Agenda

TG-6: Testing of Heavy Brine

- Call to Order
- TG-6 Charges
- Roll Call
- Previous Meeting Minutes – Approval
- Publication Status/Reports/Data/Conclusions/Recommendations/Gantt Chart
- Old Business
- New Business - Next Scheduled Meeting
- Action Items
- Adjourn
TG – 6 Charge

Recommend, develop and evaluate procedures for field and laboratory testing of heavy brines.


Form Work Groups to achieve specific charges.
TG-6 Members / Role Call

1. Paul H. Javora – Baker Hughes – Chair
2. Saleh Al-Ammari – Aramco
3. Roop Prasad – Champion Technologies
4. Brent Estes – ChevronTexaco
5. Judy Guy-Caffey – Tetra
6. Bill Foxenberg – Schlumberger
7. Catalin Ivan – ExxonMobil
8. Paul Scott – ConocoPhillips
9. Tom Shumate – Baroid
11. Bing Yang – Shell
Previous Meeting Minutes

Met in Fort Worth, Tx, January 2011

Members Present
1. Paul Javora
2. Brent Estes
3. Judy Guy-Caffey
4. Shannon Stocks (Catalin Ivan)
5. Paul Scott
6. Tom Shumate
7. Victoria Qiu

Absent: Saleh Al-Ammari, William Benton, Bill Foxenberg, Cheryl Stark
Approval of Previous Minutes

- Motion:
- Maker:
- Second:
- Result:
1. Revisions to Testing of Heavy Brines WG (ISO 13503-3 & RP-13J)

Edit, revise & process DIS/FDIS comments of submitted documents – Adopt back as RP-13J.

Activated to address ISO 13503-3 requirements – TG-6 involved.
2. Buffer Work Group, Del Son Chair –

**Hibernation**

Prepare a method for determining the buffering capacity of brine, review and submitted for ISO formatting, etc. Participate in ISO acceptance of the document.
Buffer WG Roster

- Del Son – Chair
- Beth Prasek, MI-SWACO
- Kingsley Nzeadibe, Halliburton
- Siv Howard, Cabot
- Mohammad Tej, Baker Hughes Drilling Fluids
- Judy Guy-Caffey, Tetra Technologies
- Paul Javora, Baker Hughes
3. PCT Work Group, Don Isaac & Co-Chair, Halliburton

Evaluate and qualify “in-house” PCT test procedures. Draft document on the Round Robin testing for the PCT of Brines completed. One company needed for Last Round Robin

May 2011 December 2011
<table>
<thead>
<tr>
<th>Name</th>
<th>Company/Position</th>
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</thead>
<tbody>
<tr>
<td>Don Isaac</td>
<td>Co-Chair, Halliburton</td>
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<tr>
<td>Ferrill G. Dalton</td>
<td>Halliburton</td>
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<td>Paul Javora</td>
<td>Baker Hughes, Tetra Technologies</td>
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<td>Weyman Dunaway</td>
<td>Ambar Lonestar</td>
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<td>Andree Dunston</td>
<td>Baker Hughes, Drilling Fluids</td>
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<tr>
<td>Mohammad Tej</td>
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<td>Ken Slater</td>
<td>MI-SWACO</td>
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<tr>
<td>Charlie Svoboda</td>
<td>MI-SWACO</td>
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<tr>
<td>William Benton</td>
<td>Cabot</td>
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</table>
4. Corrosion Work Group, Judy Guy-Caffey, Chair, Tetra Technologies, Inc.

Hibernation

Update and complete the corrosion section of RP-13J, review and submit for publication, and participate in ISO acceptance of the document. Participate in ISO acceptance of the document.
Corrosion WG Roster

Ed Malachosky (Co-secretary)  Chevron
Mohammad Tej (Co-secretary)  Baker Hughes Drilling Fluids

John Augsburger  Halliburton
Bill Bailey  Baker Oil Tools
William Benton  Cabot
Rashmi Bhavsar  Schlumberger
Yue Chen  Shell
Andree Dunston  Ambar Lonestar Fluid Svcs
Dodie Ezzat  Halliburton
Bob Horton  CorsiTech
Don Isaac  Halliburton
Paul Javora  Baker Hughes
Ardjan Kopliku  BP
Keith Sharp  Hess
Report

5. Future-Projects Work Group, Judy Guy-Caffey, Chair, Tetra Technologies, Inc.

Hibernation

Establish/Suggest future projects for TG-6 to go beyond 2009. Future-Projects were identified, reviewed, submitted, selected and established. Document completed.
Future Projects WG Roster

Judy Guy-Caffey – Chair  Tetra Technologies
John Augsburger  Halliburton
Ferrill Dalton  Halliburton
Paul Javora  Baker Hughes
William Benton  Cabot
Siv Howard  Cabot
Bob Horton  CorsiTech
The assumption that the chosen reservoir drilling and completion fluids are non-damaging needs to be proved, not assumed before field applications.

