Using Drilling Fluids to Optimise Productivity

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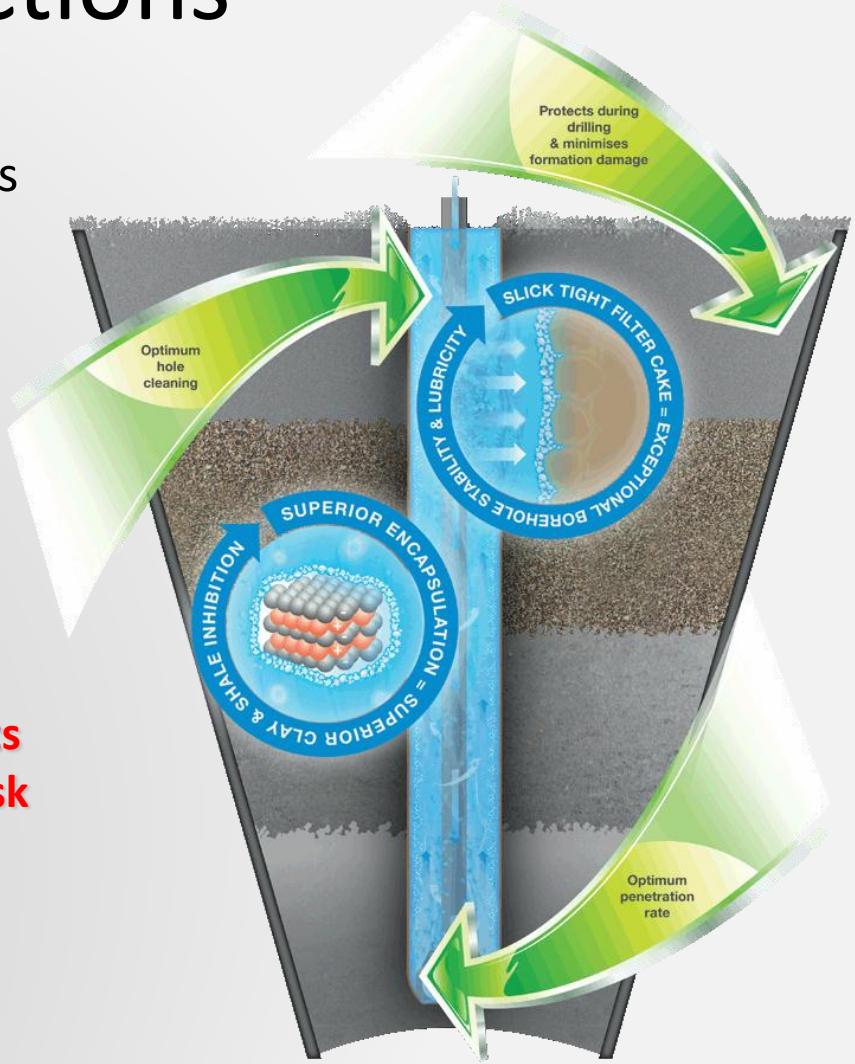
Drilling Fluid Functions

- Stabilise the borehole
- Suspend and transport drilled solids
- Settle drilled solids at surface
- Control subsurface pressures
- Lubricate drill rods and drill bit
- Cool drill rods and drill bit
- Lubricate product being installed
- Optimise equipment performance



To maximise profits and control costs we need to minimise and manage risk

In all drilling applications RISK = THE GROUND

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Correct Soil Identification Is Critical

Reactive (Fine Soils)

Clay

Shale

Non-Reactive (Coarse Soils)

Sand

Gravel

Cobble

Boulders

Rock

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Formation Types

COARSE SOILS
SAND, GRAVEL AND ROCK

POROSITY

&

PERMEABILITY

INERT & NON-REACTIVE

DON'T SWELL

DON'T GET STICKY

FINE SOILS
CLAY AND SHALE

SWELL

&

GET STICKY

LOW POROSITY

&

PERMEABILITY

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Requirements of the Drilling Fluid

Viscosity = **Aids transport of drilled cuttings at low annular velocity.**

BEWARE viscosity also creates resistance to flow (the higher the viscosity the greater the annular pressure and the chance of fluid loss).

