

## CBMax 200™

**Generic System Name:** Coal bed methane drilling fluid, coal bed methane coring fluid, coal bed methane drill-in fluid.

**Introduction:**

Category: A water based or brine based fluid used for drilling in coal beds.

Application: Drilling wet or dry coals in vertical or horizontal profiles. It is recommended that CBMax 200™ be used in horizontal wells while either system (CBMax 100 or 200) may be used in vertical wells.

Replacement for: No known replacement system.

**Components: CBMax200™**

<i><b>QMax Product</b></i>	<i><b>Function</b></i>
<i><b>Water</b></i>	Continuous phase
<i><b>*QXAN XCD</b></i>	Viscosifier
<i><b>Caustic Soda</b></i>	Alkalinity control
<i><b>*QPAC LV/HV</b></i>	Fluid loss control
<i><b>*QSTAR ENV</b></i>	Fluid loss control
<i><b>*CBMax</b></i>	CB stability additive

\* Proprietary or brand name product

### Key aspects

- Q Specially designed to drill CBM wells
- Q Preferred to be used in horizontal wells
- Q Keep QXAN XCD concentration for LSYP
- Q Maintain alkaline environment

## Typical System Properties

<b>CBMax 200™</b>		
<b>Property</b>	<b>Range</b>	<b>Min/Max Recommended</b>
<b>Mud Weight, ppg (kg/m<sup>3</sup>)</b>	8.8 – 9.2 (1,050 – 1,100)	< 9.2 (< 1,100)
<b>Plastic Viscosity, cP</b>	5 – 10	< 20
<b>Yield Point, lb/100ft<sup>2</sup> (Pa)</b>	10 – 20 (5 – 10)	< 12
<b>Gels, lb/100ft<sup>2</sup> (Pa)</b>	4/10 – 12/24 (2/5 – 6/12)	As required
<b>pH</b>	10.0 - 11.0	> 10.0
<b>Calcium, mg/l</b>	40 - 200	< 200
<b>MBT, ppb-eq (kg/m<sup>3</sup>)</b>	0 – 10 (0 – 28)	< 12 (<35)
<b>API Fluid Loss, cc/30min</b>	5- 8	< 10
<b>Sand Bed Invasion Test, cm</b>	3.0 - 4.5	< 4.5

## Field Operations

### Mixing Procedures

For New System: Mix new systems in a premix tank with hopper and bring to suction as premix. Treat fresh water with bleach and ascorbic acid for bacteria, Mix 7.0 – 10.5 ppb (20 – 30 kg/m<sup>3</sup>) CBMax at 5 – 10 min per sack, raise the pH to 10.5 with caustic soda and mix QPAC LV and QSTAR ENV at a ratio of 1:1 up to 1:4 to reduce fluid loss. If required, adjust the viscosity with small additions of QXan.

For mix “on the fly”: Not recommended

### Key aspects

- 🔍 Keep drilled solids content at minimum
- 🔍 Hole cleaning must be monitored
- 🔍 Have silicone-based defoamer in stock
- 🔍 Recommended for low densities

### Maintaining Properties

- pH at 10.5 alternating caustic and lime at a 1:1 ratio in the CBMax 200™ if carbonates/bicarbonates are noted.
- Maintain density as low as possible with all solids control equipment when drilling or circulating the hole.
- Fluid loss at less than 8cc per 30min with QPAC LV, and QSTAR ENV at a ratio of 1:4 over 2 circulations.
- Maintain CBMax concentration at 10 ppb (28 kg/m<sup>3</sup>) by adding CBMax every 2 - 4 hours while drilling ahead.

### Fluid Specific Tests and Equipment

- Complete WBM testing kit
- Sand Bed invasion test kit (recommend 3 – 4.5 cm sand invasion)
- PHPA test kit (if MAXCAP D is added)

Contaminants: effect and treatment

<b>Contaminant</b>	<b>Mud Effect</b>	<b>Treatment</b>
<b>Aeration</b>	Gritty appearance. May cause pump cavitation, increased corrosion	Treat with small additions of silicon defoamer
<b>Bacteria</b>	Odour, reduce viscosity, increased filtration, carb/bicarb change	Bactericides
<b>Calcium</b>	High Ca <sup>++</sup> content – Polymers will be inefficient	Soda ash
<b>Cement</b>	May destroy rheology, filtration in CBMax 200™	Sodium bicarbonate
<b>CO<sub>3</sub><sup>2-</sup>/HCO<sub>3</sub><sup>-</sup>/CO<sub>2</sub></b>	Reduces pH	Lime & caustic
<b>H<sub>2</sub>S</b>	NA	NA
<b>Inhibition</b>	NA	NA
<b>LGS</b>	High PV, filtration and filter cake	Centrifuges
<b>pH</b>	May destroy rheology, filtration in CBMax 200™ if above 12	Citric acid, sodium bicarbonate
<b>Salt</b>	Increase in Cl <sup>-</sup>	Dilution
<b>Surfactant</b>	Foaming	Silicon defoamer
<b>Water influx</b>	Mud dilution, reduction of viscosity etc.	Replenish to required levels with premix and/or additives.

### Operational Recommendations and “Best Practices”

- Foaming will occur when mixing the CBMax additive although it rarely affects pumps or downhole equipment while drilling. Shut down mixing hopper when not in use and keep hopper valve closed at all times except when mixing, keep suction tank volume high and use defoamers sparingly as any surfactants adversely affect CBMax component. Best to spray problem tanks with a spray gun with a silicone based defoam agent.

In order to minimize the formation of coal fines that could produce formation damage impairment, the following practices are recommended:

- Prior to trips, pump to surface a hi-vis hole cleaning sweep from the pill tank consisting of 3.0 m<sup>3</sup> of active mud with 1 sack of CBMax and 1-2 vis cups of QXAN XCD.
- Run in hole trip speed should be a maximum of 2-3 min per stand to avoid surge pressures which could induce formation fractures.
- Slide as much as possible rather than rotate to prevent coal crushing on the lower part of the hole. Exercise as low bit RPM as possible for the same reason as above.
- Employ the use of a big bowl centrifuge at all times. Process the entire flow and adjust centrifuge settings for high RPM, as high G force as possible and long retention times.
- The use of tri-cone bits rather than PDC bits is recommended.
- Weighted brine slugs have been used to pull dry pipe while tripping. Note this is only recommended for use in the CBMax200™ system.
- Sweeps can be utilized if hole conditions indicate tight connections, higher than expected torque or rounded cuttings are noticed at the shakers. Mix QSTOP & CBMax @ 2:1 ratio in 6 - 12 bbl (1 - 2 m<sup>3</sup>) of water in the pill tank and pump around. Monitor results on the shaker and drilling data.
- Employ “Dry Reaming” technique.
- Use bits with back reaming capability.