

QPLUG

Generic System Name: Mixture for plugging high loss zones.

Introduction:

Category: The system is based on polymers, silicate and calcium chloride brine and uses sands/solids in the formation or added LCM materials to plug loss circulation zones in shale, sand, limestone and dolomite.

The "Q-PLUG" system is comprised of two basic components, the functions and features are described below:

- **QLOSS TERMINATOR:** Is a calcium chloride brine solution including polymers and surfactants. This solution has thixotropic characteristics. Base densities between 8.8 – 11.6 ppg (1.05 - 1.39 g/cc) and a yield point of 8 - 14 lb/100ft² (4 – 7 Pa) are recommended. The density can be adjusted to the special conditions of the well using carbonate; fine and medium and sealing cellulosic fibers. It also inhibits any moisture in the rock due to osmotic effect and can be used in wells drilled with water based or oil based fluids.
- **QACTIVATOR:** Is the activator solution (sodium or potassium silicate) which on contact with the QLOSS TERMINATOR reacts and produces crystals within the fissures, which link within the structure of the loss zone, sealing the zone. It prevents the hydration of shales due to the interaction with calcium in the interstitial water.
- **Washer:** Is an optional solution consisting of caustic soda. It removes any precipitate formed by the reaction of QLOSS TERMINATOR and QACTIVATOR. This can be used if needed later to remove the seal formed, i.e. in production zones.

Application: Used in severe loss zones in shale, sand, limestone and dolomites.

Replacement for: Salt plug, and other type of plugging for severe loss problems.

Key aspects

- Q Effective for sealing fractures
- Q Better if pumped with cementing unit
- Q Easy to mix
- Q Extensively used in Mexico

Water-Based Drilling Fluids

Components: QLOSS TERMINATOR

<i>QMax Product</i>	<i>Function</i>
<i>Water</i>	Continuous phase
<i>CaCl₂</i>	Crystal Maker
<i>*QPAC HV</i>	Viscosifier

Components: QACTIVATOR

<i>QMax Product</i>	<i>Function</i>
<i>Water</i>	Continuous phase
<i>*QM-11</i>	Crystal Maker
<i>*QPAC HV</i>	Viscosifier

Components: Washer

<i>QMax Product</i>	<i>Function</i>
<i>Water</i>	Continuous phase
<i>Caustic Soda</i>	Crystal destroyer

Key aspects

- Q Lab testing required for concentrations
- Q Ca⁺⁺ in make-up water must be <100mg/l
- Q Be careful handling the Washer
- Q All components to be mixed separately

Water-Based Drilling Fluids

<i>Additional Products</i>	<i>Function</i>
<i>Calcium Carbonate</i>	Weighting and bridging agent

* Proprietary or brand name products

Typical System Properties

<i>QPLUG</i>		
<i>Property</i>	<i>Range</i>	<i>Min/Max Recommended</i>
<i>Mud Weight, ppb (kg/m³)</i>	8.8 – 11.6 (1,050-1,390)	As required
<i>Viscosity Marsh, seg/qt</i>	As required	As required

Key aspects

- Q Maximum density 11.6 ppg
- Q Viscosity will depend on the application
- Q Filtration rate is not controlled
- Q Not mixed in base drilling fluid

Field Operations

Mixing Procedures

Prepare the pills separately:

QLOSS TERMINATOR: Start with a clean tank. Add the water in the mixing tank with moderate agitation, add dry calcium chloride and mix until the salt is 100% dissolved. Allow the pill to cool to room temperature. Add the polymer to according to severity the loss. If total losses, viscosify as high as possible, adding a weighting agent if needed.

If making the pill at the mud plant, store in 1m³ containers for subsequent use in field.

QACTIVATOR: Start with a clean tank. Add water and apply moderate agitation, add the required concentration of silicate (QM-11 or QM-12) and stir. Add the polymer to the viscosity required according to the severity of the loss, if the loss is total, viscosify as much as possible, adding a weighting agents if needed.

After generating the pill at the mud plant, store in 1m³ containers for subsequent use in the field.

Washer: Add the water in the mixing tank with moderate stirring. Add high concentrations of caustic soda. Once the mixture cooled, store in 1m³ containers for subsequent use in the field.

Fluid Specific Tests and Equipment

- Marsh funnel and cup
- Mud balance
- Calcium test kit

Operational Recommendations and “Best Practices”

- Locate the area of losses as accurate as possible.
- Calculate the volume necessary to cover the area of losses.
- Determine the required density of pills.
- Determine the severity of losses
- Use spacer pills in front of the QPLUG in all fluids system. If necessary, apply a second pill adding more material as cellulose or other fibrous materials, etc to the QLoss Terminator pill.
- Sometimes it is necessary to pump more than one treatment.