Gel Strength = **Suspends and supports the drilled cuttings during periods of inactivity.**

Filter Cake = **Controls fluid loss and stabilise unconsolidated formations.**

Inhibition = **Control clay and shale hydration and help prevent bit balling.**

Velocity = **To aid hole cleaning**

Drilling Fluid Must be Designed for the Specific Formation

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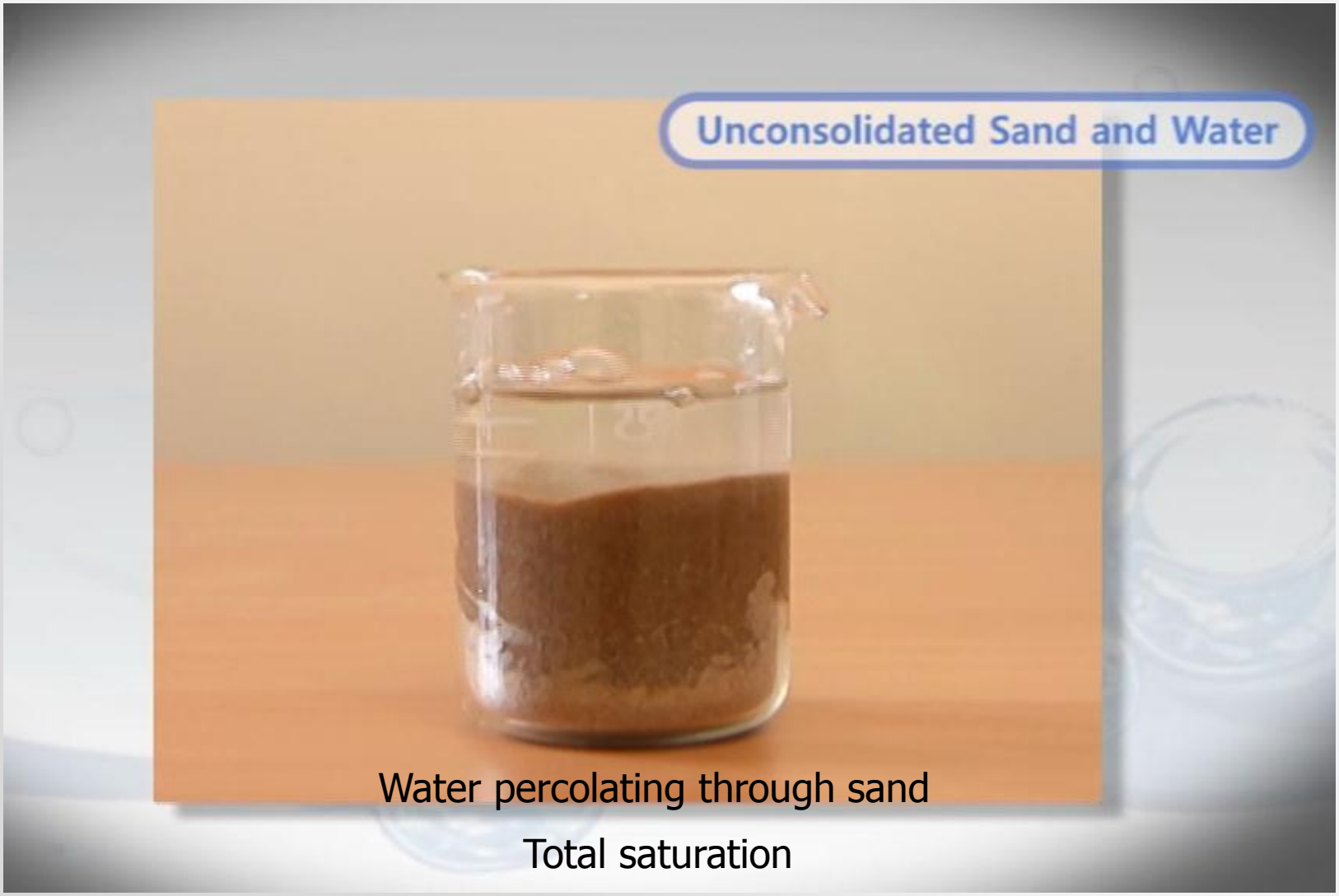
Fine to Medium Sand



Water percolating through sand

Total saturation

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Pure-Bore® Creating a Tight Firm Filter Cake to Seal and Support Unconsolidated Sand

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Clay & Water (Reactive Soils)

Clay in Water Swells, Hydrates and Gets Sticky

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Clay Mixed With Water/Pure-Bore®

Pure-Bore® Polymer Encapsulates Clay Reducing Hydration, Swelling and Sticking

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Pure-Bore® in action – clay cuttings removed over shale shaker

