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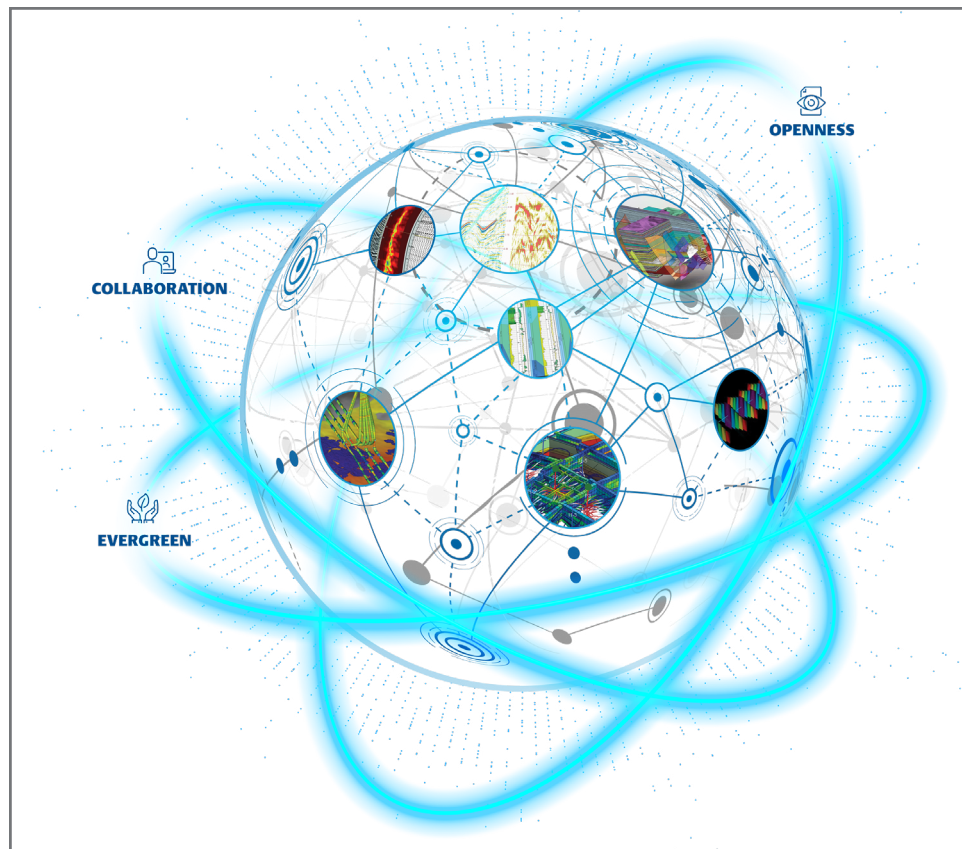
— Better Business Decisions through Accurate Uncertainty Assessment and Reliable Production Forecasts

# Aspen Big Loop™



# Embrace Digital Transformation for Better Collaboration and Team Efficiency

In fast-paced environments, critical field development decisions require seamless collaboration. A unified, reservoir model based on a collaborative approach between multi-disciplinary experts is therefore of immense value.



Aspen Big Loop is a digital transformation solution - higher efficiency with less effort.

The answer to this challenge is Aspen Big Loop, an open ecosystem for setting up automated, reproducible and auditable ensemble-based workflows. The workflows help propagate uncertainties and capture their dependencies, resulting in reliable probabilistic predictions. Easy to update, they enable asset teams to spend more time analyzing the results and building a common understanding of the reservoir.

In Aspen Big Loop, subsurface uncertainties captured at every stage of the modeling process are used as inputs within a repeatable workflow. By adjusting these inputs, an ensemble of models can be created via an iterative loop, with their likelihoods constrained by production history and other data. The result is a ready-to-analyze flow model calibrated to multiple geophysical, geologic and production data, ensuring consistency with the underlying geology.

