A new versatile algorithm for petrophysical interpretation

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Agenda

- Introduction

- Problem Definition

- Project Background

- Problem Solution

- Project Implementation

- Value to KMG organization

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# Project background

What is the **petrophysical interpretation**?


I'd say, about 3 billion tons

Data collection

Data QC

Processing

Answers

Project background

What is the **petrophysical interpretation**?

Hole conditions	Local knowledge	Core	Offset wells	Production
data	Tests	World knowledge	Dependencies	Logs
Skill	Patience	Common sense	Ingenuity	Experience

Data collection

Data QC

Processing

Answers

Petrophysical Interpretation

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Project background

What is the **petrophysical interpretation**?

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Data QC

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Answers

Petrophysical Interpretation

Geological and Reservoir modelling
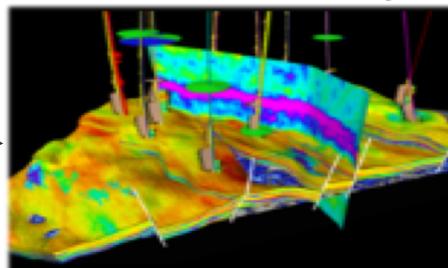
Reserves estimation

$$\frac{q}{\Delta p}$$

$$\frac{1}{b_{pss}}$$

$$\frac{S_o N_p}{c_t \Delta p}$$

OOIP (N)
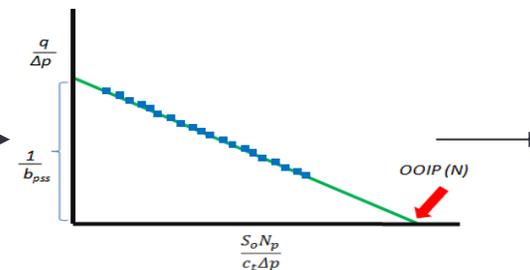
Economics

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Project background | Uzen reinterpretation

Key companies of the KazMunayGas group

Uzen oilfield

| Oil upstream	Oil transportation	Oil refining and marketing	Gas production and processing	Services
Ozenmunaigas (100%)	KazTransOil (90%)	Atyrau refinery (99,4%)	KazTransGas (100%)	KMG-Security (100%)
Embamunaigas (100%)	Kazmortransflot (100%)	Pavlodar OCR (100%)	Intergas Central Asia (100%)	KMG EP-Catering (100%)
Karazhanbasmunai (50%)	Kazakhstan-China oil Pipeline (50%)	KMG International N.V. (100%)	Asia Gas Pipeline (50%)	KMG Engineering (100%)
Kazakhturkmunay (100%)	MunaoTas (51%)	PetroKazakhstan Oil Products (50%)	KazRosGas (50%)	OzenMunaiServis (100%)
Mangistaumunaigaz (50%)	Caspian Pipeline Consortium (20,75 %)	Caspi Bitum (50%)	Beineu-Shymkent gas pipeline (50%)	KMG-Kumkol (100%)
Tengizchevroil (20%)	Batumi Oil Terminal (100%)	KazMunayGas-Aero (100%)	Karachaganak Petroleum Operating (10%)	KMG Drilling & Services (100%)
Petrokazakhstan, Inc (33%)		Air Liquide Munay Tech Gases (25%)		Oil Service Company (100%)
Ural Oil & Gas (50%)				
Caspian Oil and Gas (50%)				
JV Kazgermunai (50%)				
NCOC (8,44%)				
Kazakhoil Aktobe (50%)				
Urikhtau Operating (100%)				
Tsentralnaya Oil and Gas (50%)				

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Project background | Uzen reinterpretation

Uzen field general information

5th biggest oilfield in Kazakhstan
Operator – UzenMunaiGas
Recoverable reserves – 463 mt
Last reserve estimation - 2006

2006	2010	2020
Estimated reserves	Increase of the reserves for 40%	Re-estimation of reserves

