



Flex™ MPD

# Service Capabilities

## Service Levels

	Flex™	Flex™ Pro	Full MPD
Halliburton Personnel on site	Limited	X	X
Automated Control	X	X	X
Tabulated Programmable Backpressure		X	X
Displays Trends		X	X
Incorporates 3rd Party Data		X	X
Flow Out Monitoring		Optional	X
Surge/Swab Control		Limited	X
Fluid Rollover Compensation		Limited	X
Real-Time Logging		Limited	X
Real-Time Hydraulics Model			X
Remote Monitoring			Optional
Tablet Controlled	X	Optional	
Hazardous Area Computer	Optional	X	Optional
DAS Cabin		Optional	X

## Overview



### Equipment

» RCD and Choke manifold

» RCD, Choke manifold,  
Coriolis meter

» RCD, Choke manifold,  
Coriolis meter

### Control

» Programmed  
backpressure control

» Calculated and tabulated  
backpressure control

» Real-time hydraulics  
monitoring  
» Real-time ECD control

### People

» 24/7 remote support

» Increased control with  
limited onsite support

» Full service automated  
MPD with expert MPD  
crews onsite

# Flex™ MPD

## OVERVIEW

Flex™ MPD applies surface backpressure during drilling and during connections based on well parameters. Maintaining backpressure during drilling and increasing pressure during connections limits connection gas and can enable lighter mud while drilling.

This service comes with a choke and software interface which are provided to the driller or operator. The MPD control can be tuned to provide good surface control once on location, accounting for mud properties and flowline restrictions. Halliburton personnel connect the equipment into the flow line, do a system check to make sure the system is working, and to show the driller or operator how to use the equipment. The driller has the option to control the system by either defining a backpressure or by simply adjusting the choke position (or a combination of both). Once the job is completed, Halliburton personnel rig down the equipment, make sure that the customer has collected the data, inventory all equipment, and take the equipment back to the base for a full inspection.

### Equipment

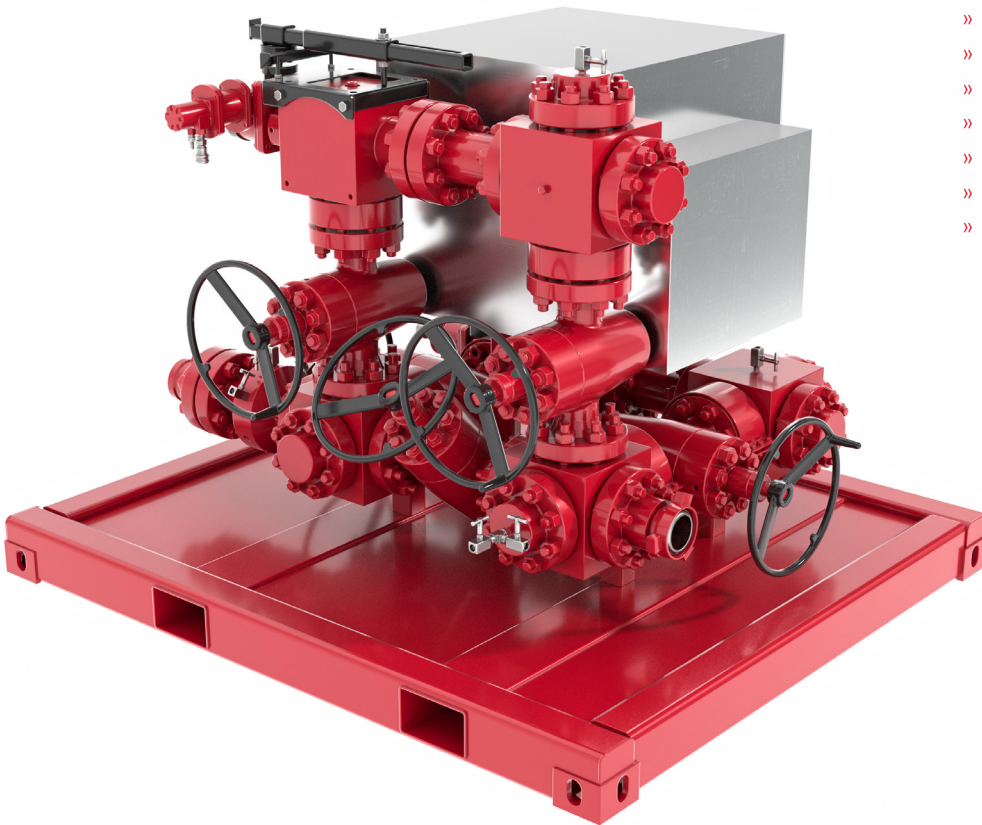
- » Choke manifold
- » 2,000 psi pipe package
- » Intrinsically safe hazardous area tablets with MPD software
- » Intrinsically safe wireless router