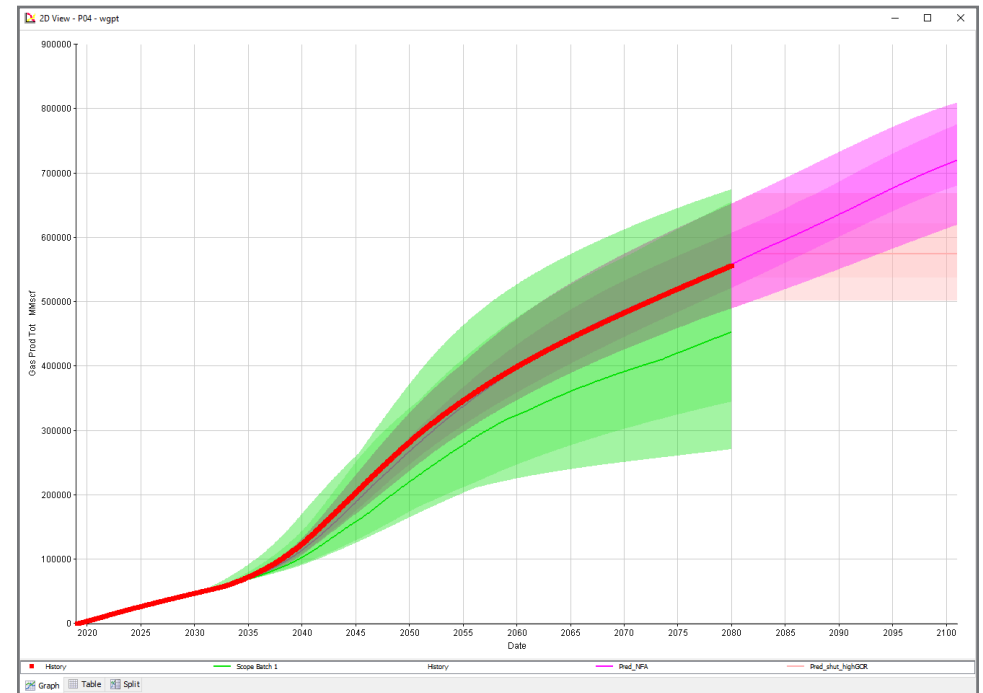
The results provide valuable input that enables asset teams to make informed recommendations for:

- Exploration and appraisal
- Field development
- Field production
- Advice to Business Units

The Aspen Big Loop workflow is open and scalable, running on premise or on the Cloud, from PC to HPC.

# Ensemble: Propagate Uncertainties from Where They Apply to Where They Matter

Aspen Big Loop is able to capture, preserve and propagate uncertainties throughout the workflow: in seismic interpretation, well picks and petrophysical logs, well trajectories, velocity and structural models, and property and petrophysical models. All of the uncertainties are honored and used to generate multiple ensembles of the static and dynamic models, reflecting the range of possibilities associated with each subsurface feature.



Ensembles provide a reliable measure of the risk for green and brown fields. They can be used to confidently predict reservoir performance.







## Evergreen: Keep Your Model Up to Date with the Latest Field Information

As a repeatable workflow, Aspen Big Loop enables models to be updated quickly and easily as new data arrives, ensuring that future decisions are based on the very latest information. Geoscientists can create an ensemble of possible models, to support multiple hypotheses and scenarios. Cross-domain workflows are fully automated and repeatable, so that they can be reused with new data, including horizontal wells. High degrees of automation allow any subsurface specialist to run the workflow and test for sensitivities, with little prior application knowledge.

## Collaborative: All Domains Contribute to Defining the Model for Increased Efficiency

A common workflow integrating all disciplines, from seismic to simulation, provides a unique collaborative environment that leverages the contribution of every member of the asset team. A unified understanding of the reservoir results in greater quantification of risk and well-informed decisions about future development scenarios.



