

# DeepPVT™

Insights for Smarter  
Reservoir Decisions

An aerial view of a large offshore oil rig in the middle of the ocean. The rig is a complex of steel structures, including a central platform with several towers and a long, narrow walkway extending from the platform towards the viewer. The water is a deep blue, and the sky is overcast with grey clouds.

## What is DeepPVT™?

- A next-gen AI-powered PVT Analysis & Reservoir Fluid Characterization platform.
- Integrates AI/ML, Digital Twin, and Uncertainty Quantification for accurate modelling.

### Key Features:

- AI-driven PVT Predictions
- Equation of State (EOS) Tuning
- Advanced Reservoir Fluid Analytics

# The Need for Advanced PVT Analysis

## Challenges in Traditional PVT Analysis

- Expensive & time-consuming lab tests
- Uncertainties in reservoir modelling
- Limited real-time decision-making capabilities

## DeepPVT Advantages

- AI-powered automation
- Real-time simulation & predictive analytics
- Cloud-integrated for remote accessibility

# DeepPVT™ Functional Modules



**PVT Correlation Suite** (Gas, Oil, Water PVT calculations)



**EOS Tuning & Model Calibration** (Peng-Robinson, Soave-Redlich-Kwong)



**Reservoir Simulation** (Dynamic Modelling with AI)



**Fluid Characterization** (Phase behaviour, Bubble & Dew Point Analysis)



**Gas Injection Optimization** (ML-driven enhanced recovery modelling)



**Uncertainty Quantification & Sensitivity Analysis**

# Workflow Overview

Data Preparation & Upload

PVT Analysis & Characterization

EOS Tuning & Model Calibration

Reservoir Simulation & Optimization

AI/ML-Based Predictions & Sensitivity Analysis

Report Generation & Download

# AI Enabled PVT Analysis



**Automates Fluid Property Estimation** using AI models



**Inputs:** Pressure, Temperature, API, GOR, FVF



**Outputs:** Bubble Point, Dew Point, Viscosity, Z-Factor, Formation Volume Factor

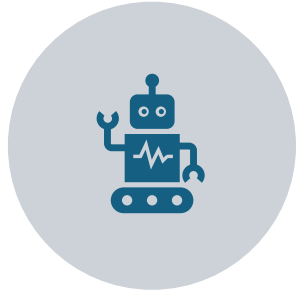


**Machine Learning Techniques Used:** Regression Models (Random Forest, XGBoost, Neural Networks)  
Uncertainty Calibration



**Example Visualization:** AI-predicted vs. actual PVT properties

# How DeepPVT™ Differentiates from Competitors



Fully AI-integrated (not just conventional EOS)



Live Digital Twin-based Reservoir Fluid Tracking



ML-driven Optimization for Recovery & Injection Strategies



Uncertainty Quantification for risk-aware decision-making



# DeepPVT™ Demo Screens

# EOS Tuning & Model Calibration

## Equation of State (EOS)

### Models Supported:

- Peng-Robinson
- Soave-Redlich-Kwong
- CPA (Cubic Plus Association)

### Tuning Process:

- Input Lab Data → Match AI Predictions with EOS Models
- Adjust parameters → Validate against real field data
- Deploy in live reservoir simulations

#### DeepPVT™ Navigation:

- EOS Tuning
- EOS Parameter Fitting
- Reservoir Simulation
- Fluid Characterization
- Viscosity Modeling
- Compositional Analysis
- Phase Behavior
- Gas Injection Modeling
- Bubble Point Analysis
- Dew Point Analysis
- Fluid Sampling
- Gas-Liquid Ratio
- AI-Powered PVT Prediction
- EOS Tuning & Model Calibration
- Digital Twin for PVT Analysis
- AI-Driven Fluid Phase Classification
- AI-Based Bubble Point & Dew Point Detection
- ML-Based Gas Injection Optimization
- Uncertainty Quantification & Sensitivity Analysis
- Predictive Analytics for Reservoir Fluid Behavior

## Peng-Robinson EOS Tuning

Temperature (K)

300.00

- +

Pressure (bar)

50.00

- +

Critical Pressure (bar)

100.00

- +

Critical Temperature (K)

