



LICENSE MODULE DESCRIPTIONS

RFDYN.COM



ABOUT tNavigator®

tNavigator, developed by Rock Flow Dynamics, is a one-stop comprehensive reservoir management solution that leverages modern computing architecture to deliver superior speed, scalability & ease-of-use.

Promoting cross domain collaboration, tNavigator is a single environment that enables subsurface teams to work together to navigate the reservoir and save time or data lost by moving between applications. In tNavigator you will find unique integrated workflows from geophysics to reservoir modeling, allowing geoscientists to construct a robust interpretation and reservoir model of their field. In the same interface, models can be instantly carried forward to simulation, well and surface network modelling, allowing for thorough analysis and evaluation of the field and more informed decision making.

#readywhenyouare

INTEGRATED STATIC AND DYNAMIC MODELLING

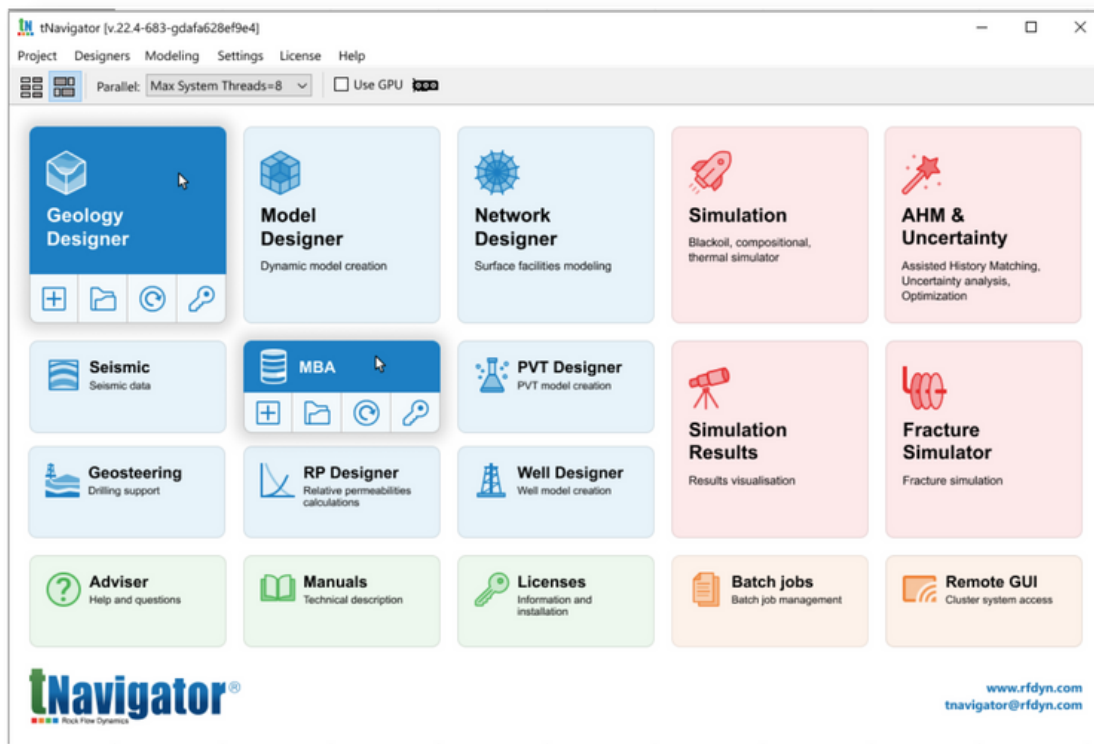
> From reservoir to wells
to surface networks

24/7

global support team

150 +

training tutorials



From the reservoir to the wells to the surface network facilities, tNavigator allows all subsurface domains to work together with a **"One Asset - One Software"** mentality.

- Geomodelers
- Geologists
- Geophysicists
- Reservoir Engineers
- Exploitation Engineers
- Production Engineers
- Production Technologists
- Completions Engineers

Beyond your immediate team, Rock Flow Dynamics permits global usage of the tNavigator licenses, allowing for not only integration within your region, but within your global team as well.

Licenses can be installed locally or on a network license server, with no additional fees for the latter.

