4.0 Real-Time Integrated Operations Center based on Big Data Analytics, Machine Learning and CBM Solutions
Creation of Value and Knowledge

Digital Transformation

Use of technology to enhance performance, reliability and ensure better results.

> Process Safety
> Operational Performance
Where are we going to ARRIVE?

OCYAN SMART

+ **Integrated advanced technology platform** of remote data access, integrating people, systems, sensors and processes;

+ Over 15,000 tags processed per rig

+ Development of **dashboards and custom graphs** to display real-time data;

+ Algorithm development using **Artificial Intelligence** and **Big data Analytics** to detect any anomaly situation and send automated alerts of predefined critical deviations, with direct involvement of technical specialists;

+ **CBM: Condition Based Maintenance** of equipment using monitored data and trends, reaching greater reliability;

+ Automated interface of the platform with **Maximo CMMS to access maintenance history**, certifications, spare parts, as well as other systems (Credit360 / RimDrill);

+ Access to **Risk Analysis Database and Lessons Learned Operations**

+ Accessibility anywhere, at anytime

+ Partnership with technology companies and Startups;

Ocyan SMART • Rodrigo Chamusca Machado
1. Drilling / MPD

- Data from Drilling and MPD Systems;
- Real-time Drilling parameters:
  - Hook load, WOB, Torque, STP Pressure, Tank Volume, Mud Weight, Pump Rate, Bit and Well Depth.
- Drilling Equipment:
  - Real-time data and Operational History;
  - Vibration and Oil Analysis;
  - CBM;
  - Monitoring of equipment alarms (VFDs, Lubrification System, Engines, Panels, PLCs, etc.);
- Operational Performance monitoring in real-time;
- Operational modes detected automatically (Tripping, Stripping, Drilling, Reaming, Circulating, etc).
- Integration with Operations Database (RimDrill)
- Drill Pipe Integrity Management
2. Well Control & Integrity

- Real-time monitoring of well conditions;
- Real-time Overbalance (Operational Window);
- RSM (Riser safety margin) calculation in real-time;
- Negative test monitoring;
- Automated kick detection;
- Automated Trip Sheet, with deviation detection (kick identification);
- Flow Check verification;
- Loss/Gain while drilling or connections (Fingerprinting).
3. Subsea

- BOP Systems data;
- BOP Management:
  - Real-time data and Operational History;
  - Valves and preventors status;
  - Fluid Analysis;
  - Cycle counting;
  - CBM.
- Health Dashboard – BOP Condition:
  - Power, Communications, Hydraulics (HPU), Surface To Subsea, POD Health, Flow Meters);
- Records and monitoring of BOP Pressure Tests in real-time;
- BTW Maintenance Plan based on Operations History
3. Subsea

- BTW Maintenance Plan Report based on:
  - Event Logger Raw Data
4. PMS – Power Management System

- PMS Systems data;
- Health Dashboard – PMS Control Condition:
  - Controllers, UPSs, Switchs and OSs of the system.
- Management of Motor Generator and Auxiliaries:
  - Operational Status;
  - Efficiency, Consumption and Emission of Gases;
  - Real-time data and Operational History;
  - Vibration and Oil Analysis;
  - CBM.
- Alarm management;
- Identification of Degraded Natural State;
- Used Power x Available Power;
- Blackout detection and alerts.
5. Dynamic Positioning (DP)

- DP Systems data;
- Thrusters Management:
  - Operational Mode and Status;
  - Real-time data and Operational History;
  - Vibration and Oil analysis;
  - CBM.
- Positioning, Heading, Off-set and Angle Reference;
- Navigation Speed;
- Real-time WSOG and Riser Analysis;
- Monitoring of Weather Conditions;
- Real-time monitoring of sea conditions (Wave, Current, Heave, Swell, Pitch, Heave, Roll).
SMART: APPLICATIONS

6. CCTV
(Real-Time Streaming & Recording)

- Real-time access to 10 cameras and continuous recording of 4 cameras (per rig);
- Analysis of Operations in Real-time and issue of reports for post-task investigations;
- Use videos in preparation of training for high performance teams;
- Application of Artificial Intelligence to detect anomalies from video (partnerships with Startups or technology companies).
CONCLUSIONS & BENEFITS

- **Big Data**
  - Real-time data
  - Analysis and Correlations

- **Artificial Intelligence**
  - Machine Learning
  - Operations Historical Autonomous Decisions

- **IoT**
  - Alarms
  - Wireless Sensors

- **Digital Twins**
  - BOP Digital
  - Top Drive
  - Thruster
  - Engines

- **Integrated Systems**
  - Interface with CMMS
  - Interface with Credit 360
  - Interface with RmDrill

**ADVANCED INTEGRATED PLATFORM**

- **Performance**
- **Drilling**
- **BOP**
- **Maintenance**
- **Marine**

**Additional Benefits**

- **Process & Well Safety**
- **Operational Performance Improvement**
- **Increased Reliability and Access of Engineering Data**
- **Reduction in Maintenance Costs**
- **Reliability in Operations**
- **Access and Transparency of Operations**
- **Quality and Agility in Decision Making**
- **Increase Competitiveness with Continuous Technological Innovation**
- **Asset Performance Optimization and Maintenance Strategies**
- **Compliance with Contractual Requirements and Regulators (BSEE, ANP, etc)**

Ocyan SMART • Rodrigo Chamusca Machado
FLEET RESULTS 2019

Fleet Recordable Incidents Rate (TFIR)

- 85%

Operational Uptime (%)

+ 2.8%

95.40%
SMART: VIDEO

Filmr

Ocyan SMART • Rodrigo Chamusca Machado
FUTURE AND ONGOING TECHNOLOGY & DIGITALIZATION PROJECTS

- View 360 – (AR/VR)
- Hybrid (Battery) Propulsion
- Red Zone Management
- Ultra-Shallow Water Operations - DP 150m (Real-time WSOG)
- Fingerboard Latches Monitoring
- 3D Impression – Additive Manufacturing
- Storekeeper 4.0
- UWILD Robots
- Bow Tie Digital
- Drone Inspection
- Ocyan University
- Rig Automation

Ocyan SMART • Rodrigo Chamusca Machado
Thank you!
Questions?

Rodrigo Chamusca Machado – rchamusca@ocyan-sa.com