### Service Included

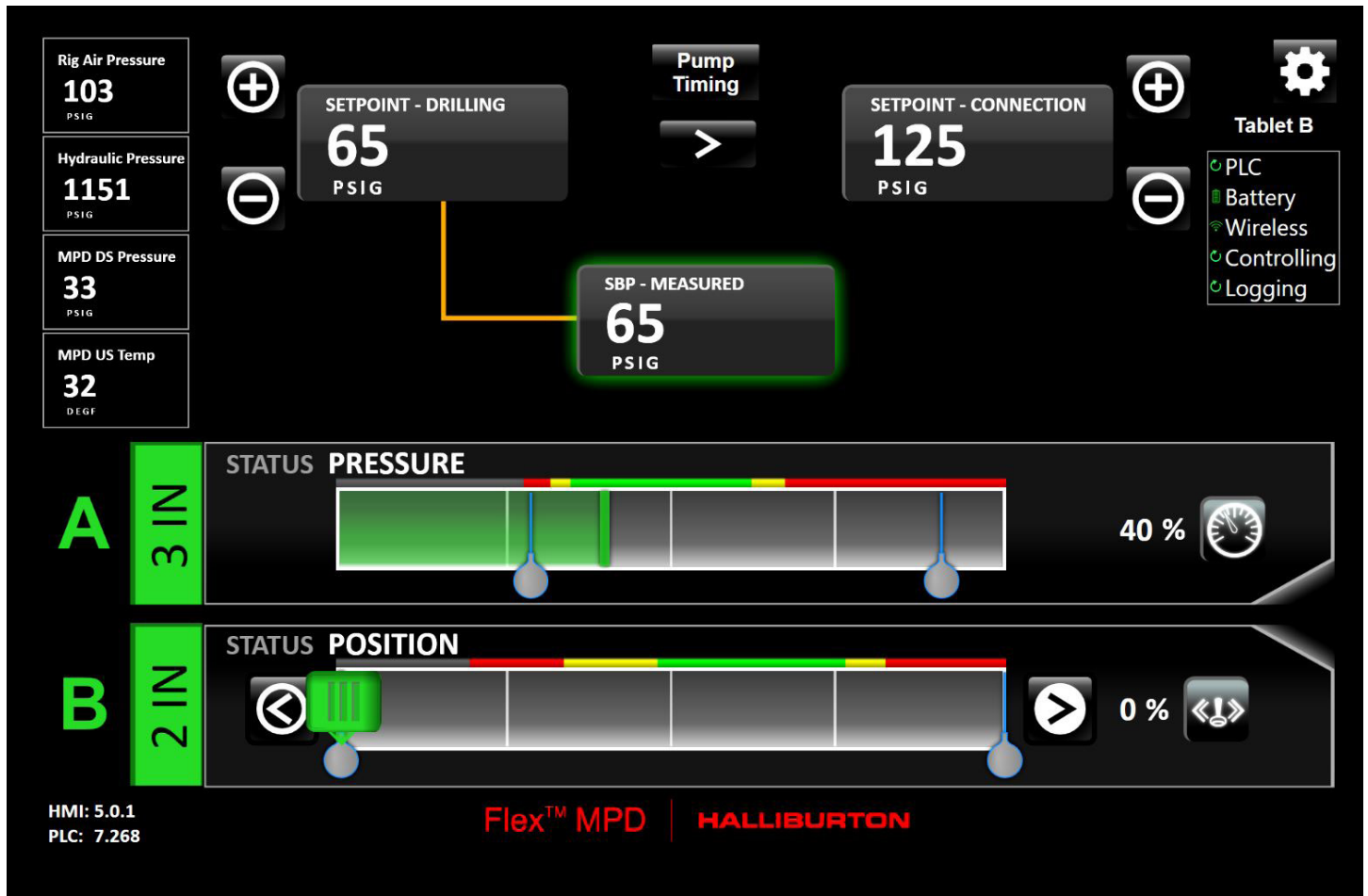
- » Mobilization of all equipment to rig site
- » Equipment rig up
- » Review functionality of system with driller / driller hand-off
- » 24/7 remote support
- » Rig down and demobilize all equipment

