Drilling Automation

Technology Collaboration Center
Rice University, Houston Texas

Automation & Robotics Workshop
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Mark W. Anderson
GM Drilling Mechanics Technologies

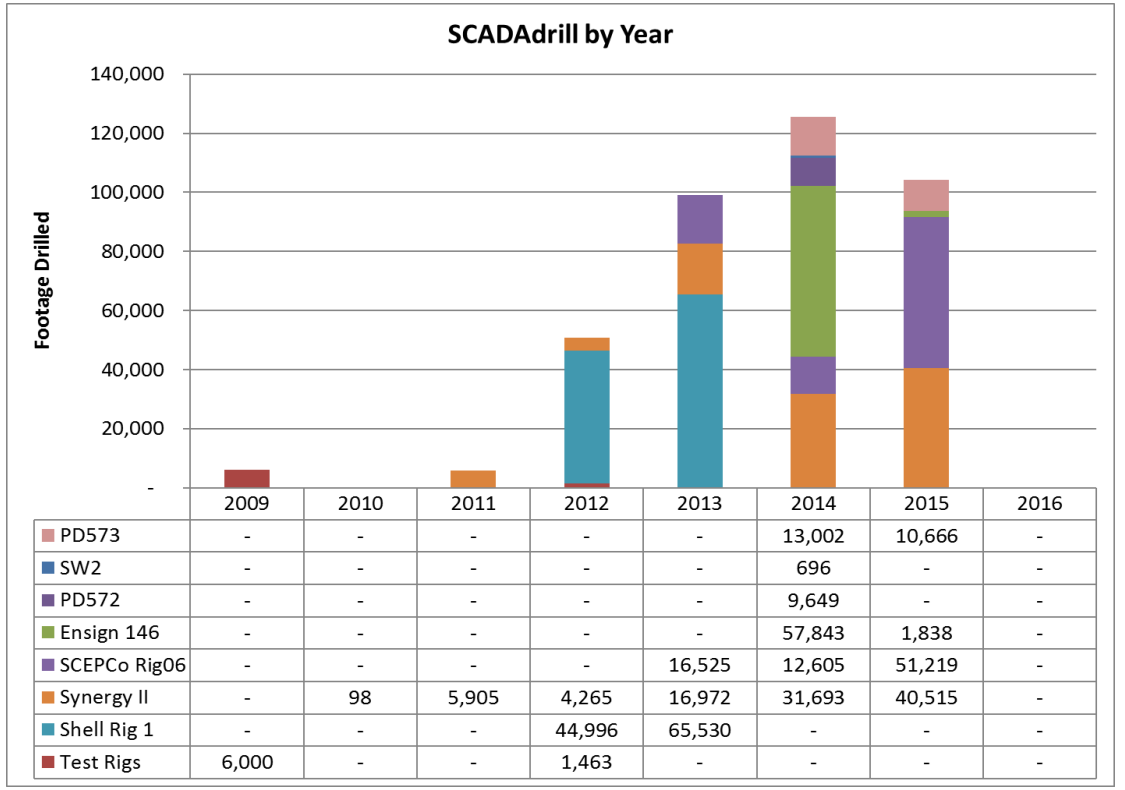
Roughnecks working on a drilling rig in Greeley, Colorado in 2008

Courtesy of National Institute for Occupational Safety and Health

Drilling ahead, Synergy Rig, The Netherlands in 2015

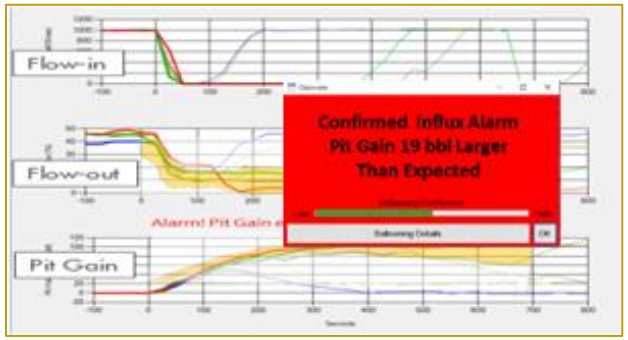
Shell's "SCADAdrill" Project (Short Story Version)

