

ViChem Specialty Products MHA Drilling Fluid System

Multi-Hydroxyl Alcohol



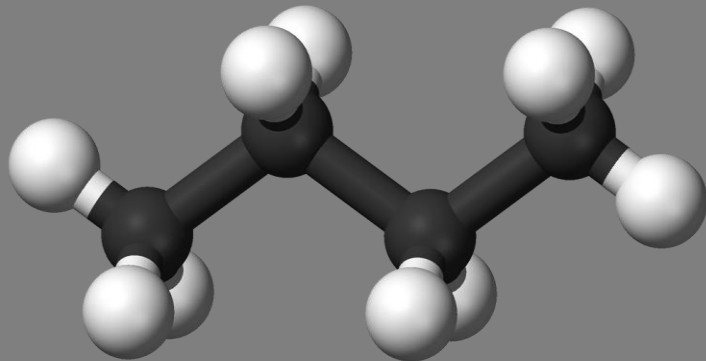
**ViChem
Specialty Products LLC.
Conroe, TX**



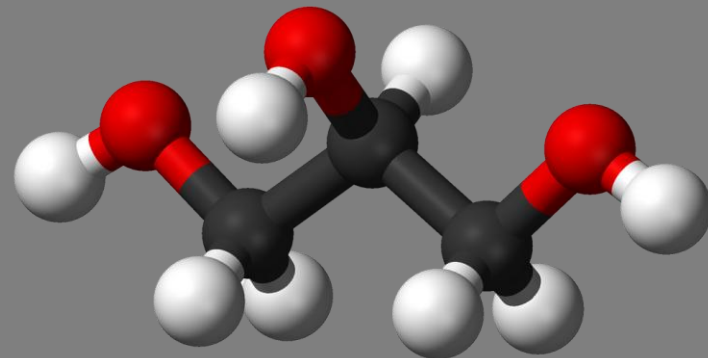
MHA Drilling Fluid System

- Utilizes the unique properties of Multi-Hydroxyl Alcohols
 - Stability and performance characteristics comparable to Oil Based Muds
 - Nontoxic to the environment

Oil Hydrocarbon

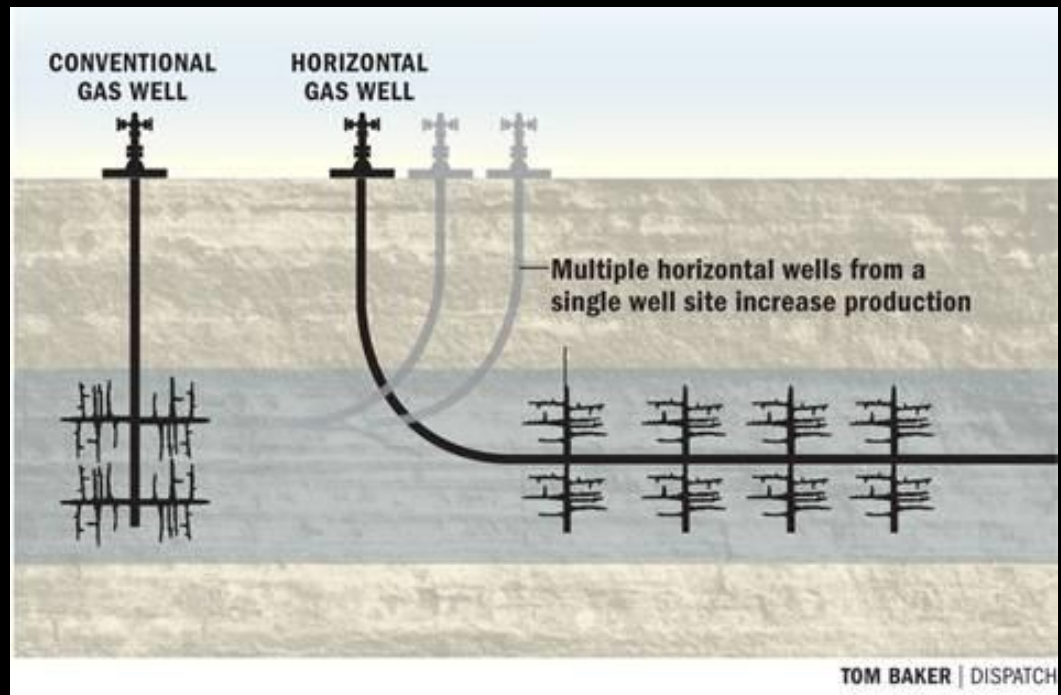


Multi-Hydroxyl Alcohol



MHA Drilling Fluid System

- Highly inhibitive water based drilling fluid formulation
- Specifically designed to drill long laterals



