VICTUS™ INTELLIGENT MPD

Achieving unmatched safety and cost savings through an end-to-end MPD solution

Fabricio Clemente
MPD Business Manager

November 29th, 2019
# AGENDA

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Background</td>
</tr>
<tr>
<td>2</td>
<td>MPD Applications</td>
</tr>
<tr>
<td>3</td>
<td>Current Deepwater MPD System &amp; Challenges</td>
</tr>
<tr>
<td>4</td>
<td>Intelligent MPD System</td>
</tr>
<tr>
<td>5</td>
<td>Automated MPD Riser</td>
</tr>
<tr>
<td>6</td>
<td>Intelligent Control System</td>
</tr>
<tr>
<td>7</td>
<td>Topside Equipment</td>
</tr>
</tbody>
</table>
1968
First RCD in the world

2007
Introduced award-winning Microflux® control system

2010
First API 16RCD certification

2019
First automated MPD riser system
Introduced Victus™ intelligent MPD

1983 – 1996
Expanded our RCD portfolio

2004
First MPD job from a semisubmersible

2008
Improved RCD design for marine environments

2014
First fully integrated MPD riser assembly below the termination joint on the rig
## Conventional vs MPD

<table>
<thead>
<tr>
<th>CONVENTIONAL DRILLING</th>
<th>MANAGED PRESSURE DRILLING (MPD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open to the Atmosphere System</td>
<td>Closed System = Quick BHP Adjustments</td>
</tr>
</tbody>
</table>

### Bottomhole Pressure (BHP)

- **CONVENTIONAL DRILLING**
  - \[ \text{BHP} = \text{Mud Weight (MW)} + \text{Friction} \]

- **MANAGED PRESSURE DRILLING (MPD)**
  - \[ \text{BHP} = \text{Mud Weight (MW)} + \text{Friction} + \text{Backpressure} \]
MPD Applications

- Information
  - Performing dynamic formation-integrity tests (FIT) and leak-off tests (LOT)
  - Performing dynamic pore pressure tests (DPPT)

- Drilling
  - Identifying and mitigating common drilling problems
  - Applying constant bottom hole pressure as a method of MPD
  - Executing pressurized mud-cap drilling (PMCD) in wells with total losses.

- Control
  - Automatically detecting and controlling kicks and losses
CURRENT CHALLENGES

INTEGRATION
HANDLING
INSTALLATION
CERTIFICATION
VICTUS ™ INTELLIGENT MPD

TECHNICAL SPECIALISTS

INTELLIGENT CONTROL SYSTEM

AUTOMATED MPD RISER SYSTEM

TOPSIDE EQUIPMENT
AUTOMATED MPD RISER SYSTEM

Expedite offshore installation with an integrated, compact, and smart design
VICTUS™ INTELLIGENT MPD

- **REduce 80% installation time**
- **Remove people from danger zones**
- **Connect umbilical & flowlines all at once**
- **Safe, reliable operations every time**

- Smart rotating control device (RCD)
- Annular isolation device (AID)
- Hands-free flow spool
VICTUS INTEGRATED RISER JOINT

Physical Features
Length less than 50ft
Weight less than 88,000 lbs
57in max OD

Technology
AID Qualified to close open hole (CSO)
RCD features Pressure between Elements and RPM
Integral Bleed line
Camera Package
VICTUS HANDLING (ROBOTIC) ARM

- Hydraulic controls either local or remote
- Standard base fits standard API guidewire spacing.
  - Custom arms available for permanent rig integration
- Allows for stabbing of the umbilical and mud return lines in a single operation
VICTUS UMBILICAL AND REELER

- Umbilical carries electrical, hydraulic and fiber optic communication
- Localized control at the reeler
- Provides parking for transport of stabbing manifold
INTELLIGENT CONTROL SYSTEM

Enhance your brainpower with advanced modeling and automation
Weatherford International

VICTUS INTELLIGENT MPD

INTELLIGENT CONTROL SYSTEM

Advanced hydraulics model

Smart control algorithms

Easy-to-integrate, secure PLC system

Simplified UI and alerts

Condition-based monitoring

Reliable automated reporting

Remote control via single user interface

Data consistency
Victus™ Modules

- **Operation Driller**
  - Remotely opens and closes chokes
  - Maintain constant bottomhole pressure
  - Collects data received from WITS and sensors and visualizes it

- **Operation**
  - Incorporates control system with existing pressure control equipment, such as RCDs, chokes, degassers, pressure sensors, flow meters, and hydraulics model.
  - Enables switching between MPD techniques and conventional drilling

- **Planning and Simulation**
  - Helps identify potential drilling problems. Run analyses and what-if scenarios.
  - Recreates real-time operation to determine optimal approach avoiding problems ahead of the bit.
CBM - Condition Based Maintenance

- RCD Performance Monitoring
  - Bearing Assembly life
  - Sealing element failure
- Coriolis monitoring
- AID Monitoring
- FS Valves Monitoring
- Others
Automated Reporting

- Daily Automated Report
- SBP Operating Area
- DPR

- Operational Report
- KPI Summary
- Total Time Breakdown
- Drilling KPIs
  - Average ROP
  - Average Trip Speed
- Tripping KPIs
  - Average Trip Time
- Connection KPIs
  - Average Time per Joint

- 24h Performance Summary
- Daily Summary / Outlook
TOPSIDE EQUIPMENT

Customize this best-in-class design for any rig
Microflux from Gen 2 to Victus

**Microflux Gen 2 (2011 to 2013)**
- 1 Skid
- ICU

**Microflux Gen 3 (2014 to 2016)**
- 2 Skids
- IU & CU

**Microflux Gen 4 _2017**
- Modular Skids
- ICU
- PRV

**Victus Manifold _2019**
- Customizable
VICTUS™ INTELLIGENT MPD

DESIGN BASED ON
DECADES OF PERFORMANCE

BUILT-IN REDUNDANCIES
TO CONTINUE DRILLING

DETECTS & CONTROLS
INFLUXES IN SECONDS

SMALL, MODULAR
RIG FOOTPRINT

CUSTOMIZABLE MPD MANIFOLD

REMOTE CHOKE SWAPPING

UPSTREAM CORIOLIS FLOWMETER OPTION

REMOTELY OPERATED ELECTRIC OR HYDRAULIC VALVES

REDUCED FRICTIONAL PRESSURE LOSS

INTEGRATED JUNK CATCHER

CONTINUOUS FLUID ANALYSIS
THANK YOU