

# INSIGHTS

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Can we squeeze more value from reservoirs in production - from better use of data?

Time to treat reservoir simulators with more scepticism?

Using changes in gravity and subsidence on the seabed

Working with repeat seismic recorded on the seabed

Using fibre optics in wells for measuring seismic

Rock relative permeability from a digital rock sample

# Paradigm k – a new cloud-based system for production engineers

Oil and gas E&P software company Paradigm has developed a cloud-based system for production engineers that provides well surveillance data, reservoir simulations, and online collaboration capabilities.

Oil and gas E&P software company Paradigm has developed a cloud-based software solution for production engineers called Paradigm k, to help them perform reservoir simulations and production surveillance analysis.

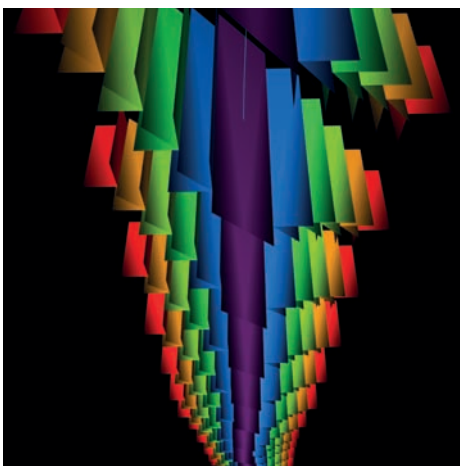
“The task of production engineers is to maintain production targets. Historically this has meant mainly surveillance, seeing what production currently looks like. Access to reservoir simulations will give them a better understanding of why changes in production rates are happening,” says Indy Chakrabarti, senior vice president of Product Management at Paradigm. “It is a merger of subsurface and surface workflows coming together.”

The system can be used by production engineers to test different plans for in-fill wells, and predict how much oil they might produce. They can investigate reasons why a well is not achieving its target production, or predict what might happen if you change the choke size or do an artificial lift.

The software can ‘ingest’ surveillance data from well flowmeters and sensors. This data can be used to update the reservoir model.

The software also supports collaboration, making it possible to share what you are doing at each well with your colleagues, as well as the results of those activities.

Paradigm sees this evolving into a knowledge base around wells. For example,



Paradigm k can predict fluid flow in complex fractured environments, in minutes – and without time consuming setup.

someone might post that they are planning a workover for a certain well, and someone else notes that the same well was worked over a few years ago and sends details of the outcome.

There are no software requirements to get started – you can run it from an existing reservoir model, or take whatever inputs you have. It is hosted on Amazon Web Services.

Paradigm is initially offering the product to customers involved in shale oil and gas, where the modelling complexity can be most acute, particularly when modelling fractures.

“Paradigm can offer data management as part of the service, or oil companies can manage the data themselves. Oil companies are increasingly paying attention to their sensor data, and historian software systems for storing it, Mr Chakrabarti says.” “We can tap into those systems.”

Until now, production engineers have basically had two options if they wanted to understand their reservoirs: Either oversimplified, seeing the reservoir as a tank of hydrocarbons with no complex geology, or performing full-scale reservoir simulation, which production engineers often find challenging, Mr. Chakrabarti says. “That process is onerous, and as a result, limits who can do it”.

And the majority of reservoirs in the world still do not have numerical simulations, Mr Chakrabarti adds.

## Production engineer decision making

The role of the production engineer includes daily monitoring of the well (often referred to as ‘production surveillance’) to see how individual wells are performing, whether injection systems seem to be helping, and whether the company is on track to achieve its production goals.

Production engineers also have to make more long-term decisions, such as whether to install artificial lift. Experienced production engineers might be able to understand well behaviour merely from



Indy Chakrabarti, senior vice president of Product Management at Paradigm

observation. However, using Paradigm software can help them put numbers behind their ideas, in order to compare production improvements against any extra costs.

The data can be stored in different ways, including with data historians (typically used for production surveillance data), relational databases and models.

## A different kind of simulator

Paradigm has developed a different kind of reservoir simulator for Paradigm k, which uses the full resolution of the available geological information, while running much faster.

Standard reservoir simulators divide the reservoir into tiny 3D boxes, and model the parameters for each box individually. This is a computationally intense process which also requires simplifying the geological model into boxes.

The Paradigm k simulator, on the other hand, looks at the entire geology without simplification, and then uses equations to calculate the flows. This means that it does not require any reduction in resolution to run, and can provide a simulation within minutes, Paradigm says.

Tests show that the outcomes of the simulator are very similar to those from a more sophisticated simulator, in much less computing time.

This semi-analytical simulator has been used on unconventional reservoirs, which have fractures which are very difficult and time-consuming to numerically simulate.

“You don’t have to build a simulation deck for a production engineer,” he says. With this software, “We can represent the fractures and the full complexity.”

