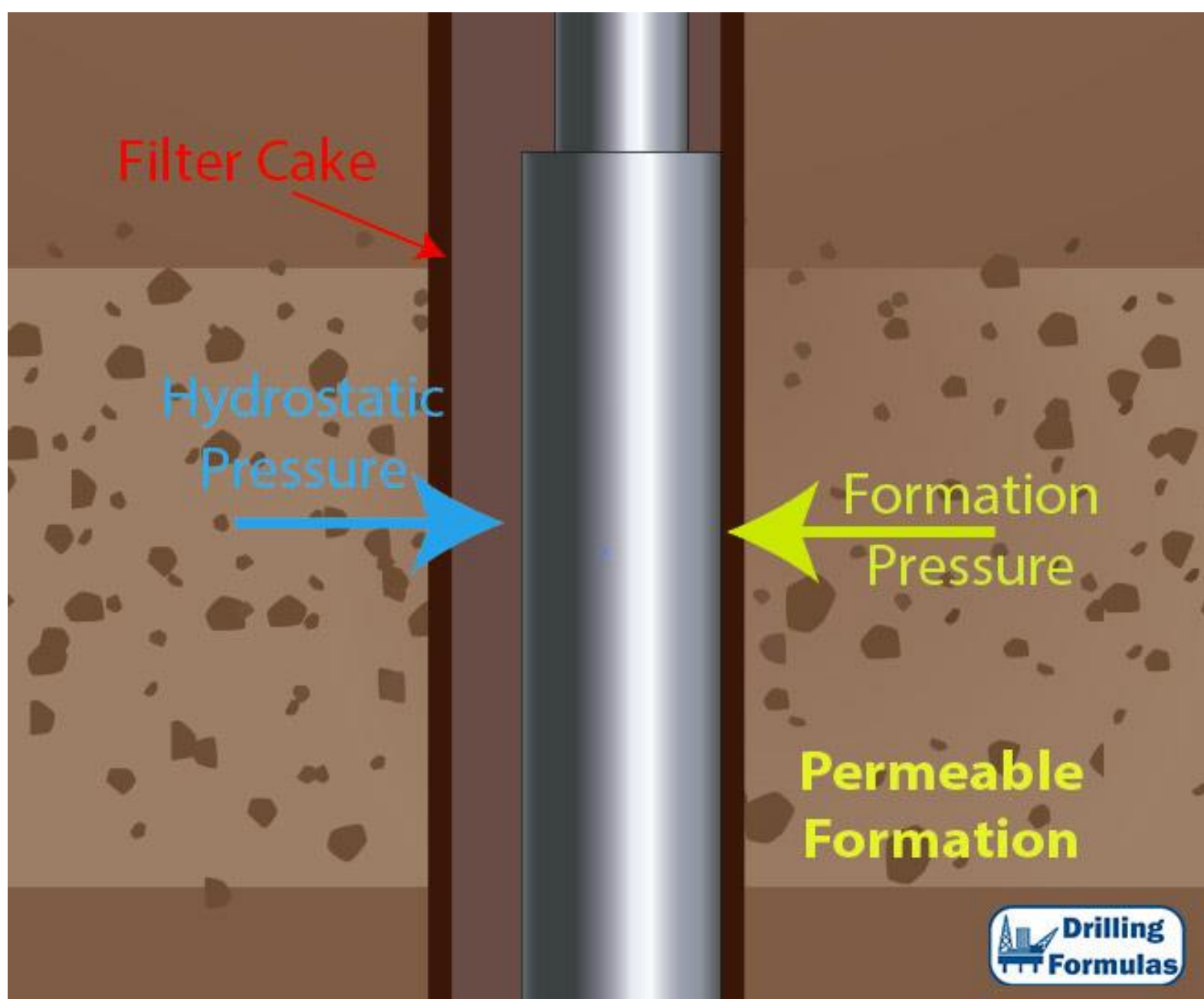
There are two types of stuck pipe:

1. Differential sticking pipe.
2. Mechanical sticking pipe.

Differential Sticking

Differential Sticking is one of the most common causes of pipe stuck. It can happen when differential pressure (overbalance pressure) pushes a drill string (BHA) into permeable formations.





