Visual Analytics in the New Normal: Past, Present & Future

daloLOGIC Technology Showcase
Adapting to the New Normal, Nov 16th, 2017
Presentation Overview

PAST → How did we get here... and what is the “new normal”?

PRESENT → How are innovators adapting to the new normal?

FUTURE → What could it look like & what challenges do we face?
PAST

How did we get here?
Producing Wells

In 2017 horizontal wells account for 23% of total Producing Wells
In 2017 horizontal wells account for 65% of total Gas Production
Growth of the Montney

WCSB Gas Production by Formation

2017 WCSB Top 10 Gas Formations (mcf/day)

- Montney Formation: (5,450,987) 30%
- Spirit River: (2,660,776) 15%
- Ellerslie Member: (308,910) 2%
- Turner Valley Formation: (321,600) 2%
- Duvernay Formation: (335,707) 2%
- Viking Sandstone: (359,450) 2%
- Glaucolithic Sandstone: (658,009) 4%
- Oil Sands: (692,211) 4%
- Cardium Sandstone: (756,677) 4%
- COMMINGLED: (2,163,703) 12%
- Remaining: (4,439,209) 24%
In 2017 horizontal wells account for 79% of total Oil Production
Growth of the Oil Sands

WCSB Oil Production by Formation

2017 WCSB Top 10 Oil Formations (bbl/day)

- Remaining: (540,776) 22%
- Glauconitic Sandstone: (41,859) 2%
- Montney Formation: (46,547) 2%
- Lloydminster Member: (63,461) 2%
- Lower Grand Rapids: (63,623) 2%
- Midale Beds: (54,445) 2%
- Sparky Member: (55,782) 2%
- Viking Formation: (65,518) 3%
- Bakken: (68,606) 3%
- Cardium Sandstone: (72,182) 3%

Oil Sands: (1,428,229) 58%
Completions Learning Curve

Completion Trends - Cardium

Year


WCFD - Completed Length (m) Array

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WCFD - Stages Actual (#) Array

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WCFD - Proppant Placed (total tonnes) Array

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WCFD - Avg Frac Spacing Array

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Data provided by GDC Public Data - Nov 12, 2017, 8:29 PM VERDAZOLM
Oil Price (lower for longer)
Gas Price (has been low since 2009)
Price Impact on Drilling Activity
Impacts of Low Commodity Prices

- Exodus of larger companies from Canada
- Stranded production (pipelines not approved & Petronas FID)
- Service price reduction… is now rebounding
Consolidation of Producers

WCSB 10 Largest Producers (2017 Jan-Aug boe/day)

- CANADIAN NATURAL RESOURCES LIMITED: (654,849) 12%
- CENOVUS: (538,449) 10%
- HUSKY OIL OPERATIONS LIMITED: (265,306) 5%
- ENCANA CORPORATION: (238,468) 4%
- TOURMALINE OIL CORP.: (206,301) 4%
- SUNCOR ENERGY INC.: (197,479) 4%
- IMPERIAL OIL RESOURCES LIMITED: (170,650) 3%
- CRESCENT POINT ENERGY CORP.: (150,850) 3%
- DEVON CANADA CORPORATION: (136,874) 3%
- PROGRESS ENERGY CANADA LTD.: (133,973) 2%

Remaining: (2,672,025) 50%
What is the “new normal”?

1) **Prices “lower for longer”**
   - Smaller teams, same amount of work (~50,000 job reduction in Canada)
   - Attempt to grow with minimal hiring

2) **This will result in a greater reliance on data and technology**

3) **Smaller margins will create a greater emphasis on:**
   - Reduced operating costs
   - Calculated capital expenditures
   - Better uncertainty/risk management and planning
   - Market sensitivity to production shortfalls
2017 investors’ reactions to production guidance shortfalls resulted in share price reductions

From Verdazo blog: Managing Uncertainty: the difference between Investing & Gambling
PRESENT

How are innovators adapting to the new normal?
Analytics in the Royalty Review

Visual analytics informed the Alberta Oil & Gas royalty review

- Use of geoLOGIC’s Well Completion & Frac Database
- Consortium contribution of actual data for calibration with DOE results
- C* calculation evolved to include proppant
- Analysis was done in VERDAZO in real-time with stakeholders in the room
Operator Example 1: Digital Meetings

1) Bye-bye production reports
   - paperless, digital discussions that happen in real time

