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Fluid/Solids Control Management

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MudLabs Fluid/Solids Control Management Program

The MudLabs Fluid/Solids Control Management Program utilizes Particle Size Analysis in conjunction with drilling fluid testing to monitor and subsequently optimize solids control, drilling fluids, and waste management to significantly lowering drilling costs. These interrelated drilling fluid variables continuously interact, directly influencing ROP/Days on well, NPT, fluid properties, solids removal efficiency, solids separation, and most importantly cost. The MudLabs Fluid Management Program takes a progressive approach in monitoring, identifying, correcting, and optimizing those interactions between metrics to achieve a desired impact on KPI's. The Program consists of:

- Real-Time Integration of Particle Size Analysis w/ drilling fluids, solids control, & waste mgmt.
- Patented method used to pinpoint the impact which particle size is having on the relationship between drilling fluids, solids removal efficiency, and waste streams
- Generation of solids control reports and optimization of solids control equipment parameters
- Solids control process optimization
- Equipment recommendations
- Cost/Savings Analysis
- Trend Analysis
- Implementation of new set of best practices

MudLabs Fluid/Solids Control Management Program (Project Management)

The experience and expertise associated with testing and analyzing over 15,000+ particle size analyses ensures the highest quality service. Because real-time testing at the rig site is standard practice, the data can be used to its full potential to make informed, timely decisions. The scope of MudLabs Fluid/Solids Control Management processes include:

- **Step 1 – Establishment of a Fluid Management Project Team. Essential elements for successful implementation of MudLabs fluids/solids control management program. These elements included:**
  - **Visible and continuous commitment from local management to implement and sustain the fluid management plan;**

- **Dedicated project team consisting of: Operator sponsor with the authority to represent the views of management;**
- **Technical champion with the training and experience to work with all engineering and operations stakeholders as a technical resource for the development, implementation and review of the plan;**
- **Fluid management plan Coordinators responsible for field implementation of the plan;**
- **Cooperation of product vendors and service providers.**
- **APACHES's management's dedicated commitment and support and a focused project manager/team with a clear mandate to implement an effective Fluid/Solids Control Management Program**

Step 2 – Detailed Fluid Process and Equipment Assessment

1. **Field Survey:** Rig inspection by a **MudLabs** Field Engineer on Location
   - Establish points of contact on location for future inquiries or direction
   - Locate & assess all predefined equipment, challenges, and influences on drilling fluid, Solids Control Equipment, waste streams, and related variables
   - Identify and assess all rig specific equipment, challenges, and influences on drilling fluid, SCE, waste streams, and related variables
   - Catalog and record all pertinent, non-variable data associated with equipment, challenges, and influences as pertains to drilling fluid, SCE, waste streams, and related variables
   - Locate and assess predefined sample collection points
   - Identify and assess rig specific collection points & any challenges associated with collecting a representative sample
2. **Particle Size Analysis: Regular Analysis of the particle size distributions from several collection points as pre-defined**
   - Test Results
     - **Timeline**
       - Daily Checks
       - Results in 5-10 minutes or less is standard practice
   - Lab has tested and analyzed over 15,000+ drilling fluid and related samples from over 1,000 well being drilled.
     - **SOP's to provide the most accurate and relevant results**
   - Complies with ISO 13320:2009 (Particle Size Analysis: Laser Diffraction)

- Tailored to each rig's specific needs
  - **Solids removal packages**
  - **Drilling fluid systems and specific fluid applications**
  - **Rig's Hardware and Plumbing**
  - **Other operational variables**
- **Sample Collection: When and Where?**
  - **Daily Checks/Samples**
    - Flow Line Shakers, Screen Underflow
    - Centrifuge 1 Feed (in)
    - Centrifuge 1 Overflow (Effluent)
    - Centrifuge 2 Feed (in)
    - Centrifuge 2 Overflow (Effluent)
    - Suction
  - **Miscellaneous Checks/Samples**
    - Pre/Post drilling processing
    - Flow Line
    - Dewatering
    - Drying Shaker, Screen Underflow
    - Mud from storage
    - Reclaimed Diesel
    - Mud from plant
    - Mud delivered
    - Mud shipped out. Etc…

3. Integrated Drilling Fluid Testing and Solids Characterization

- **Standard Drilling Fluid Testing**
  - 50 ml O/W Retort
  - Rheology
  - Density
  - Electric Stability
  - Alkalinity (POM)
  - Chloride Content
  - Water Phase Salinity

4. MudLabs Fluid Management Implementation

- Integration of Particle Size Analysis with the management of the Drilling Fluids, Solids Control, and Waste Management programs
- Real-Time Data Analytics will provide decision makers with the information necessary to optimize equipment and SOPs for the highest levels of efficiency
- Well Profiles are generated from daily data collected, well after well, to provide continuously improving analytics tailored to each rig
- Field Tech Support will ensure recommendations are implemented understood properly

MudLabs Mobile Lab Testing Services

1. **Individual Particle Size Analysis**
   a. Tailored to each rig's specific needs.
      I. Solids removal packages
      II. Drilling fluid systems and specific fluid applications
      III. Rig's plumbing
      IV. Other operational variables
   b. Results available within 5-10 minutes
2. **QA/QC for Standard Drilling Fluid Testing**
   a. All testing procedures comply with API 13B-1 and 13B-2
   b. 50 ml O/W Retort
   c. Rheology
      I. Plastic Viscosity
      II. Yield Point
      III. Tau 0
      IV. 6 and 3 rpms
      V. Gel Strengths (10 sec, 10 min, 30 min)
   d. Density
   e. Electric Stability
   f. Alkalinity (POM)
   g. Chloride Content
   h. Water Phase Salinity
   i. On site same day Results Available
3. **Complete Solids Characterization**
   a. Standard Drilling Fluid Testing comply with API 13B-1 and 13B-2