CONDITIONING RESERVOIR MODELS TO DYNAMIC DATA
WORKSHOP 06 – Amsterdam, Sunday 7 June 2009

Convenors
Glyn Williams (BP)
Olivier Gosselin (Total)
Jonathan Ovens (Improved Recovery Consulting Ltd)
Francesca Verga (Politecnico di Torino)

Description, Objectives and Deliverables
The workshop will be concerned with current practice and new developments in conditioning reservoir models to dynamic data. Aspects covered include: case studies; importance in making robust decisions; getting the static model right; matching 4D seismic data; and assisted history matching.

The objectives of this workshop are to share knowledge, understand current practice and discuss new developments on conditioning reservoir models to dynamic data. The deliverable from the workshop will be a summary document from discussions posed by keynote speakers.

Agenda
9:00 Introduction, objectives & agenda (Glyn Williams)
9:15 “Better decisions through good calibration practice”
    Tim Moulds (BP)
10:00 “Up-dating geological reservoir models”
    Jacques Vittori (TOTAL)
10:45 Coffee break
11:00 “Conditioning models with 4D data”
    Palle Mikkelsen (Consultant)
11:45 “Assisted History matching”
    Sigurd I. Aanonsen and Gurbat S. Agaev (Statoil)
12:30 Lunch
13:30 Feedback survey (Francesca Verga)
13:40 Set up syndicates (Jonathan Ovens)
13:45 Syndicates
15:15 Feedback from syndicates & discussion
17:00 End of workshop (Olivier Gosselin)
Organisation

- All participants are encouraged to share their experiences in the discussions and syndicates to promote improved understanding. The number of attendees has been limited to provide an informal and fruitful interchange of technical information and ideas.
- Invited keynote speakers provided a brief synopsis of their presentation, (given below).
- All participants are asked to fill a survey (about 20 questions) handed out at the beginning of the workshop, collected during the break, compiled and analysed during the lunch. The results will be presented at the beginning of the afternoon.
- Syndicate sessions in small groups will be held to discuss questions raised by the keynote Speakers. This will be followed by feedback to the whole workshop and further discussion.

Who Should Attend

This workshop is aimed at professionals and academia in the oil and gas industry who are interested in multidisciplinary and integrated reservoir characterisation and management and in the conditioning of reservoir models to dynamic data in particular. The most relevant disciplines for the workshop are Reservoir Engineering, Geology, Production Engineering, Petrophysics, Geophysics and Earth Science.
ABSTRACTS

“History match in a large mature field” by Tim Moulds (BP)

This talk will use the case study of a large North Sea oil field with decades of production data to consider the benefits and challenges of applying assisted history match techniques. The field has been on stream for 26 years with 74 wells drilled. There is a wealth of RFT and PLT data as well as production and injection rates and BHP data to which the full field model is to be matched. The field has been under waterflood from start-up, it now also operates a gas injection EOR scheme.

Describing such a field immediately raises the need to consider many hundreds of variables in the reservoir description. The talk will consider the pre-history match planning activities, selection of the appropriate modelling tool and how the work was structured to ensure optimum use of available resources. This then leads to discussion of strategies followed during the history match and the insights provided to understanding uncertainty in the prediction phase. The lessons that were learnt will be described as will the benefits that assisted history matching brought to business decisions. A final look-back at the study will conclude that assisted history matching may be at its most productive when used alongside more conventional history matching techniques.

“Updating Geological Reservoir Models” by Jacques Vittori (TOTAL)

A reservoir model ready and useful for production forecast and reservoir management is the result of a complex multi-disciplinary team work. Good practice includes gathering, analysing, understanding and integrating multi-scale data through iterative processes. All available data are needed early to design a consistent and fit to purpose model. This integrated model is both the product of, and the tool for static and dynamic syntheses.

Identified uncertainties will guide proactive data acquisition, (re)interpretation and development strategy. Even after setting the initial quantitative geomodel, further dynamic data acquired along the life of the field must be confronted to the model response, and be assimilated to enhance the static model making it more predictive through feedback loops. Revisiting older data set such as analogues (field or outcrops), 3D interpretations and well test responses, often proves to be valuable but time consuming. Through real field examples the talk will raise and review questions and challenges, as well as routes for R&D investigations.
“Improved Reservoir Management Through Integration of 4D Seismic Interpretation, Draugen Field, Norway” by Palle Mikkelsen

4D seismic interpretation plays a key role in the reservoir management of the Draugen Field, situated offshore Norway. Time lapse seismic surveys of exceptional quality conducted in 1990, 1998, 2001 and 2004 have all shown outstanding areal and vertical definition of the water movement towards the producing wells.

Excellent reservoir properties with relatively few high rate wells and an expected recovery factor exceeding 60 percent make Draugen one of the best performing fields offshore Norway. The field has a simple geology; however, the reservoir structure is relatively uncertain due to the low number of well penetrations for calibrating the structure. Fortunately, the 4D seismic interpretations have largely compensated for this shortcoming by providing improved lateral control for refining the reservoir simulation models.

All of the 4D interpretations conducted so far have indicated the need for simulation model changes such as modified reservoir volumes in certain areas, revised fault transmissibilities, and the need for improved relative permeability characteristics. Integration of the 4D interpretation results has greatly improved the various Draugen reservoir simulation models enabling improved forecast and reserve estimates as well as better business decisions. Effects on the field reservoir management have included revising the water injection strategy, converting a producer to injector, re-positioning a development well and drilling an appraisal well.

“Assisted history matching” by Sigurd I. Aanonsen and Gurbat S. Agaev (StatoilHydro)

In this talk we will look into different methods, software and examples of assisted history matching, including field examples from StatoilHydro. We will raise some fundamental questions with respect to how we do history matching, and discuss the difference between using assisted methods to aid a traditional history matching work flow versus what one could call “modern” methods.

Other topics which will be discussed are how we should capture uncertainty in assisted history matching, uncertainty in history matching versus uncertainty in predictions, how to capture geological constraints in assisted history matching, and issues with respect to measuring the quality of a match.