H2S Removal

OIL CONTROL LLC

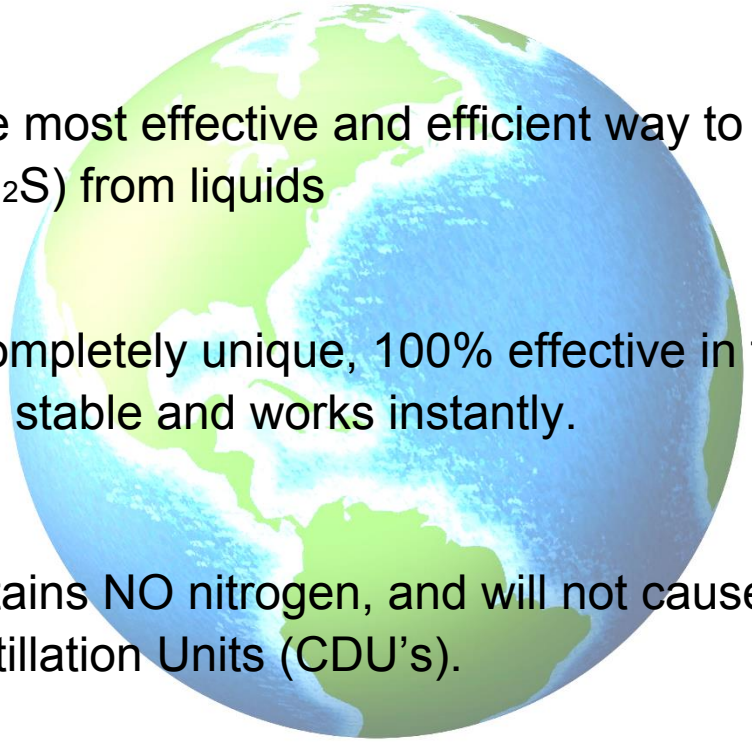
Innovative Chemical Solutions for the Oil and Gas Industry

www.oilctl.com

HSO 6869™

The Oil & Gas industry have been looking for a better and more economic way to remove hydrogen sulfide for years……

OIL CONTROL LLC has it!



