



Lima Section

Society of Petroleum Engineers
Lima Section

DIGITAL TRANSFORMATION IN WELL DRILLING PROJECTS

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Why are we here today?



GOOD OLD DAYS



Content



- Digital Transformation (DT).
- Cepsa Digital Transformation.
- Data Management (DM) Technology.
- Data Quality Assurance & Quality Control (QA/QC).
- The Drilling Process.
- Drilling Data Analytics.



Digital Transformation

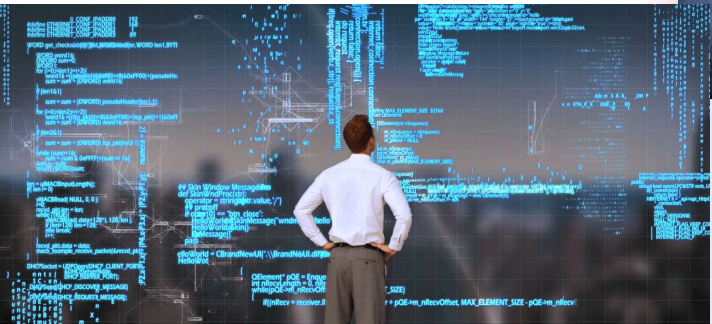


What is DT?

Transforming **Innovation**



Transforming **Teams**



Strategic



Planned

Organizational

Change.



Transforming **Culture**

.... enabled by **Technology**

Digital Transformation



DT around the world:



Today Success

Today?

Digital Transformation



Technology creates a perfect storm of changes:



Big Data



The internet of things



Robotic

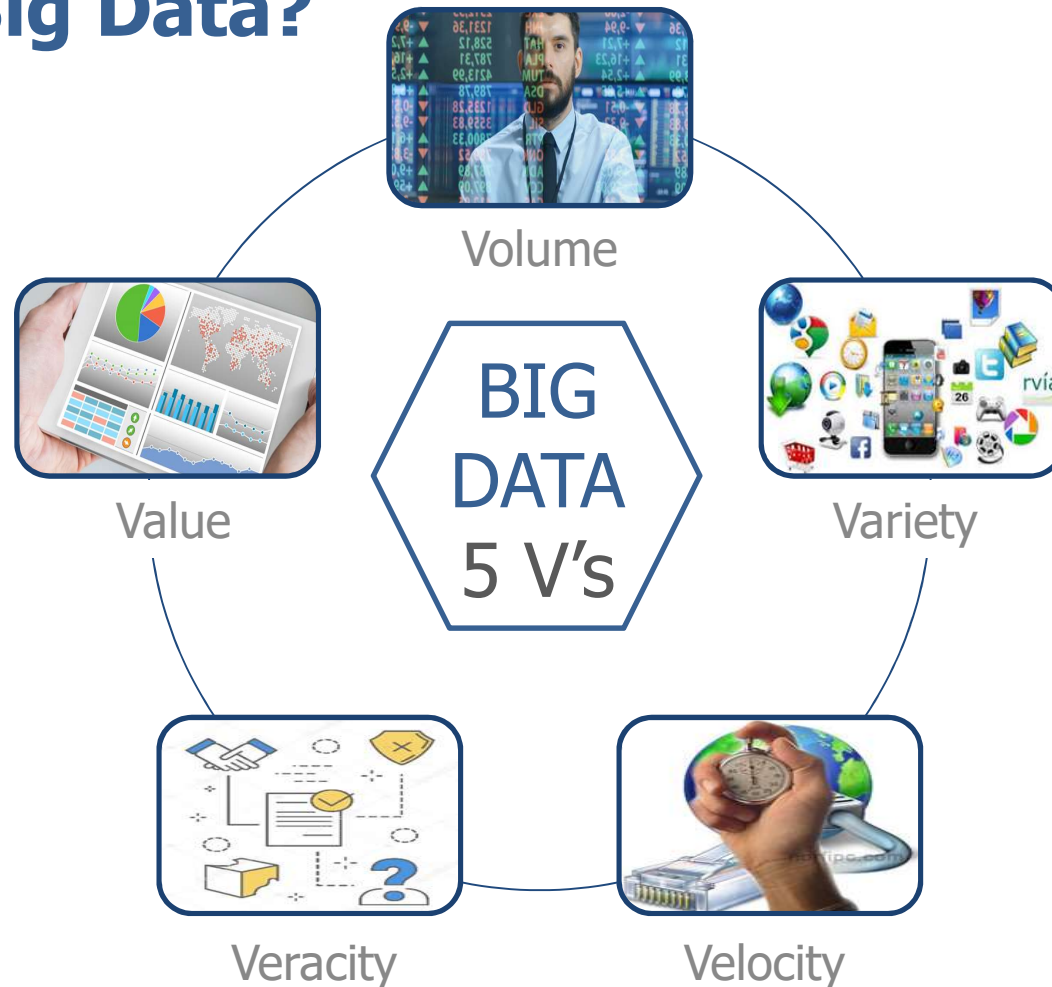


Artificial Intelligence

Digital Transformation



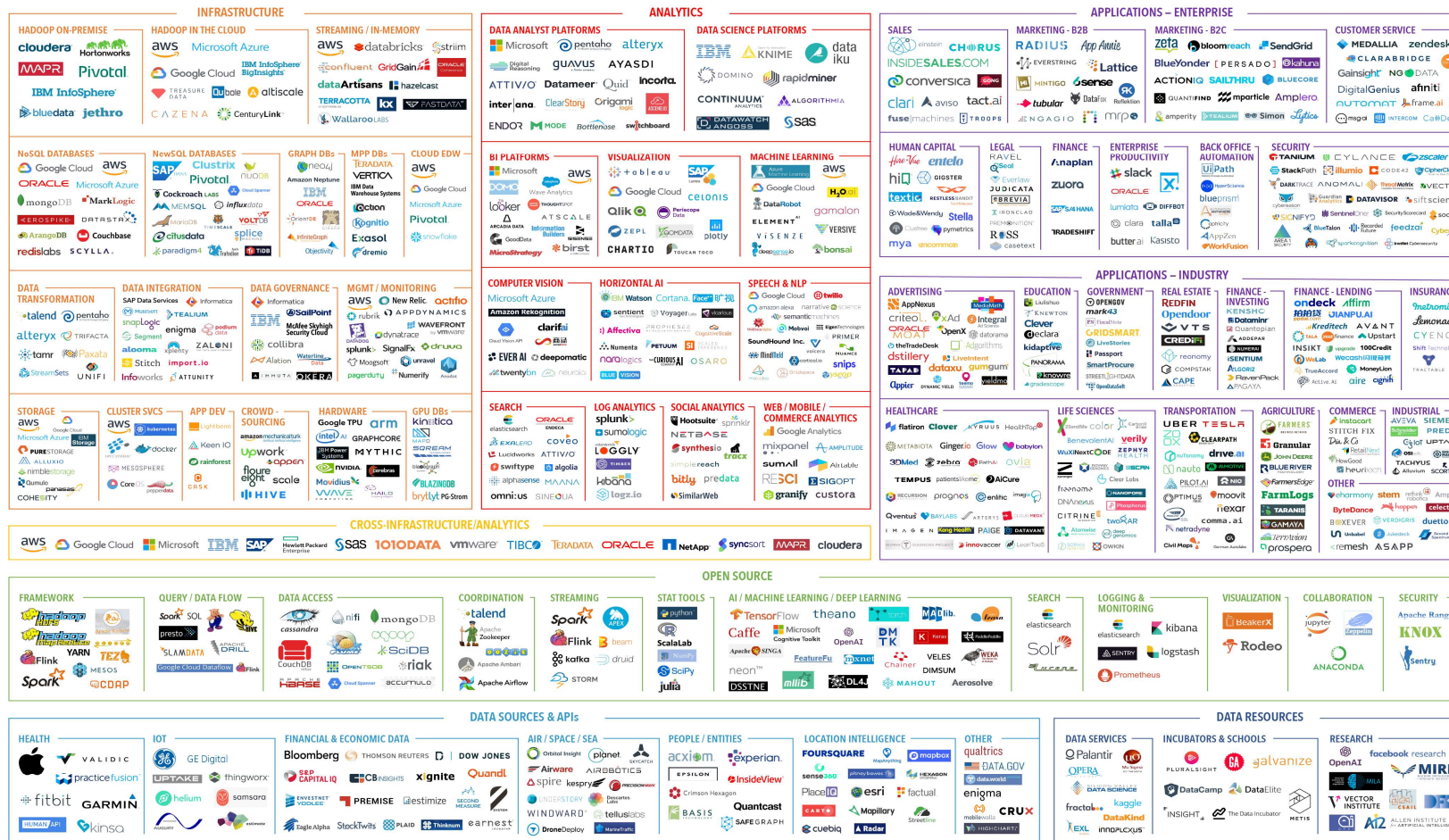
What is Big Data?



