Unconventional Tools and Workflows
Objective
Items in our Toolbox

Screwdriver

Hammer

Box Cutter
# Items in our Toolbox

<table>
<thead>
<tr>
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![Image of a cardboard box]
Items in our Toolbox

Screwdriver  Hammer  Box Cutter
Items in our Toolbox

Screwdriver

Hammer

Box Cutter
Items in our Toolbox

Decline Curve Analysis
• ARIES
• PHDWin
• OFM

Economics
• Aucerna
• ARIES
• MOSAIC
• Peep

Machine Learning
• BetaZi
• C3IoT
• DeepCast

Visualization Tools
• SAS
• Spotfire
• Tableau
• Verdazo
Evolution of MFHW Models

SRV

Trilinear Flow

Conjugate Fractures
Evolution of MFHW Models
Evolution of MFHW Models

SRV

Trilinear Flow
Evolution of MFHW Models

Trilinear Flow With Enhanced Regions

Non Uniform, Non Planer
Evolution of MFHW Models

Analytical Model with DFN

Numerical Model with DFN
Incorporation With Other Tools

Analytical DFN with Micro Seismic

Numerical DFN with Micro Seismic
Incorporation With Other Tools

Frac Models
Our Acreage in the Midland Basin

* https://www.britannica.com/place/Permian-Basin
Corporate Type Curve (30 Years)

5,000 ft Lateral
EUR = 540 MBOE
Drilling Longer Laterals

10,000 ft Lateral
EUR = 995 MBOE
Did We Account for Variations in?

1) Rock Properties
   • Relative Permeability
Did We Account for Variations in?

1) Rock Properties
   • Relative Permeability

Gas Rates Increase
But Oil Rates Decrease
We lose our drive mechanism
too quickly and gas out
1) Rock Properties
   • Relative Permeability

2) Fracture Properties
   • Contacted Fracture Height

Smaller Fracture Height and Length!
1) Rock Properties
   • Relative Permeability

2) Fracture Properties
   • Contacted Fracture Height

3) Well Spacing Impact
   • More Wells / DSU
1) Rock Properties
   • Relative Permeability

2) Fracture Properties
   • Contacted Fracture Height

3) Well Spacing Impact
   • More Wells / DSU

Did We Account for Variations in?

Parent Well
Child Wells
Did We Account for Variations in?

1) Rock Properties
   • Relative Permeability

2) Fracture Properties
   • Contacted Fracture Height

3) Well Spacing Impact
   • More Wells / DSU

Potential Difference of 350 MBOE when we account for different variations
KAPPA UR Workflow

n-Well Load (DB, File, Web)
Diagnostic
DCA

Advanced modeling

Get forecast & single step (TC)
Refit TC or Model Mining
• Just like hardware tools, software can be general or fit for purpose

• George Box (Statistician) once said, “All models are wrong but some are useful”

• Modeling representative wells using complex methods and re-applying them to a larger number of wells will ensure we have captured the physical processes without the time
Thank you

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