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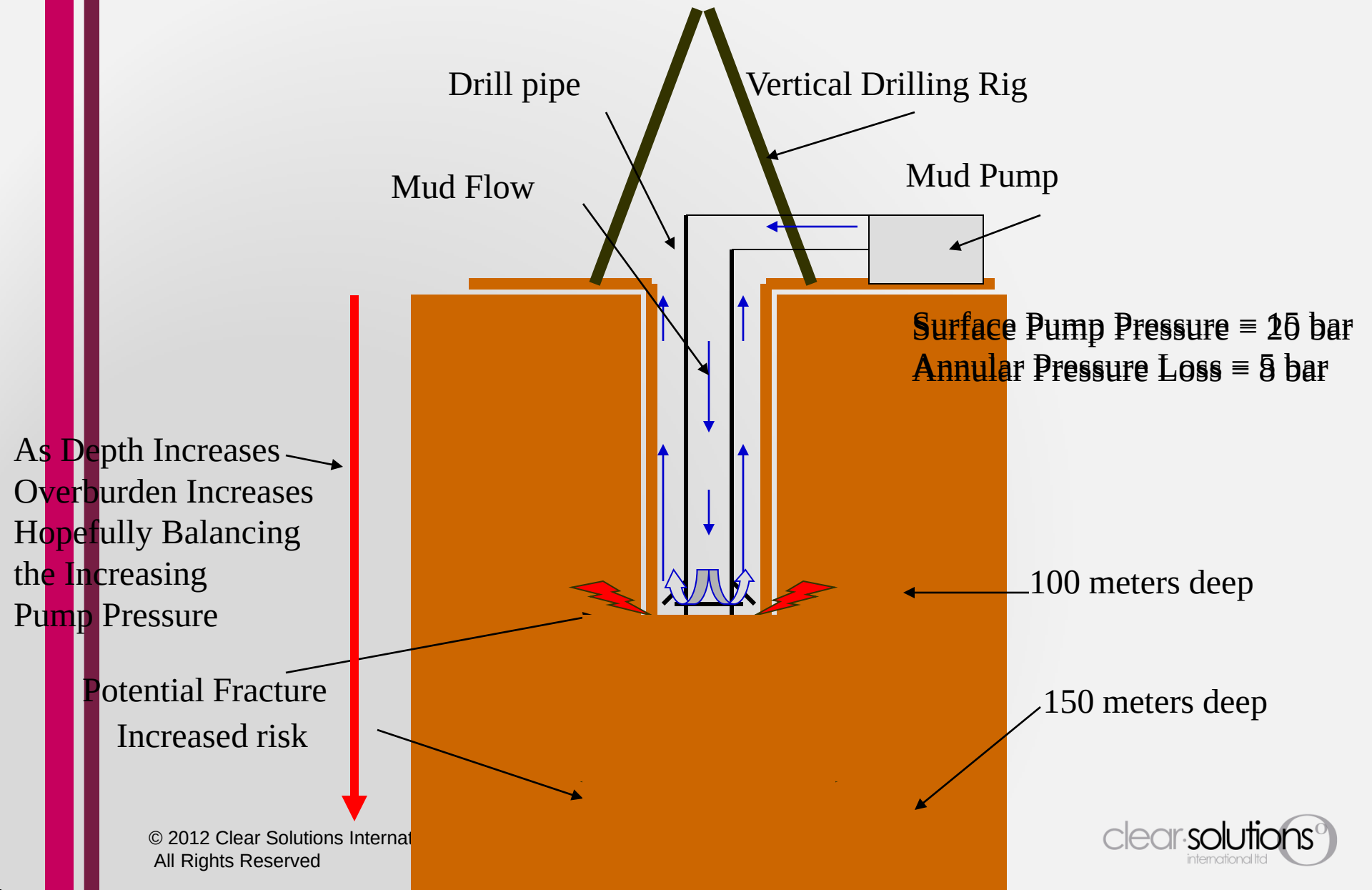
Factors Influencing a Vertical Drilling Fluid



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How Do We Drill Deeper, Faster and More Cost Effectively

The answer is to:

- Use a lower circulating pressure
- Reduce the mud weight whilst maintaining a positive hydrostatic head
- Optimise hole cleaning

By reducing the viscosity of the drilling fluid we reduce the circulation pressure.

At the same time we need to provide adequate viscosity to effectively remove the drilled solids.

AN INTERESTING DILEMA!!!!