Digital Transformation



Big Data Landscape:



Digital Transformation

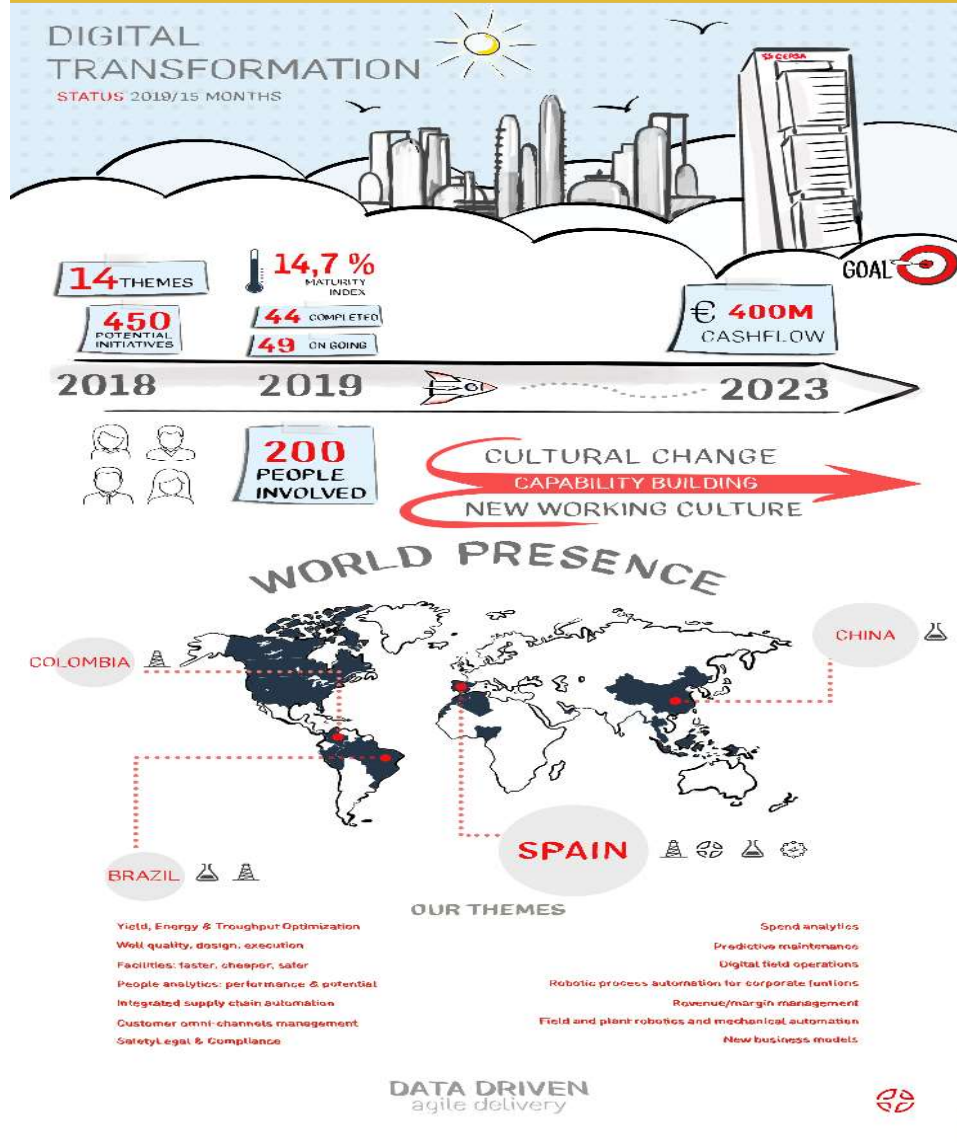


Big Data - What is cloud Computing?



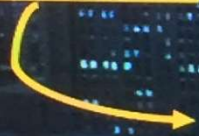
It is the **glue** in digital transformation

CEPSA DT



- 15 months driving Cepsa's DT.
- Cultural Overhaul
- Numerous Initiatives
- New Agile-based Working Ways
- Best Decisions based on Data
- Becomes More Efficient

data



insights



decisions

“Data Driven and Agile Delivery”

DATA DRIVEN

We have to build the Data Lake in order to support the construction of Product over it.

data

algorithms

visualization

“Our people continuously learn how to achieve superior efficiency, flexibility and innovation for our customers and ourselves through the daily application of proven digital technologies, tools and methods” ”

DATA LAKE



“The democratization of the Data”

There is a lot to do. **Cepsa** needs you.

THE
FUTURE
DOESN'T **JUST**
HAPPEN

DM Technologies



How can we take advantage of all this data?

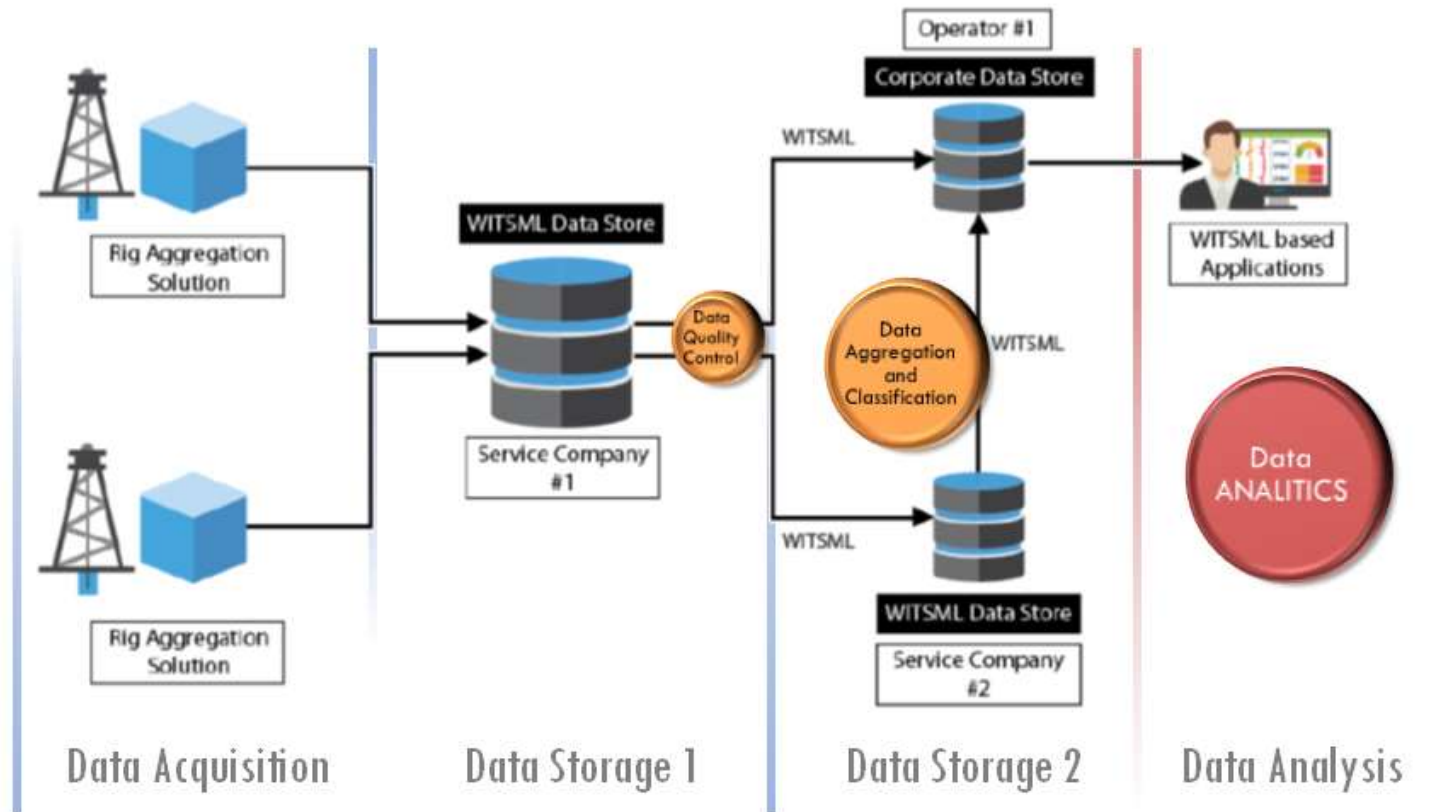


Data Management (DM) Technologies

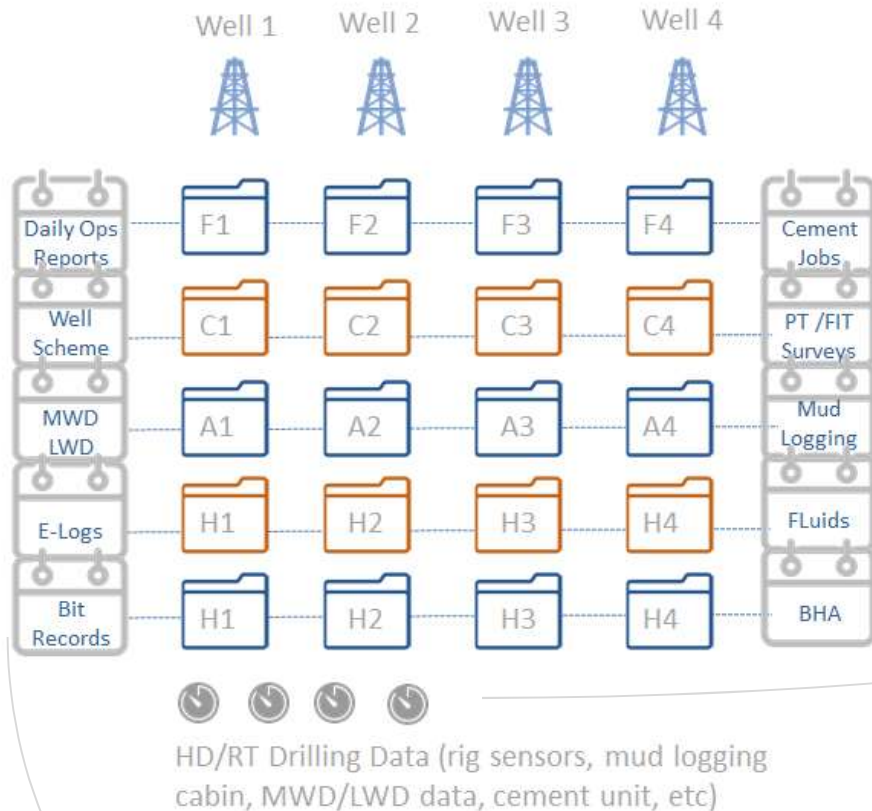
DM Technologies



Data Exchange Standard Upstream O&G Industry



DM Technologies



- **Person filling in the form.**

- Same data from different service companies.
- Time stamp in real-time data.