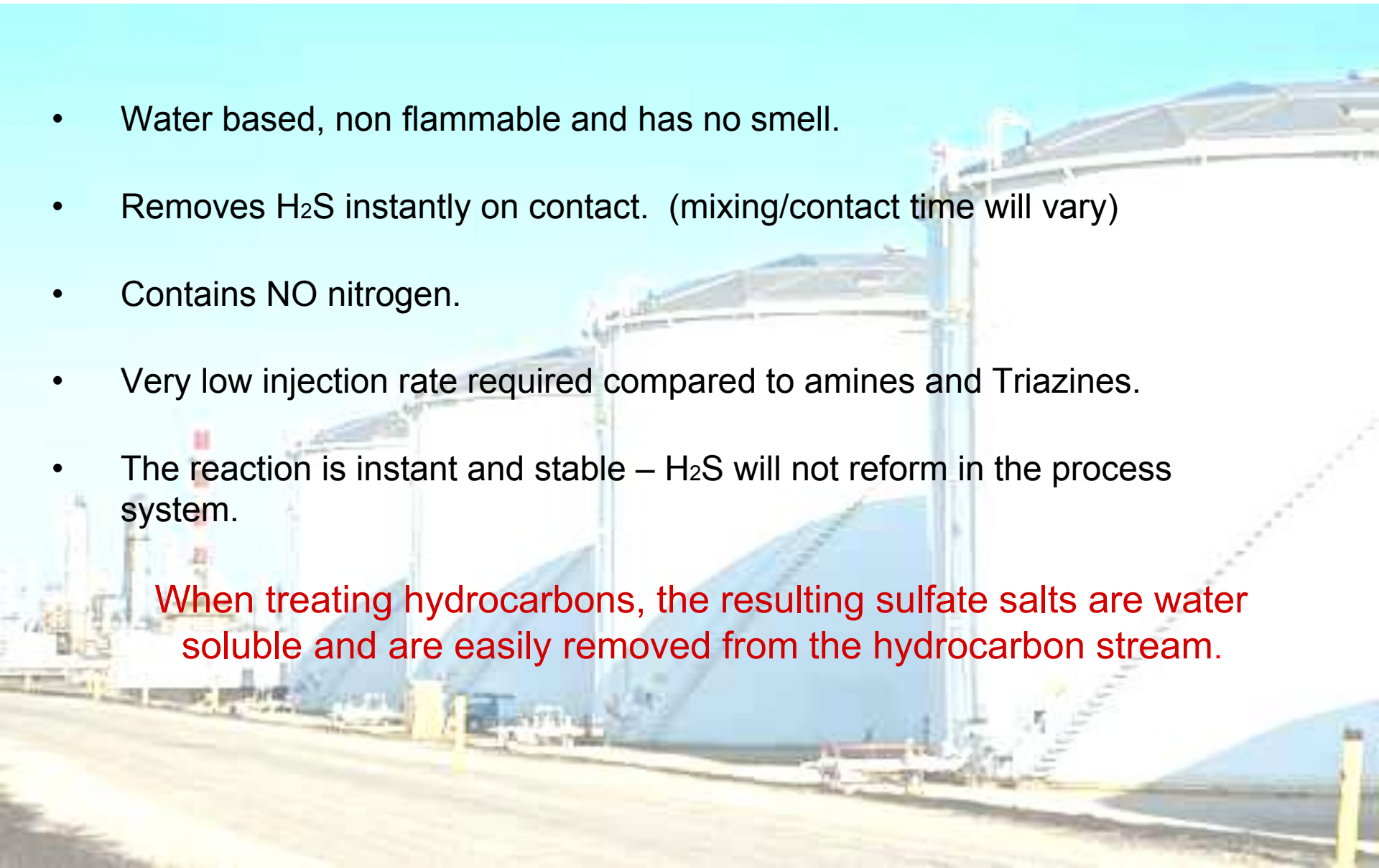
HSO 6869 is the most effective and efficient way to remove Hydrogen sulfide (H_2S) from liquids

HSO 6869 is completely unique, 100% effective in the removal of H_2S, the reaction is stable and works instantly.

HSO 6869 contains NO nitrogen, and will not cause fouling in heat trains or Crude Distillation Units (CDU's).

The required dosage of HSO 6869 required is a fraction of that required of other chemicals and the cost per gallon is lower!

HSO 6869™



- Water based, non flammable and has no smell.
- Removes H_2S instantly on contact. (mixing/contact time will vary)
- Contains NO nitrogen.
- Very low injection rate required compared to amines and Triazines.
- The reaction is instant and stable – H_2S will not reform in the process system.

When treating hydrocarbons, the resulting sulfate salts are water soluble and are easily removed from the hydrocarbon stream.

	Triazine	Formaldehyde	HSO 6869
Sediment	Appears in some cases	Appears always. Equipment clogging problem	**None**
Extraction efficiency	70%	90%	**100%**
Excess unreacted scavenger	May cause fouling and corrosion, high aquatic toxicity	Potential to create explosive environment	**Can be safely disposed with water**
Reaction products	Dithians + free amines, changes pH severely	Dithians, polymethylene sulphides	**Water soluble sulfate salts**
Toxicity/Environment	Toxic/Not Safe	Extremely Toxic/Not Safe	**Safe/Safe**
Reaction time	2 hours and more	2 hours and more	**immediate**
Stability	Unstable, pH change breaks down scavenged molecules	H2S may come back by reverse reaction	**Irreversible reaction, water soluble reaction products**
Ethyl mercaptane extraction	incomplete	Slow and incomplete	**Full and Irreversible**
Removal Requirements	20:1	10:1	**5:1**
Flammability	Non Flammable	Flammable	**Non Flammabile**
Other consideration	May cause mineral scaling, problematic for refineries	Forbidden in EU, USA	**REACH and CEFAS certified**