FORTUNATELY WE HAVE THE ANSWER

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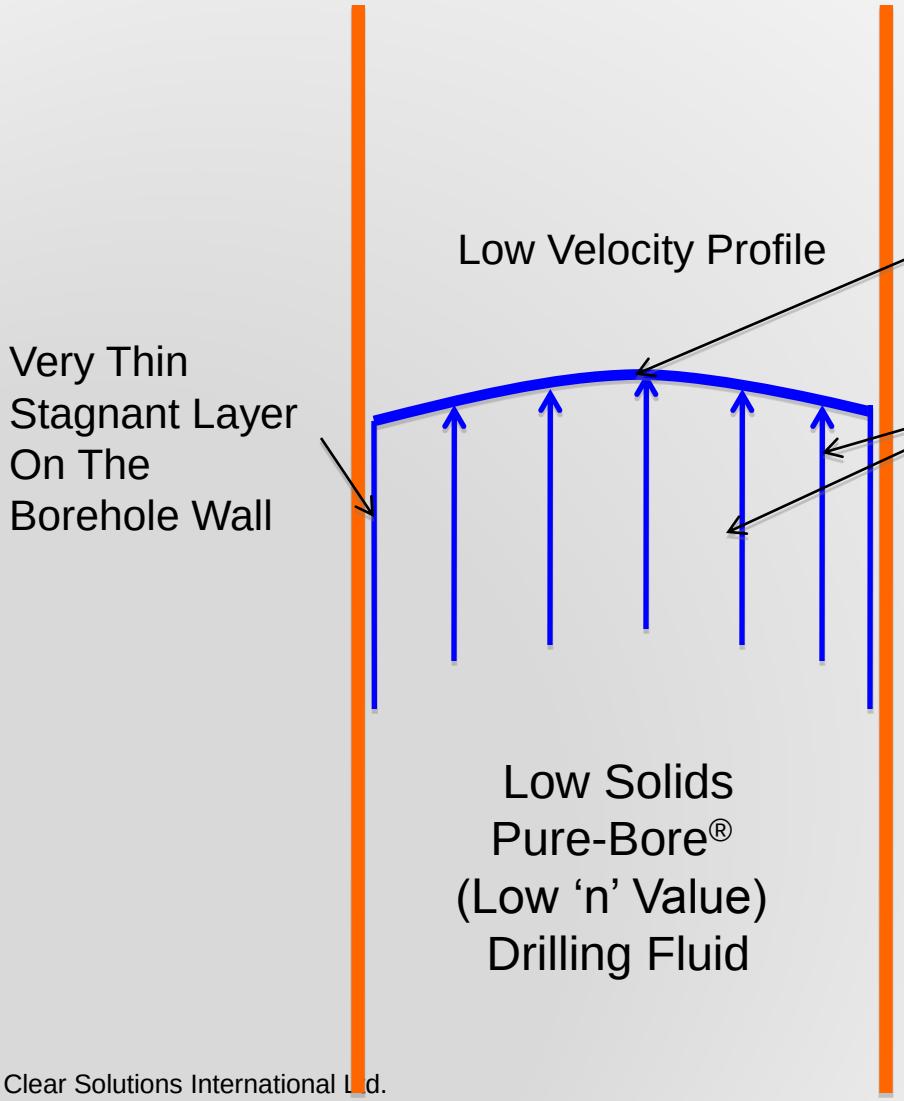
Laminar Flow in a Clean High Shear Thinning Drilling Fluid (Pure-Bore®)



EFFECT

- **Pure-Bore® Drilling Fluid Providing Very Effective Hole Cleaning**
- **Very Low Annular Pressure Loss**