- Sensors calibration & consistency of measurement.

- Units of measurement.

... **Reliability of data source is more important than acquisition method**

DM Technologies



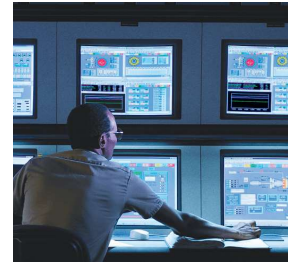
Data Storage: Multiple Databases



User 1



User 2



User 3



User 4



Application 1



Application 2



Application 3



Application 4

Drilling Data



DataBase 1

Costs Data



DataBase 2

Production Data



DataBase 3

Other Data



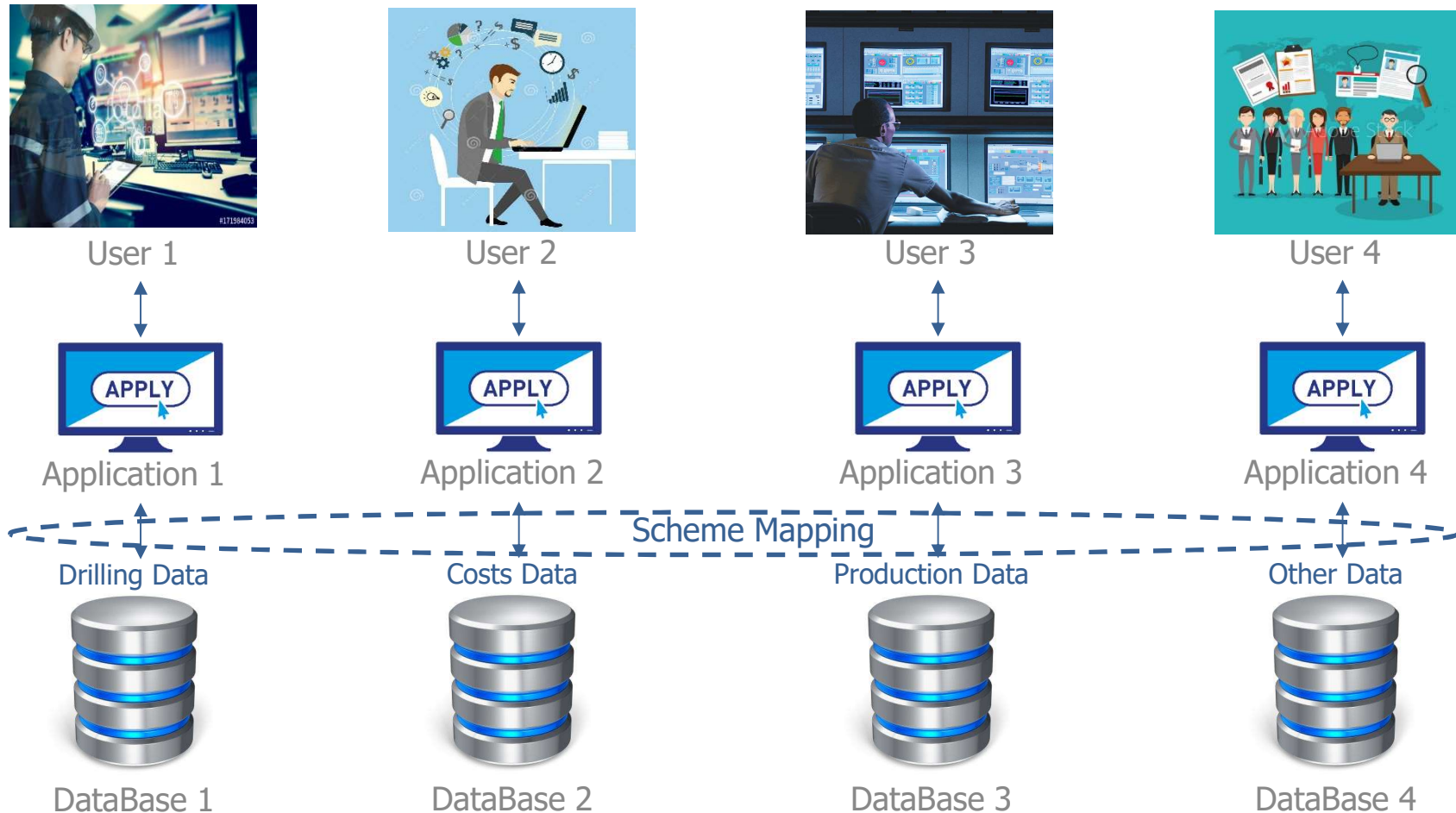
DataBase 4

Multiple Databases (Data silos)

DM Technologies



Data Storage: Multiple Databases

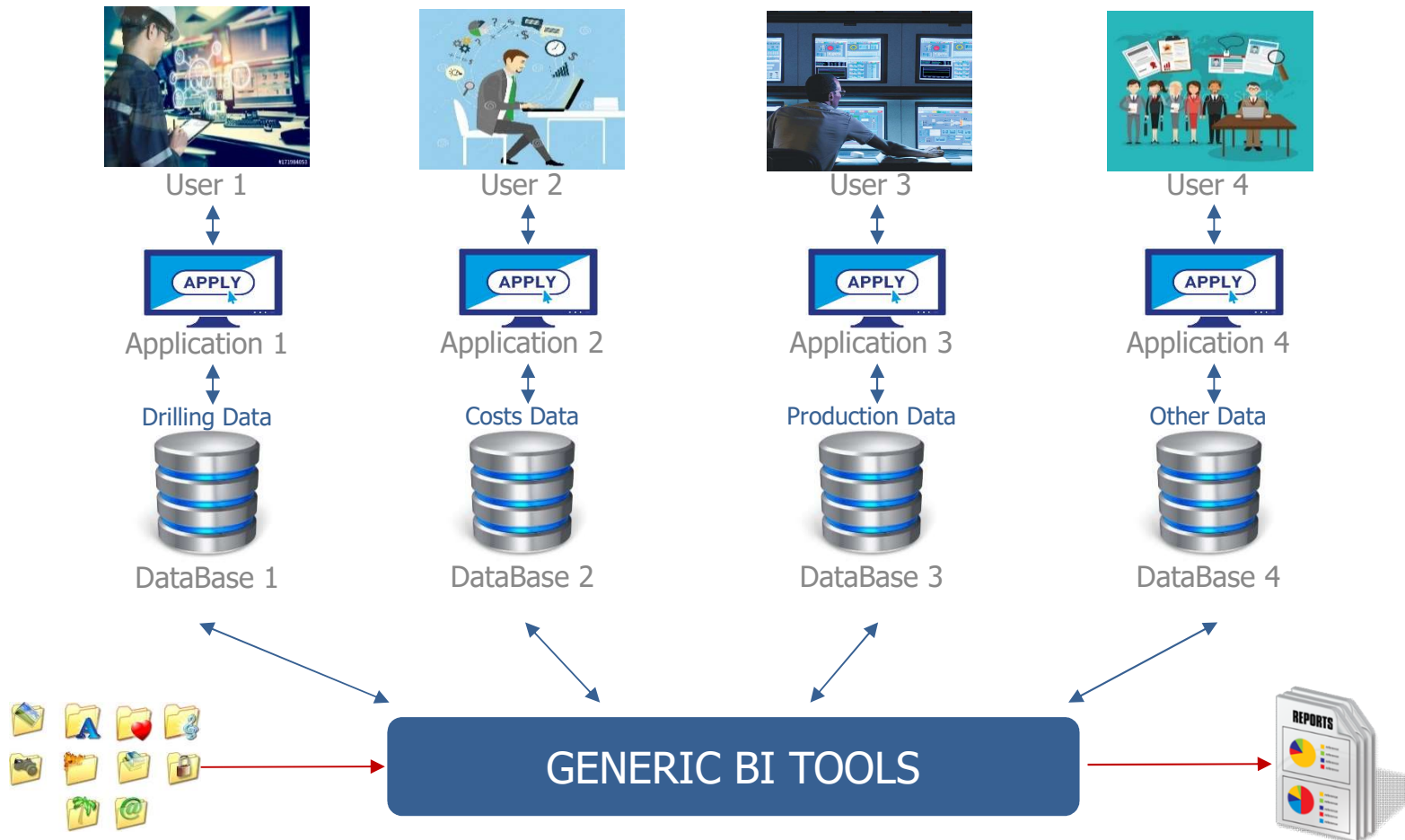


Multiple Databases (connectors and scheme mapping)