Please speak to your local representative for more information on licensing, and any exceptions that may apply, or alternatively contact rfdsales@rfdyn.com for assistance.

INTEGRATED MODULES AVAILABLE



Model Designer

Model Designer provides a unified interface for all pre and post processing workflows. Open an existing tNavigator project or import from a third-party software straight into the interactive interface, with the functionality to edit, modify, rebuild, create and compare models. Automated workflows with python integration are embedded for easy management of cases and analysis of development strategies; this also allows uncertainty and optimization experiments to be launched with ease. Model Designer offers seamless integration between static and dynamic models, as well as the ability to incorporate PVT tables, wells and surface network facilities into the project.

Add-on extensions to Model Designer:



Fracture Simulator:

Hydraulic Fracture modeling allows you to integrate completion engineering with reservoir simulation, through the proper modeling of the geomechanical properties and the completion design interaction; parallel simulation and optimized simulator code will allow you to simulate planar 3D hydraulic fractures faster. Can be run independently from MD.



Relative Permeability Designer:

Undertake core analysis with capillary pressures and relative permeabilities to align your reservoir model with lab data. Can be run independently from MD.



Material Balance Analyzer

Calculate simplified reservoir models based on a set of proxy simulation methods. The MBA model allows combining an unlimited number of reservoirs, between which flow calculation is supported.

INTEGRATED MODULES AVAILABLE



Simulation

Dynamic reservoir simulation is where tNavigator started. It is still at the heart of what we do. Results from reservoir simulation drive major investment decisions and are used in ongoing operations. tNavigator is differentiated by its speed, scalability, ease of use, and value for money. A comprehensive list of features means that tNavigator is appropriate for modeling all modes of recovery: primary, secondary, and tertiary. It handles all fluid types from heavy oil to dry gas. Simulation with tNavigator is equally appropriate for conventional and unconventional assets. It's advanced features and comprehensive environment are also finding applications in developing technologies such as CO2 storage (CCUS) and geothermal projects. **All simulation options can be run on both CPU and GPU for maximum speeds.**

Add-on options for Black Oil Simulation Engine:



Compositional

Model multicomponent fluid reservoirs and deal with challenges such as gas condensate reservoirs; miscible flooding including CO2 solubility in oil and water; modeling of thick reservoirs with compositional gradients; chemical reactions; and near-critical fluids. A variety of equations of state (EOS) can be modeled and generated in tNavigator's companion PVT Designer, or can come from an external product.



Thermal

Builds on functionality in the compositional simulator to handle the additional complex physics of thermal and thermodynamic processes, allowing models to deal with challenges such as steam assisted gravity drainage (SAGD), in-situ combustion, electrical heaters, etc. Four phases are modeled: oil (hydrocarbon components), gas (hydrocarbon components, water), water and the solid phase.



Geomechanics:

A joint system of coupled equations is used to calculate reservoir fluid flow and geomechanical effects simultaneously, in a parallel way utilizing all available CPU & GPU cores for maximum performance and efficiency.

INTEGRATED MODULES AVAILABLE



Geology Designer

Our technology offers a comprehensive package for the resource industry by providing advanced 3D geological modeling, geological characterization, and production solutions. With our single solution platform, the user can utilize the full suite of geophysical & geological interpretation tools, where they can explore and make full use of all their data. Construct 3D models and characterize prospects by utilizing our advanced geostatistical and machine learning capabilities.

Add-on extensions to Geology Designer:



Seismic

Load, visualize, and interpret seismic using an array of tracking tools in 3D, 2D, and cross-section views while working in both time and depth domains. Sample seismic into 3D geological models to enhance property modeling workflows. Can be run independently from GD.



Geosteering

Integrate seismic and 3D models to aid in steering wells within tNavigator's predefined geosteering workspace or in other interpretation windows. Stream in live data using WITSML or load files rapidly using predefined workflows. Can be run independently from GD.



PVT Designer

PVT Designer acknowledges the fluid characterization for all the modules available in tNavigator. This tool allows for choosing different library components, entering user components, and setting their properties. Once these properties have been established, a saturation pressure curve and a phase envelope can be created.

