



Advantages Of Synthetic Oil based Mud over Water based Mud System

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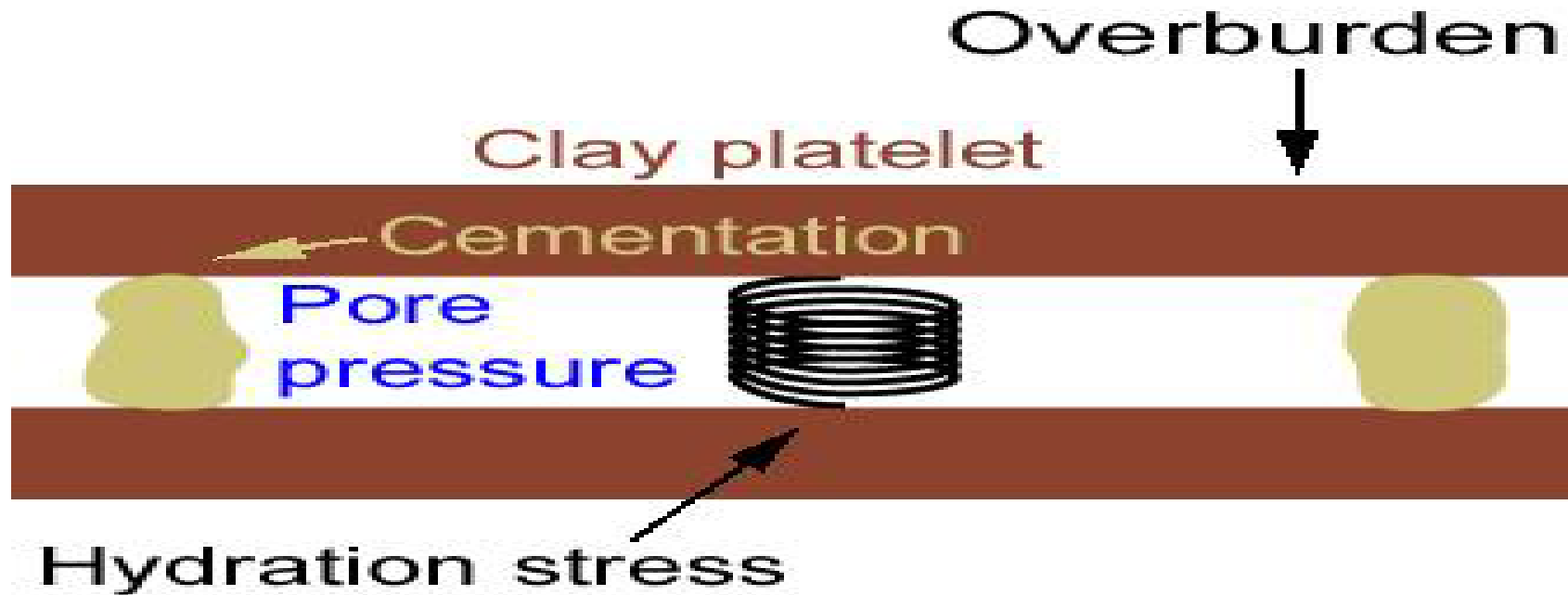
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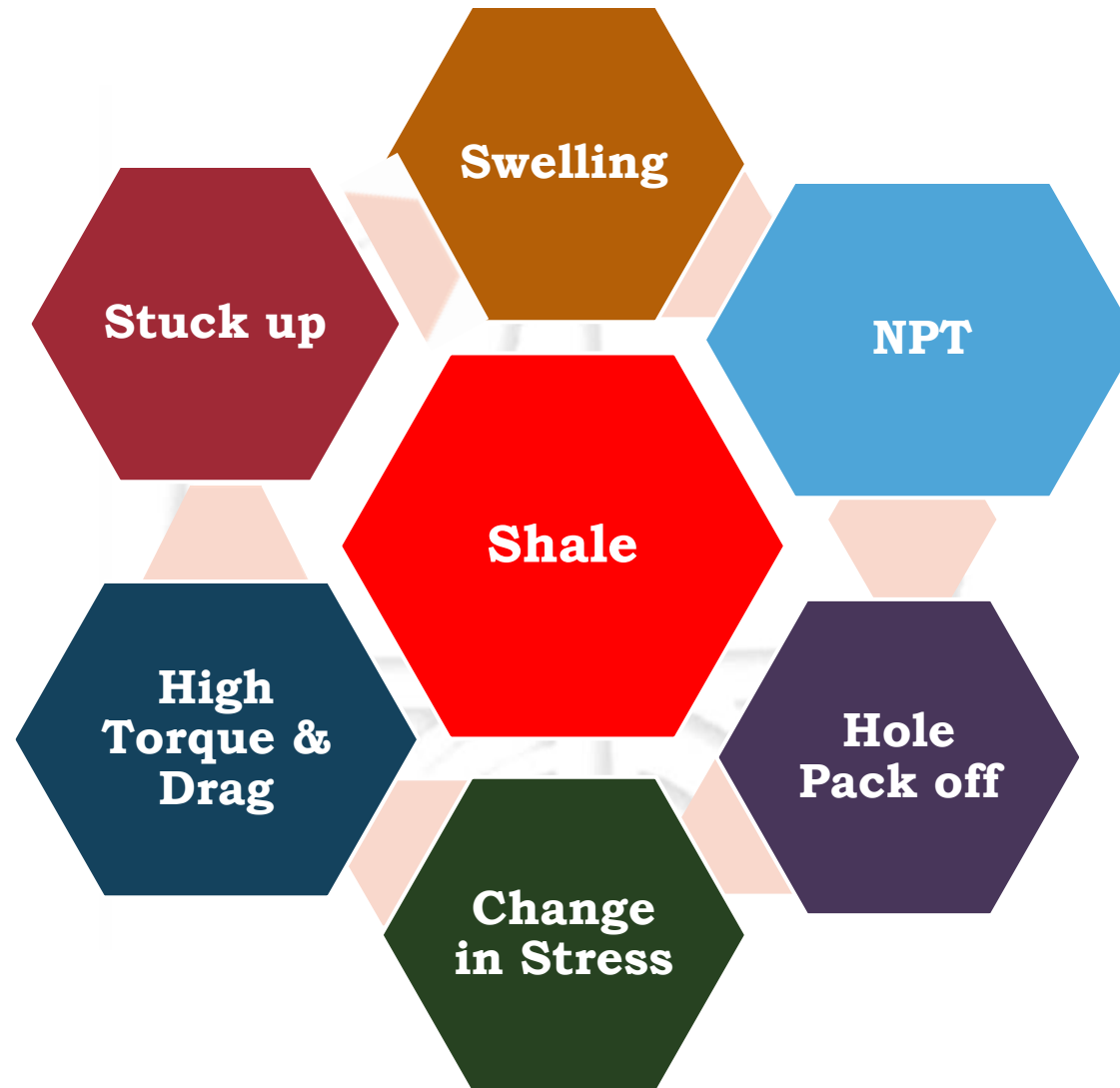
History of SOBMs in ONGC