2020

Re-estimation of reserves
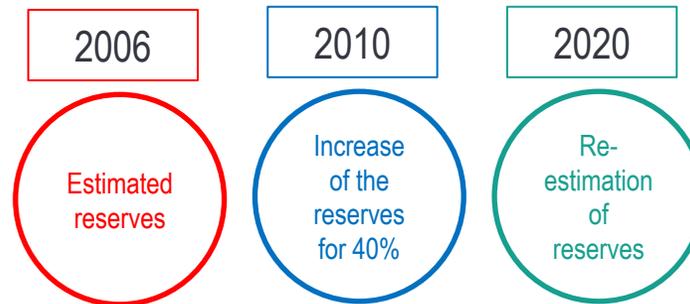
➢ More wells drilled
➢ New perforation jobs
➢ Additional core and laboratory analysis

Uzen oilfield

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Problem definition and analysis
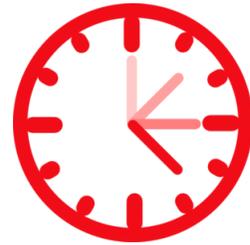
Uzen oilfield

Tight deadline
2
year

The biggest well stock in KZ
7817
wells

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Problem analysis

1 well ~ 4 hours

7817 wells ~ 31268 hours ~ 15.5 years

Tight deadline

2
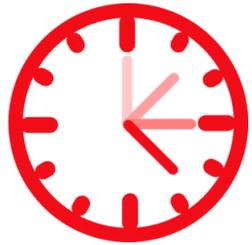
year

The biggest well stock in KZ

7817

wells

➢ Very strong petrophysical tool
➢ Very convenient for single-well mode
➢ Simple in use

1

year

15

years

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Problem analysis

1 well ~ **4** hours

7817 wells ~ **31268** hours ~ **15.5** years

1 year

15 year

- ➢ Very strong petrophysical tool
- ➢ Very convenient for single-well mode
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Data collection

Data QC

Processing

Answers

Petrophysical Interpretation

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Solution

Data collection → Data QC → Processing → Input selection / Calculation → Answers → Petrophysical Interpretation

Techlog
Because every well counts
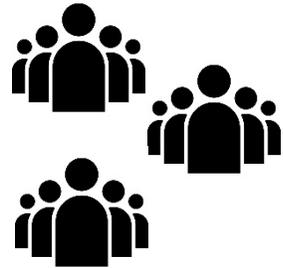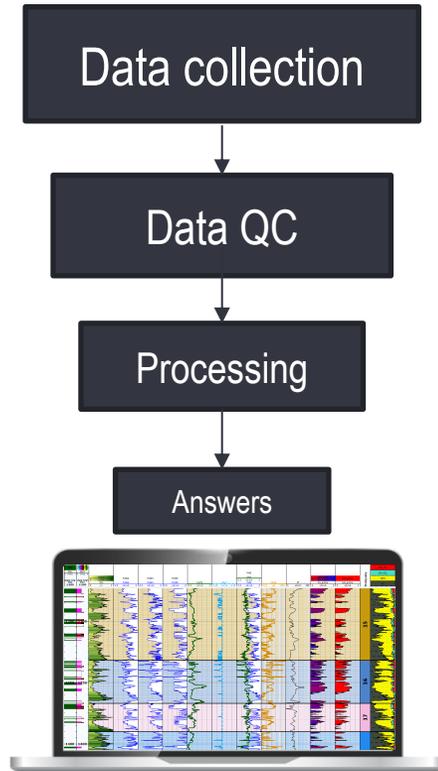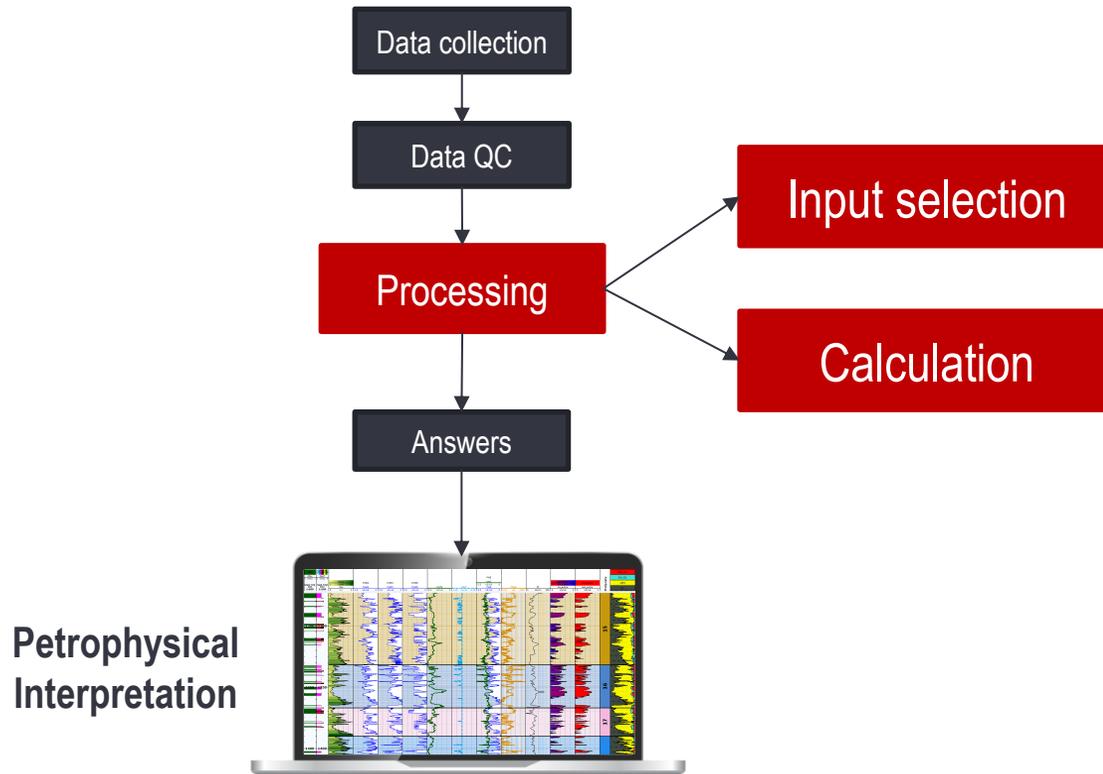
- Industry standard petrophysical tool
- Multi well mode
- Multiple disciplines
- Easy to customize using algorithms