### Additional Services

- » Flex™ MPD trailer
- » 5,000 psi pipe package
- » Additional tablets
- » Additional manual and HCR valves
- » Engineering support
- » Operators
- » Service calls
- » Choke optimization



**EASY**  
INSTALLATION  
and rig integration



## SOFTWARE CONTROL SYSTEM

- » Manual back-pressure setpoint control for both drilling and connections
- » Choke position control
- » Automated pumps on/off transition timing for connections
- » Redundant control devices
- » Tuning with chokespeed adjustment

USER FRIENDLY  
**NO** ADDITIONAL PERSONEL REQUIRED  
 PORTABLE  
 LIGHTWEIGHT  
 Quick Mobilization

# Flex™ Pro MPD

## OVERVIEW

Flex™ Pro MPD provides basic MPD control based on well planning and well modeling prior to the operation. It includes some level of automation by allowing the user to input a lookup table and interpolating values in between the tabulated information based on current depth and flow rates. It also includes the ability to monitor flow in and flow out with the addition of rig data and a coriolis flow meter.

Halliburton personnel rig up equipment and perform a system check to make sure the system is working, and run the MPD system from the drill floor. Drilling parameter trends are monitored including Flow in/out (when the coriolis meter is installed). With the addition of WITS data, Flex™ Pro MPD gives Halliburton the option to offer surge and swab compensation. We also provide the ability to control the system based on the standpipe pressure. Once the job is completed, Halliburton personnel disassemble the equipment, provide the customer the logged data, and take the equipment back to the base for a full inspection.



### Equipment

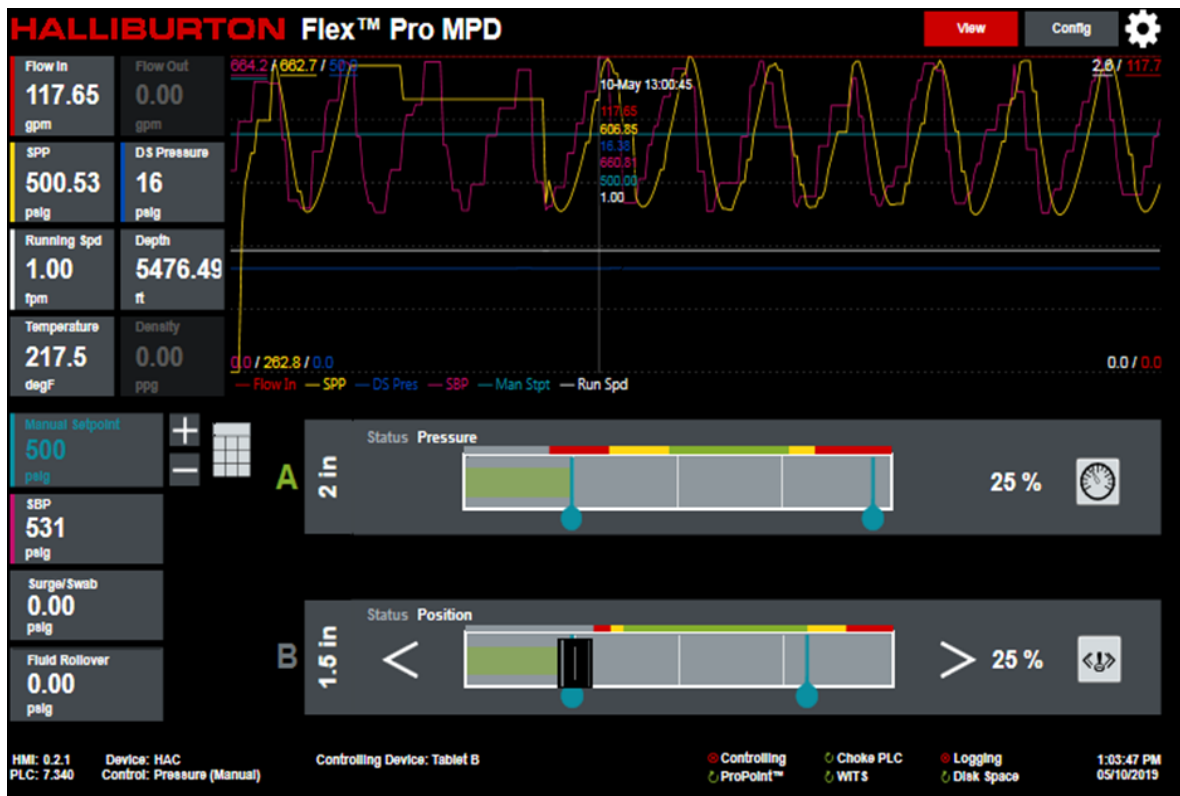
- » Choke manifold
- » 2,000 psi pipe package
- » Intrinsically safe hazardous area tablets with MPD software
- » Intrinsically safe wireless router
- » Hazardous area computer
- » Flex Pro MPD software
- » Coriolis flow meter