DM Technologies



Data Storage: Multiple Databases

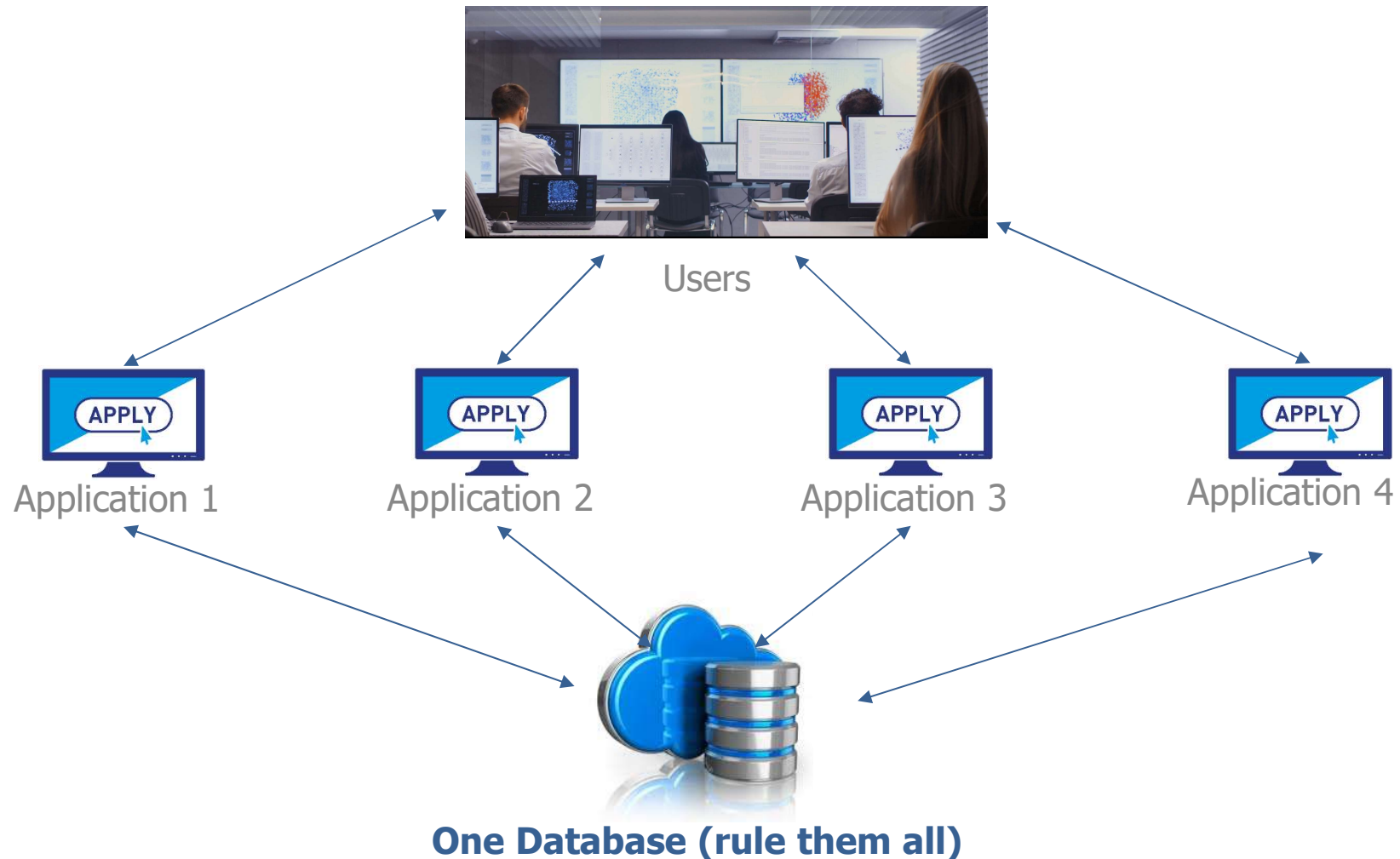


Multiple Databases (Combine data from different sources)

DM Technologies



Data Storage: Multiple Databases

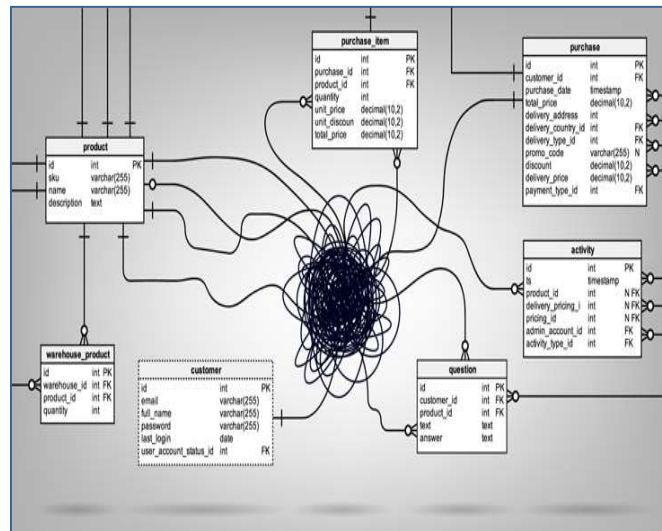


Data QA/QC Analysis



Data Quality Control Analysis

...Most common **E**rrors in drilling database:



- Wrong datum/Unit.
- Inconsistency.
- Dispersed data source.
- Outliers/anomalies.
- Bad relationship between data entities.
- Missing data.
- Data from uncalibrated/bad sensors.

Data QA/QC Analysis



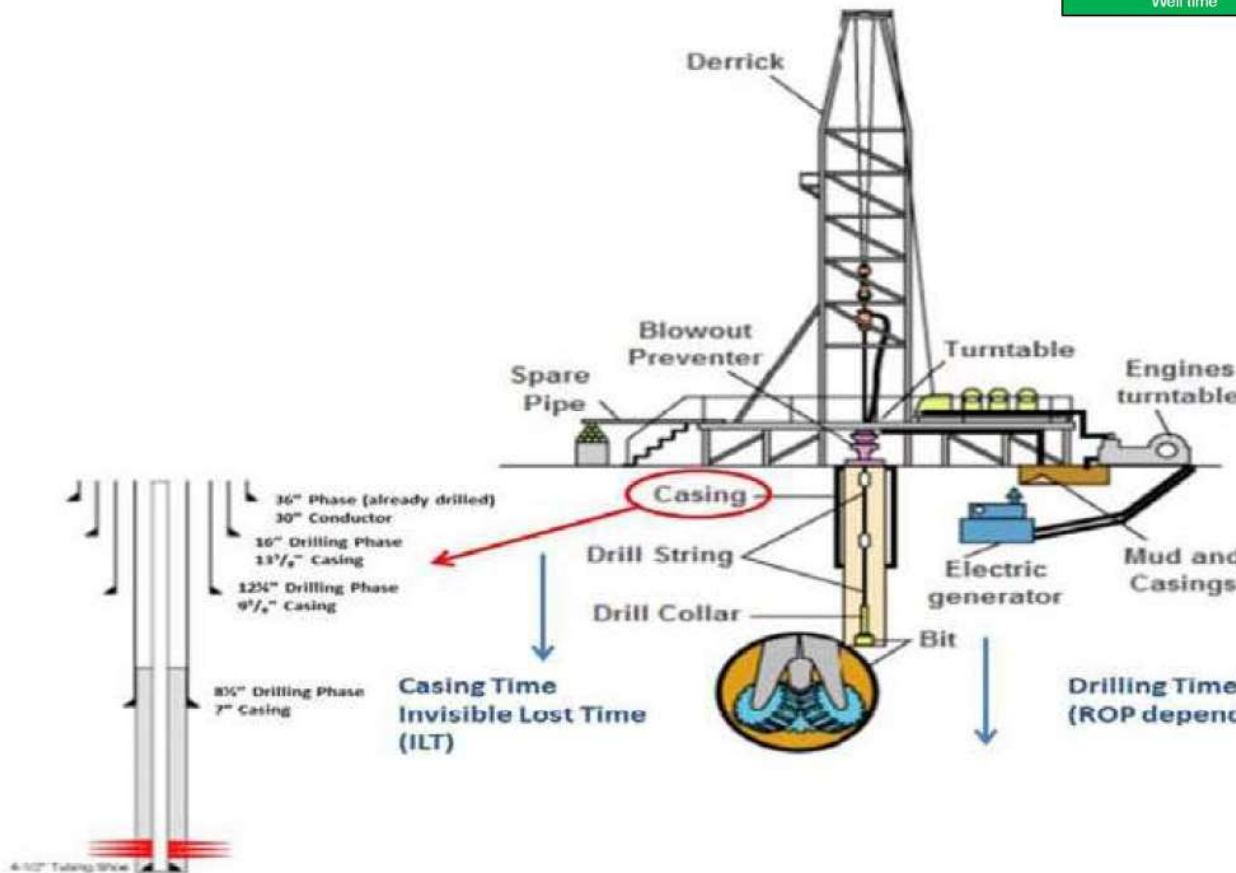
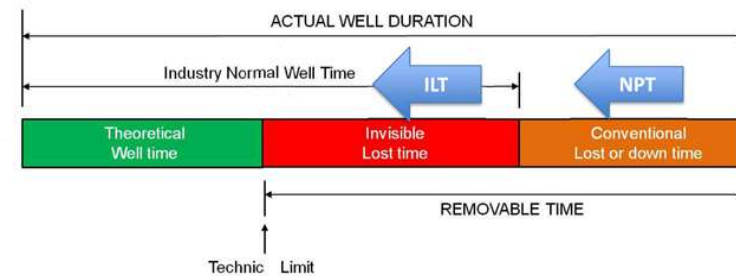
- What to clean?
- When to clean?
- How to clean?
- Who is cleaning?
- Where to keep cleaned data?



