Progress in IOR/EOR
Seen from a Danish perspective

IOR Norway 2015
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Flemming Ole Rasmussen
Danish Energy Agency
Outline

- Introduction
- Background
- Government/industry initiatives
- Recent initiatives
- Conclusion
Introduction
Danish oil production profile
Introduction

• Danish oil production:
  • 90% from Chalk reservoirs
  • Expected initial recovery <10%
  • Great potential for IOR/EOR
  • Some potential already released
  • >30% already produced from best chalk reservoirs

• DEA expect research in new technology will increase total recovery with 5%
Background
Background

- 1966 oil was discovered in the North Sea
  - Highly skilled and trained work force,
  - Without experience/ knowledge from oil business

- Arrival of the oil industry introduced new demands to local society including universities, laboratories, factories, service providers and governmental administration and thinking.
License conditions for IOC’s included training of local workforce, and investments in local industry/research.

Newly upgraded workforce gave inspiration to the traditional oil industry.

Traditional oil industry gave inspiration to new local industry.
Danish Government/industry initiatives
Danish government/industry initiatives

- Energy Research Programmes
- Danish Energy Research, Development and Demonstration Programme (EUPD)
- Innovations Fonden – Denmark
- Joint Chalk Research Programme
- Mærsk Oil and Gas AS, Danish North Sea Partner and Danish Energy Agency’s initiative 2008
- The Danish Hydrocarbon Research and Technology Centre
- Danish Governments new strategy
Classic Programme set-up

- Energy Research Programmes.
- Danish Energy Research, Development and Demonstration Programme (EUPD).
- Innovations Fonden – Denmark.
  - Programme invites, funding – based on quality and support from industry
  - Initiative from research institution, university or service provider
  - Oil and gas only funded under very special circumstances
Government initiative industry funding
Joint Chalk Research

- 7 Phases
- Always between 6 and 10 companies
- Unanimous agreement of projects in the first phases
- Later Agreement of Themes and voting on projects
- First phases understanding and describing chalk
- Today IOR experiences and discussions.
## JCR Themes

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### JCR Phase V
- A Joint Chalk Stratigraphic Framework
- Well performance in Fractured Chalk Reservoirs
- Characterisation and upscaling of fractured chalk
- Chalk Rock Catalogue

### JCR Phase VI
- Depressurization Process in Chalk Reservoirs
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### JCR Phase VII
- Library-NPD
- EOR-Mærsk
- Fluid-Rock COP
Mærsk Oil and Gas AS, Danish North Sea Partner and Danish Energy Agency’s initiative 2008

- Investigation into the worldwide status of EOR methods that could be applicable in Danish sector. Based on full life circle experiences.
- Enhanced Oil Recovery (EOR) Field Data Literature Search Prepared By Dr. Larry Lake and Dr. Mark P. Walsh, Department of Petroleum and Geosystems Engineering, University of Texas at Austin
- Proved CO2 injection to be the most viable option in those days.
EOR report

• 390 papers studied
• The papers included over 130 different gas EOR projects, ranging from large-scale commercial projects to small-scale pilot projects, including immiscible and miscible projects.
• 7 were selected, to create a simple model to predict CO2 Flooding
Examples of CO$_2$ flooding
Recent initiatives
Recent initiatives

- The Danish Hydrocarbon Research and Technology Centre.
- Taskforce to create a oil- and gas strategy for the North Sea.
Danish Government New Strategy

- October 2013 it is stated in the government’s ‘Growth Plan for Energy and Climate’ that the government in cooperation with the industry will work for making a long-term strategy, which on commercial basis shall optimize the production of oil and gas from the fields in the Danish sector of the Nord Sea.
Strategy (continued)

- Supervisory committee:
  - Danish Ministry of Climate, Energy and Building
  - Ministry of Finance
  - Ministry Business and Growth
  - Oil Gas Denmark appoint participants

- Chairman and secretariat:
  - Danish Energy Agency
Strategy (continued)

- Special Tasks mentioned:
  - Map the potential for recovery of oil and gas from the Danish part of the North Sea.
  - Coordination of renewal and renovation of existing infrastructure for production, treatment and transportation of oil and gas.
  - Analyze possibilities to safeguard that highly educated workforce with the necessary competences for exploration, production and attached enterprises are available in the future.

- Work in progress strictly confidential
- Work finished end May
Conclusion
Remaining Oil & Gas Reserves and Resources

Reserves and resources approx. 300 m. m³ Oil

- Expected production profile
- Technological resources
- Prospective resources

Oil Reserves and resources approx. 300 m. m³ Oil

- 51% in 2010
- 15% in 2020
- 34% in 2030

m. m³ Oil
Join forces to recover more

Thank you for your attention!

Flemming Ole Rasmussen
Danish Energy Agency
Amaliegade 44
DK 1256 Copenhagen K
Phone: +45 33 92 67 00
fora@ens.dk
ens@ens.dk
www.ens.dk