Improved Oil and Gas recovery

Joining Forces

2-3.02.2016

Technical Committee
Improved Oil and Gas recovery

- Robert Moe, ConocoPhillips

- Camilla Vavik Pedersen, Statoil

- Erik Søndenå, Petoro (Chairman)

- Etienne Reding, Repsol

- Roar Kjelstadli, BP Norge (Vice chairman)

- Sjur Arneson, VNG Norge

- Johanna Ravnås, DEA

- Eli Jens Høgnesen, NPD

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Network groups

The network groups within FORCE are an important arena for the companies to exchange information through for example workshops, seminars and fieldtrips.

All members are welcome to join any network group. Please note that some networks only allow one member per company.

**Mature fields -
Maximize Recovery**

**Improve EOR
competence**

Force network group
Improved EOR Competence Building Group

Network group:
Mature fields – Maximize Recovery

Objective:

- This network group aims to raise awareness about methods available to maximise oil and gas recovery in mature fields:

  - Identification of remaining hydrocarbon resources and improved understanding of sweep mechanism
  - Drilling and completion technology to access undrained hydrocarbons
  - Production optimisation
  - EOR implementation

- The group will organise regular seminars and workshops. Relevant material will be published on the FORCE web page

Plan for 2016:

- Find topics for 1-2 seminars in 2016

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EOR Competence Building Group

- Our vision is to share knowledge and to enhance technical and professional competence on Enhanced Oil Recovery (EOR) Processes amongst FORCE members

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Proposed Activities

- The group will organize regular seminars and workshops. Relevant material will be published on the FORCE web page

- Technical workshop 2016 primarily focused on one particular topic, e.g. Polymer Flooding or WAG, etc (first half of the year)

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Lunch and Learn is s new activity in IOGR

- The plan is to organize four Lunch and Learn per year

- Proposed L&L themes

    - **OPM - Open Reservoir Simulator (Oct 2015)**
    - **History Matching – what is sufficient HM for prediction/well planning (Dec 2015)**
    - Modelling of fracking beneath injectors (March 2016)
    - Fast Modelling Update
    - EOR – polymertypes
    - MEOR
    - VAG simulations
    - Relative Permeability – various themes
    - End Point scaling   .

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Focus area and Technology challenges

- Mapping, release and transport of immobile oil
  - LoSal and Surfactant

- Improved volumetric sweep
  - Deep diversion technology
  - Polymer

- Optimized combined EOR methods
  - Identify new methods and/or hybrids

- Develop green chemicals.

- Tools and methodology for decision support
  - Improve dynamic simulation and measurement of EOR processes
  - Environmental issues, process challenges, produced water management

- Identify complex and marginal in-fill drilling targets
  - Improve reservoir characterization and 4D seismic

- Active reservoir development :
  - Technology that contributes to faster use of more data to reduce uncertainty in the reserve base and giving a better decision basis
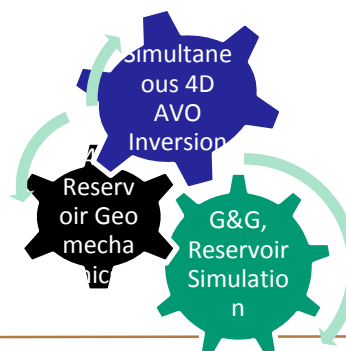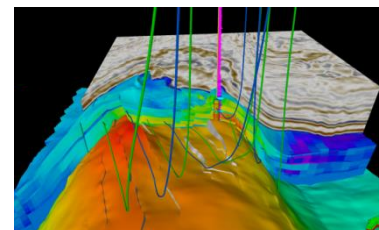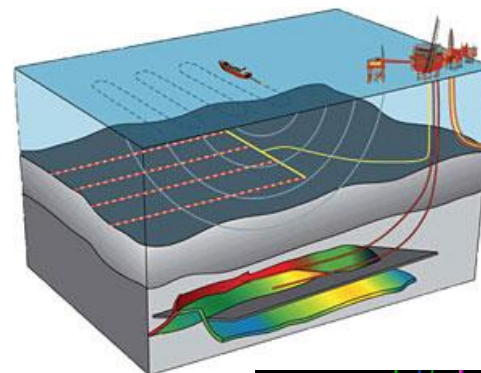
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Reservoir management

