



Technical Report:
Wyoming Oil Reservoir EOR Database
Release 1.0

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Introduction

The following describes the contents of an accompanying spreadsheet.

Description

The Wyoming Oil Reservoir EOR Database represents an effort by the Wyoming Enhanced Oil Recovery Institute to compile a single data repository of EOR pertinent parameters for oil reservoirs in Wyoming. The majority of the data collected is available publically but up to this point has resided in separate databases, which has presented difficulties for operators when researching the EOR potential of prospects in Wyoming.

This is the first release of the database to the public and future releases will occur regularly and incorporate updates both in content and accessibility. This release contains a selection of the data compiled by the EORI (those data considered most pertinent to typical EOR processes and screening) and any advanced queries should be addressed to the EORI.

Contributors

EORI officers

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External data sources

This database is a compilation of publicly available data sources and records relating to reservoirs in Wyoming as data derived by the scientists and engineers of the EORI. The external sources include the Wyoming Geological Association Field Reports, the Wyoming Oil and Gas Conservation Commission (WOGCC) online database, a database of crude oil analyses performed by the National Institute for Petroleum and Energy Research and now hosted by the Department of Energy's National Energy Technology Laboratory (DOE/NETL), the National Petroleum Council Public Database; also hosted by the DOE/NETL and a Rocky Mountain Basins Produced Water database compiled and hosted by the DOE/NETL (see references 1 – 7).



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The database release contains:

For all fields in Wyoming:

- Field-Reservoir Combination (FRC)
- Field Name
- Reservoir
- Basin/Regional Setting
- Location
- Discovery Year
- WOGCC Remarks
- Cumulative Production (@ 12/31/2007)
- Production in 2007 (Oil, Gas, Water)
- OOIP
- Lithology
- Porosity
- Permeability
- Net Pay Thickness
- Production Area
- Depth (TD) by reservoir
- Temperature by reservoir (Median Reported)
- Temperature by reservoir (Correlation Derived)
- API
- Specific Gravity
- Viscosity (Median Reported)
- Viscosity (Correlation Derived)
- Molecular weight C5+ by reservoir
- Minimum Miscibility Pressure (MMP) by reservoir
- CO₂ Formation Volume Factor (BCO₂) by reservoir
- Pour Point
- Sulfur (wt%)
- TDS (ppm)
- pH
- Na (ppm)



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- Cl (ppm)
- Mg (ppm)
- Ca (ppm)
- SO₄ (ppm)
- Well Status

Parameter Sources and Descriptions

Field Name

Reservoir

Basin/Regional Setting

Multiple sources: Wyoming Geological Association symposium and field report volumes, DOE/NETL Produced Water Chemistry Database.

Location

Latitude/Longitude centroids from WOGCC Well Header database.
Township/Range from WOGCC 2007 Statistics Book and online Field data record.

Discovery Year

WOGCC 2007 Statistics Book and online Field data record.

WOGCC Remarks

WOGCC 2007 Statistics Book and online Field data record.

Cumulative Production (@ 12/31/2007)

For the field. WOGCC 2007 Statistics Book and online Field data record.

Production in 2007 (Oil, Gas, Water)

For the reservoir. WOGCC 2007 Statistics Book and online Field data record.

OOIP by reservoir

Calculated using decline curve analysis of production data obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC) database.

OOIP Estimation Methodology:

1. Graph cumulative production against production rate, for individual reservoirs, using WOGCC data base.
2. Project the resulting curve to a zero production rate. Note projected cumulative production based on 1978 to 2007 data.
3. Estimate early (pre-WOGCC individual reservoir data, i.e. pre-1978) relative production for each field reservoir (its portion of the total field



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- production) based on post 1978 relative production amounts as recorded in WOGCC data base. (Assume the relative production proportions among reservoirs have been constant.)
4. Combine estimated pre 1978 reservoir cumulative production with projected post 1978 cumulative production for each reservoir to give the individual reservoir projected final cumulative production.
 5. Assume that this represents the end of water flooding (some research is done on reservoirs with abnormal decline curves using WOGCC data available from the web site.)
 6. Assume that at the end of secondary water flooding 35% of OOIP will have been recovered from each individual reservoir.
 7. If pre 1978 data is available the pre 1978 estimation for production is revised.

Lithology

Multiple sources: Wyoming Geological Association symposium and field report volumes, DOE/NETL Crude Oil Chemistry Database.

Porosity by reservoir

Extracted from Wyoming Geological Association symposium and field report volumes.

Permeability by reservoir

Extracted from Wyoming Geological Association symposium and field report volumes.

Pay thickness by reservoir

Extracted from Wyoming Geological Association symposium and field report volumes.

Production area by reservoir

Extracted from Wyoming Geological Association symposium and field report volumes.

Depth (TD) by reservoir

Multiple sources: Wyoming Geological Association symposium and field report volumes, DOE/NETL Crude Oil analysis database, DOE/NETL Produced Water Chemistry Database, WOGCC Well Header database. Where multiple values are available, medians are calculated and reported.

Temperature by reservoir

Reported values: Wyoming Geological Association symposium and field report volumes, DOE/NETL Crude Oil analysis database, DOE/NETL Produced Water Chemistry Database. Where multiple values are available, medians are calculated and reported.



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Correlation values: Calculated using a correlation with depth (correlation is equivalent to a thermal gradient of 24°C/km (71°F/Mile)).

API by reservoir

Multiple sources: Wyoming Geological Association symposium and field report volumes, DOE/NETL Crude Oil analysis database, WOGCC 2007 Stats book. Where multiple values are available, medians are calculated and reported.

Specific Gravity

DOE/NETL Crude Oil analysis database.

Viscosity by reservoir

Reported values: Wyoming Geological Association symposium and field report volumes, DOE/NETL Crude Oil analysis database. Where multiple values are available, medians are calculated and reported.

Correlation values: Calculated using a correlation with API.

Molecular weight C5+ by reservoir

Calculated using a correlation reported in Ref-8 relating mwC5+ to API.

Minimum Miscibility Pressure (MMP) by reservoir

Calculated using a correlation reported in Ref-9 relating MMP to mwC5+ and temperature.

Fracture Pressure

Calculated using fracture gradient of 0.68.

CO₂ Formation Volume Factor (BCO₂) by reservoir

Extracted from appendices of Ref-2.

Pour Point

DOE/NETL Crude Oil analysis database.

Sulfur (wt%)

DOE/NETL Crude Oil analysis database.

TDS (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).

pH

DOE/NETL Produced Water Chemistry Database

Na (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).

Cl (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).



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Mg (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).

Ca (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).

SO₄ (ppm)

DOE/NETL Produced Water Chemistry Database (non-charge balanced).

Well Status

WOGCC Well Header database. (<http://wogcc.state.wy.us/codes.html> for codes)



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References

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Ref. 8 - Advanced Resources International, Inc., *Basin Oriented Strategies for CO₂ Enhanced Oil Recovery: Oklahoma*, Prepared for U.S. Department of Energy, March 2005.

Ref. 9 - Jarrell, P. M., Fox, C. E., Stein, M. H., Webb, S. L., 2002, Practical Aspects of CO₂ Flooding, Monograph Vol. 22. Society of Petroleum Engineers. Richardson, TX.