

Not Your Father's H₂S Scavenger

Crude Oil Quality Association
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Agenda

▲ Outline

- Overview: Novel Non - Triazine H₂S Scavenger
- The Industry Standard: Triazines
- HSCV10273A
 - Product Overview
 - Physical Properties
 - Field Evaluation
 - Laboratory Evaluations

The Industry Standard: Triazines

Non-Regenerative H₂S Scavengers



Triazines

Non-Regenerative H₂S Scavengers

▲ Advantages

- Globally Available
- Decent Economics
- Industry Proven
- Formulation Flexibility
- Application Flexibility

▲ Disadvantages

- pH: 10 or Higher
- Scale Deposition
- High Volatility (MMA Triazine)
- Base Amine Can lead to challenges with corrosion
- Insoluble Reaction Products
- Solids Require Mechanical Removal or Line Removal



HSCV10273A

Novel, Non-Triazine H₂S Scavenger



HSCV10273A

New Key Innovation: Non-Triazine H₂S Scavenger

Description of Technology:

- ▲ Non-Triazine H₂S scavenger for oil, water and gas streams

Benefits Compared to Triazine:

- ▲ Higher Capacity for H₂S Removal
- ▲ High Reaction Kinetics
- ▲ Lower pH
- ▲ Lower Amine Content
- ▲ No Volatile Amines

Status of Project:

- ▲ 3 Year Development Project
- ▲ Patent Pending
- ▲ Commercialization March 2016



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Physical Properties

- ▲ Flash Point = 113°F (45°C)
- ▲ Specific Gravity @ 20°C = 1.0996
- ▲ pH (Neat) = 8.76
- ▲ pH (10% in 3:1 IPA:DI Water) = 8.65
- ▲ Pour Point = -40°F (-40°C)
- ▲ Viscosity: 30cPs at 70F



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Field Studies



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Field Trial: Bakken Shale

- ▲ Full Well Stream, Topside, Continuous Injection
- ▲ Target: Comparison vs. Triazine/Scale Inhibitor Product
- ▲ Result: Sweet Tooth removed an additional 36% removal (H₂S per lb) with lower volume

Product	Injection Rate	H ₂ S Inlet	Average H ₂ S Outlet	Gas Production	H ₂ S Removed	Actual Capacity
Name	Gallon/Day	ppm vapor	ppm vapor	MMscf/D	Lbs/Day	Gallon/Lb H ₂ S
Triazine	15.00	1500.00	400.00	0.073	7.26	2.07
HSCV10273A	12.00	1500.00	4.00	0.073	9.88	1.21

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Lab Studies



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Partitioning Evaluations

- ▲ A sample of H₂S scavenger is dosed into a 50/50 (vol%) mixture of 1-octanol and water
 - Two samples
 - Neat Product: A sample H₂S Scavenger before reaction with H₂S
 - Reaction Product: A sample of H₂S Scavenger post reaction with H₂S
- ▲ The samples are mixed and separated by gravity
- ▲ Aliquots from the 1-Octanol phase and water phase are analyzed through analytical instrumentation
- ▲ The amount of each sample is quantified for each fluid medium
- ▲ The values are provided as overall percent

Sample	1-Octanol	Water
Description	%	%
Neat Product	10.5	89.5
Reaction Product	92.5	7.5

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Portable Electric Desalter Evaluation

- ▲ The evaluation is a static test to observe changes in emulsion tendencies.
- ▲ A water-in-oil emulsion is prepared under shear with the addition of an emulsion breaker and the test samples.
 - Blank Sample
 - 2 Test Samples:
 - Neat H₂S Scavenger
 - Reaction Product
- ▲ The emulsion is poured into glass tubes and placed into the PED unit where the emulsion is exposed to heat and electric field.
- ▲ The resolution of the emulsion is noted by the volume of water resolved during the period of time of testing.
- ▲ Voltage = 500 volts - 1500 volts applied for one minute.
- ▲ Duration = 60 minutes
- ▲ Temperature = 248°F (120°C)
- ▲ Fluid Medium Volume = 100 mL: 95 mL of crude oil and 5-mL of washwater

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Portable Electric Desalter Evaluation

Results

- ▶ No negative impacts in emulsion tendencies were observed with the addition HSCV10273A or the reaction product



BLANK dosed
with Emulsion
Breaker

H₂S
Scavenger:
Active
Concentration
= 125PPM

H₂S Scavenger
Active
Concentration =
1000PPM



BLANK dosed
with Emulsion
Breaker

Reaction
Product:
Active
Concentration
= 125PPM

Reaction
Product:
Active
Concentration
= 1000PPM

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Neat Corrosion Evaluations

High Temperature

Set Up	Static Autoclaves
Metallurgy of Coupon	Mild Steel F-22
Temperature	250°F
Duration	14 Days
Corrosion Rate (Active)	1.1 mpy

Low Temperature

Set Up	Glass Vessels
Metallurgy of Coupon	SS 304 and SS 316
Temperature	130°F
Duration	84 Days
Corrosion Rate	0 mpy



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Summary

- ▲ Nalco Champion has developed a novel non-triazine H₂S scavenger
 - EPA approved
 - In final stages of commercialization
- ▲ HSCV10273A exhibited superior scavenging capacity as compared to triazines without scale formation in upstream applications
- ▲ Early laboratory evaluations indicate less detrimental effects than triazine