Drilling Uncertainty – Prediction Technical Section

- Technical Section Charter
- Challenges related to Drilling Uncertainty
- Examples of Work being done by DUPTS Participants
- DUPTS Update
  - History
  - Meetings and Webinars
- Goals for 2018
The Drilling Uncertainty Prediction Technical Section will address major challenges affecting the cost and efficiency of drilling operations.

By integrating resources and experience from both the Drilling and Subsurface (G&G) worlds, the primary aim will be to ensure accurate and safe well placement while addressing the needs of the Industry to reduce Invisible Lost Time and mitigate or in some cases even eliminate Non-Productive Time through accurate predictions of geo-hazards.
Integrating resources, experience and technologies from Drilling Geology, Reservoir, and Geophysics teams to ....

Reduce Uncertainty which then leads to better wells with lower construction cost, reduced lifting costs and higher hydrocarbon production potential.

........ with or without Automation
Examples of DUPTS Members Technical Challenges and Solutions
Driller sees the effect of formation changes, overpressure, etc. before the sensors are able to see them.
The Bit as a Sensor

- The trends match between logging data and surface sensors
- Correlations picked on the Drilling Sensor Integrated Prediction Errors are later validated by the Subsurface Logging tool trends
- The trends are predictable: ‘Drilling Ahead of the Bit’
Integrating Geology with Directional Drilling
Uncertainty in the Bit Location

Wouldn’t it be nice to reduce the uncertainty between survey stations?
Automated Modeling of the Bit Position

Automatic Analysis to Compute:

- Which direction is the bit being pushed in rotary mode?
- How rapidly can we turn when sliding?
- Can we track the bit position between survey stations?
- Modeled Real-Time Borehole Position (every 3 inches rather than 90 feet)

Calculations performed continuously and with much more detail than humanly possible.
Automated Formation Top Detection
Reducing Uncertainty using Bayesian Networks

- Continuously updated estimates of structure and well path
- Reduce slow, human Geosteering interpretation on critical path while drilling
- More rigorous answers through probabilistic reasoning
Uncertainty Related to Drilling System Automation - Technical Section
The Driller cannot always see the Road Ahead...

DSATS  …………… Would you put on the Cruise Control in Fog?...
Lack of Prediction
• DUPTS focuses on Better Integration of G&G with Drilling
  • Leads to better wells with lower construction cost, reduced lifting costs and higher hydrocarbon production potential.
  • Reducing Uncertainty forms the foundation to move to full Drilling Automation
DUPTS Timeline

- Saudi Aramco internal initiative called ‘Drilling Ahead of the Bit’ to reduce drilling uncertainty
- Aramco wished to establish this as an SPE initiative
- The ‘Drilling Ahead’ name was rejected by the SPE Board
- Next name proposed by the SPE: Drilling Performance Simulation and Prediction Technical Section (DPSP)
- This was approved by the SPE in mid 2014.
- DPSP was changed to the Drilling Uncertainty Prediction Technical Section in 2015
DUPTS 2017 Update

DUPTS Events
- Drilling Ahead of the Bit Workshop, Saudi Arabia, 23 April 2017
- DUPTS Special Session at ATCE, Dubai, 26 Sept 2016
- Drilling Ahead of the Bit Workshop, Saudi Arabia, 20 April 2015

Events with a DUPTS Presentation/Meeting:
- SPE Young Professionals, Villarhermosa, Mexico, 25 Nov 2016
- SPE Mumbai Section, Mumbai, India, 28 July 2016
- SPE Mexico, CMP in Monterrey, Mexico, 9 June 2016
- SPE - Drilling Best Practices, Dubai, 18-19 April 2016
- SPE EAGE Geosteering and Well Placement Workshop, Dubai, 8-10 Feb 2016
- SPE Oil & Gas India Conference and Exhibition, Mumbai, 24–26 November 2015
- SPE - Intelligent Oil & Gas Abu Dhabi 15-16 September 2015
  – Getting it right the first time

Future Events:
- Summer workshop in Houston 2017
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* Founding Officers
Webinars – Past and Upcoming

- Drilling Real-time Prediction Environment In Saudi Aramco, by Salem Gharbi, on 26 July 2016
- Assessing and Improving Data Quality for more Effective Data Analytics, by David Johnson, on 14 Sept 2016
- Automation: Kick Detection Solutions Example, by Dr. Abdullah Yami, on 30 Nov 2016
- Drilling Optimization, Risk and Uncertainty Reduction, and Future Workforce Education Using Big Data Analysis, by Dr. Eric van Oort, on 22 Feb 2017
- Your Data...Streamlined. Faster. Easier. Trusted... And With Less Turbulence, by Ross Philo and Jay Hollingsworth, Energistics, 11 April 2017
- Automated Real Time Prediction of the ECD and Drilling Window Ahead of the Bit; Not a Holy Grail Anymore!, by Rolv Rommetveit Phd and Ane Lothe PhD, 16 May 2017
- Estimation of Risk Level Embedded in Drilling Operation Plans. By Eric Cayeux, on 15 June 2017
- Rock Type Classification using Machine Learning, Sridharan Chandrasekaran and Taufan Rusady, 14 November 2017
- **Real-Time Modeling of Bit Position Between and Ahead of Surveys, Bill Chmela, 29 November 2017**
DUPTS Goals 2017-2018

- Develop a DUPTS technology roadmap
- Define areas of technological interest related to drilling uncertainties and publish related material
- Promote Modeling and simulation for blended development
- Student competition on modeling and simulation for drill ahead
- Increase membership and engagement
- Promote ETP and RESQML initiatives for integration with earth models