400.00

- +

Acentric Factor

0.20

- +

Calculate EOS Tuning

Calculated Molar Volume (V): 68.2412 m<sup>3</sup>/mol

Predicted EOS Pressure: 25.98 bar

Phase Type: Gas

# Digital Twin for PVT Analysis

## Why Digital Twin for PVT?

- Real-time monitoring & predictive insights
- Enhanced decision-making with AI-augmented models

## Components:


- Historical vs. Live Data Analysis
- Cloud-Integrated PVT Simulation
- Multi-Scenario Forecasting

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## Digital Twin for PVT Analysis

### Select Mode

- Static (Historical Data)
- Dynamic (Live Simulation)
-  Simulating PVT Behavior in Real-Time

### Pressure (psia)



### Temperature (°F)



### API Gravity



### Solution GOR (scf/STB)



Simulated Formation Volume Factor (FVF): 1.140 RB/STB

Simulated Oil Viscosity: 2.200 cp

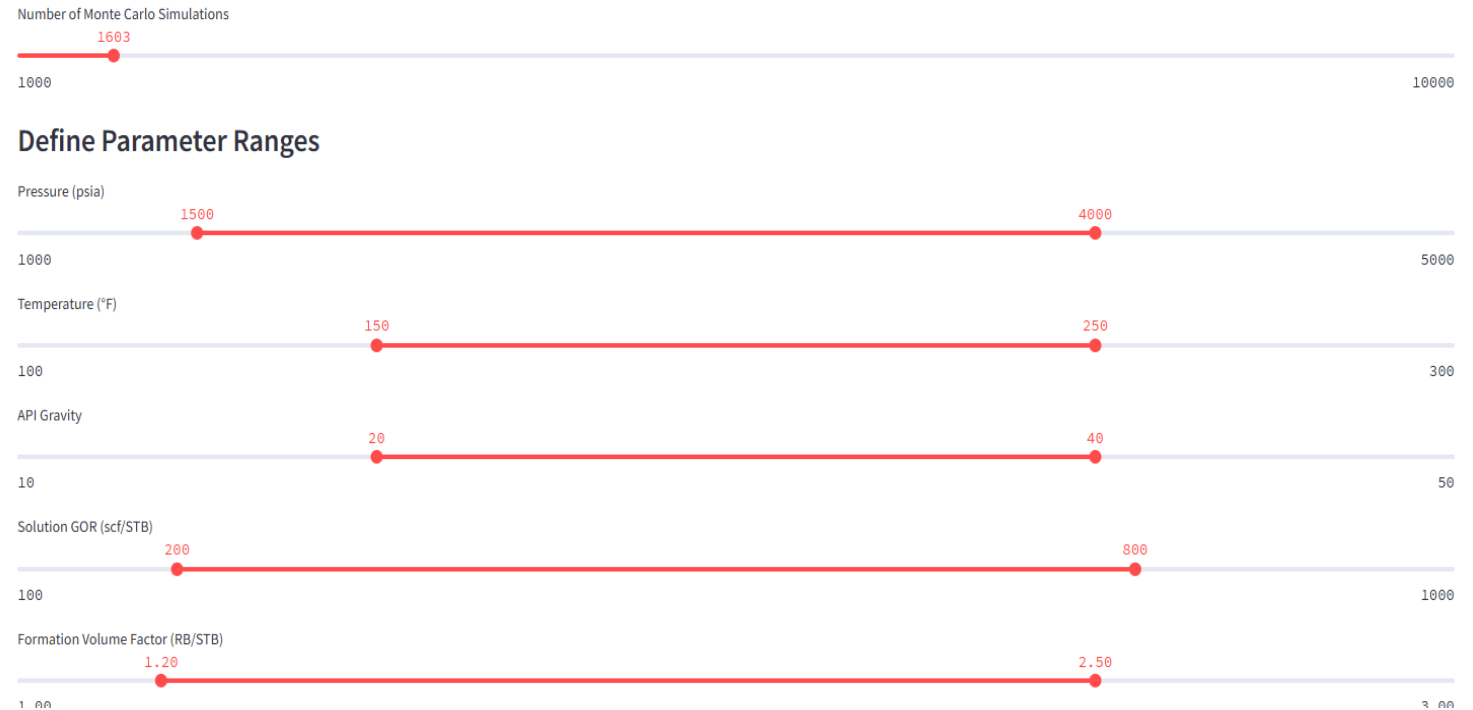
# Uncertainty Quantification & Sensitivity Analysis