Benefits of the MHA System

- Nontoxic to the environment
- Superior lubricity
- Inhibits shale hydration
- Specifically designed for horizontal drilling
- Maximizes cost efficiency
- More control over loss circulation problems than with OBM or SBM
- Cleaner and easier to use than OBM or SBM

MHA System Components

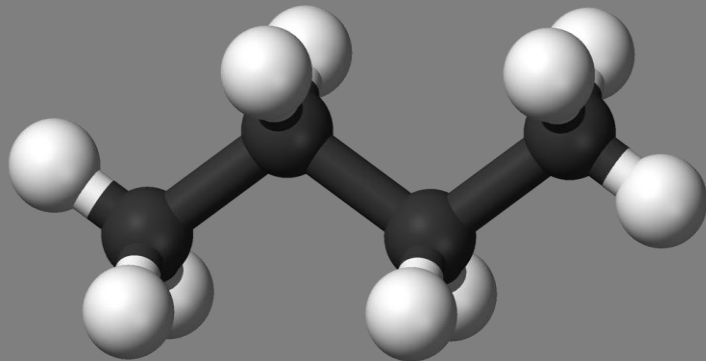
- Multi-Hydroxyl Alcohol base
- ViChem L-20 Lubricant
- Proprietary Shale Inhibitors
- ViChem CQ Bio-324
- Bio-Polymers



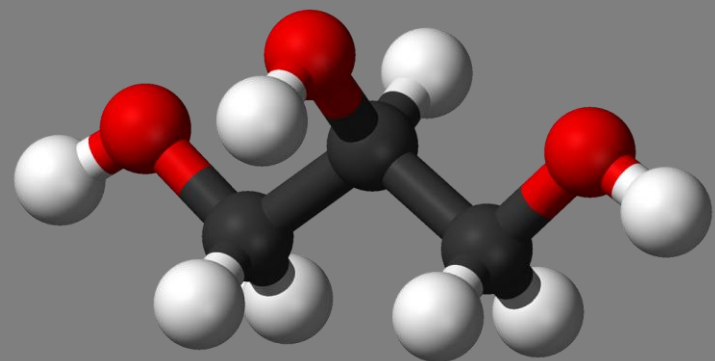
Multi-Hydroxyl Alcohol

- Gives the system its unique properties
- “Alcohol hydrocarbon” as opposed to an “oil hydrocarbon”
- Hydrocarbon molecule blend containing multiple hydroxyl groups allowing it to act like an oil and an alcohol

Oil Hydrocarbon



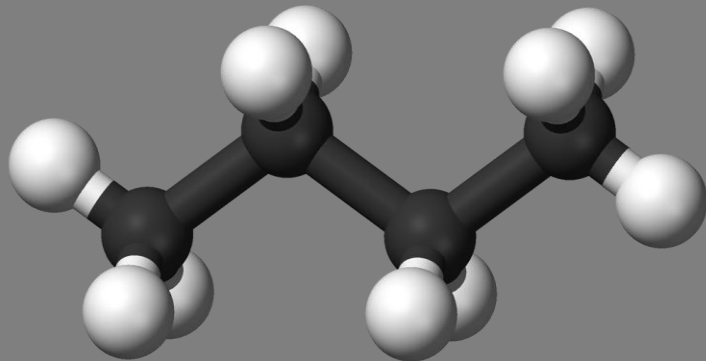
Multi-Hydroxyl Alcohol



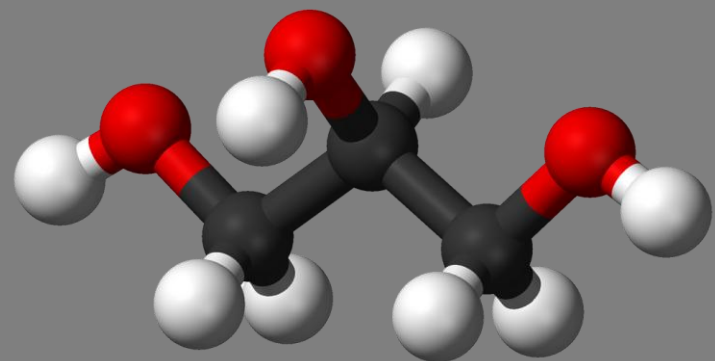
Multi-Hydroxyl Alcohol (cont.)