- Started in 2008 – as proprietary project
  - Scope: drilling [slips out to slips in]
  - "Prize" directional drilling cost and consistent "good" performance
- Overcame many issues, including:
  - Various commercial parties
  - No standard data protocols
- Achieved "technical success"
  - Automation system "beat" human Driller, drilled 391,478 feet
- Couldn't beat low oil price & reduction in drilling activity:
  - Lack of multiple rigs to spread fix costs
  - Rigs moved to one year contracts
  - Rig crews high-graded
- Cost driven pivot in 2016
  - Embed functionality into rigs native control system
  - *Initial indications of successful deployment in Permian [work in progress]*



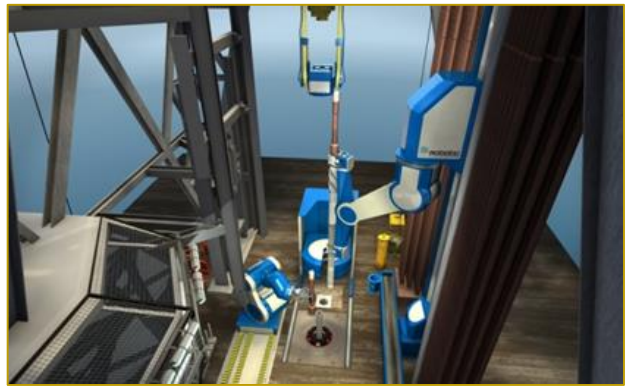
	2009	2010	2011	2012	2013	2014	2015	2016
PD573	-	-	-	-	-	13,002	10,666	-
SW2	-	-	-	-	-	696	-	-
PD572	-	-	-	-	-	9,649	-	-
Ensign 146	-	-	-	-	-	57,843	1,838	-
SCEPCo Rig06	-	-	-	-	16,525	12,605	51,219	-
Synergy II	-	98	5,905	4,265	16,972	31,693	40,515	-
Shell Rig 1	-	-	-	44,996	65,530	-	-	-
Test Rigs	6,000	-	-	1,463	-	-	-	-

Other automation projects…

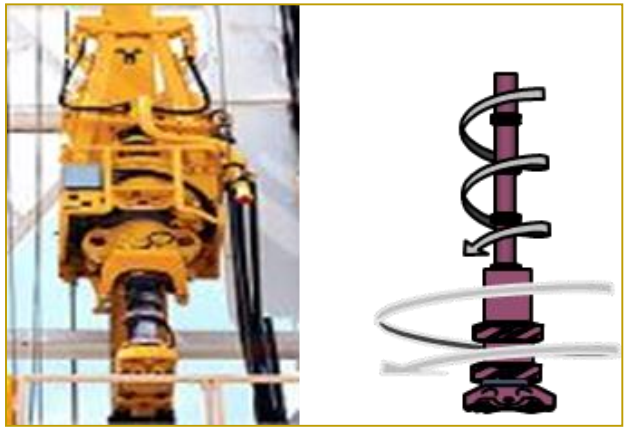


Kick Detection Automation
Inflow Detection At Pumps Stop IDAPS v10.0

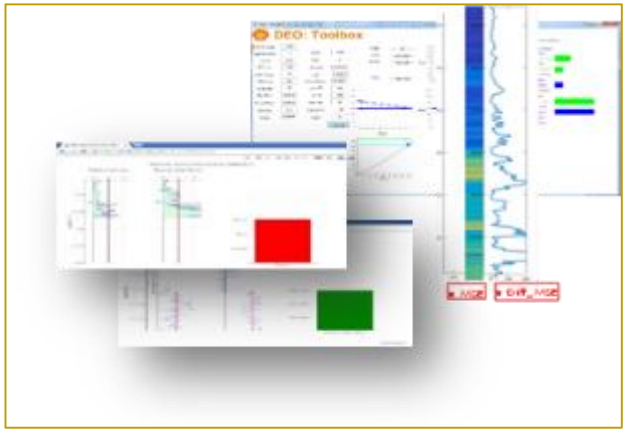
Automated BOP Testing



Drillfloor Robotics
JIP



Stick-slip Mitigation
Z-torque



Analytics / Machine Learning
Advisory Mode

Scope…
Ideas > Resources