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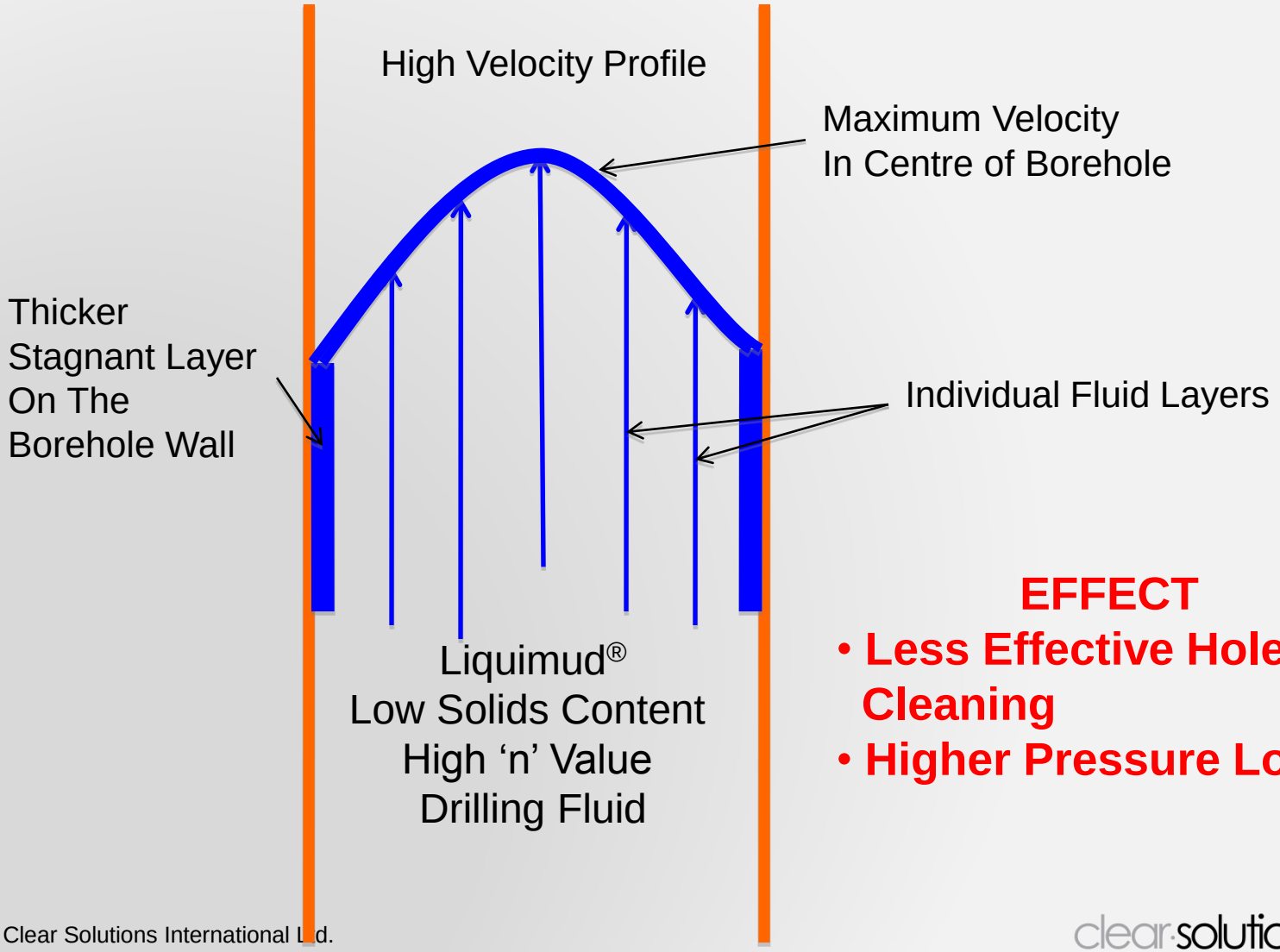
Laminar Flow in a Low Shear Thinning Drilling Fluid (Liquimud®)



EFFECT

- **Less Effective Hole Cleaning**
- **Higher Pressure Loss**

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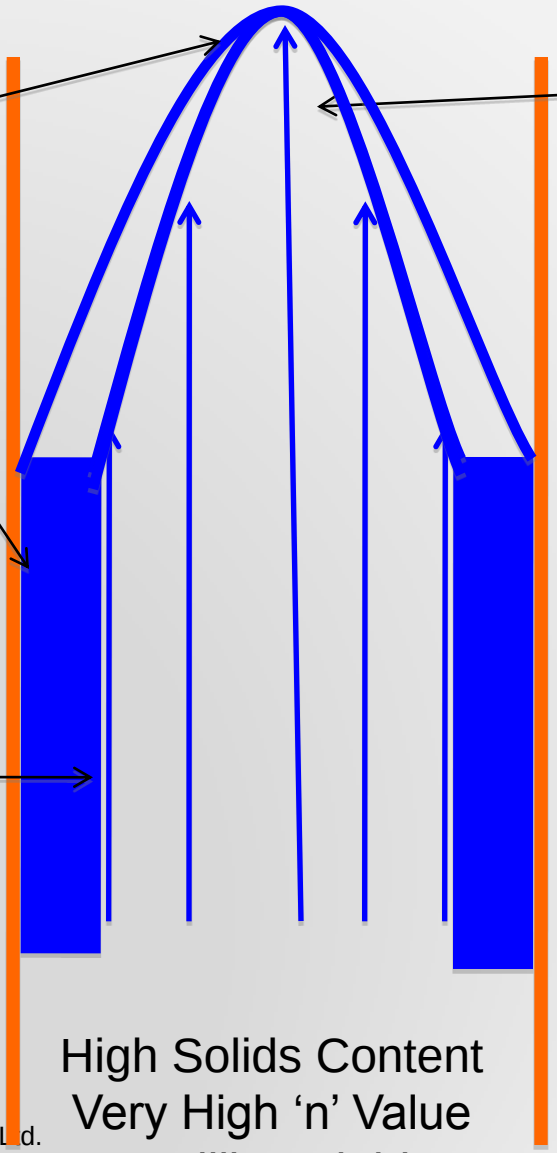
Laminar Flow in a Dirty Low Shear Thinning Drilling Fluid (Liquimud®)



Very High Velocity Profile

Maximum Velocity In Centre of Borehole

Very Thick Stagnant Layer On The Borehole Wall

Very Poor Hole Cleaning Near the Edge Of The Borehole

High Solids Content
Very High 'n' Value
Drilling Fluid

EFFECT

- **Inefficient Hole Cleaning**
- **High Pressure Loss**
- **High risk of Stuck Pipe**
- **Difficult to Grout**

