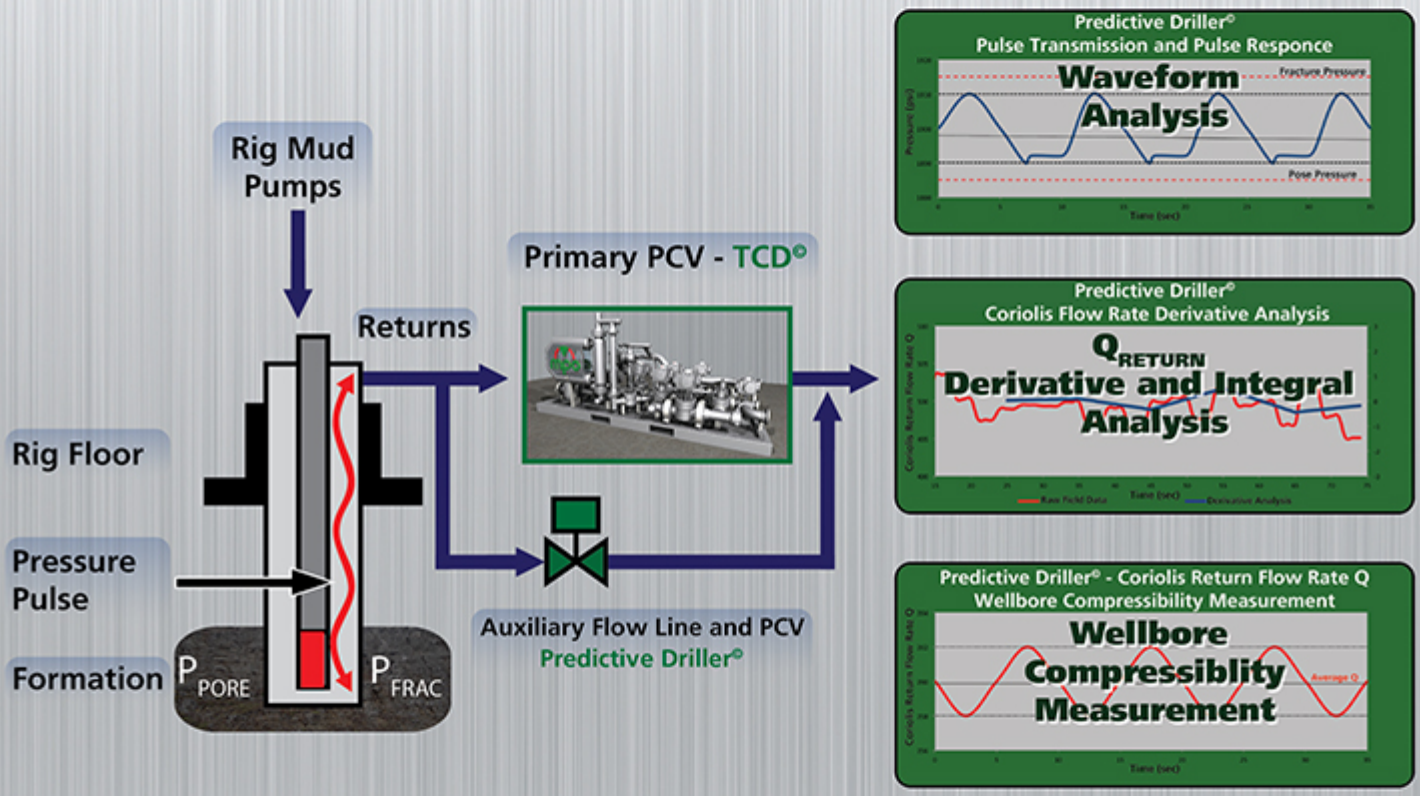
Predictive Driller©

The Predictive Driller© is the next generation well bore pressure control system in MPD to meet the growing challenges of drilling narrow formation pressure margins and unanticipated changes in formation pressure gradients.

The Predictive Driller© is a pro-active and preventative system that allows the detection and prediction of changing formation pore and fracture pressure boundaries dynamically during MPD operations.

In a closed loop MPD system, a pressure pulse is generated at the surface via a small bore auxiliary flow line and Pressure Control Valve (PCV) that operates in parallel to the primary TCD© manifold PCV, referred to as the Predictive Driller© PCV. The average down hole pressure *remains within the MPD target bottom hole pressure for drilling and never crosses the set formation pressure margin thresholds.*

The Predictive Driller© incorporates new patented methodology to identify the reaction to induced changes of pressure in the wellbore for prevention of formation fluid influx or drilling fluid loss events. Using this unique analysis tool; the new target bottom hole pressure and drilling pressure margins are safely and rapidly re-established before down hole conditions can escalate to a recordable down hole event.