### Service Included

- » Mobilization of all equipment to rig site
- » Equipment rig up
- » Review functionality of system with driller
- » 24/7 on site support
- » Rig down equipment and demobilization

### Additional Services

- » Flex™ MPD trailer
- » 5,000 psi pipe package
- » Additional computers or tablets
- » Additional valves and operators
- » Surge and swab recommendations/calculations
- » Rollover offset recommendations/calculations



## SOFTWARE CONTROL SYSTEM

- » Controlled from the rig floor
- » Both automated and manual back-pressure setpoint control
- » Choke position control
- » Pressure look up table
- » Flow out monitoring
- » Basic automated surge and swab control
- » Fluid rollover compensation
- » Standpipe pressure controller
- » Tuning with chokespeed adjustment

COST EFFECTIVE  
SOLUTION

EXTENSIVE  
MPD  
EXPERIENCE



CUSTOMIZED  
AND EASY TO  
UPGRADE

ADAPTABLE  
SIMPLER  
SYSTEM

# Full MPD

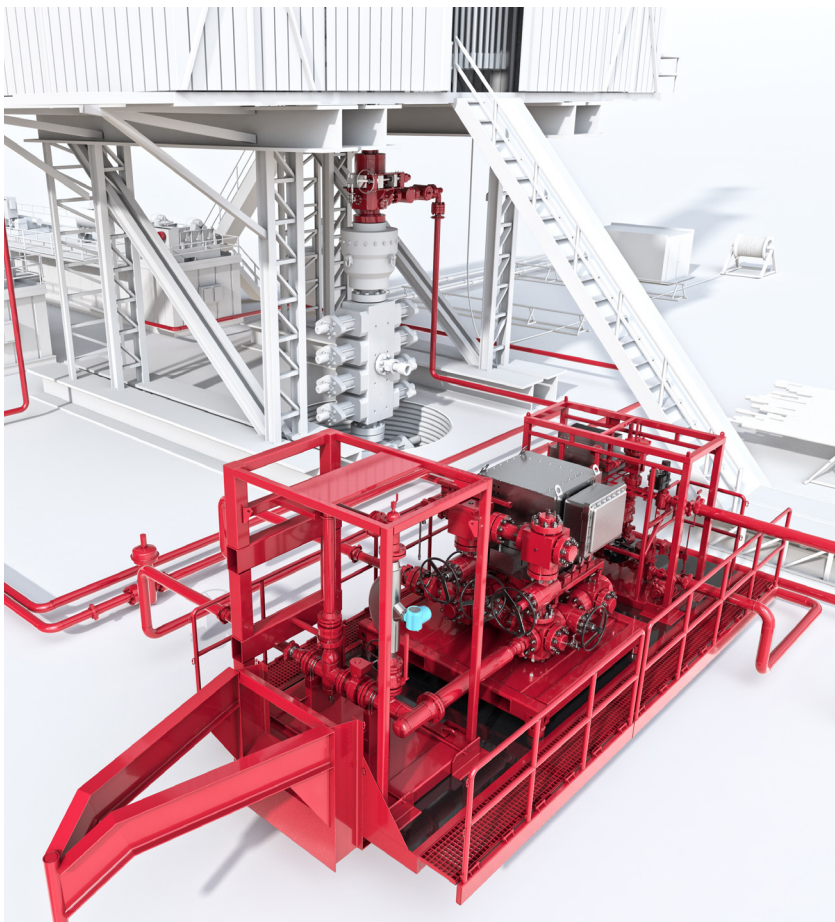
## OVERVIEW

Full MPD represents the latest in automated managed pressure drilling. With real-time hydraulics modeling, kick detection and automated kick control, and the latest equipment, we continue to make advances in automation to better control the well during all drilling operations.