The inclusion of experimental data from PVT tests such as CCE, DLE, CVD, swelling test, the definition of minimum miscibility pressure (MMP), grading test, separator test, and blending allows model lumping (create pseudo-components), and splitting to match points of experiments data (samples).

INTEGRATED MODULES AVAILABLE



Assisted History Match & Uncertainty

Uncertainty Quantification: Evaluating multiple scenarios helps to deepen the understanding of the reservoir and to gain more confidence by evaluating risks and probabilities.

Assisted History Matching: Easily calibrate your simulation model to match observed history with powerful experimental design & optimization algorithms. The simple experiment setup and automated case generation work in synergy with tNavigator's powerful simulation engine.

Forecast Optimization: Optimizing production strategies, well targets and development plans ensures optimal reservoir performance. The non-trivial task of optimization is simplified with state-of-the-art optimization algorithms. Project efficiency is boosted by the fully-parallel simulation engine.



Network Designer

tNavigator offers a powerful engineering tool for field development strategy analysis and production optimization, providing true integration between the reservoir and surface facilities. tNavigator Network Designer allows the engineers to build and edit surface network models, with an extensive library of elements available. PVT tables and well design can be incorporated into the model, to allow for the calculation of pressure and temperature distribution. This enables a better understanding of a given development strategy and to analyze the effect of surface facilities on the wellbore and subsurface state.

Reservoir models with different PVT properties can be coupled and controlled by the surface elements in order to run the forecast and account for all elements of the production system. Run the model faster, saving time for analysis and decision-making.

INTEGRATED MODULES AVAILABLE



Well Designer

Design and visualize well models in an interactive interface with advanced tools for editing well geometry and construction, calculating fluid flow patterns using multiphase flow calculations, and calculating VFP tables with the option to integrate experimental data. Integrated workflows allow each VFP project to be linked back to corresponding well in the dynamic model, and provide unified fluid properties and PVT models across your project.



Graphical User Interface (GUI)

Unified interactive interface for the tNavigator platform, shared between all license modules. Without any other modules activated, the tNavigator GUI allows users to open and visualize Designer projects and existing simulation results in Read-only mode.

Includes the following tools:



Adviser

Quick help is a click away in the tNavigator GUI with the Adviser tool; Integrated fast context search in all manuals and tutorials



License Manager

Easily connect to Rock Flow Dynamics cloud license server, connect to your company's network license server, or get started with a local standalone license dongle.



Remote GUI

Control simulation calculations running on a cluster



Batch Jobs

Submit and manage batch simulation jobs for successive calculations on workstations or clusters

tNavigator[®] HARDWARE RECOMMENDATIONS

Hardware selections are dependent on the models that you are running (number of active grid cells, number of wells, years of production history, complexity of layers, etc.) as well as the purpose and simulation run times you are looking to achieve – to best assess your hardware needs, please talk to your local RFD representative who can take a look at your model and give you the best recommendations for your needs.

Although tNavigator can run on any hardware configuration, in general, we recommend the following for efficient runs on:

GPU Laptops for Smaller Models:

CPU: Intel i7 9750H, or newer
GPU: NVIDIA GeForce GTX 1070, or better
Memory: 32 GB RAM for REs, min 64GB for seismic workflows

Workstations for Mid-size Models:

CPU: 24 or 32 cores, Intel i7 or newer
GPU: NVIDIA GeoForce RTX 40xx series
Memory: 256 or 512 GB, depends on number of cells and components

Additional notes for IT regarding hardware configuration:

- Linux and Windows are both supported
- Dual processor systems are ideal in order to optimize memory channels
- When choosing CPU, please note that the number of cores is of higher importance than frequency
- Populate all memory channels with the same DIMM module type
- For one license, you can have up to 2 compatible GPU cards per box

LAPTOPS AND WORKSTATIONS

Our go-to choices for our Reservoir Engineers and Geological Modelers at RFD:

Laptop:

Off-the-shelf gaming laptop with the latest discreet mobile GPU from NVIDIA

Workstation:

High-end workstation with dual socket server CPUs and 1-2 discreet high-end gaming or computation GPUs from NVIDIA.

Accelerate your simulation runs even further with clusters - both CPU and GPU clusters supported. Please contact us for recommended specs.

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