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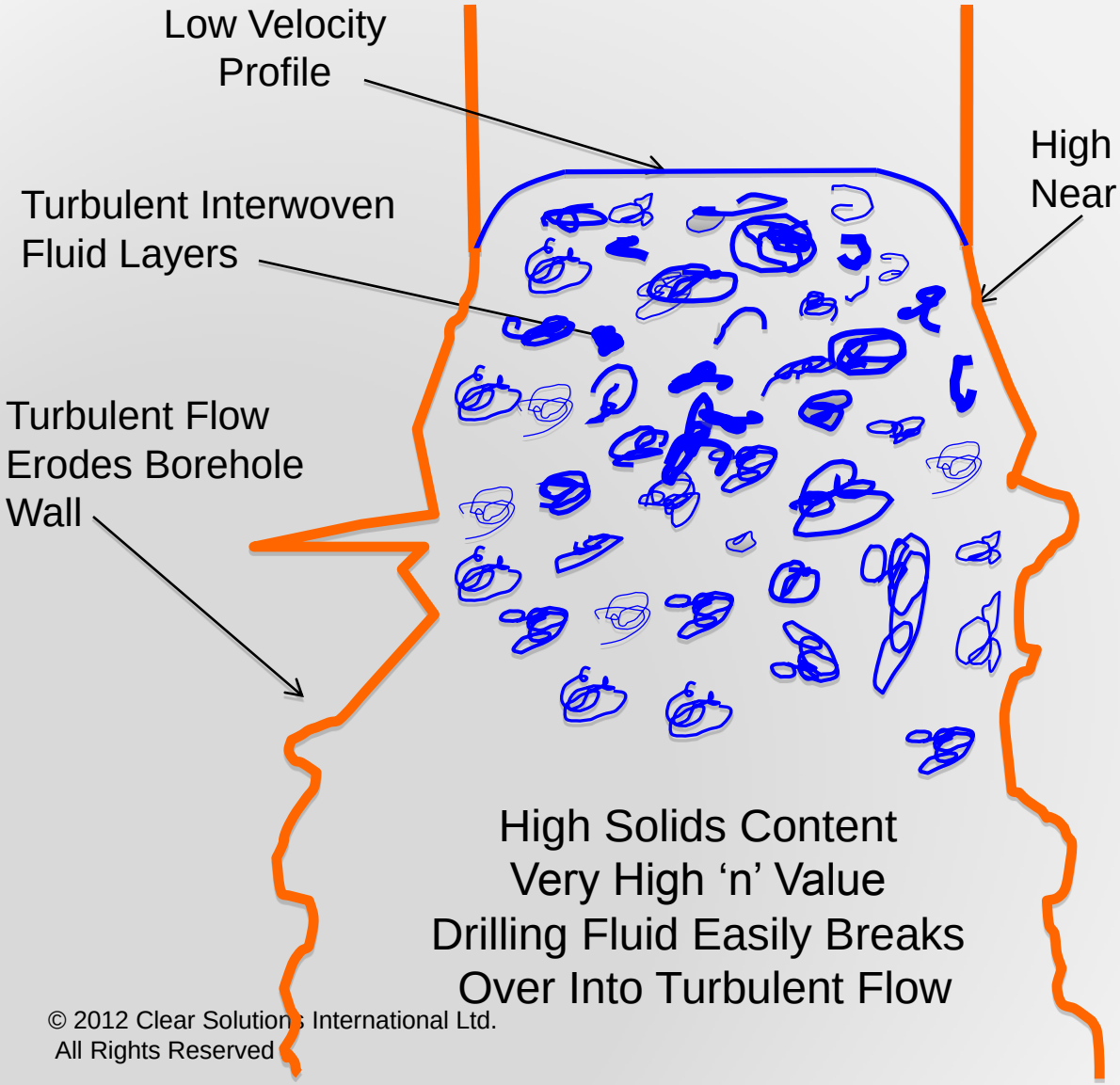
Dirty, Low Shear Thinning, Drilling Fluid Breaking Over Into Turbulent Flow



EFFECT

- **Very Effective Hole Cleaning**
- **Increased Chance of Washout**
- **High Pressure Loss**
- **Effective Grouting Almost Impossible**