Four Factors Causing the Differential Sticking

- **Permeable formation:** Permeable formations for example are sandstone, lime, carbonate, etc.
- **Overbalance:** Typically hydrostatic pressure (mud weight) in the well is more than formation pressure.
- **Filter cake:** Poor and thick filter cake increases the chances of sticking the drill string.
- **Pipe movement:** If the drill string is stationary, the potential of getting differentially stuck is increased.

Prevention of wall sticking

1. Reduce the differential pressure
2. Reduce the contact area: **install stabilizers**
3. Use an oil-emulsion mud
4. Use extreme-pressure lubricants
5. Use low mud weights
6. Use low solids content in the mud
7. Stop circulation only when necessary
8. Avoid long strings of large-diameter drill collars
9. Keep the hole as straight as possible
10. Never stop drill collars adjacent to any permeable formation

Stuck Identification

1. The pipe was stationary before it got stuck
2. Full circulation is possible

Freeing differentially stuck pipe

1. Apply torque and tension to try to work the pipe loose
2. If possible, reduce the mud weight
3. Determine the stuck point and spot a mixture of surfactant and oil

Mechanical Sticking

In mechanical sticking the pipe is usually completely stuck with **little or no circulation**

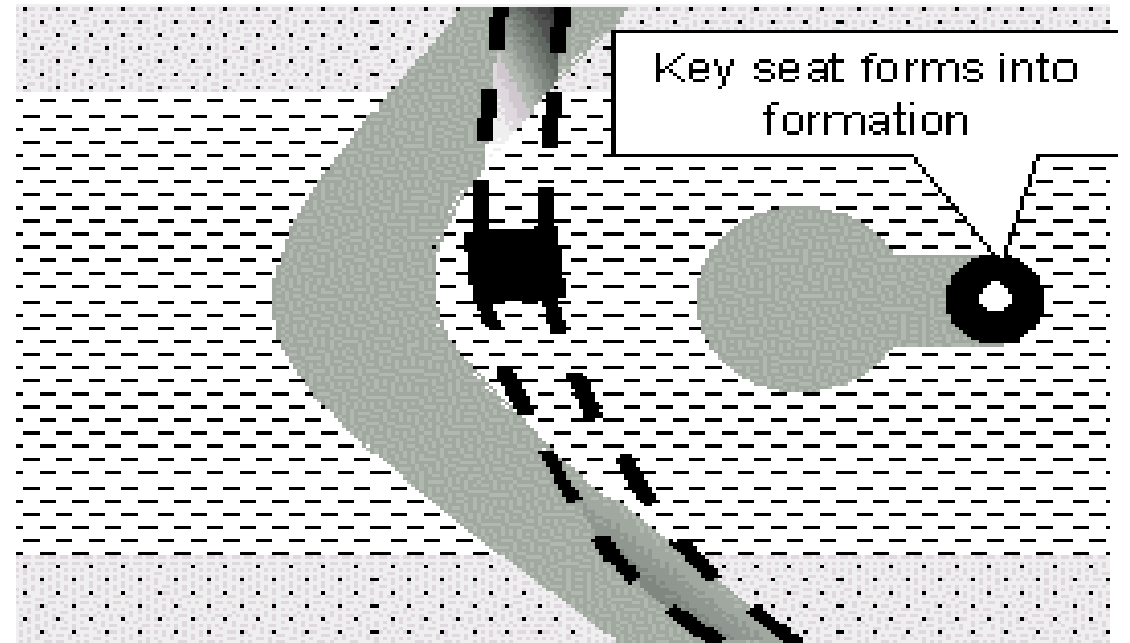
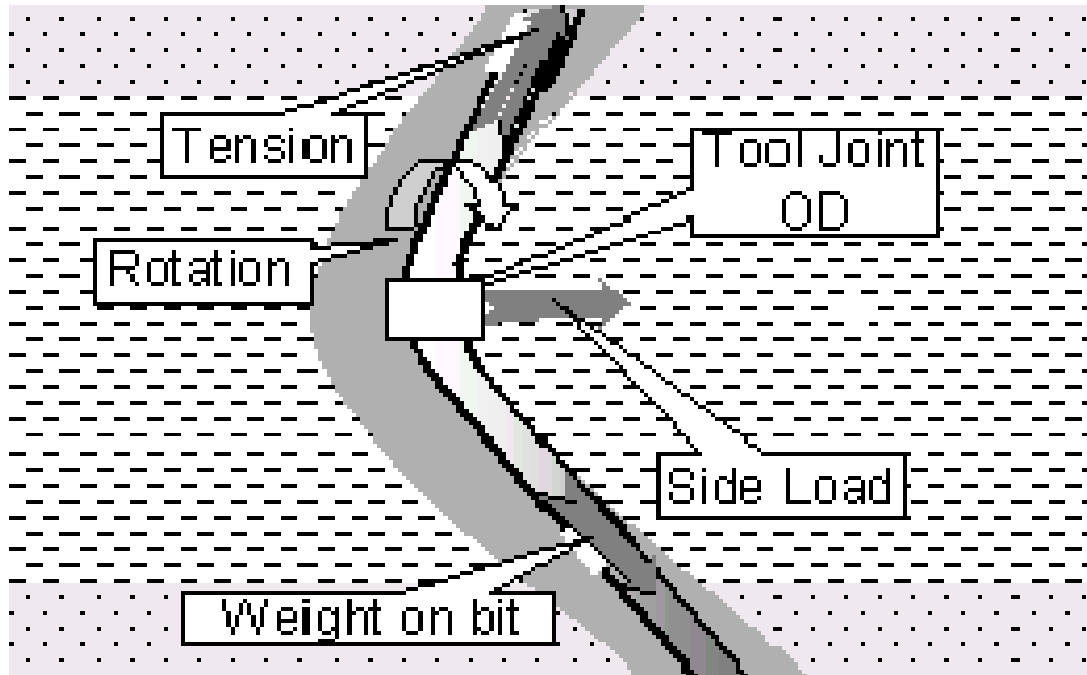
1. Cuttings and sloughing formations pack off the annular space around the drill string (especially during a pump shutdown period)
2. Drill through several layers of formation of different hardness
3. Junk dropped from surface
4. The drill string is run too fast until it hits a bridge, a tight spot or the hole bottom

