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Intelligent Manage Pressure Drilling (iMPD) Comparison

Rotating Control Device Positives and Negatives

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iMPD versus Halliburton

- **Halliburton RCD 3000**
- Positives;
  - The most modern piece of equipment with real-time data, predictive monitoring
  - Worldwide presence will cover build, installation and operations site in Brazil.
  - Easy release of bearing assembly. Well designed.
- Negatives;
  - High cost of equipment
  - Unknown additional personnel required to operate system, unsure if can buy or supply.
- **iMPD Advantages;**
  - No additional personnel required, saving to drilling contractor
  - 70% less working parts, cheaper and more reliable.
  - Halliburton does not use Kick Detection Coriolis Meters
  - Equipment of Halliburton not as good a quality as iMPD
  - iMPD RGH 66% Shorter in length compared to Halliburton.



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iMPD versus Weatherford

- **Weatherford RCD 7875 DS**
- Positives;
  - The strongest presence in Brazil and a partnership with Petrobras with worldwide presence will cover build, installation and operations site in Brazil.
  - Will be able to smoothly transition Government approval of MPD systems since both Petrobras and Weatherford already have agreement.
  - Largest MPD suppliers in the world with unlimited support.
- Negatives;
  - Older system, well proven but downtime is regular.
  - Previous experience, high cost of equipment.
  - Numerous additional personnel required to operate system, constant overhead.
  - Rig personnel not involved in day-to-day operation
- **iMPD Advantages;**
  - No additional personnel required, saving to drilling contractor
  - 70% less working parts, cheaper and more reliable.
  - Very high cost with low quality equipment.
  - Weatherford equipment quality extremely inferior to iMPD Equipment



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iMPD versus SLB: MI-Swaco

❖ **SLB: MI-Swaco RCD**

➢ Positives;

- Largest company in the world with worldwide presence will cover build, installation and operations site in Brazil.
- Good combination of Mi-Swaco and SLB on valves / choke systems.
- Lightweight and simple to use, single life operation during deployment.
- Worked with Stena to produce their system. So willing to work alongside client.

➢ Negatives;

- Pressure ratings in operation unknown, not clear/ambiguous.
- Unknown cost of equipment
- Unknown additional personnel required to operate system, buy or rent personnel overhead.
- Rig personnel not involved in day-to-day operation if operated by SLB/Mi-Swaco

❖ **iMPD Advantages**;

- iMPD no additional personnel required, saving to drilling contractor
- 70% less working parts, cheaper and more reliable.
- SLB: Very high cost for installation of MPD Equipment.
- SLB Equipment does not use Coriolis Meters for gauging kicks compared to iMPD Equipment



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iMPD versus Oil States

- **Oil States: RCD**
  - Positives;
    - UK, Singapore and Brazil Operations will cover build, installation and predicted operations site in Brazil.
    - Close to Electro Flow Controls in Aberdeen which would be envisaged to manufacture Control System; therefore, integration testing can be conducted prior to sending to rig for installation.
    - Stated size of equipment and working parts massively reduced.
    - In the same country as control system manufacturer.
  - Negatives;
    - Unsure if the system has been previously manufactured and not a lot of product information, without official approach current status unknown.
    - Unknown cost
    - Unknown additional personnel required to operate system, unsure if can buy or supply.
    - Unknown if dual element.
- **iMPD Advantages;**
  - iMPD no additional personnel required, saving to drilling contractor
  - 70% less working parts, cheaper and more reliable.
  - Oil States not currently contender within MPD without much more research.
  - Oil States Equipment does not use Coriolis Meters for gauging kicks compared to iMPD Equipment
  - No information on Kick Detection Equipment.



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iMPD versus NOV

❖ **NOV Active Control Device: ACD System:**

➢ Positives;

- Worldwide coverage with no boundaries to working for Petrobras in Brazil Operations.
- Very good support service
- Less breakdowns due to new type of system designed by NOV (non-moving parts)
- Possible to supply entire MPD system
- DNV and ABS approved system

➢ Negatives;

- Unsure downtime is accurate or sales pitch. Current data unknown, need proof.
- Unknown cost, do NOV supply one piece of equipment or only supply entire system
- Unknown additional personnel required to operate system, unsure if can buy or supply.

❖ **iMPD Advantages;**

- iMPD no additional personnel required, saving to drilling contractor
- 70% less working parts, cheaper and more reliable.
- Manufacturing costs, cheaper due to less parts.
- NOV Large Company, supports large team, high costs associated with Team.
- ACD Equipment does not use Coriolis Meters for gauging kicks compared to iMPD Equipment
- ACD does not have a track record within Oil and Gas drilling.



iMPD System Advantages

- Class Society Design Advantages:
  - Due to new regulations by both DNV and ABS the iMPD System is the only system worldwide that complies with all the new standards issued API 16RCD Regulations.
- Technical:
  - The iMPD system is the only system that has the capacity of 1800 GPM flow rate, other systems have a reduced flow rate as low as 600 GPM.
  - The iMPD System has both block and bleed and dual redundancy unlike any other systems.
  - The entire system is the only system to comply fully with API 6A Standards.
  - The entire system is modular and can be installed quickly in a limited space none invasive to operations.
  - All valve operations can be operated by the iMPD Drillers Panel showing flow paths and valve position.
  - The iMPD system is one of the first to use API 7K Hoses with No33 Gas Carcass and approved by ABS.

iMPD System Advantages

- Driller Friendly:
  - The control system using flow-in verses flow-out via the Advanced Kick Detection is the only system that can detect a kick at 0.1 Barrel and as little as 1.5 gallons.
  - System also detects ware and inefficiencies on Mud Pump liners.
  - No additional costly personnel required. Drill Crew Only
- Rotating Control Device:
  - The RCD device in-house design requires 20 minute change out and can be repaired on the Rig unlike any other systems in the market. With 70% less parts than the competitors.
- Riser Gas Handling:
  - The entire system is only 25’ in length including all major components 1/3 the length of rival MPD Joints

iMPD System Advantages

- Riser Gas Handling:
  - The entire system is only 25’ in length. All major components 1/3 the length of rival MPD Joints.