The Drilling Process



What is the problem?



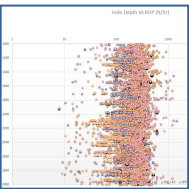
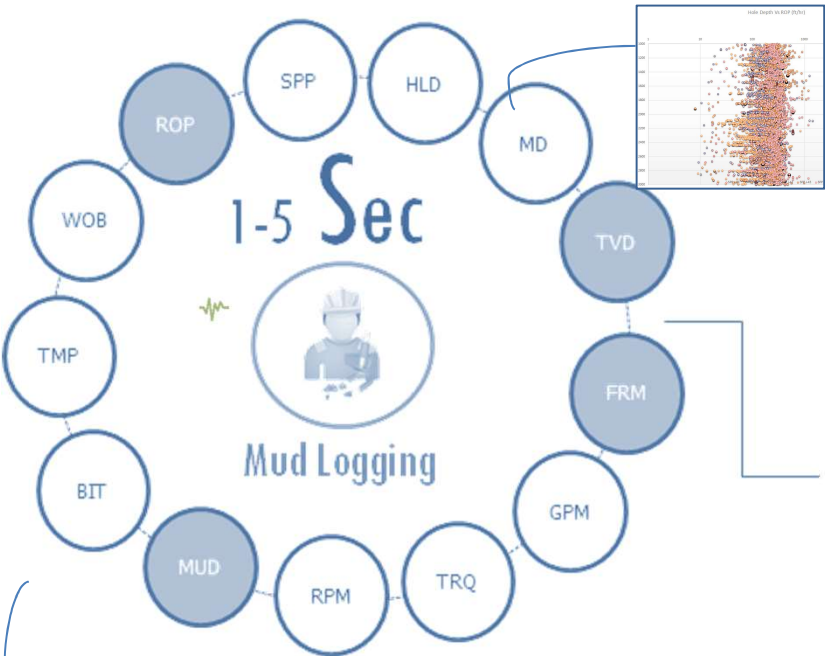
Flat Time Invisible Lost Time (ILT)

- Wellhead working time
- Cementing time
- Picking up and Laying down Bottom Hole Assembly time
- BOP Test time
- Logging time

Tripping Time Invisible Lost Time (ILT)

- Connection Time ILT
- Reaming (Weight-to-Slips) time:
- Run (Slips-to-Weight) time:
- Stationary (Slips-to-Slips) time:
- Circulation time

Data Analytics



Drilling Process



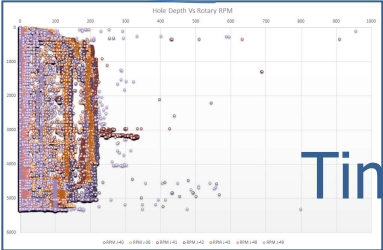
Directional Drilling



1-24 Hr

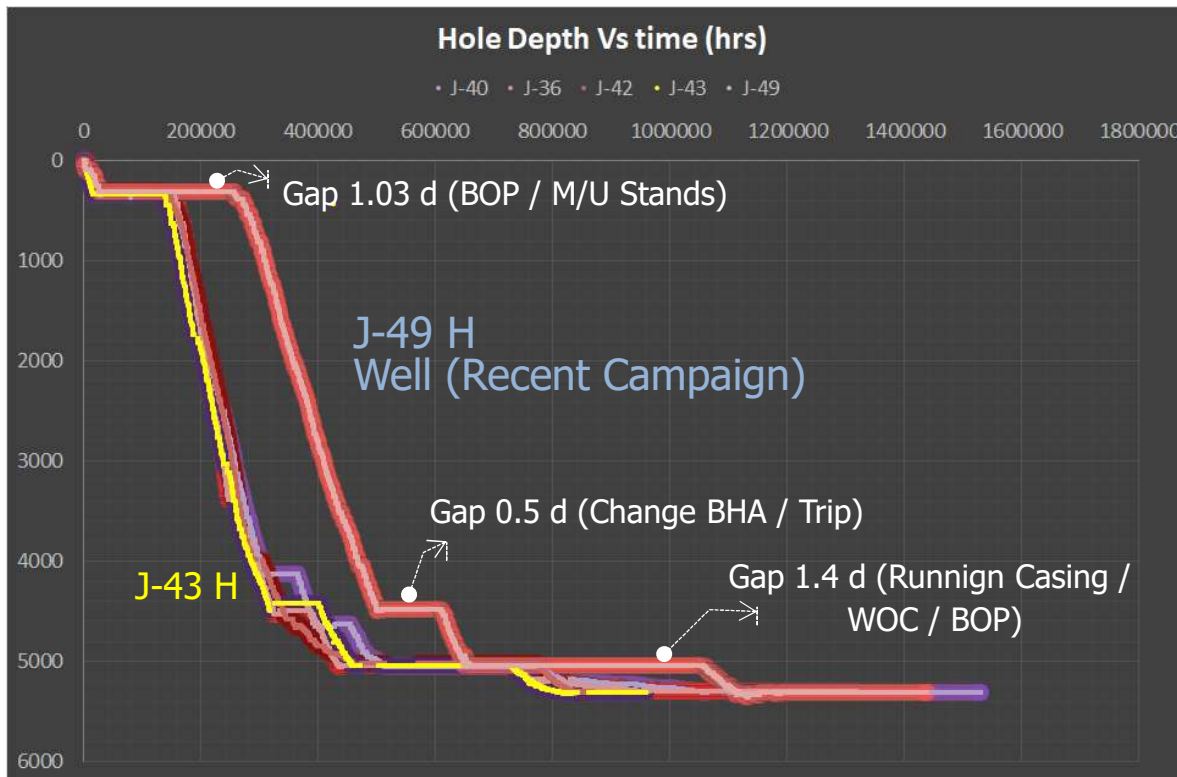


Operator



50-300 K
Time data points

Traditional Approach?

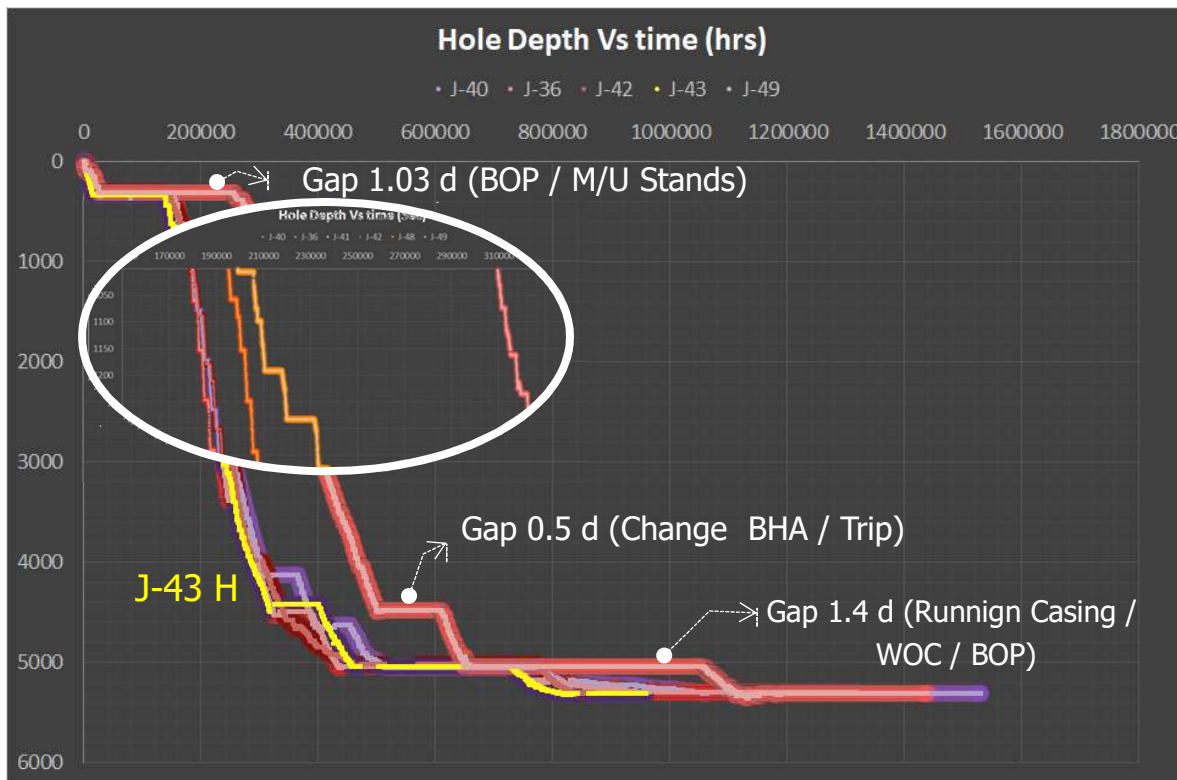


- Time Plan Vs Real
- Technical Limit
- Best Performance
- NPT Analysis
- Flat Time Analysis
- Average ROP

Data Analytics



Can we do more?