- Miscible in water while still retaining its oil like properties in the areas of lubricity and inhibition
- Completely biodegradable

Oil Hydrocarbon



Multi-Hydroxyl Alcohol



ViChem L-20 Lubricant

- Non-petroleum based organic vegetable oil
- Uniquely high affinity for coating particles and metal surfaces
- Superior performance as a lubricant, shale stabilizer and corrosion inhibitor
- Completely Biodegradable



Proprietary Shale Inhibitors

- Because the MHA system is water-based, a wide variety of shale inhibitors are possible
- ViChem SI-60 combines a proprietary mix of cationic molecules to inhibit shale hydration
- Can be used “off of the shelf” or custom blended based on laboratory testing of formational shale samples



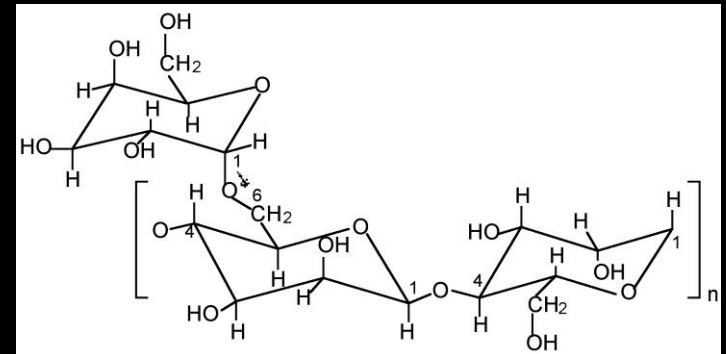
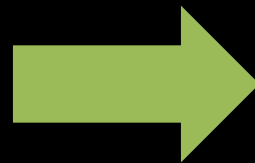
ViChem CQ Bio-324 Biocide

- Microorganisms can directly impact drilling operations as well as cause problems down the line
- Broad spectrum biocide
- Long term effectiveness
- High temperature/pressure tolerant
- Granted full regulatory approvals by EPA for use in oil and gas applications



Bio-Polymers

- Use a combination of natural and semi-synthetic polymers
- Viscosity and API filtrate control
- Well-bore stability
- Can use ViChem polymers or custom blends based on customer needs



Benefits of the MHA System

- Shale stability
- Lubricity
- Increased ROP
- Environmental compliance
- Other benefits



Shale Stability

- MHA Components combine to create an inhibitive system providing wellbore stability and integrity