Features of the Predictive Driller©

- Enhanced formation pressure boundary detection methodology
  - ✓ Negligible formation fluid gain or drilling fluid loss during event detection
  - ✓ NPT associated with well control or severe drilling fluid loss events is mitigated
  - ✓ Improved response time, well control capability and overall safety on the rig
- Assists in determining and analysing the phase of the fluid if a hydrocarbon influx occurs

The Predictive Driller© is part of the MPO MPD systems which also include the Riser Pressure Control©, Total Control Driller, Non-Stop Driller© drill pipe/subs and RDD© systems. MPO currently has Patents Pending on the Predictive Driller©

mpo *Take **Total Control** of your **Well*** mpo

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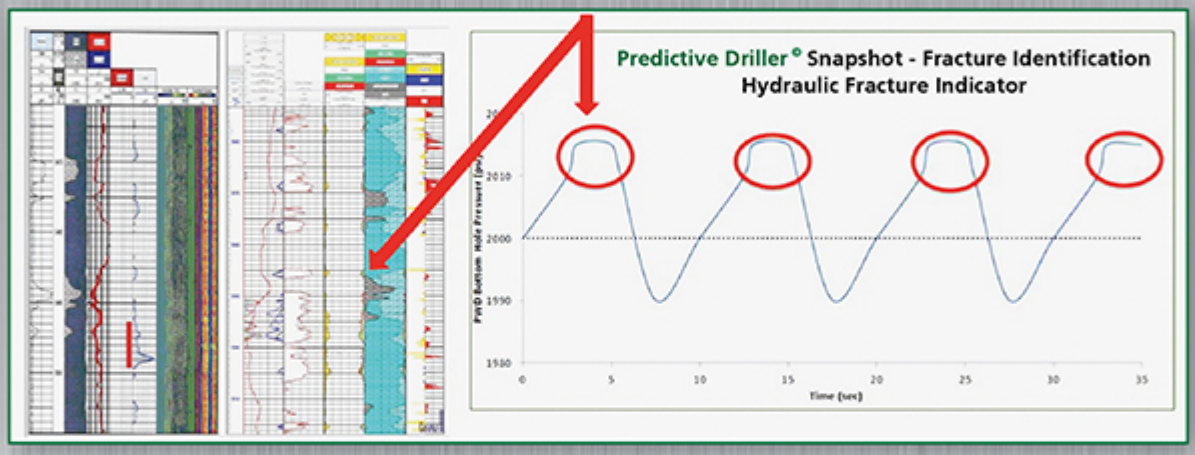
Predictive Driller©

Applications of the Predictive Driller©

- ✓ Narrow operational formation pressure margin and exploration drilling applications
- ✓ Optimal when used with the NSD© continuous circulation system to counteract effects of thermal expansion and well bore ballooning

CONVENTIONAL APPROACH	MPD APPROACH	PREDICTIVE DRILLER© APPROACH
✗ Reactive process	✗ Reactive process	✓ Proactive process
✗ No immediate control upon detection ✗ Detection dependent on reactive data interpretation	✓ Immediate control upon event detection ✓ Choke reaction and applied surface pressure	✓ Immediate control upon event detection ✓ Choke reaction and applied surface pressure ✓ Advanced detection with pressure pulse analysis
✗ Inaccurate detection ✗ Reliance on pit volumes ✗ Masking effects of rig heave	✓ More accurate detection ✗ Reliance on multiple variables for mass and volume balance	✓ Enhanced detection accuracy ✓ Advanced model algorithms and unique methodology
✗ Inflow volume can be large ✗ Volume depends on detection time, and duration to close BOP	✓ Influx volumes generally smaller ✗ Errors in hydraulics modeling that control choke ✗ Multiple event misinterpretation	✓ Negligible volumetric changes ✓ Minimal exposure with pressure pulse amplitudes ✓ Enhanced data filtering
✗ Long response time ✗ High probability of recordable well control event	✓ Faster response time but not always the case ✗ Medium probability of recordable well control event	✓ Enhanced response time ✓ Improved well control measures ✓ Low probability of recordable well control event

Pulse Interpretation Correlated To LWD Log Response



- ✓ A real time fracture identifier using the correlation of the patented Predictive Driller© analysis method to MWD/PWD/LWD data
- ✓ Confident zone identification for optimal hydraulic fracture placement in tight gas reservoirs

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