A unique solution tailored for the special client need in increasing the productivity of petrophysical interpretation

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Solution

Purpose	Features	Advantages

Interpretation results

○ Old data
○ Recent data
○ New data

Shale volume
Porosity
Permeability
Saturation
Lithology
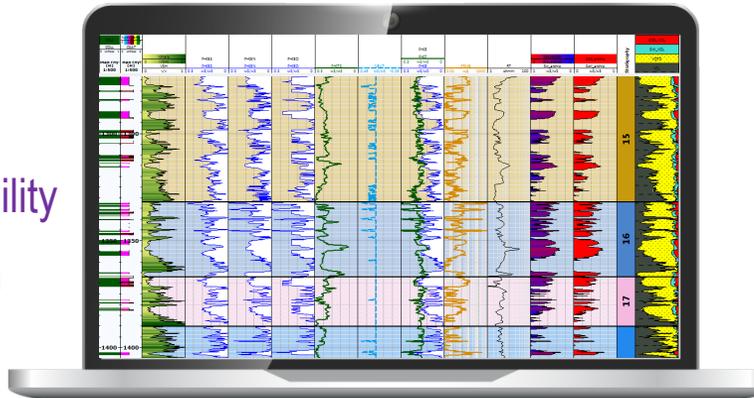
PetroEval

