tNavigator – breaking reservoir simulation speed limits in Europe!

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For many years now reservoir simulation has been a practical and accepted practice within oil and gas recovery, adopted by nearly all petroleum companies today. Running dynamic models of an asset, or a specified sector of the field, using numerical engines to predict fluid flow behaviour and quantify oil and gas recovery is seen as a best practice solution to de-risk each drilled well and ultimately optimise the overall recovery when creating a field development plan.

Over recent years we have witnessed a surge in static modelling capabilities. Huge full field models are created with high resolution of associated field data that can now be constructed to create a representation of the subsurface, allowing for better understanding of the asset. Added to this the industry also faces very challenging (and not to mention, costly!) wells, therefore making time-dependent predictions for field optimisation is of paramount importance. Around 30 years ago, standard reservoir simulation technologies made enterprising developments for tying in applied physics to a numerical simulation. However, many of these standard simulation packages are unable to optimise the modern supercomputer hardware platforms to take full advantage of parallel scalability performance, thus leading to some frustrating workarounds for reservoir engineers, constantly confronted with a difficult comprise between time of simulation; resolution and active cell count of the model; and monetary budget for software licences and available hardware capacity.

With these bottlenecks in mind, Rock Flow Dynamics have created a reservoir simulation technology that tackles these compromises in order to hand the advantage back to the reservoir engineer. tNavigator is a fully parallel hydrodynamic simulation technology that can run models at the geological scale within reasonable simulation time. A highly intuitive graphical user interface that works on the fly during simulation also saves reservoir engineers a lot of time, as they do not have to wait until the simulation is finished to analyse the results.

tNavigator technology has expanded worldwide due to some key features that are changing the way companies view reservoir simulation. Intel Capital also invested into Rock Flow Dynamics with a co-marketing agreement in 2010, recognising the potential of this product for the petroleum industry.

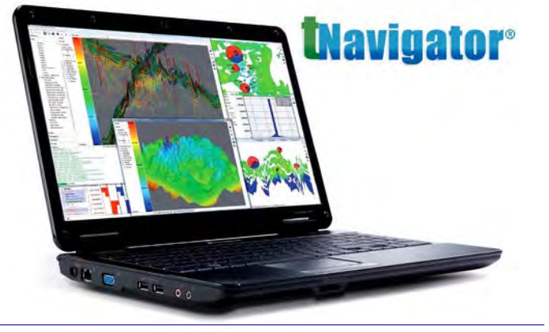
Towards the tail end of 2014 an office was set up in Europe to promote tNavigator and provision all client interactions with front line support. Since this milestone moment there has been a number of evaluations taken up within the UK, Norway, Germany, Spain, France, Italy, Austria and Holland. There are now many new clients added to the growing list with future sales forecasts looking extremely positive.

In order to achieve such success there are some fundamental values aligned with the technology in order to simplify the perceived constraints of moving from tried and trusted methods to something that is now commonly being described in the industry as a "game changer".

The first point of call is that tNavigator is vendor neutral. It recognises standard industry formats so there is limited, or in most cases, zero format conversion that is required. Embedded convertors in tNavigator will seamlessly 'read' the current model and bring it to life in a 2d and 3d visual representation. For many reservoir engineers, this will be the first time that they have seen their dynamic model displayed in something that is not lines of outdated text scripts. Visually, it is a very impressive start….

The design and layout of the graphical user interface has been fully led by the reservoir engineering community. In order to reduce mouse clicks and ensure that all functionality is within logical proximity to one another the guidance of simulation experts was utilised in order to develop the product. Being able to interact with your model before, during and after a simulation run adds tremendous benefit that permits the reservoir engineer to fully explore all kinds of data that were once not thought possible (or practical) for analysis. A distinct benefit about the interface is that there is so little training required in order to get up and running. For an experienced reservoir engineer, picking up tNavigator is simple. By utilising the pdf tutorials and simple guidance from the RFD local support team, it takes almost no time to begin using the software to great effect.

Now that the reservoir engineer is in control and able to work with the model more fluently, the logical next step is to actually run the simulation. Every line of tNavigator code is fully parallel giving unrivalled scalability for acceleration performance improvements. So regardless of the size and complexity of the model it is always possible to reduce simulation time by adding more hardware. The vision of Rock Flow Dynamics is to ensure that high resolution simulations and huge history matching and uncertainty studies are not so much a dream but a reality, therefore the licensing policy is to include full parallel performance of all available cores within the workstation or cluster node per standard simulation engine. The high-end desktops, such as HP z840 currently have up to 36 computational cores. With proper implementation of the software this hardware allows for up to 25-30 times speed-up compared to simulations on the single core. This means the simulation time for a challenging model can be reduced from 1 day to 1 hour on a workstation. As for high-performance clusters, there is no limit really. The recent studies show up to 100+ and even 1000+ times speed up for large models. With the capabilities and price effective rates of modern hardware it is now possible to improve acceleration performance by almost limitless means. Meaning, if you need a faster reservoir simulation, it is now scalable on tNavigator and at a cost permitting solution.



Quotations:

"Occasionally someone comes along with a truly new approach. And is usually met with disbelief, because the status quo is always more comfortable. With over 35 years' experience in reservoir simulation, I would like to say, that tNavigator have created this Eureka moment and have taken simulation into the 21st century. Superfast processing comes with synchronised GUI for maps, line graphs and well displays; it allows for immediate timestep by timestep analysis of the history match in progress. Stop/Retrace/Start technology allows for ad hoc intervention during a run, alleviating the need to wait to the last timestep; effectively conducting multiple runs in one. Interrogation of the results is so improved, that one now considers whole new data, which were previously left untouched. Truly a game changer!"

- Bruce Stevens, Reservoir Engineering Consultant, EnQuest

"We were initially looking for a cost effective solution to our simulation needs. tNavigator provided much more than that. Its impressive muti-core capabilities, coupled with intuitive and reservoir engineering oriented features provided a step change in some of our simulation studies. Simulation runs that would take days, now can be run, analyzed and fully exploited within hours. Its user friendly design made it possible for our engineers to switch from other simulators to TNavigator in a matter of a few hours. What RFD has achieved in the space of a few years is an impressive technical achievement which, coupled with a competitive price strategy, provides real and tangible value to our organisation."

- Xavier Lopez, Senior Reservoir Engineer, VERMILION REP

"The tNavigator technology represents a game-changer for us compared to other reservoir simulation software in our organization. We not only can tackle far more complex reservoir models with the software, but we are also able to fully exploit the exceptional speed of tNavigator in combination with our assisted history matching software to significantly reduce project cycle times. This in turn has made reservoir simulation a much more valuable tool to our organization."

- Larry Murray. Manager, Waterflood Modeling, Occidental Oil and Gas California Operations

"Having been a user of reservoir simulation for over 30 years, I was looking for the next step change in technology that allowed us to do the things we wanted to do, at the resolution we wanted, in an acceptable timeframe and at reasonable cost. RFD achieved this, and I'm sure will achieve a significant part of the reservoir simulation marketplace as others realise that this is a step change in the performance/price value driver."

- Steve Flew. Technical Director, Petrofac Malaysia

"I've used the tNavigator for a while now for our polymer study, but also other simulations since it's so fast and it fits nicely into our Petrel workflow. It's so intuitive that none of us had to attend any training course."

- Geir–Magnus Sæternes. Reservoir Engineer. Lundin Petroleum Norway.