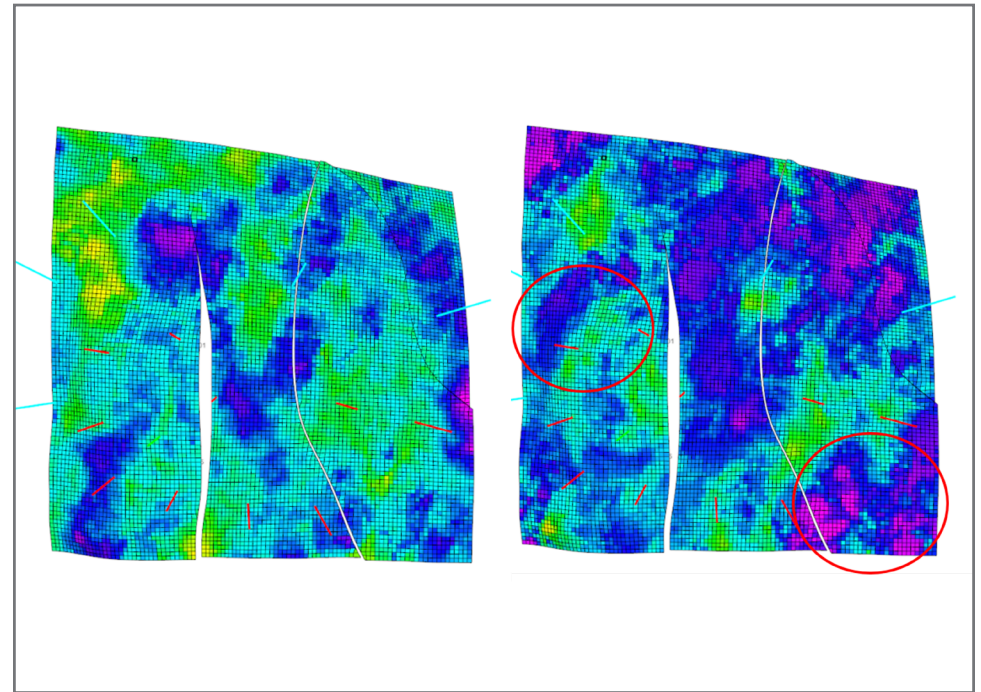
# Tight Integration of Static and Dynamic Domains

Aspen Big Loop tightly integrates dynamic and static parameters throughout the full E&P lifecycle, from seismic interpretation to geomodeling, reservoir engineering and production forecasting, with uncertainty distributions correlated across domains.

Sensitivities can be tested, and their effects on the static and dynamic model determined. Static and dynamic modeling occur near-simultaneously. History matched dynamic models are geologically consistent. Knowledge from one domain is preserved and communicated in the next, with data integrity preserved throughout the workflow. There is no such thing as a simple or complex model; models are fit-for-purpose. The result is dramatically reduced cycle times.

## The Aspen Big Loop Ecosystem

The flexible, open Big Loop ecosystem allows in-house and third-party applications to be integrated via the Roxar™ App Connector. All steps can be automated through the Aspen Tempest™ ENABLE and Aspen RMS™ Workflow Manager. The offering also incorporates the mature and proven Aspen SKUA™ solution. All runs are easily controlled and instantaneously screened thanks to flexible and intuitive data management and displays.



Before history matching (left), history matching using Aspen Big Loop (right).



## Aspen Big Loop Features

- Automated scalable workflows, from G&G to Reservoir Engineering
- An ensemble-based workflow that tightly integrates the static and dynamic domains, supporting collaborative workflows and reliable risk assessment
- The ability to quickly and efficiently build models and update them as new data arrives - “evergreen” models
- Capture, preserve and propagate uncertainties across all domains for better predictions and decision support
- Generate revised history matched ensembles with minimal clicks
- Sample through uncertainty spaces and automatically create hundreds of models. Uncertainties can be automatically combined and generate hundreds of runs.
- Machine learning-optimized assisted history match - models reservoir response to parameters in order to minimize the number of models needed to achieve history match

## The Advantages of Aspen Big Loop

- Fully automated cross-domain workflows facilitate easy model updates, enabling domain specialists to focus on analyzing results and not (re)making manual fixes.
- Aligning disciplines through a common platform increases efficiency, enables better collaboration across typically siloed disciplines, and supports optimal decision making.
- Ensembles (machine learning technology) improve prediction quantification by calibrating all available geology and production data.
- Comprehensive ensemble analytics tools help dramatically improve understanding of the reservoir and uncertainties, and assess overall reservoir risk throughout the life cycle of an oil or gas field.
- Embrace digital transformation for better collaboration and team efficiency. Change the way models are designed, from building one “perfect” but wrong model to creating multiple models that can be improved automatically as new data arrives.







## **About AspenTech**

Aspen Technology, Inc. (NASDAQ: AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in capital-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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