Shale After 12hrs of Heat Rolling

Base Lab Mud



MHA System



Shale Stability

– MHA Components

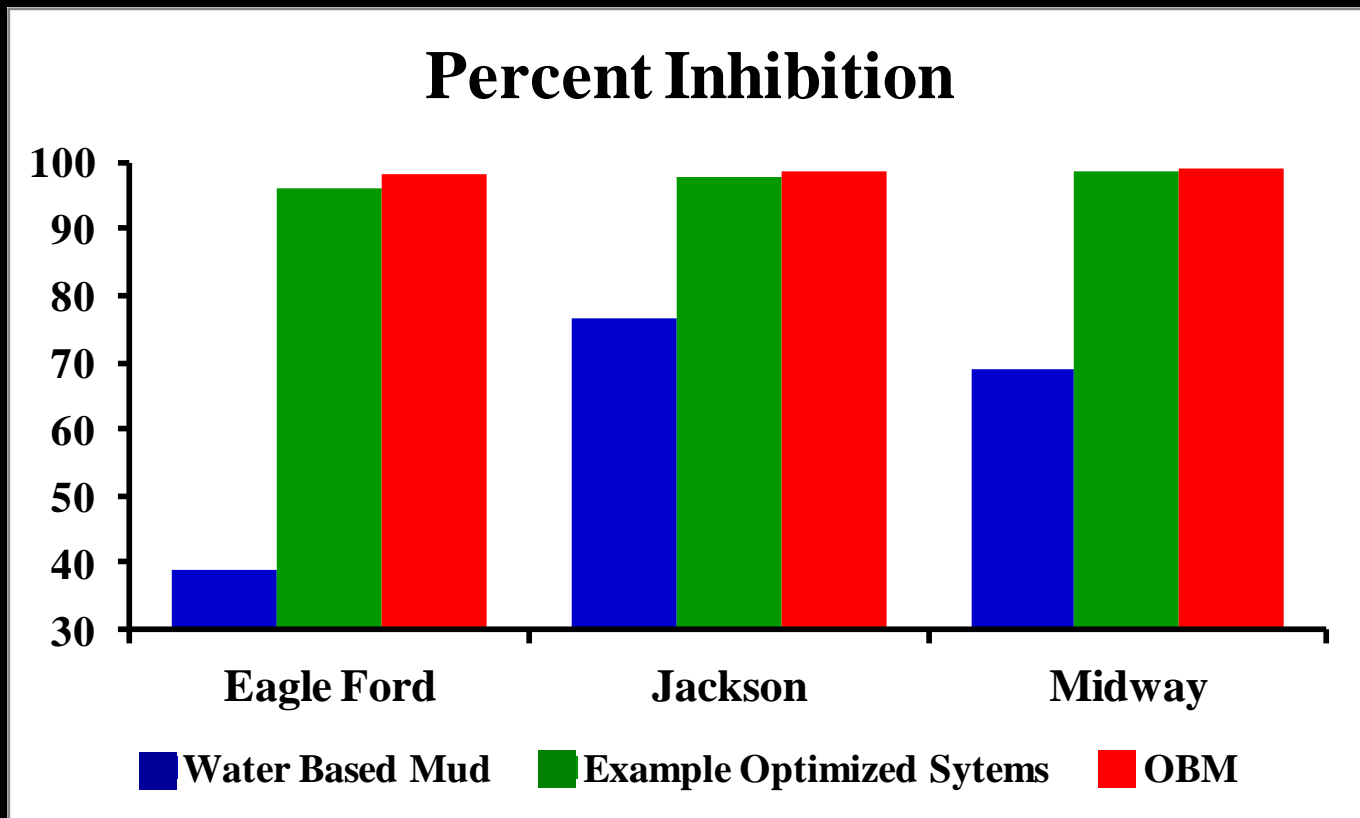
- Can promote clay and shale stabilization to prevent swelling and/or dispersion
- Encapsulate gumbo reducing bit balling and increasing ROP
- Seals small fractures in stressed shale formations

Percent Inhibition

	Eagle Ford	Jackson	Midway
Water Based Lab Mud	39.0	76.4	69.0
BLM + 3.0% L-20	80.4	78.2	83.2
BLM + 60% MHA	75.3	82.5	87.1
BLM + 2.0% SI-60	93.1	91.9	95.3
Example Optimized Sytem	96.2	97.9	98.5
Oil Based Mud	98.3	98.5	99.1

Shale Stability

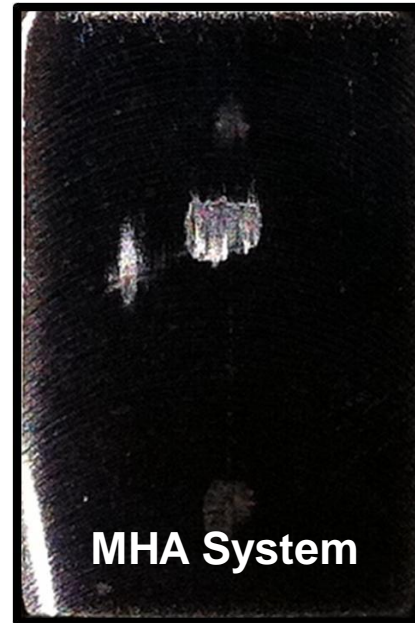
- MHA system designed specifically to compete with OBM and SBM while drilling reactive shale
- Shale inhibitors can be optimized to meet specific needs



Lubricity

- Multi-Hydroxyl Alcohol plus the L-20 organic vegetable oil combine to provide superior lubricity
- Uniquely high affinity for coating particles and metal surfaces

