

Tachyus software solutions have empowered upstream producers to consistently realize hundreds of percent return of investment by applying proprietary optimization technology.



Operators have leveraged our platform across more than 25,000 wells to achieve 20%+ increases in production and 40%+ reductions in operating costs.

Tachyus' breakthrough technology, *Data Physics™*, combines machine learning and reservoir physics to rapidly integrate all relevant data sources in real-time to explore thousands of scenarios and identify the optimal injection, drilling, and completion plans. Founded in 2013, our team combines centuries of experience across petroleum engineering, data science, and software engineering companies.

Fundamentally, energy production requires understanding where resources are located, identifying the volumes of reserves in place, and knowing how to

extract them cost-effectively and safely. Over the last decade, operating companies have deployed significant capital to collect massive quantities of real-time sensor data; however, given highly volatile commodity prices and high operating costs, companies are still seeking new ways to modernize analysis techniques to become more efficient and effective, and achieve the desired return on investment from these data sources.

In order to accomplish this mission-critical objective, operators need a platform to rapidly integrate all data, including seismic data, cores, well logs, real-time production data, maintenance records, and financial/operational constraints. Such a software platform needs to not only integrate and display this disparate data, but also provide predictive analytics allowing engineers to quickly make decisions on what to do to meet specific company goals such as how to redistribute waterflood injection, which wells to cyclic steam, where to infill drill, and how to design completions in unconventional reservoirs. Ultimately, to transform data into value, operators need a prescriptive analytics tool that explores millions of "what-if" scenarios and identifies the optimal operational and development plans to meet any specific company goals.

Physics and Simulations

$$Q = \frac{-kA}{\mu} \frac{(p_b - p_a)}{L}$$

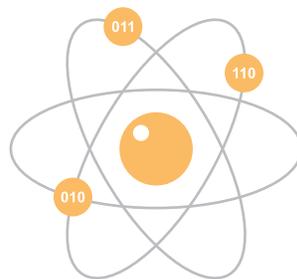
Darcy's Law

$$\frac{\partial}{\partial t} \left[(1-\phi)p_M U_M + \phi \sum_{k=1}^P p^k U^k S^k \right] \dots = 0$$

Conservation of Energy

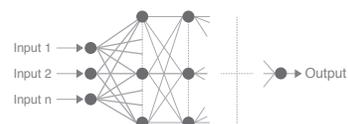
$$\frac{\partial}{\partial t} \left(\phi \sum_{k=1}^P p^k x_i^k S^k \right) - \sum_{k=1}^P (p^k x_i^k V^k + S^k J^k) - Q = 0$$

Conservation of Mass



TACHYUS
Data Physics™

Data Science and Machine Learning



Neural Networks



Fuzzy Logic

0	77	684	473	5	7	09	458	683	70	04
992	010	8	62	308	164	514	673	3	21	5
380	646	109	42	21	560	82	38	55	155	3
32	574	135	42	426	1255	412	2	281	773	3
4	513	03	870	260	184	45	3	681	24	724
0	751	35	260	06	81	1	1	27	202	2
468	917	94	84	05	06	3	3	1	1	1
	732	14				23	241	151	55	416
									203	41
									1	920
									351	2
									2	24

Machine Learning

To support this purpose, Tachyus has invented a patented breakthrough technology called *Data Physics™* that merges modern data science and the physics of reservoir simulation. While simulation models require months to set up and days to run, *Data Physics* models, like machine learning models, require only days to set up and can be run in real-time. But, in addition, because these *Data Physics* models also include all the same physics as a reservoir simulation, they offer robust long-term predictive capacity even when historical data is sparse or missing.

Unlike traditional reservoir simulation workflows which assimilate data sequentially, *Data Physics* models integrate production data, log data, and seismic data in a single assimilation step. The data assimilation is automatic and leverages sophisticated algorithms requiring minimal human intervention. These models directly incorporate raw data without the need for manual interpretation. Thus, *Data Physics* models can be built rapidly, updated continuously, and assimilate various forms of data without inconsistencies.

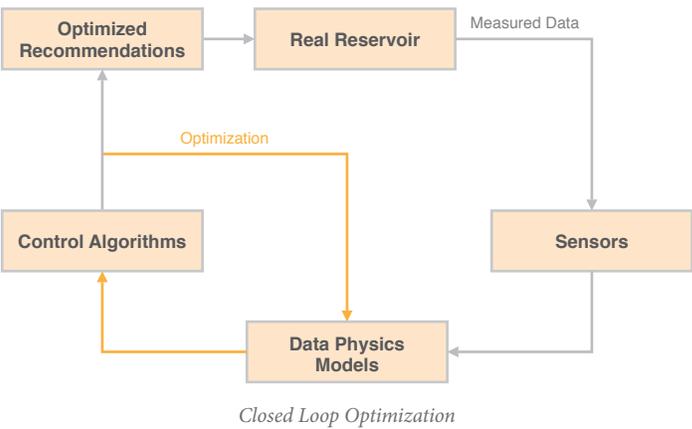
The *Data Physics* workflow is not intended for geological characterization of a subsurface reservoir or to create a geo-model. The objective is to provide solutions to the many “what if” scenarios so that field operations and reservoir specialists can make the best decisions based on their defined objectives such as maximizing production, minimizing operating costs, reducing completion costs, increasing initial production rates, and managing uncertain cashflows.

The Tachyus optimization platform has many modules configurable to meet the needs of the specific asset. Each module includes intuitive, easy-to-use visualization tools, a “what-if” analysis workflow to allow users to predict the production response of scenarios in real-time, and an optimization engine to help engineers select optimal scenarios.



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Aqueon
 Optimize distribution of water injection and location of infill producers/injectors.
- 
Atmion
 Optimize distribution of steam injection and location of infill producers/injectors.
- 
Thermion
 Optimize which wells to cyclically steam and what volume of steam.
- 
Dioxeon
 Optimize CO₂ injection distribution, WAG cycles, and infill locations.
- 
Baryon
 Cut costs and increase production in SAGD operations.
- 
Fraceon
 Minimize frac cost and maximize IP rates. Manage choke settings to balance recovery and short-term production.

Fast-running, physically accurate models with quantitative production estimates and statistical confidence in a closed loop process have never before been possible. With a closed loop system, the simulation is constantly re-run and re-tuned, so the reservoir model remains true to actual field conditions at all times and does not fall “out of date”. Tachyus *Data Physics* technology powers an evergreen platform that ingests field data daily, and updates optimizations nightly, ensuring that your models are always up-to-date, fitted to the latest data, and ready to use.





Quantitative Optimization

Success in the oil patch requires smart capital allocation, investment and risk management. Tachyus users leverage our optimization algorithms to mitigate risk while determining the best possible use of capital across ongoing operations and new asset development.

In The News

Prescriptive-Analytics Modeling Technology
www.spe.org/en/jpt/jpt-article-detail/?art=2568

Wall Street Journal: Oil Industry Vets Back Tachyus With \$5M
www.wsj.com/articles/oil-industry-vets-back-oil-data-startup-tachyus-with-5m-1476271805

Forbes 30 Under 30 2016: Energy
www.forbes.com/30-under-30-2016/energy