2) Zero prep time for well reviews
   - interactive live visualization and collaboration
   - integrated analysis of production, financial, forecast & public data
   - Example company: >$175,000 reduction in well review prep time alone
Operator Example 2: Digital Workshops

1) Visual analysis workshops
   - questions explored and answered in real-time
   - connected to live data sources (e.g. geoLOGIC data sources + proprietary data sources)
   - reliable, repeatable, auditable decision support

2) Workshops include:
   - Downtime reduction (e.g. $12 million net revenue improvement on 41 wells)
   - Completion optimization (statistical, multivariate, Machine Learning)
   - Competitor analysis
   - Acquisition analysis

"Tasks that would take an entire day now take 1-2 hours or in some cases minutes… with ultimately a better result"

Chevron Senior Engineer
Operator Example 3: Optimizing Revenue

1) Creative integration of multiple data sources

2) Complex algorithms to find value & plan ahead... for example:
   - Current netback analysis (supports shut-in planning for different price scenarios)
   - Theoretical gas component vs actual sales (ensuring all liquids revenue is being captured)
Operator Example 4: Automation

- ~10,000 CBM wells (managed by 5 engineers)
- Avg rate = 30 mcf/day
- Creative use of data to develop optimization algorithms
- Algorithms run daily
- Automatically sends cleanout requests to service company
Adoption is strongest where data is readily available with a strong connection to a production outcome.

**Completions**
- Industry adoption = **moderate to high**
- **Data is readily available & of high quality**
- **Analysis:** correlations, statistical, regression/multi-variate & AI/ML

**Drilling**
- Industry adoption = **low to moderate**
- **Data volume is massive & complex**
- **Analysis:** mainly focused on basic KPI’s (+ real-time)

**Operations**
- Industry adoption = **low**
- **Requires significant data integration**
- **Analysis:** dominated by Excel (often isolated efforts by individuals)
Current Trends

1) **Stronger integration across disciplines to look at assets more holistically, across all life stages (G&G, Planning, Drilling, Completions, & Operations)**

2) **More and better integration of multiple data sources**

3) **Visual analytics use company wide (a culture of analytics)**

4) **Increased reliance on data quality in decision making**
Current Trends cont’d

5) Automation of repeatable tasks

6) **Stronger reliance on technology & vendors with domain expertise** to expedite process improvements & efficiencies

7) Emphasis on best practices (e.g. asset reviews, type-curves, uncertainty management)

8) Vendors working together to deliver better solutions for their clients
FUTURE

What could/should it look like & what challenges do we face?
Analytics Hype vs Proven Benefits

Start with proven technology...
Visual Data Discovery

Expectations

Time

Years to mainstream adoption:
- 0 less than 2 years
- 2 to 5 years
- 5 to 10 years
- more than 10 years
- obsolete before plateau

As of July 2016
Analytics Adoption Rate by Industry

“...we believe the next 5 years to be the first tangible commercialization period for Big Data & Advanced Analytics in the Oil & Gas Industry”

Darcy Partners, Perspectives on DATA & ADVANCED ANALYTICS IN THE OIL & GAS INDUSTRY, 2015
Effect of digitization still unknown, and disruptive changes remain to be seen; these industries have a similar level of digitization.
1) The O&G Industry has a long way to go (see previous 2 slides)

2) Investing in innovation while in a cost reduction mode...

   “I know I can save money if I invest in technology... 

   but I don’t have any money to spend”

3) Change Management: Technology is not the obstacle, it’s People, Processes and quality Data
1) **Advanced Analytics**
   - Automation, notifications, predictive analytics, AI / Machine Learning
   - Will help us to understand, focus on what counts & improve the dialogue across disciplines
   - Will move activities up the value chain, it won’t replace people

2) **Consortiums / data sharing / joint studies**
   - Operators sharing data to leverage processing capabilities and insights of advanced analytics

3) **Continued focus of advanced analytics on G&G modelling, drilling and completions with slow adoption across operations**
Conclusions
Conclusions

1) The industry has transformed how it produces, increasing their response to supply demands, which could limit price recovery.

2) Lower prices for longer and growth without hiring are the “new normal” making data and technology key to market survival and success.

3) The industry requires a major shift in its approach towards, & investment in, technology and will rely more on forward thinking vendors with domain expertise to take full advantage of analytics opportunities.
Thank You

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