➢ **Retrieve results based on field algorithms in Techlog**

➢ + Automize the best available method selection process

Intricate algorithm which consists of >1000 rows

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Solution

Unique algorithm

Algorithm is aimed to use the best available logs for calculation
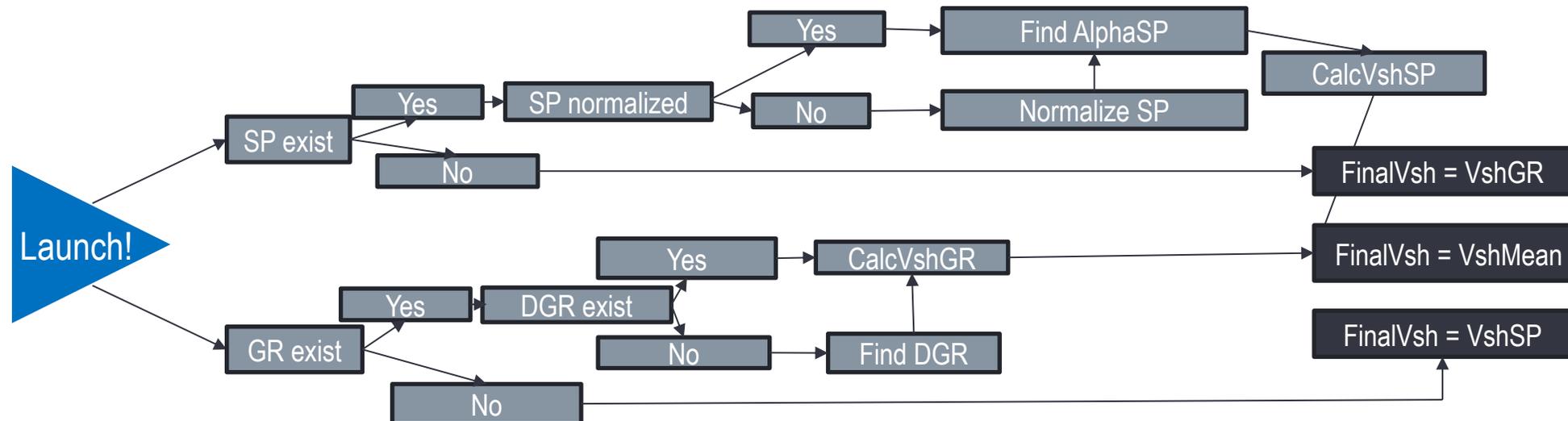
Solution