Extreme Pressure/Film Strength Test

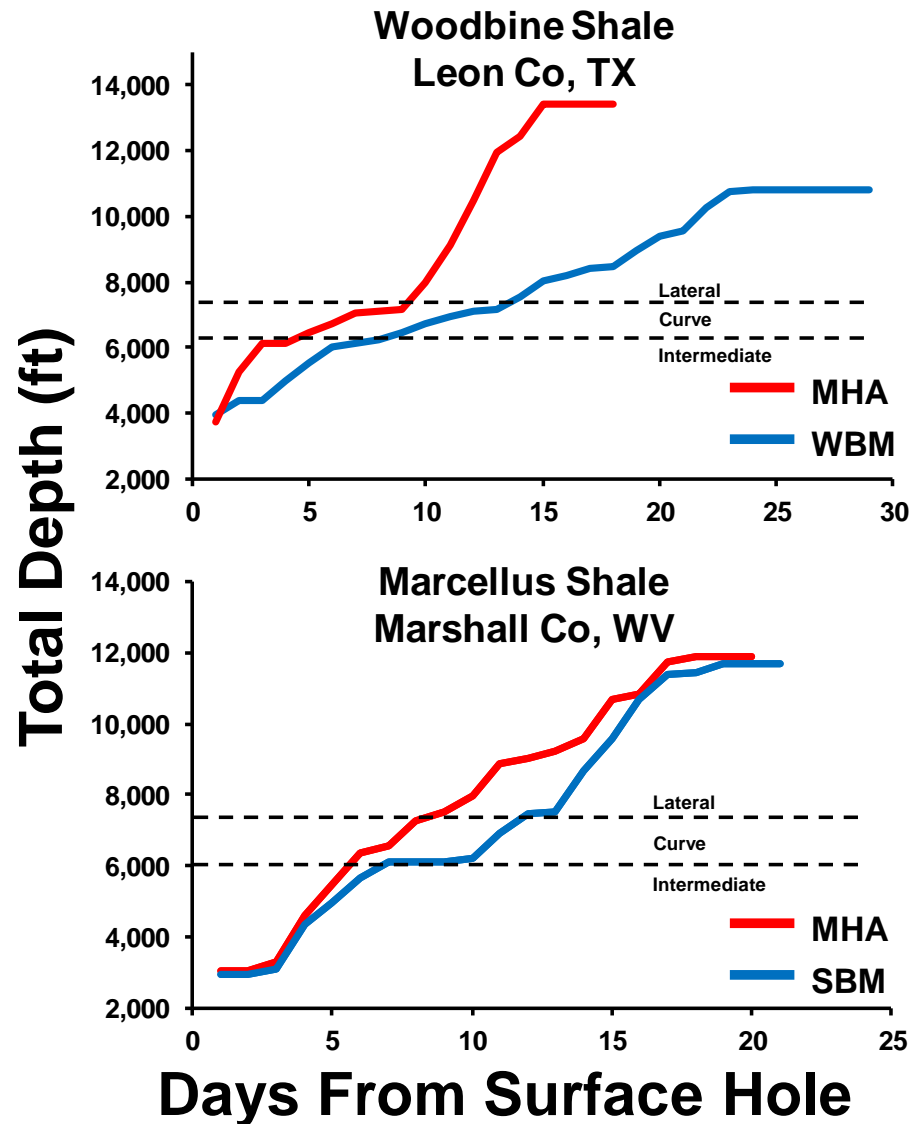


Lubricity

- Advanced Lubricant
 - Film strength and lubricity testing confirm field observations of superior lubricating properties
 - Smoother, faster trips reduce down time
 - Facilitates sliding operations for longer laterals

Water-Based Mud Testing			
	Base	Base Plus L-20 Lubricant	MHA System
9.4 ppb Drilling Fluid			
PV/YP	14/8	16/9	13/8
Coef. Lubricity	0.214	0.044	0.023
% Reduction	--	79.4%	89.2%
Film Strength	16,000	43,800	48,800
% Increase	--	274%	305%
10.5 ppb Drilling Fluid			
PV/YP	18/10	20/11	17/10
Coef. Lubricity	0.402	0.202	0.127
% Reduction	--	49.8%	68.4%
Film Strength	11,200	35,500	39,500
% Increase	--	317%	353%

Increased ROP



Environmental Compliance

- Readily metabolized and does not bioaccumulate
- Degrades rapidly in the presence of microorganisms
 - Well over 50% degradation in 5 days
- Reacts with atmospheric hydroxyl radicals
 - Estimated half-life in air is 33 hours

- **Aquatic Toxicity**

- LC50 (Fish, 48hr) >10,000mg/liter
 - virtually nontoxic
- EC50 (Crustacea, 48hr) >10,000mg/liter
 - virtually nontoxic
- Very low toxicity to aquatic life

ViChem MHA	
0	Health
0	(NFPA) Flammability
0	Reactivity
B	Personal Protection Equip

Other Benefits

- Clean up and handling easier than OBM or SBM
- No emulsification required
 - Possible effect of skin damage to the pay zone, from “emulsion block” is eliminated
- Offers the flexibility of water based systems
- Reduces disposal costs and liabilities
- Minimizes HSE issues