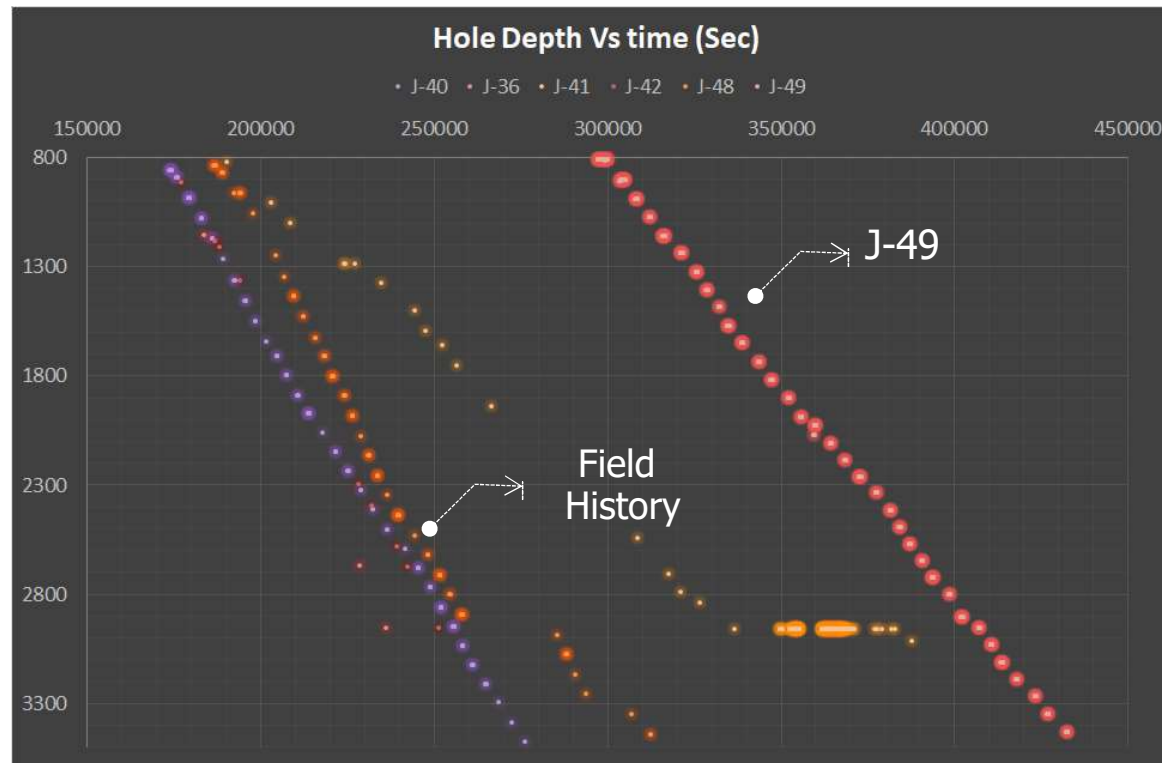


- Reaming Stands
- **Connection Time**
- Failures IRN
- Effective ROP
- Circulation Time
- DD settings

Data Analytics



Interactive Filtering?

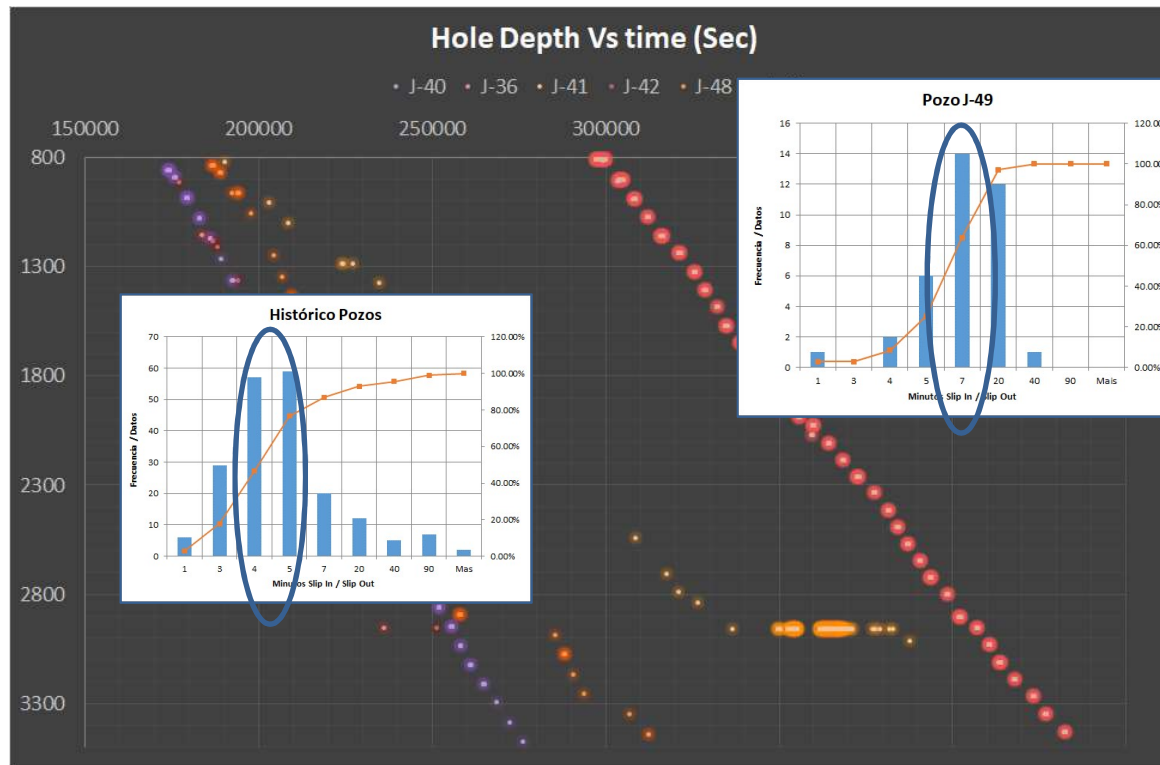


- T Vs Depth Filter
- Hook Load Filter
- Drilling stage Filter
- **Slip In – Slip Out**
- # Counts

Data Analytics



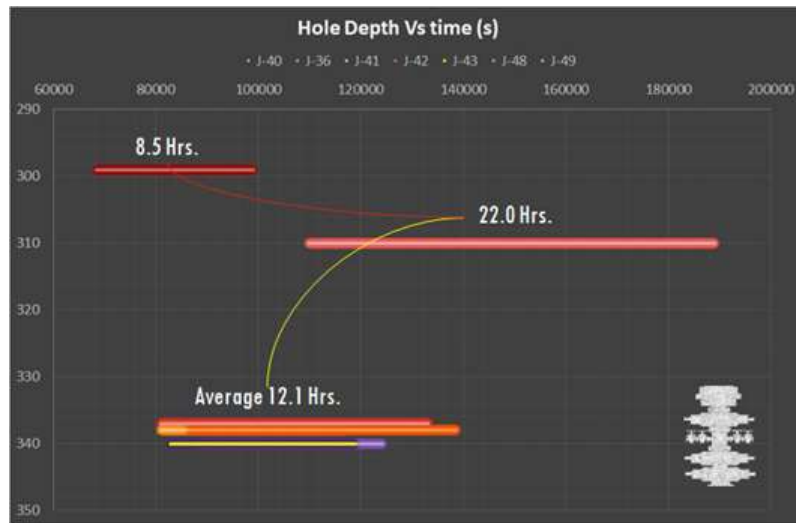
Stats?



- T Vs Depth Filter
- Hook Load Filter
- Drilling stage Filter
- **Slip In – Slip Out**
- # Counts
- **Histograms**
- Specific Tech Limit

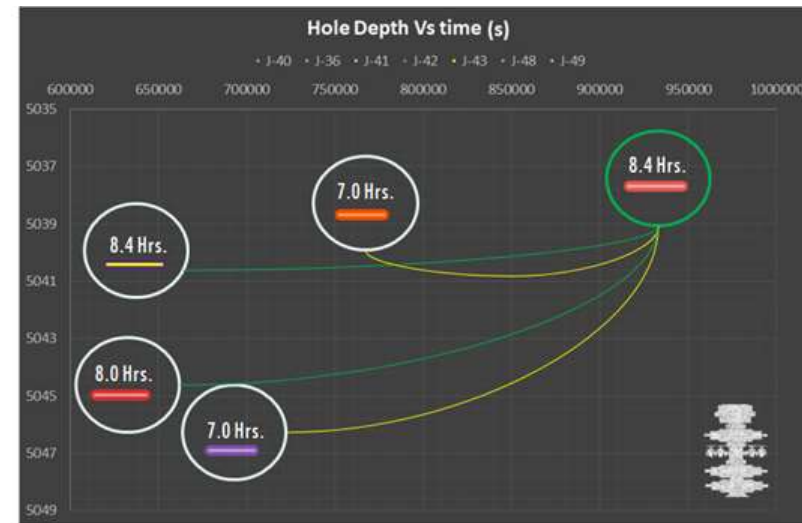
More Filtering?