Unique algorithm

Algorithm is aimed to use the best available logs for calculation
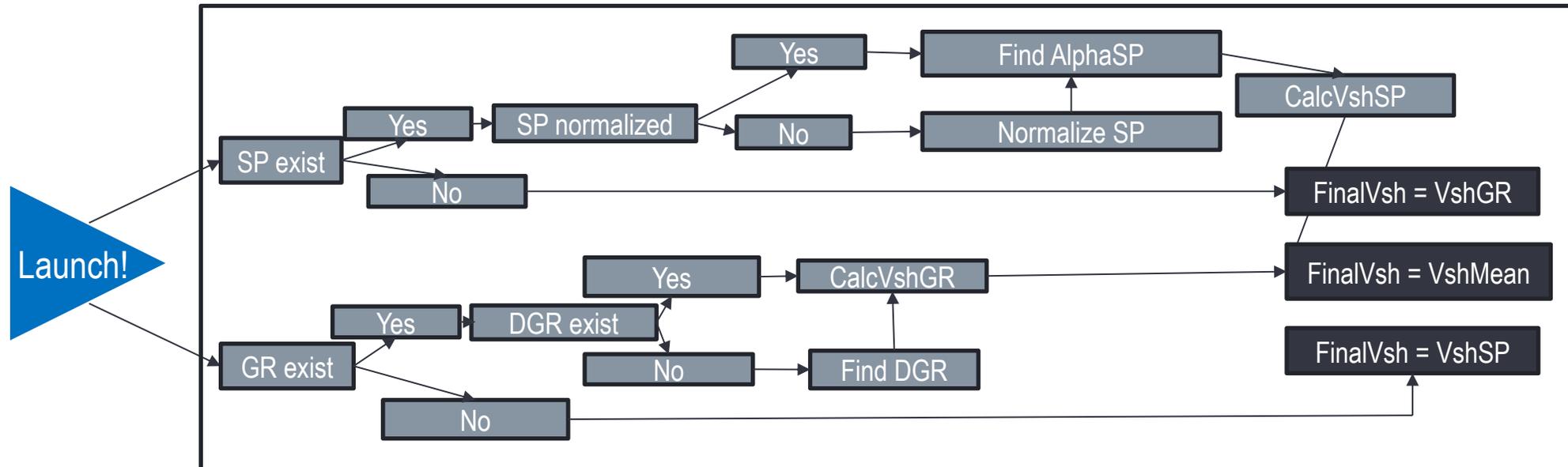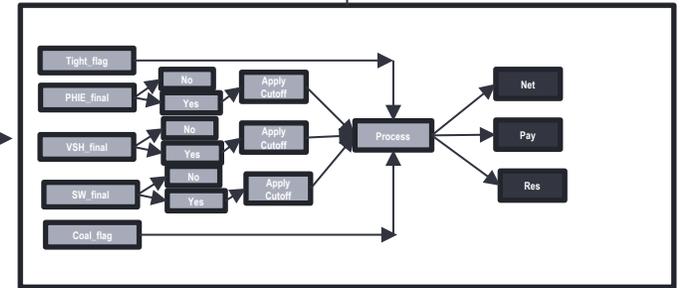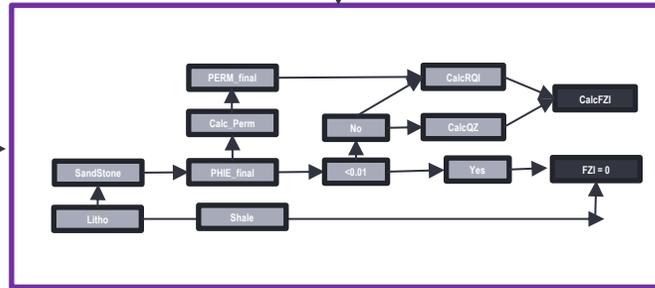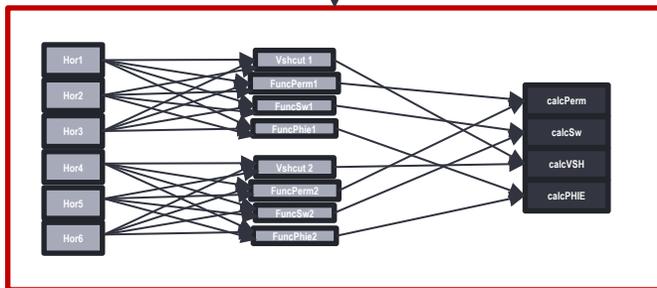