- Monte Carlo Simulations for Risk Assessment
- Sensitivity Studies for Fluid Behaviour Changes
- Impact of Uncertainty on Reservoir Decision-Making
- Visualization: Probability distributions & sensitivity plots

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## DeepPVT™ - Insights for Smarter Reservoir Decisions

### Uncertainty Quantification & Sensitivity Analysis



# Gas Injection Optimization

## ML-Based Gas Injection Strategy

- Optimize Recovery Factor
- Predict best injection rates
- Minimize Gas Breakthrough

## Example Model:

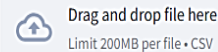
- Train AI with historical production data
- Predict Optimum Injection Rate vs. Recovery Factor

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## ◆ ML-Based Gas Injection Optimization

Upload Gas Injection Data (CSV)



Limit 200MB per file • CSV

Browse files

### ⚡ Optimize Gas Injection for Maximum Recovery

Injection Rate (MSCF/D)

1500.00

- +

Reservoir Pressure (psia)

3500.00

- +

Temperature (°F)

200.00

- +

API Gravity

35.00

- +

Gas Specific Gravity

0.70

- +

Solution GOR (scf/STB)

500.00

- +

Optimize Gas Injection

# Predictive Analytics for Reservoir Fluid Behaviour

## AI Models for Reservoir Fluid Flow Forecasting

- Predict how fluid properties evolve over time
- Machine learning-based phase stability prediction

### Example:

Time-series forecasting of gas/oil ratios

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### Predictive Analytics for Reservoir Fluid Behavior

Upload Reservoir Fluid Data (CSV)



Drag and drop file here

Limit 200MB per file • CSV

Browse files



reservoir\_fluid\_behavior.csv 264.0B



Model trained! MAE: 0.0814, R2: -1.3390

Download Model

Pressure (psia)

3000.00



Temperature (°F)

200.00



API Gravity

35.00



Gas Specific Gravity

0.70



# Applicable Use Cases of DeepPVT™



## Digital Oilfield Optimization

AI-driven real-time PVT property estimation  
Predictive analytics for production forecasting



## Enhanced Oil Recovery (EOR) Strategies

Gas injection modelling & optimization  
AI-powered fluid phase classification for better EOR design



## Uncertainty Quantification & Risk Analysis

Monte Carlo simulations for reservoir fluid behaviour  
Sensitivity analysis for optimal decision-making



## Carbon Capture & Storage (CCS) Feasibility

AI-based EOS tuning for CO<sub>2</sub> storage & sequestration  
Real-time digital twin monitoring for safe CCS operations



## Reservoir Simulation & History Matching

Automated PVT data validation for simulation inputs  
Hybrid AI-EOS models for improved accuracy in simulation models

# Deployment & Integration

## Deployment Options:

**On-Premise** – Secure deployment within corporate data centers.

**Cloud-Based** – AWS, Azure, Google Cloud integration for scalable AI-driven analytics.

**Edge Computing** – IoT-enabled real-time reservoir monitoring.

## Integration Capabilities:

**Industry-Standard PVT & Reservoir Simulation Software:** CMG, Eclipse, Petrel

**Data Storage & Management:** PostgreSQL, MongoDB, Cloud Data Lakes

**APIs for Connectivity:** RESTful APIs for seamless integration into existing digital oilfield infrastructure

# Why Choose DeepPVT™ ?

## Advanced AI/ML Models

- Machine learning-driven PVT property prediction, fluid phase classification, and EOS tuning.

## Real-Time Digital Twin Integration

- Live monitoring of reservoir fluid behaviour with dynamic scenario modelling.

## Comprehensive PVT Analytics

- Covers gas, oil, water PVT properties, uncertainty quantification, and sensitivity analysis.

## Optimized Recovery & Injection Strategies

- ML-driven optimization for gas injection, EOR, and fluid phase stability.

## Risk & Uncertainty Quantification

- Monte Carlo simulations for robust decision-making under uncertain reservoir conditions.

## Cloud & Edge-Ready

- Deployable on-premise, cloud, or edge-based AI platforms for seamless integration with existing systems.

# Thank You

**Driven by Data. Designed for Industry.**

