Enabling Technology – Unlocking Africa’s Upstream Potential

APPO CAPE VII – Focus on Technology

5th April 2019 – Malabo, Equatorial Guinea
Schlumberger at a Glance

- Founded in 1926. Leading provider of oilfield technology, products & services
- 100,000 employees, 140 nationalities, in more than 85 countries
- Over 80 years in Africa
- 16 GeoMarkets
- 20 Product Lines
- 90 Technology Development Centers and Manufacturing Facilities
“I agree to disburse to my sons, Conrad and Marcel, the funds necessary for research study in view of determining the nature of the subsurface, in amount not exceeding five hundred thousand francs…. they must devote themselves to it entirely…”

Paul Schlumberger, 1919
Schlumberger - Pioneering Technology Deployment in Africa

1923, Geophysical surveys in **SOUTH AFRICA & DRC**

1934, 1\(^{st}\) Log interpretation in **GABON**

1952, Wireline logging in **CAMEROON**

1958, Wireline logging in **NIGERIA**

**ACCELERATED TECHNOLOGY DEPLOYMENT ACROSS AFRICA**
Schlumberger Suite of Technologies
Full Suite of Integrated Pore-to-Pipeline Technologies

Well Construction
- Bits & Drilling Tools
- Directional Drilling
- Logging-While-Drilling
- Surface Logging
- Drilling Fluids
- Solids Control
- Cementing
- Land Rigs

Reservoir Production
- Pressure Pumping
- Completions
- Artificial Lift
- Subsea Production Systems
- Well Intervention

Reservoir Characterization
- Seismic Services
- Wireline
- Well Testing
- Software
- Petro-technical Expert Services

Production Delivery
- Production Systems
- Process Systems
- Valves & Measurement
- Chemicals & Treatment
- Production Management
Maximizing Production & Digital Solutions

New Technology examples with application in Africa
Sensia - Fully integrated digital oilfield automation solutions

MILWAUKEE and HOUSTON, February 19, 2019 — Rockwell Automation, (NYSE: ROK), the world’s largest company dedicated to industrial automation and information, and Schlumberger, (NYSE: SLB) the world’s leading provider of technology for reservoir characterization, drilling, production, and processing to the oil and gas industry, announced today that they have entered into an agreement to create a new joint venture, Sensia, the first fully integrated digital oilfield automation solutions provider.
Through Tubing Oriented Perforation

Problem Statement:
Developing the reserves found between dual production packers in dual strings completions without damaging the long string.

Solution:
Oriented Perforation Technology with Wireline Perforating Platform Completion Mapper for detection of other completion strings present in the wellbore, combined with the motor tool, can orient perforations away from parallel strings.

Results:
Rejuvenation of brown fields in land, swamp and shallow waters by unlocking shallow behind tubular reserves, otherwise uneconomical.
Inflow Control Devices (ICD) Technologies

Challenge:
Production/injection along horizontal wells is not balanced, typically higher drawdown at the heel leading to early water coning.

Solution:
ICD completions as open hole production optimization solution for horizontal wells to achieve balance influx across the OH section.

Results
Improved recovery factor through the delay of the water/gas break through. Helps zonal drainage strategies for efficient reservoir management.
Well Construction Technologies

Performance Drilling
Axeblade & Stinger Bits – Delivering ROP Benchmarks in Africa

**Challenge:**
Abrasive sandstone formation, High Stick Slip, Meet directional objectives, Shocks and vibrations, Durability, Low ROP

**Solution:**
New Axeblade, 8 bladed 16mm cutter bit dressed with Central Stinger, ONYX 360 rotating cutters on the shoulder and Firestorm cutters on the fixed cutter locations; Xceed BHA, i-Drill

**Results**
Reduced number of bit runs. First time in this application for one bit to drill shoe to shoe; highest ROP achieved in the field to date, about 33% improvement

Performance Bulletin

**Axeblade™ & Central Stinger™ with SLB Xceed BHA Breaks Record on 12.25” Hole Section of Jubilee Field with Longest Drilled interval and Best ROP – Offshore Ghana**

1860 m section drilled at an average ROP of 16.41m/hr
PowerDrive Orbit – High Performance Rotary Steerable System

Challenge:
Complex 3D profiles with high dogleg build sections
Reducing drilling time with faster ROP using Realtime measurements

Solution:
Use PowerDrive Orbit* rotary steerable system with self-steering automation for precise positioning

Results
Single runs, from shoe to TD; Real-time drilling optimization using advanced downhole measurements. Several drilling records.
Geosphere LWD – High Precision Well placement & reservoir mapping

Challenge:
Injectite sands, Identify target sand, Variable sand thickness
Fluid contact uncertainty, Eliminate costly pilot hole

Solution:
Geosphere ultradeep measurements enables efficient landing and optimal well placement to maximize production.

Results
Mapped top of sand from 21m before landing – precise landing
Mapped reservoir and OWC
Eliminated the need for a costly pilot hole
FAZEPRO Fluid System

Challenge:
Deploy a nonaqueous fluid that deposits filtercake that can be easily cleaned up for a horizontal injector offshore Equatorial Guinea

Solution:
Use nonaqueous FAZEPRO reversible invert-emulsion reservoir drill-in fluid (RDF) system and FAZE-OUT reversible water-base filtercake breaker to expedite and simplify the openhole completion process

Results
Streamlined cleanup and increased performance. 30% more seawater injected at 40% less pressure. Double the amount injected in previous best offset.
Exploration Technologies

Reservoir & Prospect Evaluation
FTWT – Formation Testing Whilst Tripping

**Challenge:**
Efficient, cost effective formation testing solution

**Solution:**
Formation Testing While Tripping (FTWT) capable of flowing 6x MDT flowrates and enables hydrocarbon pumped through the tool to be circulated to surface.

**Results**
Vast increase in the volume of hydrocarbon which can be pumped during a Wireline transient test. Faster, longer flow and thus enhanced radius of investigation.
The Cognitive E&P Environment

A secure, cloud-based environment that unites planning and operations

Brings together advances in technical disciplines such as artificial intelligence, data analytics, and automation

Founded on our deep domain knowledge and petrotechnical expertise

A new standard in cross-discipline collaboration…for example in Exploration

SIS Global Forum, Paris Sept 2017
Preparing the next generation – Technology access in African universities

AUST ABUJA
DELTA STATE UNIVERSITY (DELSU)
ENUGU STATE UST
FUT MINNA, UNIJOS
FUTA, UNILAG
FUTO
LAUTECH
OAU
UNIBEN
MODIBBO ADAMA UST YOLA
UNICAL; UNN
UI; UNIVERSITY OF MAIDUGURI
UNILORIN

AIN SHAMS UNIVERSITY
AL AZHAR UNIVERSITY
ALEXANDRIA UNIVERSITY
CAIRO UNIVERSITY
SUEZ CANAL UNIVERSITY
THE AMERICAN UNIVERSITY IN CAIRO
THE BRITISH UNIVERSITY IN EGYPT

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UNGE
ITNHGE

UNIVERSITY OF CAPE TOWN
UNIVERSITY OF STELLENBOSCH
UNIVERSITY OF THE WESTERN CAPE
UNIVERSITY OF FORT HARE

UNIVERSITY OF DAR ES SALAAM
UNIVERSIDADE EDURADO MONDLANE

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