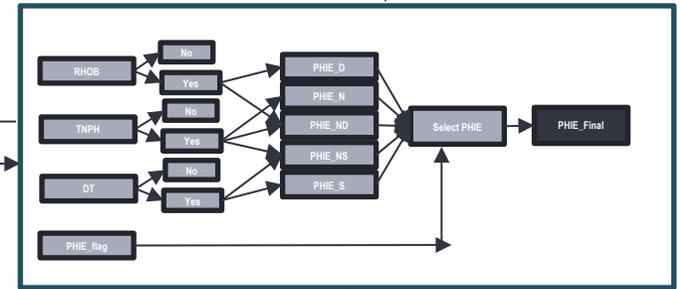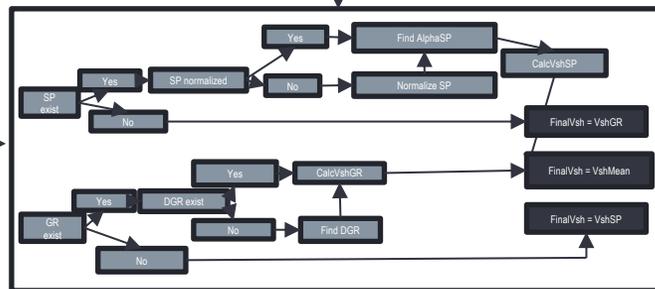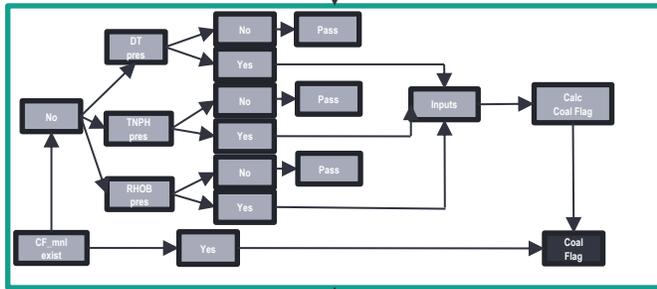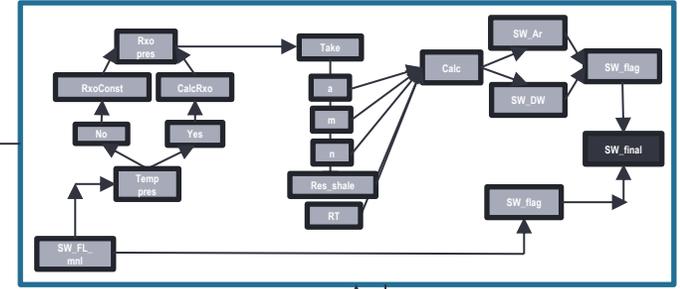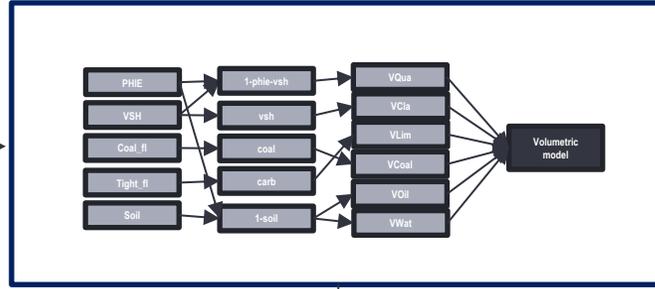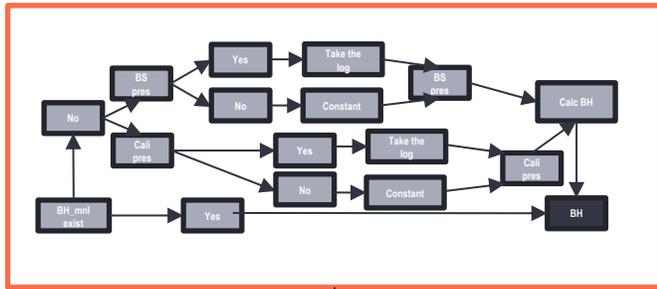
Solution