At the heart of our control system is the GB Setpoint™ real-time hydraulics simulator built on the proven Drilling Fluid Graphics software which gives you better equivalent circulating density control throughout the wellbore.

Along with our control system we have some unique and patented systems that make our MPD system one of the most advanced systems in the industry. We can update mud properties in real-time using the Baralogix® density and rheology unit, calculate real-time surge and swab values based on actual running and tripping speeds, automatically calibrate the real-time model with pressure-while-drilling (PWD) data, and even directly link to the Halliburton iCem® service to provide automated managed pressure cementing.

Except the highest level of service with Halliburton. We will mobilize equipment, ensure that all systems are working properly and are optimized to perform the best level of control based on each rig and wellbore, operate the equipment with our experienced and trained personnel, and give you the data you need to make real-time drilling decisions while keeping the operation safe.



### Equipment

- » Choke manifold
- » 5,000 psi pipe package
- » Coriolis meter
- » Data acquisition center with the full Halliburton MPD software suite:
  - » Halliburton Insite database w/WITS Capability
  - » DetectEV

### Service Included

- » Mobilization of all equipment to rig site
- » Equipment rig up
- » Review functionality of system with driller
- » 24/7 on site support
- » Rig down equipment and demobilization
- » GB Setpoint real-time hydraulics model
- » PWD calibration
- » Measure-while-drilling (MWD) downlink compensation
- » Automated fluid rollover compensation
- » Fully automated surge and swab control

### Additional Services

- » Flex™ MPD trailer
- » In house MPD engineer
- » ActEV™ automated influx control software
- » Managed pressure cementing
- » Rig pump diverter
- » Tripping speed schedule
- » Manage pressure cementing
- » Real-time remote monitoring

Halliburton is the **ONLY** service company with a Globally Certified Competency Program from the International Association of Drilling Contractors - IADC




---

## SOFTWARE CONTROL SYSTEM

---

- » Real-time transient model displaying multiple muds, which is critical for accurate pressure control during fluid rollovers, sweeps, and managed pressure cementing (MPC) operations.
- » Full wellbore ECD monitoring to visually track sweeps, fluid rollovers, cement jobs and any bottomhole events as they move through the wellbore.
- » Real-time automated surge and swab for safe tripping operations.
- » Three real-time surface setpoint methods including:
  - » Target ECD at a specified depth
  - » Volumetric control
  - » Standpipe pressure control
- » Compensation for pressure loss during downlinks ensuring constant bottomhole pressure control.
- » Real-time calibration and validation of the equivalent mud weight (EMW) with PWD
- » Cumulative flow calculation displays gain and loss rates reducing the reliance on conventional pit trends.
- » Ability to handle real-time mud properties from Baralogix® Density and Rheology Unit for mud updates every 20 minutes.

---

## CASE STUDY

---

### SUCCESSFULLY PERFORMING MANAGED PRESSURE DRILLING AND CEMENTING OPERATION FOR SHELL OFFSHORE

Shell identified the need for a MPD and MPC solution on two water injection wells to maintain constant bottomhole pressure while drilling a narrow pressure margin in the 10-5/8" x 12" section. Previous drilling in this section encountered issues with borehole instability and weak, faulted sand structures. It was also determined through further analysis of previous non-productive time and pressure-related events that the 8 1/2-in reservoir sections would benefit from MPD constant bottomhole pressure techniques

---

AVOIDED  
**2 WEEKS**  
 OF  
 NON-PRODUCTIVE  
 TIME

 DOWNHOLE  
 PARAMETERS  
 INTERPRETATION



Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H013314

© 2019 Halliburton. All Rights Reserved.