Oil: An Industry Ripe for Change

Tim Marvel
Vice President, Wellsite Automation
Dover Energy Automation
We start our meetings with a safety moment...

Weight Matters
...and lately, a prayer

PLEASE GOD, GIVE ME ONE MORE OIL BOOM

THIS TIME I PROMISE NOT TO SQUANDER IT.
The state of the oil industry today...

Global Oil and Gas Job Losses: 350,000 and Counting

James Burgess, OilPrice.com – May 12, 2016

26%

2015 to 2016 Capital Budgets

Change in upstream capital budget (2015 to 2016)
Oil is a story of boom and bust...
US Shale Changed the Game

Fracking + Horizontal Drilling = US Oil & Gas Production

Figure 2: US crude oil production, 1900-2016, million barrels per day (mbd)


Source: Gray Rucker, prezi.com

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Easy oil is more scarce....

1949 – First offshore rig in 20ft water
2016 – Drilled a well in 10000’ water
Future – 12000ft water

...Requiring Wells with with Longer Horizontal Step Outs and in Deeper Water
...Requiring Bigger and more powerful Rigs

The standard: to go deeper / farther, build the rig bigger, more powerful. “Add iron and horsepower”. How big can you get?
...Lightweight materials are being explored...
...but have not taken

Composite Drilling Riser  Aluminum Drill Pipe  Aluminum or Ti Drilling Riser

Lightweight materials are not as well known, are not proven (data not there), and lack industry understanding (both the operator and suppliers).
Two keys to breaking into the oil industry with Titanium

1) **Education**: Educating engineers on the benefits of lightweight materials in their applications (know their environment)

2) **System Thinking**: You need to have system engineers that design systems, not components. To be cost competitive, you have to understand and change the system.

“Companies from outside the oil and gas industry sometimes offer technologies that represent solid advances....If you want to sell into the oil industry, learn more than just a few basics of what happens in a well.”

~ George E. King, pg 15, JPT, August 2016

The Opportunity: The “Lightweight Metals” industry should form a consortium to re-engineer key systems to take advantage of lightweight materials.
The future of the industry is another boom...and then a bust

Oil Price Predictions: $35-$70

Breakeven Oil Prices (WTI, $/Bbl): U.S. Onshore Resource Plays

*Assumes Strip Gas Pricing
Source: Raymond James Equity Research

At Current Prices, Growth is in the Permian / OK
Biggest oil rig ever: 200k-ton Sakhalin giant begins production

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Tim Marvel, Vice President, Wellsite Automation

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North American E&P companies: Net cash flows
(operating cash minus interest payments and capex)

Source: AlixPartners
Incremental World Petroleum and Other Liquids Production
EIA Jan 2011 - Dec 2016

mb/d

- Total World Supply
- OPEC NGLs
- OPEC crude
- Other Non-OECD
- U.S. (50 States)
- FSU
- Canada
- Mexico
- Other OECD
- North Sea
- China
- Base production

Data: EIA Short Term Energy Outlook Oct 2015
http://www.eia.gov/forecasts/steo/
### What it costs to produce oil

<table>
<thead>
<tr>
<th>Country</th>
<th>Capital expenditure</th>
<th>Operational expenditure</th>
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<tbody>
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<td>Brazil</td>
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</tbody>
</table>

Source: UCube by Rystad Energy, Interactive published Nov. 23, 2015

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The fuel mix is set to change significantly...

Base case: Primary energy

Shares of primary energy

Annual demand growth by fuel

Mtoe per annum

*Includes biofuels

2016 Energy Outlook
Tim Marvel, Vice President, Wellsite Automation

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Drilling Water Depth

Data Source: Wood Group, 2H Offshore

Permian Basin Lateral Length

Data Source: Rystad

Water Depth (ft)

Lateral Legnth (ft)

0 1000 2000 3000 4000 5000 6000 7000 8000 9000


Midland Basin Delaware Basin