Surface Casing Section



- T Vs Depth Filter
- BOP Installation Filter Surface

Intermediate Casing Section

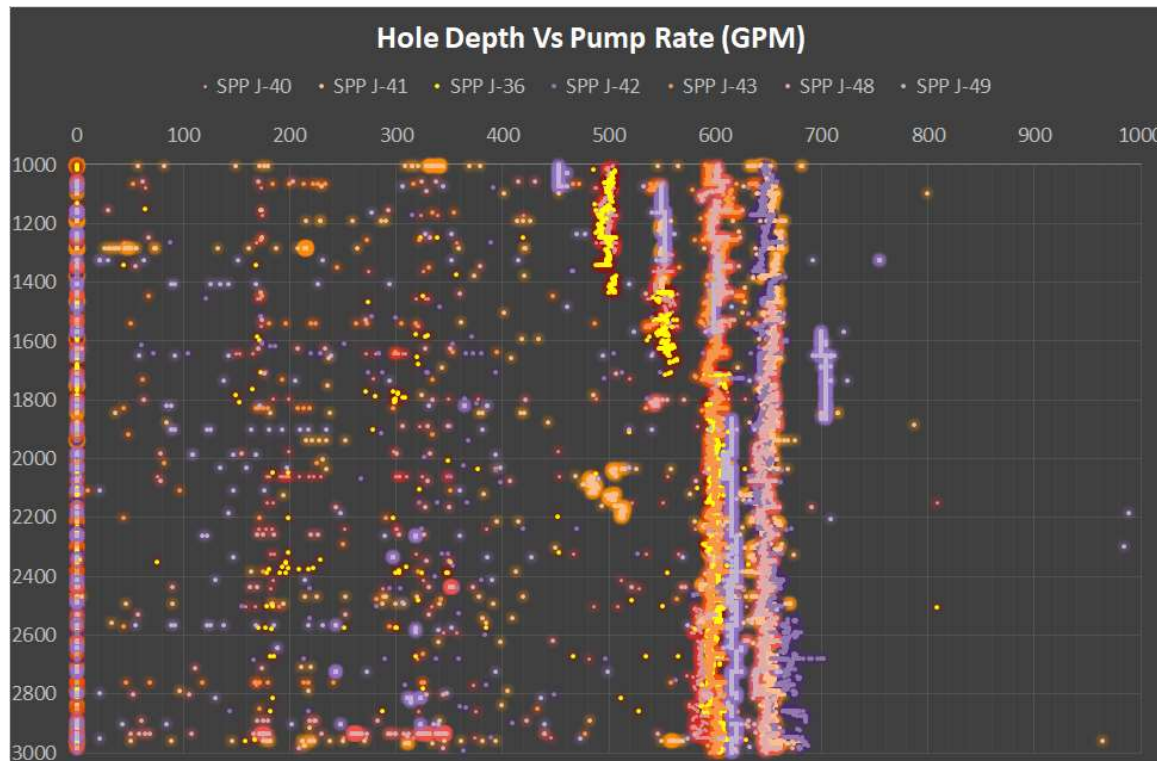


- T Vs Depth Filter
- BOP Installation Filter Intermediate

Data Analytics



Digging Deeper?

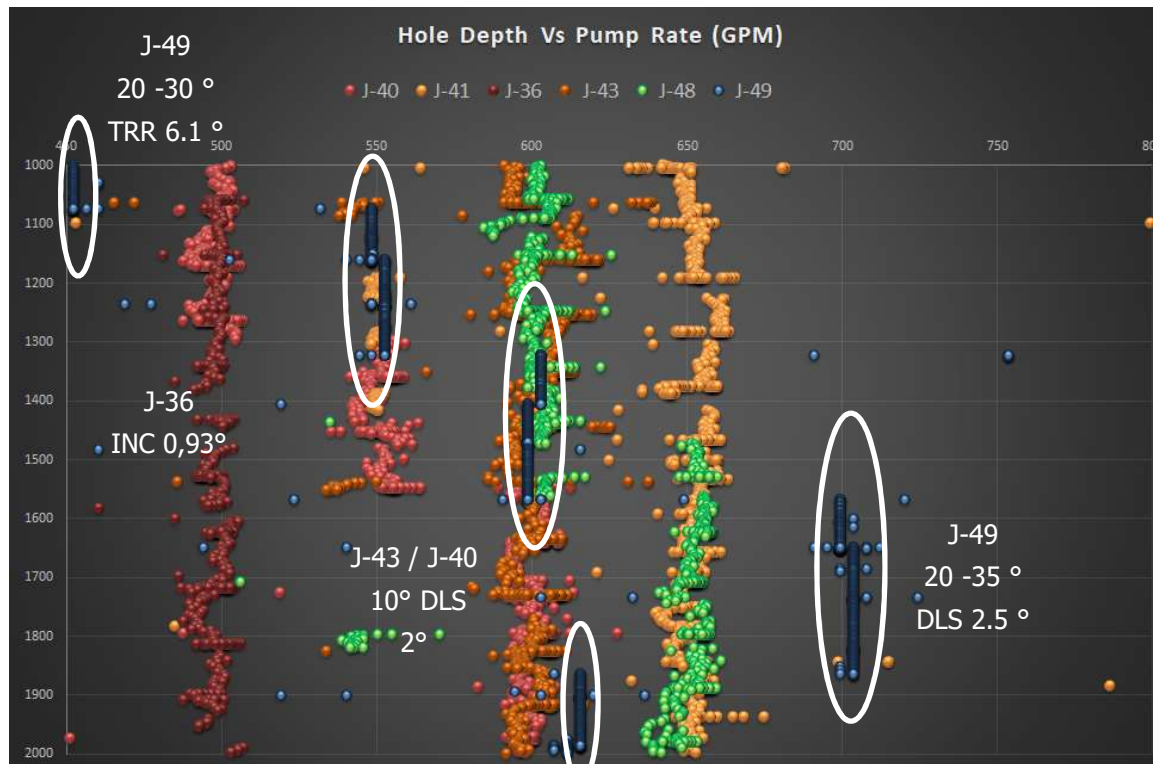


- GPM Vs Depth Filter

Data Analytics



Digging Deeper?

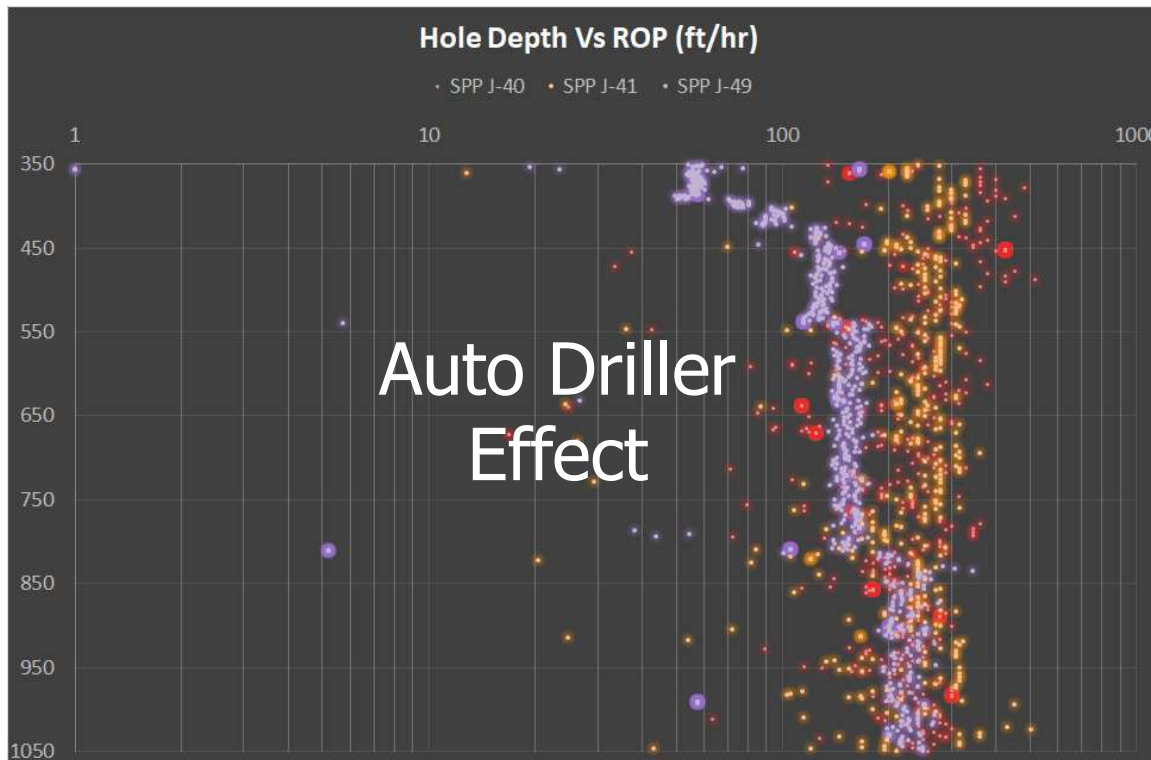


- GPM Vs Depth Filter
- DRL Filter
- **GPM Filter**
- Noisy Well Filter
- + Directional Survey
- ROP and Construction Analysis

Data Analytics



Digging Deeper?

