**Rock Petrophysical Properties and Modeling**

Sources for Core Analysis Data

- Lithofacies, Permeability, Porosity
- Wellington West Equations
- Modeling Relative Permeability
- Permeability and Pore Throats
- Archie Cementation
- Capillary Pressure
- Water Production data
- Production data
- Reconstruct Oil Production History
- Advanced Decline Curve Analyses
- Summary of IP rates from Scout Cards

**Field production recorded by lease**

Wharton Lease - 3 wells
Becker 1 - 2 wells
Waugh - 6 wells

Barrel test (Oil & Water) data available from 1989 to date - 1 test per year

Field developed between 1977 to 1985

Majority of wells drilled in 1983

Initial oil production history missing in each well

**How to reconstruct oil production history?**

Advanced Decline Curve Analyses

Match available-production [rate/time] data with a model.

Production data normally includes both transient and
decline definition

Transient - decline caused by fluid expansion with contiously increasing drainage area
Depletion after drainage radius reaches outer boundaries

Decline curves analysis production data from depletion period only.

Used to estimate missing production data or to predict future
Production provided production practice remains unchanged

This method estimates reserve volumes that are in pressure
Communication, otherwise recoverable by the wells.

Type curves, theoretical solutions to five equations, are often
used for decline analyzes.

Fitted to decline type curves were used here.
Model assumptions
- Well production operated constant DWP
- Well is centered in a circular drainage area
- No-flow occurs at drainage boundaries

**Water Production data**

Available water production data consisted of IP (initial production) and IP rate/Scout cards data records since 1989.

Reconstructed oil production data from wells in a lease when added together closely approximated recorded lease production.

To facilitate simulator modification and history matching an Excel worksheet

**Production data**

Field production recorded by lease
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Majority of wells drilled in 1983

Initial oil production history missing in each well

**Inferences from Decline Curve Analyses**

Oil production histories were compiled using initial production (IP) rates and barrel test data recorded since 1989.

Reconstructed oil production data from wells in a lease when added together closely approximated recorded lease production.

A report of the productive life of each well could be modeled by a decline curve.
This means that bottom hole producing pressure (Pbh) at the wells remained mostly unchanged.

Reconstructed production data at some of the wells indicated that wells underwent intermittent stimulation.

A very short transient decline is visible when the recorded production data is plotted on Fetkovich’s Type Curve.
This is indicative of low effective permeabilities existing in the reservoir.

**Reconstruct Oil Production History**

Advanced Decline Curve Analyses

Becker #1 - online Feb 1977
Becker #4 - online Jun 1993
Wharton #1 - online Apr 1981
Wharton #3 - online Apr 1982

Missing oil production between 1983 to 1986 estimated for Becker #1
Production history for Becker #4 completed between 1993 to 1996 by subtraction Becker #1 production from Becker Lease
Reconstructed Becker #4 history also falls on a decline curve.

Wharton #3 - online Jul 1985

Oil production histories reconstructed for Wharton #1 & #2
Reconstructed oil production data from Wharton #1 during 1985-86 estimated by automating production from Wharton #1 & #2 from lease production.
Reconstructed production history for Wharton #3 falls on a decline curve and indicates intermediate thinning.

**Wellbore data**

Waugh 1 - online Feb 1983
Waugh 2 - online Jun 1983
Waugh 3 - online Sep 1983
Waugh 4 - online Sep 1983

**Summary of IP rates from Scout Cards**