

E01

## Integrated Reservoir Modeling, Assisted History Matching and Uncertainty Management in Petroleum Reservoirs

P. Van den Hoek\* (Shell International E&P BV), G. Joosten (Shell), G. van Essen (Shell) & G. Kaleta (Shell)

### SUMMARY

---

In the past years, we developed, improved and applied to petroleum reservoirs a variety of different computer methodologies and workflows for assisted history matching (AHM) and improved uncertainty management, such as Experimental Design, Adjoint, and “Model Maturation”. In most recent years, increasing emphasis has been on bringing these methodologies to our field operations, and also include 4D seismic into the process of model maturation and history matching.

The current presentation will focus on the workflows in which the different AHM methodologies were successfully applied in real field cases, including cases where production data were matched simultaneously with 4D seismic results. Particular attention will be given to a technique called “Model Maturation” which helps geoscientists and engineers to find “unknown unknowns” in their reservoirs. This has been successfully applied to a wide range of field cases worldwide.

Finally, a future outlook will be given, mainly focusing on the (largely R&D) topic of “close the-big-loop” (fully geologically consistent) history matching where we are, amongst others, looking into developing methodologies for “business decision-relevant” modeling of reservoir uncertainties and multi-scales.



## **Integrated Reservoir Modeling, Assisted History Matching and Uncertainty Management in Petroleum Reservoirs**

**Deployment Lead Assisted History Match Technologies, Shell Global Solutions Upstream**

### **SUMMARY**

In the past years, we developed, improved and applied to petroleum reservoirs a variety of different computer methodologies and workflows for assisted history matching (AHM) and improved uncertainty management, such as Experimental Design, Adjoint, and “Model Maturation”. In most recent years, increasing emphasis has been on bringing these methodologies to our field operations, and also include 4D seismic into the process of model maturation and history matching.

The current presentation will focus on the workflows in which the different AHM methodologies were successfully applied in real field cases, including cases where production data were matched simultaneously with 4D seismic results. Particular attention will be given to a technique called “Model Maturation” which helps geoscientists and engineers to find “unknown unknowns” in their reservoirs. This has been successfully applied to a wide range of field cases worldwide.

Finally, a future outlook will be given, mainly focusing on the (largely R&D) topic of “close the-big-loop” (fully geologically consistent) history matching where we are, amongst others, looking into developing methodologies for “business decision-relevant” modeling of reservoir uncertainties and multi-scales.