HSO 6869™

PHYSICAL PROCESS

1. Water soluble blend of stabilized polyol additives
2. H2S is converted into stable water soluble components
3. The Sulfide stays with the water phase
4. Spent chemical is easily treated
5. The water salt is stable and the reaction is irreversible

CHEMISTRY

1. Stabilized Polyol & Hydroxyls
2. Stabilizer
3. Complex alcohols

Crude Oil

TRIAZINE BASED SCAVENGERS

- Efficient at removing H_2S gas – poor performance in liquids
- Reaction is unstable and H_2S can reform
- Known carcinogen – difficult to handle
- Cause fouling in heater process systems (solid formation)
- Injection rate = 0.8 – 1.0ppm of Triazine per 1ppm H_2S (gas phase)

AMINE BASED SCAVENGERS

- Poor efficiency
- Increase Nitrogen level in liquids
- Cause fouling in heater process systems
- Reaction is unstable and H_2S can reform
- Injection rate = 0.9- 1.2ppm of chemical per 1ppm H_2S (gas phase)

HSO 6869

- Removes H_2S in liquids extremely effectively (typically not suitable for gas)
- Reaction is instant and stable
- Easily Removed from hydrocarbons – no fouling in CDU's
- Injection rate = 0.15-0.25ppm of HSO 6869 per 1ppm H_2S (gas phase)
- **OVER FOUR TIMES THE EFFICIENCY OF TRIAZINE BASED SCAVENGERS**

Crude Oil

CFR Chemicals – Comparison Tests (Jan 2013)

Scavenger	Sample Size (mL)	pH	H2S Flow (sccm)	CO2 Flow (sccm)	gH2S/L Scavenger
CFR Triazine	10	11.5	750	0	10.2
HSO 6869	1	14	750	0	76.3
ACL-78	10	10	750	0	14.3
Baker Triazine	10	10	750	0	12.1
Nalco Triazine	10	10.5	750	0	16.4
Caradad Triazine	10	10	750	0	12
SulfurClear	10	9.8	750	0	12.4

CFR Chemicals Inc.
915, 4747 – 67 Street, Red Deer AB,
T4N 6H3 Ph: (403) 346-2214 Fax: (403) 346-2299
www.cfrchemicals.com

Crude Oil

Compositional Analysis of Cylinder TS-126706 to C36 plus

Before:

	Component	Mole %	Weight %
H_2	Hydrogen	0.07	0.00
H_2S	Hydrogen Sulphide	5.95	1.35
CO_2	Carbon Dioxide	5.62	1.64
N_2	Nitrogen	0.13	0.02
C_1	Methane	12.05	1.28
C_2	Ethane	6.13	1.22
C_3	Propane	7.14	2.09
iC_4	i-Butane	1.04	0.40
nC_4	n-Butane	4.35	1.68
C_5	Neo-Pentane	0.01	0.00
iC_5	i-Pentane	1.71	0.82
nC_5	n-Pentane	2.94	1.41

Compositional Analysis of Cylinder ts-126706 to C36 plus

After HSO 6869

	Component	Mole %	Weight %
H_2	Hydrogen	0.01	0.00
H_2S	Hydrogen Sulphide	0.00	0.00
CO_2	Carbon Dioxide	0.00	0.00
N_2	Nitrogen	0.14	0.02
C_1	Methane	13.24	1.29
C_2	Ethane	6.83	1.25
C_3	Propane	8.00	2.14
iC_4	i-Butane	1.16	0.41
nC_4	n-Butane	4.88	1.72
C_5	Neo-Pentane	0.00	0.00
iC_5	i-Pentane	1.93	0.85
nC_5	n-Pentane	3.33	1.46

Crude Oil

Before:

Component	Fl. Liquid ppm Mole
Hydrogen Sulfide	831.80
Carbonyl Sulfide	4.80
Methyl mercaptan	85.80
Ethyl mercaptan	75.20
Di methyl sulfide	7.20
Carbon Disulfide	6.80
i-Propyl mercaptan	49.40
Tert.butyl mercaptan	16.70
Ethyl methyl Sulfide	6.30
n-propyl mercaptan	15.40
Thiophene	43.70
Sec-butyl mercaptan	6.60
i-butyl mercaptan	13.90
Diethyl sulfide	1.50
n-butyl mercaptan	7.90
2-methyl-2-Butanethiol	7.20
Di methyl disulfide	2.60
Thiophene-2-methyl	13.10
i-pentyl mercaptan	3.50
n-pentyl mercaptan	6.20
Thiophene-2,5-Dimethyl	4.30
Ditert.Butyl Sulfide	7.70
n-Hexyl mercaptan	1.00
Di-Sec.butyl Sulfide	12.70
n-Heptyl mercaptan	21.60
Di Butyl Sulfide	14.60
n-Octyl mercaptan	11.00
n-Nonyl mercaptan	5.00
Other Sulfur and RSH	365.60
Total sulfur (ppm Mole)	1649.10

After HSO 6869

Component	Fl. Liquid ppm Mole
Hydrogen Sulfide	0.00
Carbonyl Sulfide	0.00
Methyl mercaptan	0.00
Ethyl mercaptan	2.80
Di methyl sulfide	7.00
Carbon Disulfide	0.00
i-Propyl mercaptan	22.00
Tert.butyl mercaptan	0.00
Ethyl methyl Sulfide	8.40
n-propyl mercaptan	7.20
Thiophene	37.80
Sec-butyl mercaptan	0.00
i-butyl mercaptan	0.00
Diethyl sulfide	0.00
n-butyl mercaptan	0.00
2-methyl-2-Butanethiol	0.00
Di methyl disulfide	0.00
Thiophene-2-methyl	15.50
i-pentyl mercaptan	1.10
n-pentyl mercaptan	9.10
Thiophene-2,5-Dimethyl	18.50
Ditert.Butyl Sulfide	0.00
n-Hexyl mercaptan	0.00
Di-Sec.butyl Sulfide	19.70
n-Heptyl mercaptan	33.00
Di Butyl Sulfide	30.00
n-Octyl mercaptan	25.10
n-Nonyl mercaptan	9.60
Other Sulfur and RSH	355.70
Total sulfur (ppm Mole)	602.50

Crude Oil

(Eagle Ford – South Texas)

(Eagle Ford – South Texas)

- 160 wells to be treated
- H_2S range from 200ppm to 80,000 ppm (8%)

- Tank Head Space H_2S under 100ppm
- Improved safety for workers, transporter and the surrounding communities
- Reduced chemical costs by 52% ($1.2m)

Refined Products

TEST REPORT JO10-00968.002 Re-issue: 1

** This is a re-issued document and supercedes all previous versions **

PRODUCT DESCRIPTION:	Contaminated MOGAS	**CLIENT ID:**	Request dated 03 October 2010
SAMPLE SOURCE:	As stated	**SAMPLE RECEIVED:**	03/10/2010
SOURCE ID:	Contaminated MOGAS + 360ppm Hydra Scav	**SAMPLE ANALYSED:**	04/10/2010
LOCATION:	Jebel Ali, UAE	**SAMPLE BY:**	--
SAMPLE TYPE:	Hand Blend	**DATE SAMPLED:**	Not available

PROPERTY	Units	METHOD	RESULT	
Mercaptan Sulphur				
Before Additive	mg/kg	ASTM D3227	71	
Stand for 30 minutes	mg/kg	ASTM D3227	64	
Stand for 18 hours	mg/kg	ASTM D3227	54	
Stand for 24 hours	mg/kg	ASTM D3227	44	
Hydrogen Sulphide Content (Liquid Phase)				
Before Additive	ppm (m/m)	UOP 163	37	
Stand for 30 minutes	ppm (m/m)	UOP 163	zero	#