Recovery and Reuse of drilling fluids base oil at source

Haitham Farouk
Service Delivery Manager, TWMA Abu Dhabi
Agenda

• Introduction & Overview
• Well returns
• Thermal Treatment of Drill Cuttings
• Case Study
• Integrated Service Offering
• Questions
Introduction

• In the oil and gas industry, a significant amount of returns are being produced which requires proper handling, transportation and treatment; in line with increased environmental legislation and awareness.

• Various methods are being continually developed to minimize environmental impact.

• One of the most successful methods, minimising cost and HSEQ impact, is to treat the drill cuttings at source and recover the base oil for reuse in mud system.
Well Returns

Cement  Slops & Sludge  WBM Drill Cuttings  NAF Drill Cuttings  Tank Returns  Discarded Mud

Engineering solutions to eliminate waste
Thermal Treatment of Drill Cuttings

Recovered Solids

Recovered Oil

Mill Oil

Condenser Steam

Feed

Recovered Water
Typical Offshore / Central Layout
TCC RotoMill Offshore
Typical TCC RotoTruck® Layout
Thermal Processing Outputs

Recovered solids have hydrocarbon content <1% and typically <0.1%. These solids are classed as inert and are slurrified with the recovered water before disposal, reuse or injected into a disposal well.

Recovered oil retains the physical properties found in the drilling fluid’s base oil, due to pre-determined temperature within the mill chamber. The base oil is recycled back into the drilling fluid system.

Recovered water is discharged at typically <20ppm hydrocarbon content, well within most regulatory requirements. The water may be reused, mixed with the solids and/or injected into disposal wells.
Case Study
ADNOC Offshore – Upper Zakum
Case Study
ADNOC Offshore – Upper Zakum

- ADNOC Offshore - Upper Zakum Case Study (Nov ‘12 to June ’17)
  - 1.443m bbls of drilling returns handled by TWMA on ZADCO project alone
  - Saved 71,261 skips being handled and transported and over 500,000 heavy lifts.
  - Equates to approx. 1,096 boat trips eliminated; equivalent to 184,181 kms travelled = \textbf{4.5x circumference of the globe}

- Drill Cuttings Treated on site using TCC RotoMill
  - \$12.667m of base oil recovered & returned to date.
  - Reduced drilling fluid spend.
  - Recovered base oil unaltered by the thermal process applied by TWMA technology.
  - Recovered water quality within regulatory limits for safe disposal (injection).
Planning a drilling campaign

- Understand material generated
  - WBM cuttings
  - NAF Cuttings
  - WBM Slops
  - NAF Slops
  - Cement
  - Sludge
  - Contaminated
  - Crude

- Treatment at Source Benefits:
  - Less lifts
  - Safeguard / promote sustainable environment
  - Eliminate cost of logistics & waste transportation
  - Immediate recovery / reuse of base oil
  - Reduced CO2 footprint
  - Economically advantageous
Integrated Services

- Education
- Rig Site Optimisation
- Disposal
- Treatment at Source
- Material Management

Engineering solutions to eliminate waste
TWMA is globally recognised for providing specialist solutions and services both on and offshore.

### Ancillary Equipment & Services

<table>
<thead>
<tr>
<th>Vacuum Transfer</th>
<th>Slops Treatment</th>
<th>Sludge Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit Cleaning</td>
<td>High Pressure Jetting</td>
<td>Tank Cleaning</td>
</tr>
</tbody>
</table>
Thank You for Your Time

Questions