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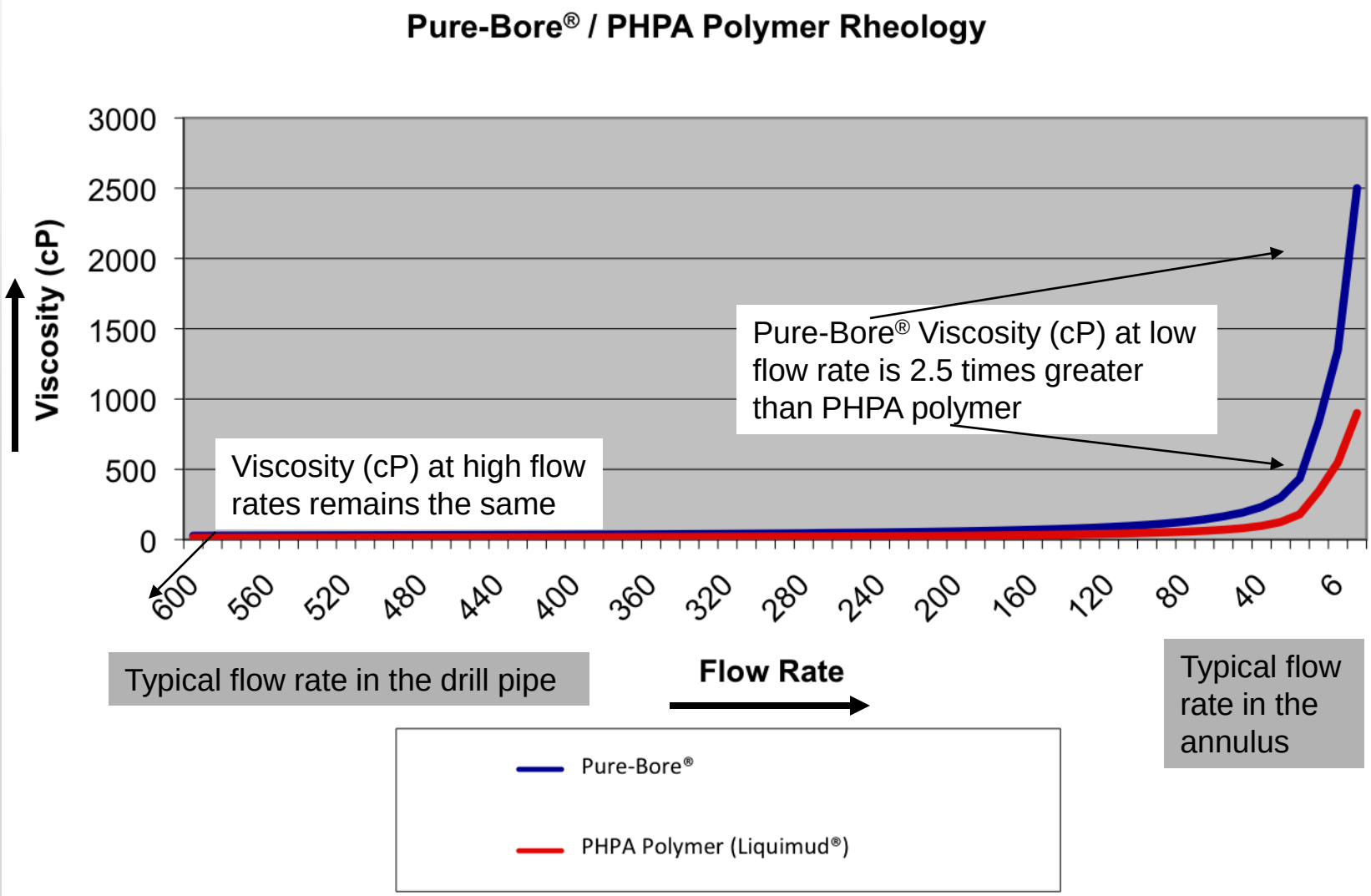
The Answer is to Develop Highly Shear Thinning Drilling Fluids



Excellent Hole Cleaning Using Ultra-Bore®
Ultra High Shear Drilling Fluid

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Ascending Annular Velocity

Recommended ascending velocity
25 to 50 meters per minute

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Pure-Bore®
What Does It Do

Viscosity = Aids transport of drilled cuttings at low annular velocity.

Gel Strength = Suspends and supports the drilled cuttings during periods of inactivity.

Filter Cake = Controls fluid loss and stabilises the formation.

Inhibitive = Inhibits clay and shale from swelling and stabilises the formation.

Biodegradable = Non-Toxic and biodegrades in 4 - 6 weeks unless stabilised for longer projects

Recycles = Can be recycled through standard recycling equipment

Low cost disposal = As Pure-Bore® slurry biodegrades drilled cuttings settle out:

- Water phase goes to sewage treatment.
- Solid phase goes to land fill.

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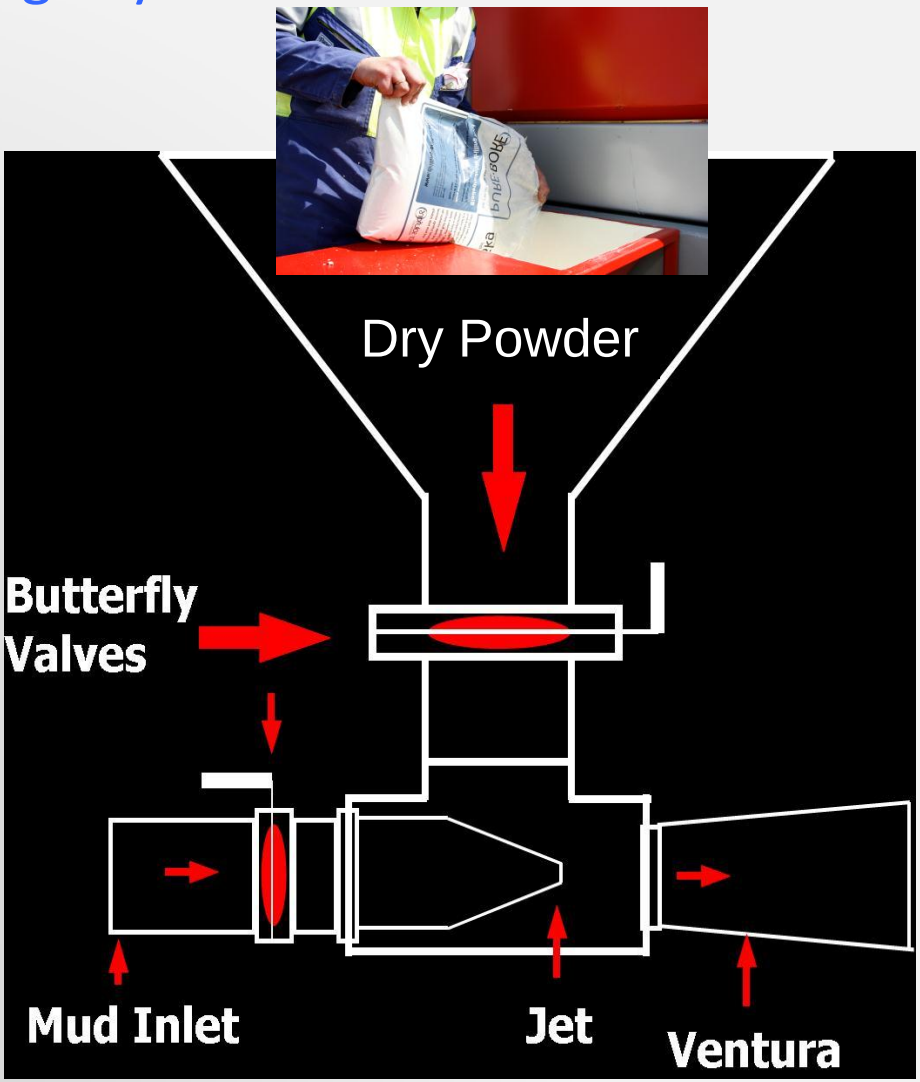
Venturi Style Mixing Hopper For Mixing Dry Powders



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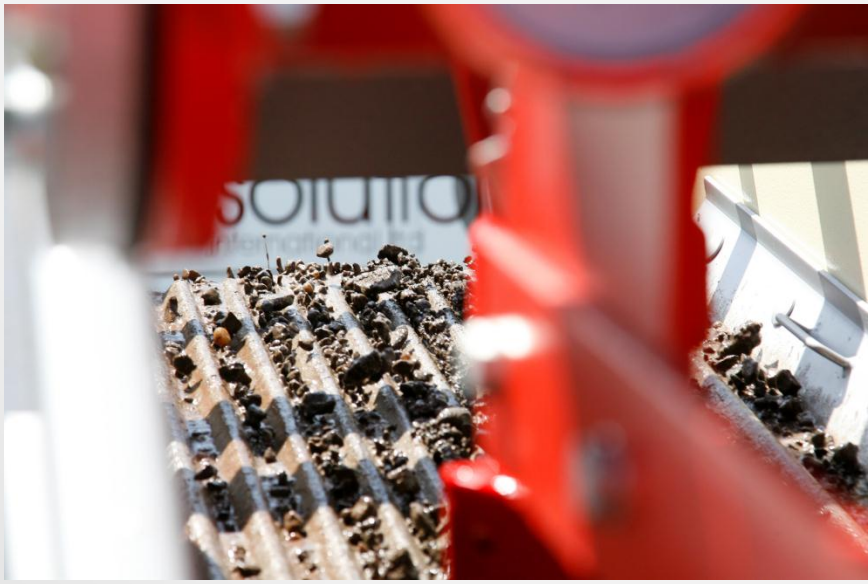
Ultra-Clean 600™ Drilling Fluid Mixing and Recycling System



The End!

Presented By
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