Why Not Water Based Mud (WBM) ?

- Hydration of Shale formations
- Not efficient at high temperatures
- Interference with the flow of oil & gas through porous rocks
- Promotes disintegration and dispersion of clays
- Dissolve salts
- Not as efficient lubricant as OBM
- Can promote corrosion
- High angle and extended reach wells



- Forces holding plates together: Overburden & Cementation
- Forces pushing plates apart: Pore Pressure & Hydration Stress (can be up to 80,000 psi = 5700 atm.)
- Clay types: smectite (worst), illite, kaolinite, chlorite, & mixed layers.



- ▶ OBM have been developed to overcome certain undesirable characteristics of WBM.
- ▶ OBM with High Speed Diesel (HSD) as base oil became ideal alternative to combat the disadvantages of WBM in late seventies.

- ▶ OBM having HSD as base fluid is hazardous in nature and dumping of cuttings in environment with adhered oil was prohibited.

- ▶ **Two alternatives were worked upon:**
 - (i) Low Toxic mineral oil with aromatic content less than 1% (LTMO)

 - (ii) Synthetic Oil

- These oils are derived from the same type of crude oil streams from which Diesel oil, Kerosene, Gasoline and lubricating oils are derived.
- A significant difference in the chemical make up for low toxicity oils is the fact that aromatics are completely removed.
- These oils are composed of Paraffinic / Naphthenic components.

- Low Sp. Gravity and High Initial Boiling Point
- High Flash Point
- Low Viscosity
- High Aniline point
- Low Pour Point
- Low Aromatic Content



- ▶ Linear Alpha Olefins (LAO)
- ▶ Internal Olefins (IO)
- ▶ Poly Alpha Olefins (PAO)
- ▶ Esters
- ▶ Ethers

- Base oil
- Primary Emulsifier
- Secondary Emulsifier
- Lime
- Brine
- Organophilic Clay
- HTHP Fluid Loss agent
- Weighting material

(1) Shale Stability :

- ▶ OBM is non reactive towards shale formations.
- ▶ Higher penetration rate.

(2) High Temperature tolerance:

- ▶ Suitable for HTHP wells.

(3) Drilling salts:

- ▶ Do not interfere with salt formations.

(4) Lubricity:

- ▶ Minimize the friction between drill pipe and the wall of wellbore.
- ▶ Reduces chances of Stuck-pipe.

(5) Low pore formation pressure:

- ▶ Mud weight as low as 7.5 ppg can be maintained.

(6) Corrosion control:

- ▶ Corrosion of pipe is controlled since oil is the external phase and coats the pipe.

(7) Reuse:

- ▶ They can be stored for long periods of time since bacterial growth is suppressed.

(8) Packer fluids:

- ▶ Oil muds may be used as long term stable packer- fluids, since the additives are extremely temp. stable.

SOBM has additional benefits compared to OBM:

- ▶ Low toxicity and reduce irritant property.
- ▶ Elimination of Diesel reduces pollution hazards.

Toxicity Testing Classification used by EPA - USA

S.No	Category	Median Lethal Concentration (LC ₅₀)
1	Non Toxic	> 100,000 mg/L
2	Practically Non Toxic	10,000–100,000 mg/L
3	Slightly Toxic	1000 – 10,000 mg/L
4	Moderately Toxic	100 – 1000 mg/L
5	Toxic	1-100 mg/L
6	Very Toxic	< 1 mg/L