Free mechanical sticking

1. To work the drill string either by rotating and pulling it or by activating a **drilling jar**
2. If this method fails, an **organic fluid** must be spotted and the above procedure has to be repeated
3. The use of **back-off operation** is the final solution

Key seating

Key seating is caused by the rotating drill string coming into contact with soft, easily drillable formations.



The rotational action causes the tool joint to erode a narrow groove in the formation which is approximately equal to the diameter of the drill pipe tool joint.

Key seats are often seen in soft formations or in wells with ledges and doglegs.

Stuck Identification

1. Stuck while tripping out
2. Circulation unaffected

Preventive Actions

Avoid severe doglegs

Sloughing shale

Different formations have a different degree of absorbing water. A condition where the shale section containing bentonite or other hydratable clays which continually absorb water from the mud, expands, swells & sloughs into the hole

Problems due to Sloughing Shale

1. Ineffective hole cleaning
2. Stuck pipe & its recovery
3. Bridges & filled up
4. Treating costs
5. Poor cement jobs & increase cement requirements
6. Difficult logging
7. Poor sidewall recovery
8. Wellbore enlargement
9. Excessive solid build up in the mud
10. A sloughing hole can jam the drill string and block circulation

Prevention of sloughing shale

1. Use a suitable mud system to inhibit hydration (high Ca & K content, OBM, oil-emulsion, ...) to decrease the tendency of mud to hydrate water-sensitive clays
2. Increase circulation rate for more rapid removal of particles
3. Increase mud density for greater wall support ($P_{\text{hyd}} > P_{\text{f}}$)
4. Decrease water loss of mud
5. Avoid fast trips or swabbing of the hole
6. Keep flow properties & annular velocity at such a level as to insure good hole cleaning.