DSATS
SPE Drilling Systems Automation Technical Section

Moray Laing, SAS
DSATS

Robin Macmillan, NOV
DSATS Membership Chairman
Member ISA
DSATS

• Why?
• Who?
• What?
SPE Drilling Systems Automation Technical Section (DSATS)

- Founded 2008
  - 1,300 members
- All Volunteer:
- Sub-Committees:
- Affiliations:
Why Automation?

- Safety
- Environmental Responsibility
- Wellbore quality
- Knowledge Capture
  - Training
  - Repeatability
- Predictable Logistics
- Reliability
- Business Cycle
- Public Relations
- Economic Reality
  - Getting more wells from the same rig
DSATS Mission and Tactics

• Facilitate the development and implementation of drilling systems automation
  – Technical Sessions at Conferences
  – Advanced Technology Workshops
  – Forum Series meetings
  – Distinguished Lecturer programs
  – Webinars
    Clay Flannigan (SWRI), Amanda DiFiore (Circadian), Kevin Wise (Boeing)
  – Liaison with other industry experts in automation - ISA
  – Publicity in journals such as JPT/Drilling Contractor

• Communicate the technology of Drilling Systems Automation
  – lessons learned and best practices
  – development of guidelines and standards

• Maintain the Momentum
Who Drives?

- ConocoPhillips
- Hess
- Shell
- Apache
- Total
- Chevron
- Maersk
- Precision
- Nomac
- Ensign
- Schlumberger
- Halliburton
- Baker Hughes
- Weatherford
- Atlas Copco
- Canyon Oak
- Streicher
- Schramm
- NOV
Economic Reality - Remember 2013?

Oil company returns have been declining in a high price environment

Upstream ROCE

Production-Weighted Average Upstream ROCE

Brent $/barrel

Upstream Returns

Brent Price

5%-15% Returns

15%-20% Returns

20%-25% Returns

10-15% Returns

Source: IHS Upstream Competition Service

ROCE data include Anadarko, Apache, BG Group, BP, Chevron, ConocoPhilips, Eni, ExxonMobil, Hess, Marathon Oil, Occidental, Repsol, Shell, Statoil, and TOTAL.
Upstream ROCE defined as [Upstream Net Income / Upstream Year-End Net Capitalized Costs].

© 2014 IHS
Drilling Systems Automation (DSA)

• Human-machine collaboration
• Information and control systems
  – Input and Output
• Focus on Process Automation:
  – All components downhole, surface and remote
• Real time – Monitor, Advise, Control
• Contextual activities
  – eg Fluid management
Levels of Drilling Systems Automation

The current level of automation in Drilling

Monitor L2
- Wellsite Monitoring Systems
- Remote Data Centers
- Smart Alarms

Advise L3-L4
- Drilling Dynamics Diagnostic Systems
- Manual MPD systems

Control L5-L7
- Auto-Driller
- Stick-Slip Surface Control
- Manual MPD systems

Autonomous L8-L10
- Downhole to Rig feedback systems
- Automated MPD

Source: SPE 166263
DSATS Rig Control System

Communications

- Interface to proprietary equipment and sensors
- Machine independent
  - data-to-information
  - control algorithms
- Standardized method for obtaining real-time data
- Simplified device control architecture
- OPC UA for automation

Automation Architecture

Receive real-time data from proprietary sensors and send real time instructions to proprietary equipment
DSATS Communications Group

• **Roles and Responsibilities**
  – Implementation of the communication architecture (OPC UA)
  – Working with Energistics (WITSML) on standards issues
  – Collaborate - drilling contractors, service companies and equipment manufacturers to develop architectural guidelines

• **Security and Threat Model**
  – Certificate procedure for system access
  – Cooperation between IADC and DSATS needed to develop security and threat model

• **Rig Information Model**
  – Data structure required to use OPC UA
  – Expose WITS and WITSML specified information through a consistent method
  – Take rig objects that are controlled {top drive, drawworks and pumps}
  – Develop standards
  – **Define minimum set of information that is required to automate a task**

Lead: Pradeep Annaiyappa, Canrig
Data Quality Assurance Group

Develop industry recommendations on drilling data quality for reliable drilling systems automation, which covers monitoring, advice (i.e., decision making), and control activities.

Formed in 2015;

– Surface Group (metadata for surface measurements)
– Downhole Group (metadata for downhole measurements)
– Data Enrichment Group (derived values, such as ROP)
– Contextual Data Group (specifications, environmental, etc.)

Lead: Pradeep Ashok, UT Austin
DSATS Student Contest: Drillbotics

• Students build a small, fully automated drilling rig to drill safely and efficiently.

• 2015:
  – University of Oklahoma (First)
  – Texas A&M University
  – University of Texas
  – University of Agder

• Sep 27: Presentation at DSATS Seminar
• Paper SPE 174920 at SPE ATCE

Lead: Fred Florence, RigOps
IADC ART Affiliation

• Exploring future technology, drilling control systems and automation
• Focus on operational guidelines, assessing new technology, and identifying key deliverables
• Future Technology Subcommittee
• Drilling Control Systems Subcommittee

Automation for Drilling Contractors – Competitive Advantage
Drilling Systems Automation Roadmap Industry Initiative (DSA-R)

- Development of a holistic roadmap for the development of Drilling Systems Automation
- Affiliated to SPE, IADC and AUVSI; formed mid-2013, 50 participants
- Adopted Sandia National Labs Roadmapping process
- Developing relationship with ISA
- Target year - 2025
# DSATS Upcoming Events

<table>
<thead>
<tr>
<th>DATE</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 22</td>
<td>DSATS Webinar – <strong>Human Factors in Automation</strong> – Amanda DiFiore, Circadian Expert Services</td>
</tr>
<tr>
<td>September 27</td>
<td>DSATS Symposium – <strong>Training for Automation</strong> – Expert panel moderated by Tony Beebe, Blue Ocean Drilling at the SPE ATCE in Houston</td>
</tr>
<tr>
<td>December 9</td>
<td>DSATS Webinar – <strong>Autonomy in Non-Linear Systems</strong> – Kevin Wise, Technology Fellow at Boeing</td>
</tr>
<tr>
<td>February 29, 2016</td>
<td>DSATS Symposium – <strong>Human Integration with Automation and Machine Intelligence</strong> – at SPE/IADC Drilling Conference in Fort Worth. Three industry leading speakers: Tom Sheridan (Professor Emeritus MIT), Mike Withers (former VP Ride Engineering Walt Disney), Alonso Vera (Chief of HIS, NASA Ames)</td>
</tr>
</tbody>
</table>
Reading Material


Links to stay in touch with Drilling Systems Automation

connect.spe.org/dsats/home/

connect.spe.org/DSARoadmap/Home/

www.iadc.org/dsaroadmap

www.iadc.org/advanced-rig-technology-committee/#access

www.drillbotics.org
Is this really us?

The PR Challenge
SPE Drilling Systems Automation Technical Section

- A Unique Forum for Collaboration
- Publicity - Increasing awareness
- Developing Standards
- Maintaining Momentum
SPE
Drilling Systems Automation
Technical Section

Please join us
Any Questions?