Solution
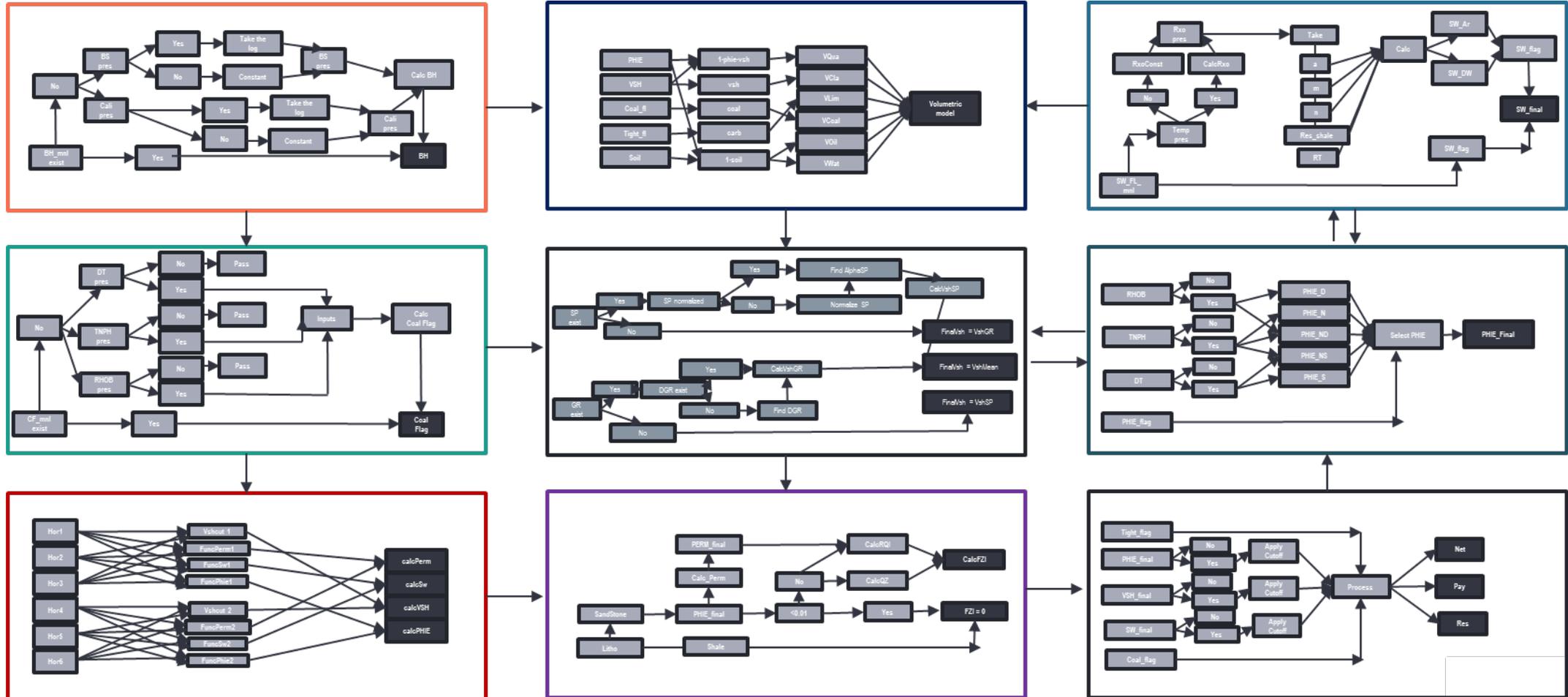
Solution

Solution

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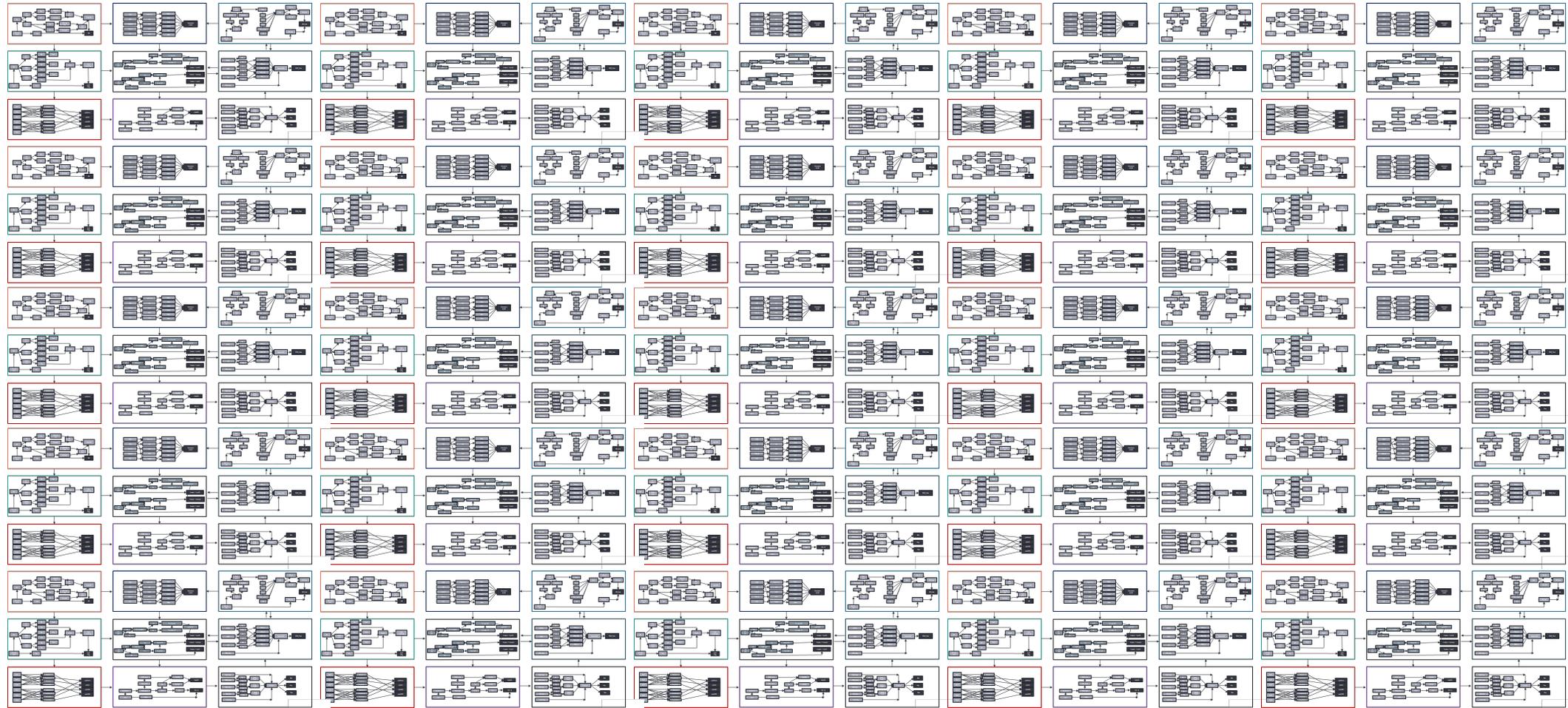
Compatibility