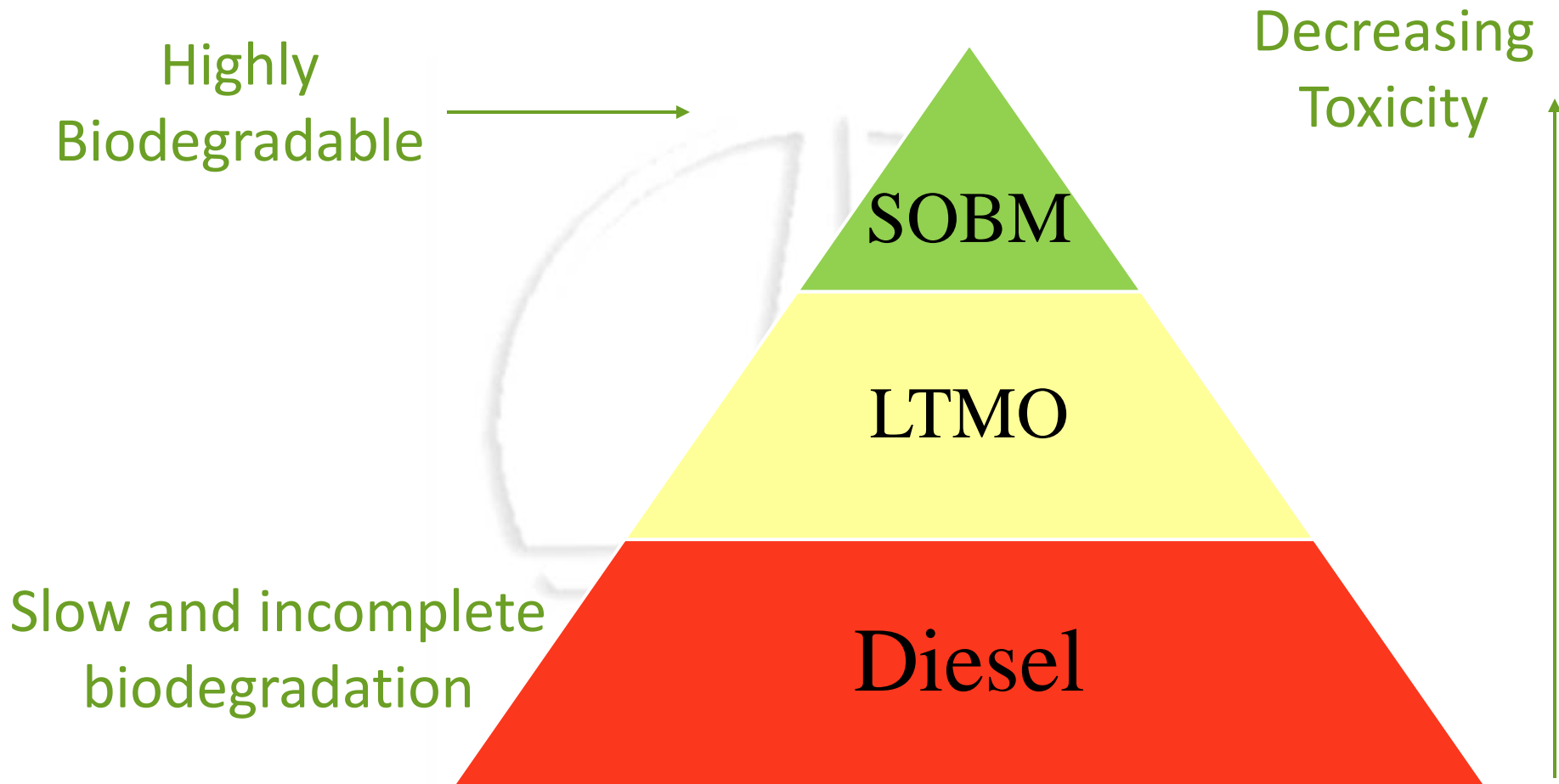
For Onshore Drilling Operations

- OBM having aromatic content less than 1% could be used under intimation to MoEF/SPCB
- Chemical additives used for the preparation of DF should have low toxicity i.e. 96 hrs LC_{50} should be $> 30,000$ mg/l as per toxicity tests.
- Drilled Cuttings separated from OBM after washing should have oil content less than 1 %.

For Offshore Drilling Operations

Additional requirements are:

- Bulk discharge of Drilling Fluid is prohibited.
- Drill cuttings of any composition should not be discharged in sensitive areas notified by MoEF.
- The Drilled Cuttings wash water should be treated to confirm to the limits given by EPA.
- Discharge of Drilled Cuttings from the installation located within 05 Km away from the shore should ensure that there is no adverse impact on the marine eco-system.



- ❖ Cost
- ❖ Kick Detection
- ❖ Not to use in Exploratory Wells
- ❖ Not against Pay zone
- ❖ Rubber parts are easily deteriorated by oil base.

(1) Must be a synthetically produced base fluid

- ▶ “oil” has poor environmental image.
- ▶ lower toxicity usually associated with synthetics.

(2) Optimize environmental factors

- ▶ high aerobic biodegradability
- ▶ low toxicity
- ▶ chlorides free

(3) Low health & safety risk

- ▶ avoid low flash points base fluids as they are classified as flammables.

- ▶ Two wells SC-7 & SC-8 were drilled in 12 ¼” with LTSOBM by MI – SWACO on nomination basis in 2004. Prior to this a lone well up to 800 mts was drilled with OBM
- ▶ The success prompted ONGC to sign a contract for 100 wells with KMC Oiltools through Limited tender , of which 98 wells were completed.

- ▶ This was followed by another contract for 175 wells with MI SWACO and ONGC completed 242 phases with LTSOBM .
- ▶ A fresh contract has been signed by ONGC with MI-SWACO in 2012 effective from November 2012 for 200 wells for using OBM Package.
- ▶ With the commencement of Kakinada OBM Plant , ONGC is also using the services of MI for LTSOBM Package in the Eastern Coast.

Thank you