Ambition: Increase quality in decision basis by use updated reservoir modells
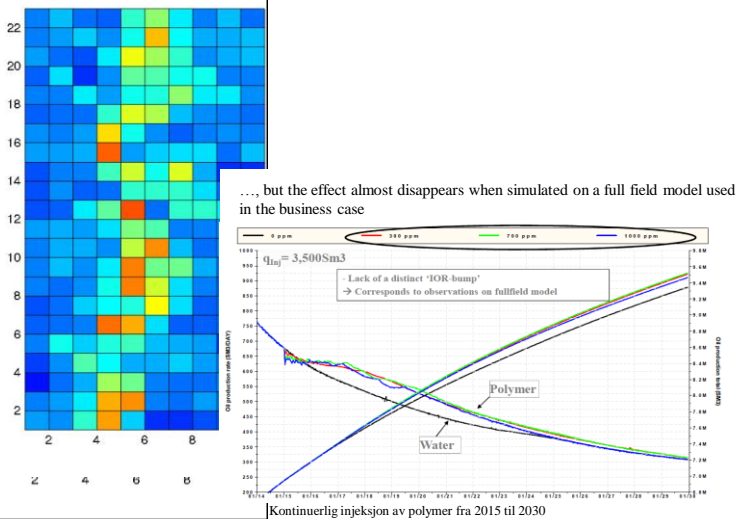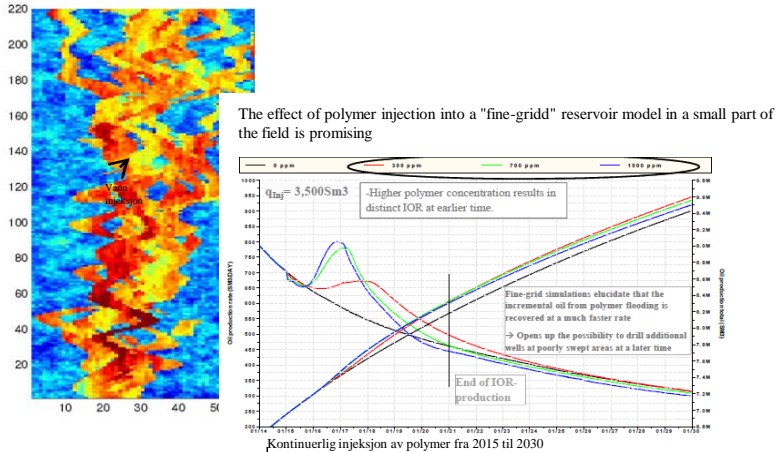**Strategy**: Faster prosess, data collection on demand and use of integrated models

Priority:

- Installation and use of PRM

- History matched reservoir model to be
  updated monthly with the well and production
  data and shall be conditioned to 4D in less
  than six months after collection

Simultaneous 4D AVO Inversion

Reservoir Geomechanic

G&G, Reservoir Simulation

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New generation reservoir modeling tools is needed

The effect of polymer injection into a "fine-gridd" reservoir model in a small part of the field is promising

Kontinuerlig injeksjon av polymer fra 2015 til 2030

…, but the effect almost disappears when simulated on a full field model used in the business case

Kontinuerlig injeksjon av polymer fra 2015 til 2030

- Reservoir simulation is important for investments decision in most oil companies

- The ordinary reservoir model often fails to demonstrate the positive effect

- To demonstrate a business opportunity through reservoir simulation requires the use of high resolution models:
  - Gas injection
  - EOR / polymer injection Multilateral wells
  - Advanced well solutions, such as ICD

With better simulation tool an increased number of sensitivities could be investigated with improved quality => reduced uncertainty in business case

- ◆ To study full field EOR potential the size of grid cells should be maximum 40X40
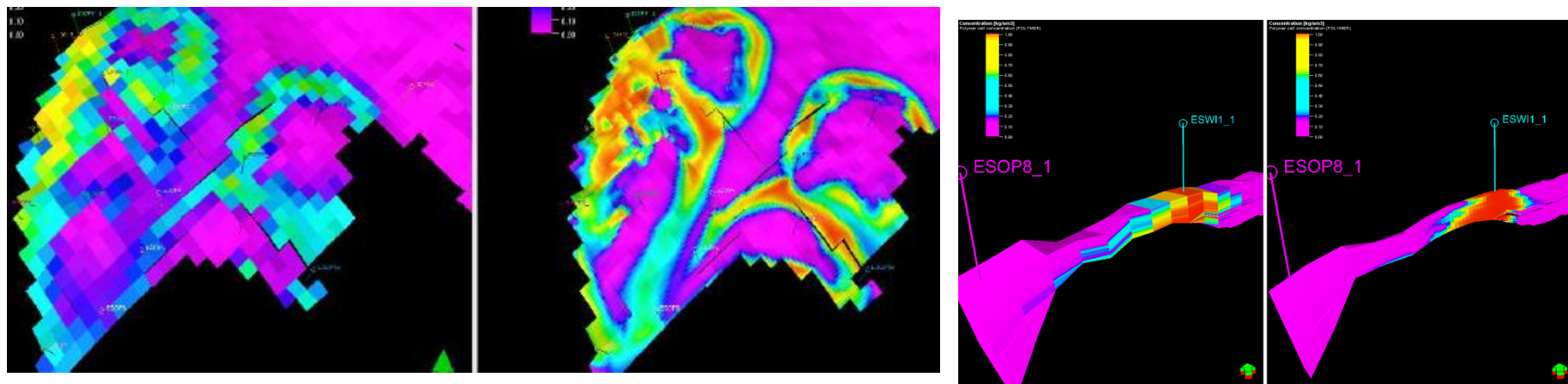
Polymer concentration in coarse grid vs. fine grid

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