Compatible with any Techlog version

Multi-well

No limits in well quantity

Reliability

Field based algorithms for reliable results

Simplicity

One click solution allows to utilize PetroEval regardless to the user knowledge

Full control

Comfortable access to the stratigraphy parameters, constants and equations

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Solution

Interpretation with different software: **Workflows comparison**

Estimation criterions:	Previous workflow in IP	Techlog implementation	Petroeval algorithm
Estimated execution time for 1 well	4 man hours	1.2 man hour	1 man hour
Time effectivity	★☆☆☆☆	★★★★☆	★★★★★
Convenience	★★☆☆☆	★★★★☆	★★★★⯪
Reliability	★★★★☆	★★☆☆☆	★★★★⯪

Solution

Interpretation with different software: **Workflows comparison**
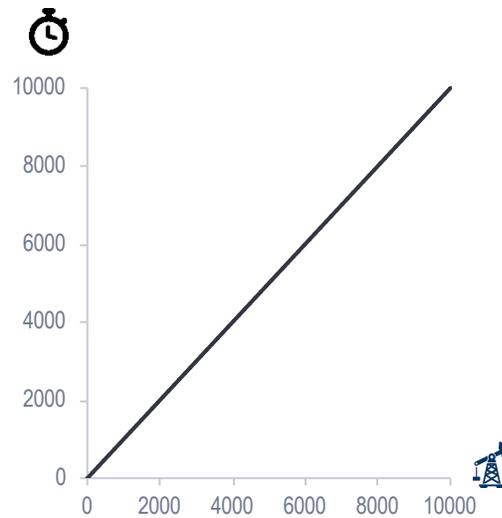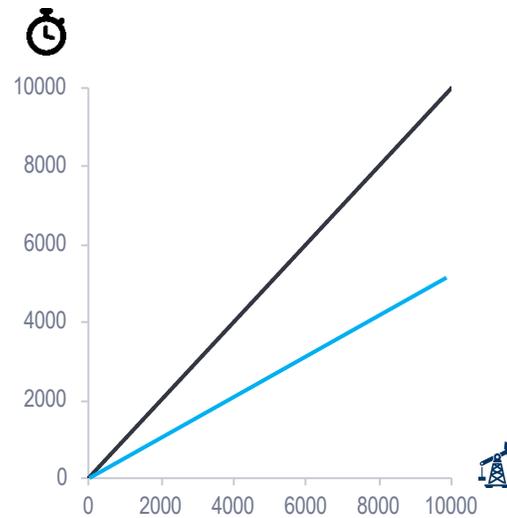
| Previous workflow in IP | Techlog implementation | Petroeval algorithm |
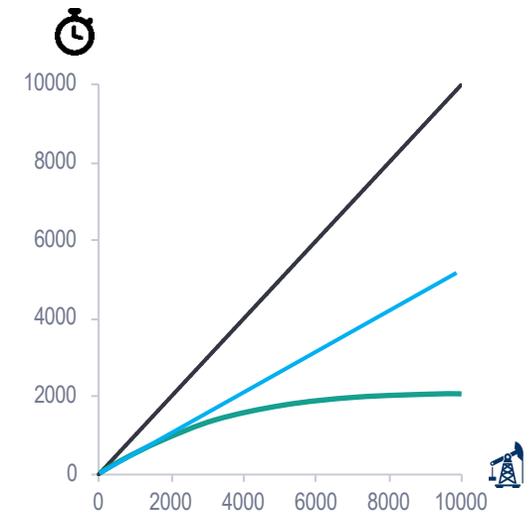
Estimated time for 10.000 wells execution

Value to KMG engineering

1 year instead of **15** years
94%
time saved for interpretation

1

Time
By minimizing manual job
client saves time

**Optimization of
labor costs for**
147k$

2

Money
By reducing execution time
client saves money

Automizing the manual job
reliable results for
90%

3

Reliability
Reliable results by Uzen
field methodics utilization

4

Standartization
Common approach allows to
harmonize the workflow

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Conclusion

➢ The **biggest** well database in KZ created in client's organization

➢ The algorithm implementation allowed to **standardize** the workflow

➢ The algorithm implementation allowed to KMG engineering to **optimize** the labor efforts

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