**Formation Damage**
"a reduction in permeability around a wellbore, which is the consequence of drilling, completion, injection, attempted stimulation or production of that well."
Return Permeability WG Roster

Dodie Ezzat – Chair
Keith Morton
Paul Javora
Saleh Al-Ammari
William Benton
Mike Byrne
Carl Stouffer
Mel Schmit

Halliburton
Chevron
Baker Hughes
Saudi Aramco
Cabot
Synergy
Return Permeability WG Roster

Dodie Ezzat – Chair
Keith Morton
Paul Javora
Saleh Al-Ammari
William Benton
Mike Byrne
Carl Stouffer
Mel Schmit

Halliburton
Chevron
Baker Hughes
Saudi Aramco
Cabot
Synergy

• Society of Core Analysts – Michael Byrne - Synergy
• The American Association of Petroleum Geologists
Core flooding apparatus for return permeability tests

Balance (flow at outlet)

Permeability Pump

Confining Pressure

OVEN

DATA ACQ.

Mud Vessel

Brine Vessel

N₂

Reservoir capacity and performance can be predicted and understood

SC13-Drilling Completion and Fracturing Fluids
CORE SAMPLE PREPARATION PROCEDURES

Studies over many years have revealed that different lithologies can be altered in different ways during plug cutting, cleaning, drying, and resaturation.
CORE SAMPLE PREPARATION PROCEDURES

The majority of reservoir rock samples available for testing are either poorly preserved or not preserved. To proceed for testing they need to be cleaned of residual solids and fluids.

There are many different methods for cleaning samples and the selection of the optimum method can have a profound effect on all results obtained from subsequent tests.
CORE SAMPLE PREPARATION PROCEDURES

Core plug samples trimmed to create right cylinders.

Cutting and trimming of core plug samples can affect subsequent petrophysical measurements and **proper procedures should be proposed for the different rock types.**
Return Permeability WG

Laboratory Return Permeability Measurements

1. Compile and evaluate test procedures
2. Summarize testing parameters
3. Determine essential/desired parameters
4. Establish a suitable method or methods that satisfy oilfield requirements

NOTE 1: Round-Robin testing not in scope
NOTE 2: Confer with the ISO project (13503 Series) already convened
Next Scheduled Meeting

October 14th, 2011
Report

7. Displacement Work Group, Ed Malachosky, Chair, Chevron

1. Compile and evaluate test procedures
2. Summarize testing parameters
3. Determine essential.desired parameters
4. Conduct Round Robin Testing
5. Establish a suitable method or methods that satisfy oilfield requirements
Displacement WG Roster

Ed Malachosky – Chair
Marshall Chiasson
Keith Morton
Ed Robinson
Dodie Ezzat
Paul Javora
Katrina Schultz
William Benton
Chevron
Tetra Technologies
Chevron
Halliburton
Halliburton
Baker Hughes
Baker Hughes
Cabot
8. Hydrate Work Group, Keith Morton - Chevron, Chair

1. Compile a list of hydrate programs
2. Summarize capabilities of each “hydrate” program
3. Generate test fluid compositions and parameters by which to test and compare the programs
4. Conduct hydrate calculations with each program for the test fluids/conditions
5. Correlate the test results
6. Identify those programs that satisfy oilfield requirements

**NOTE 1:** Round-Robin hydrate testing is not in the scope
Hydrate WG Roster

Keith Morton – Chair
Jennifer Shafer
Dodie Ezzat
Paul Javora
William Benton
Roop Prasad

Chevron
Tetra Technologies
Halliburton
Baker Hughes
Cabot
Champion Technologies
9. Scale WG Charge

Generate an informative section on oilfield scale for API RP-13J and ISO 13503-3.

- Identify and compile oilfield scaling issues.
- Compile and evaluate test procedures.
- Identify and summarize essential/desired parameters.
- Summarize findings into a ‘knowledge document’ for completion engineers.
## Scale WG Roster

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
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</thead>
<tbody>
<tr>
<td>Judy Guy-Caffey, Chair</td>
<td>TETRA Technologies</td>
</tr>
<tr>
<td>Curtis Sitz, Vice-Chair</td>
<td>CorsiTech</td>
</tr>
<tr>
<td>Brittany Gitch, Secretary</td>
<td>Baker Hughes</td>
</tr>
<tr>
<td>Paul Javora</td>
<td>BJ Services</td>
</tr>
<tr>
<td>Marc Lehmann</td>
<td>Baker Hughes</td>
</tr>
<tr>
<td>Donald Lindblad</td>
<td>Paladin Solutions</td>
</tr>
<tr>
<td>Victoria Xiaoping Qiu</td>
<td>Shell</td>
</tr>
<tr>
<td>Kern Smith</td>
<td>BJ Services</td>
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<tr>
<td>Vu Thieu</td>
<td>Baker Hughes</td>
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<tr>
<td>Roop Prasad</td>
<td>Champion Technologies</td>
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</tbody>
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Scale WG Activities