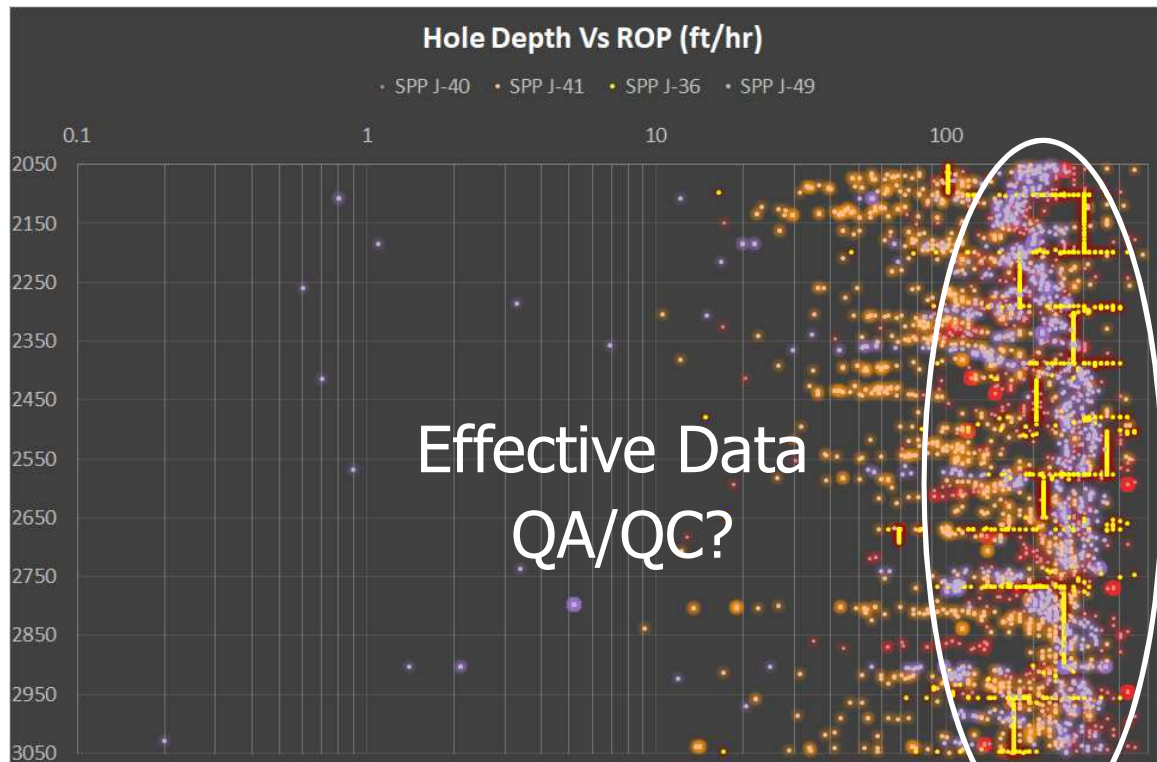


- ROP Vs Depth Filter
- DRL Filter
- Depth Filter
- **ROP Filter**
- Logarithmic Axis
- Survey Analysis
- ROP & Construction Analysis

Data Analytics



Take a Look ?

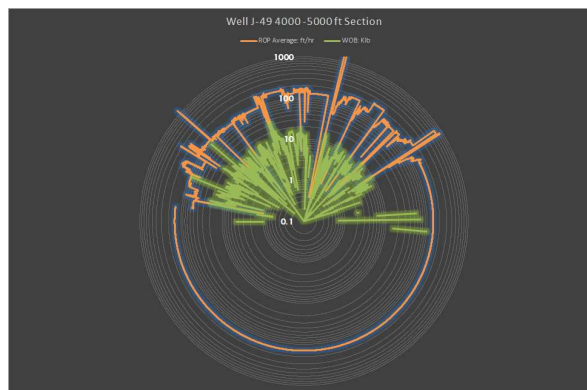
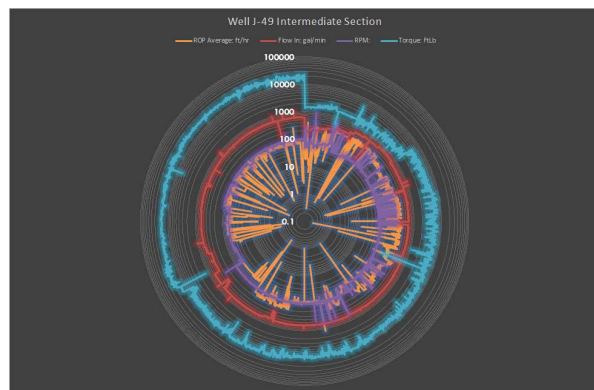
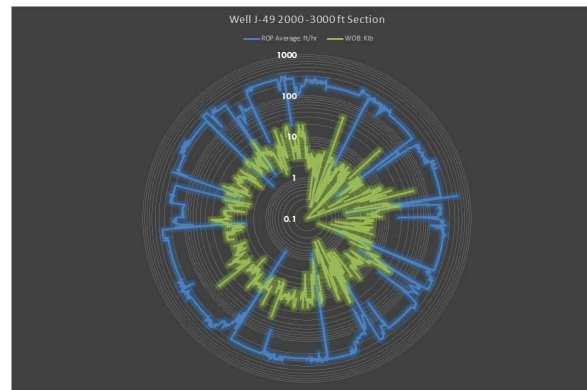
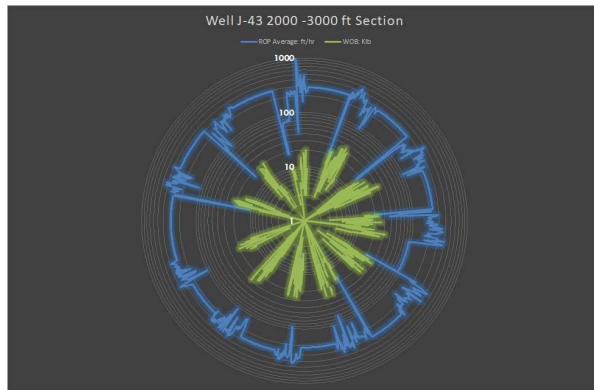


- ROP Vs Depth Filter
- DRL Filter
- Depth Filter
- **ROP Filter**
- Logarithmic Axis
- Survey Analysis
- ROP & Construction Analysis

Data Analytics



Take a Look ?

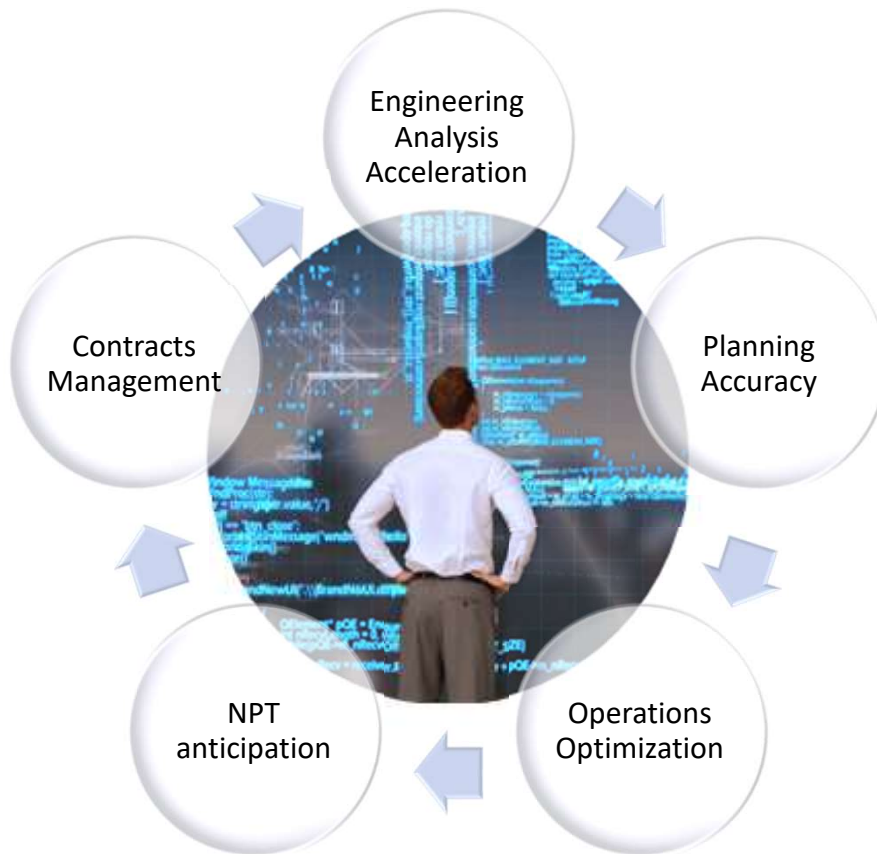


- Multivariable Analysis
- DRL Filter
- Depth Filter
- **ROP Filter**
- Logarithmic Axis
- Next? Twin Modeling
- **Monitoring Dashboard**

Data Analytics



How can we take advantage of all this data?



10 - 15 %

Capex

Reduction

References



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Thank you

Questions?



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