- Meetings: 1/13, 3/31, 6/9
- SharePoint site established for work group use (Curtis Sitz – CorsiTech)
- Scale prediction programs available to group members include ScaleSoftPitzer (Rice University), ScaleChem (OLI), MultiSCALE (Expro), Downhole SAT (French Creek Software), PVTSim (Calsep) and StimCADE (Schlumberger).
- Test case parameters being compiled for input into various scale prediction programs
Establish a laboratory method or methods to evaluate the tendency to form emulsions or sludge when drilling, completing, fracturing or treating fluids contact formation fluids.

**Phase I – Establish Base-Line Profile (In-house & Standard Procedures)**

**Phase II – Develop a Round Robin Scheme**

*Current need: 55 gallons of crude oil - untreated*
Emulsion WG Roster

Paul Javora – Chair  
Keith Morton  
Brent Estes  
David Ekas  
Dodie Ezzat  
Ferrill Dalton  
Gary McGuffey  
Katrina Schultz  
William Benton  
Patricia Potts  
Phillip Kaufman  
John Vian  

Baker Hughes  
Chevron  
Chevron  
Marathon  
Halliburton  
Halliburton  
Baker Hughes  
Cabot  
Baker Hughes  
CESI Chemical  
Schlumberger
New Emulsion Test Procedure

SPE 14414

Crude Oil Compatibility Method Significantly Minimizes Volumes Required

By Katrina Schultz & Paul H. Javora, Baker Hughes

High Shear Method - Worst Case Scenario
(equivalent to standard acid methods and RP-42)

Simple & Cost effective Apparatus

Consistent & Repeatable Test Procedure

Clear & Quantitative Results
Mini-Compatibility Test (MCT)

**Apparatus**

- Dremmel® Tool
- Flat-Bladed Stirrer (2 in. long x 5/16 in. wide)
- 10 ml Calibrated Flat-Bottom Test Tube
- Variac Transformer and Tachometer
- Clamps and Stand
- 3,600 RPM
• Qualifying Tests

Crude Oil & Brine 50:50 Ratio
• Qualifying Tests

Crude Oil & Live Acid 50:50 Ratio
Completion Brine (A) and Crude Oil
50/50 Ratio @ 180°F

<table>
<thead>
<tr>
<th>Time</th>
<th>Image</th>
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</thead>
<tbody>
<tr>
<td>10 min</td>
<td>![Image](30 min)</td>
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<td>3 hrs</td>
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<tr>
<td>24 hrs</td>
<td>![Image](30 min)</td>
</tr>
</tbody>
</table>
Completion Brine (A) and Crude Oil
75/25 Ratio @ 180°F

Before mixing | After mixing | 10 min. | 20 min. | 30 min. | 1 hour | 3 hrs. | 5 hrs. | 7 hrs. | 24 hrs.
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---

[Images of tubes showing the mixture at different time intervals]
Stacked Test at 180 F

Brine (A), Fluid Loss Control Pill, Weighted Acid & Crude Oil

Before Mixing

Immediately After Mixing

1 Hour After Mixing
11. API CRA Testing Program, Paul Javora, Baker Hughes, Chair

Implement and monitor the API CRA Testing Program.

*Funding Year 4 was initiated Q4-2010, tests for the entire year were discussed, planned, and implemented.*

*Funding Year 4 is now in the final phase of testing. Detailed evaluation of the data from years 1 to 3 is in progress.*

*To further our understanding of formate test results and the generation of hydrogen and other gases, ConocoPhilips volunteered to conduct electrochemical tests planned in February and conducted to date. Data reviewed and summarized for discussion. Phase 2 testing to follow.*
17 Participating Companies for Year 4

Baker Hughes
BJ Services Company
Cabot Specialty Fluids
ChevronTexaco Energy Technology Company
ConocoPhillips
ExxonMobil
Halliburton Energy Services
Hamilton Metals, Inc.
Marathon Oil Company
M-I SWACO
Saudi Aramco
Schlumberger
Shell International E&P Inc.
Siderca SAIC – Tenaris
Sumitomo Metal
Synergy Fluids
Tetra Technology Inc.
Old Business

1. Testing Heavy Brines, API-13J and ISO 13503-3

2. Hydrometers & Density Measurements, presented by Bernard Fraboulet, TOTAL Technology Specialists

3. Other?
New Business

1. A
2. B
3. C
Next Scheduled Meeting

- Fort Worth, TX, January 23-27, 2012
- Other ?
Action Items

1. a
2. b
3. c
Adjourn

- Motion:
- Maker:
- Second:
- Result:
- Time of adjournment: