



Offshore Mature Fields

One day workshop hosted by
International Energy Agency (IEA) Gas & Oil Technologies Collaboration Programme (GOT) - www.gotcp.net,
TNO – www.tno.nl, Imperial College – www.imperial.ac.uk

Objective of the workshop:

- To share the current state of play regarding mature fields and technology gaps on the basis of the recent studies by Rystad Energy commissioned by GOT Collaboration Programme
- To build a common perspective on the challenges related to mature fields, in particular in the North Sea area, with implementation potential in other areas around the world (Gulf of Mexico, Asia, onshore US, ...)
- To share recent innovations in the area of mature field technologies to maximize recovery of depleted oil and gas fields and minimize operational costs.

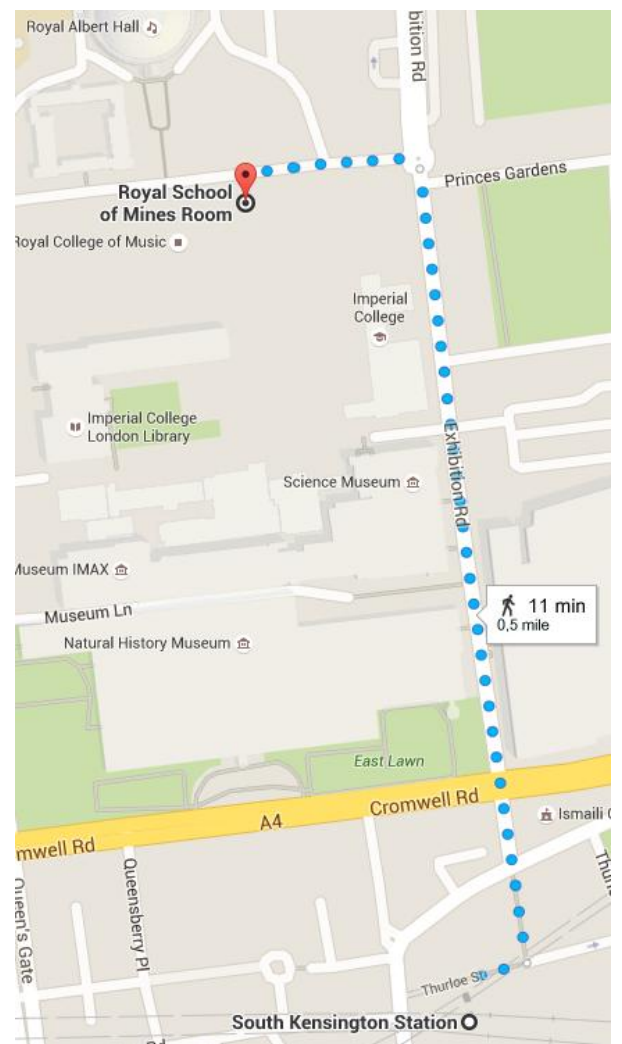
Participants:

- Representatives of the members of the current GOT Collaboration Programme
- Interested country representatives in North Sea countries
- Experts in the area of mature field technology
- Operators active in the North Sea to implement innovative mature field technologies
- Representative of the European Commission related to this theme and connected to GOT CP

When: June 13, 2016. Registration from 08:00.

Where: Imperial College, South Kensington, London. Entrance from Prince Consort Road.

To attend: Please register by email to info@gotcp.net



MONDAY, JUNE 13TH, 2016. 08:00-08:30 – REGISTRATION AND COFFEE



08:30 – WELCOME, INTRODUCTION AND KEY NOTES

**Welcome to Imperial College – Ann Muggeridge. Safety moment.
Purpose and objective of workshop. About IEA Gas and Oil Technology Collaboration Programme –
Jostein Dahl Karlsen, Chairman, GOT**

The Value of Closing Technology Gaps in Brownfield. Nils Henrik Bjurstrøm, Rystad Energy
Easy oil and gas is gone. Today, 16% of global oil & gas is from tail end production, growing to 25% by 2040. The average recovery is ~ 35% globally, while technology has put the North Sea in the lead at 45% or higher.

Maximizing gas recovery in the Dutch sector by well deliquification and water control? Shell – (tbc)

09:15: SESSION 1: OPPORTUNITIES AND CHALLENGES IN THE NORTH SEA AND OFFSHORE USA – GOVERNMENTS' PERSPECTIVE

Session Moderator: Torgeir Knutsen, Ministry of Petroleum and Energy, Norway

IOR experiences and challenges on the Norwegian Continental Shelf. Mariann Dalland, Norwegian Petroleum Directorate

More than 50% of proven oil resources in Norwegian fields will be left behind when production ends. Improving recovery by even just a few percentage points represents enormous value.

British North Sea. Dave Puckett, UK Oil & Gas Authority

MER UK: New strategy to maximize the economic recovery of offshore oil and gas in the UK. Better collaboration between companies and improved cost-efficiency.

**Enhanced Oil Recovery in the United States Outer Continental Shelf; Past, Present and Future.
Nathan Sinkula, Chief, Measurement Enforcement and Data Analysis Section, BSEE, Pacific Outer Continental Shelf Region.**

EOR in the Pacific Outer Continental Shelf: History, current areas of interest, projects/research, future looking, potential/opportunity for government/industry collaboration and need for public outreach/education

10:30 – COFFEE BREAK – NETWORKING

11:00 – SESSION 2: THE COMPLEXITY OF SUBSURFACE

Session Moderator: Ingrid Anne Munz, Research Council of Norway

Reservoir Technical Limits: Creating a system for continuous recovery improvement in mature fields. Craig Smalley, Department of Earth Science and Engineering, Imperial College

We know how to achieve high recovery factors in theory – but why is it so difficult to do it in practice? Technology and commercial issues are of course important, but work published by BP indicates that there is also an opportunity to improve communication and stakeholder alignment within companies, and between partners. The Reservoir Technical Limit approach is a simple way to help with this. It not only encourages the identification of new recovery-enhancing opportunities, but describes them in a way that fosters the progression of the opportunities through to implementation. When rolled up at a corporate or regional level, the information derived from this process allows resources to be focused on the most promising technologies and areas in mature provinces.

The Effectiveness of Tertiary EOR in Heterogeneous Reservoirs. Ann Muggeridge, TOTAL Professor in Reservoir Physics and EOR at Imperial College.

Most EOR processes are applied in fields that have been waterflooded for years, despite the fact that they are usually most effective if applied as soon as a field is developed. There is less risk associated with applying tertiary EOR processes in heterogeneous reservoirs than originally thought. Indeed the outcome may be better (in terms of % additional oil over waterflood) in more heterogeneous reservoirs.

Bo Cerup-Simonsen, Danish Hydrocarbon Research and Technology Centre at DTU.

Joining forces to recover more oil on the Norwegian Continental Shelf. Kristin Flornes, The National IOR Centre of Norway, University of Stavanger, IFE and IRIS.

The IOR Centre operates on microscopic level, all the way up to field scale. The research is based on applicability, through close cooperation with industry, in a multidisciplinary team of consisting of geologists, chemists, engineers, physicists and mathematicians.

12:30 – 13:30 – LUNCH BREAK

13:30 – SESSION 3: GROUND-BREAKING TECHNOLOGY TO UNLOCK RESOURCES

Session Moderator: Rene Peters, TNO

Subsea Recovery, Subsea Compression, Subsea Factory. Per Gerhard Grini, Technology Manager Subsea & Topside, Statoil.

Subsea wells & satellites have provided tremendous value, also by prolonging life of ageing infrastructure. New technology for well intervention and the Subsea Factory will bring subsea recovery on par with platforms.

Stimulating innovation and technology implementation in the Dutch North Sea. Berend Scheffers, Technology Director, EBN.

EBN is the governmental look-out post for stimulating operators to take advantage of new opportunities in the Netherlands. EBN stimulates the sector to produce max from the subsurface in a safe and responsible way.

New technology in mature fields – Reflections. Roy Rusaa, Technology Director, Petoro.

Petoro manages the commercial aspects related to the Norwegian states direct financial interest on the Continental Shelf. The reserve potential in present fields dominates the portfolio. Efficiency and confidence in the reserve potential are critical for realization.

15:00 – COFFEE BREAK – NETWORKING

15:30 – SESSION 4: LATE LIFE OF FIELDS

Session Moderator: Morten Wiencke

Reuse of Old Infrastructure in the Dutch Sector: Combining O&G with Offshore Wind. Rene van der Meer, Project Controls Manager, ENGIE GDF SUEZ.

Maximizing recovery from depleted gas fields in the North Sea – The TNO case study. Rene Peters, director gas technology, TNO Energy.

16:15 – WRAP UP DISCUSSION – WHERE DO WE GO FROM HERE

Panel discussion with speakers and GOT representatives - What should be priority topics for collaboration? R&D between countries? Work across IEA programmes?

17:30 – ADJOURN

Today, 16% of global oil and gas production comes from fields in their tail-end production phase, here defined as having produced more than 75% of the field resources already. In 2040, around 25% of the global base case production is likely to come from tail-end fields. On the backdrop of the increasing industry challenge of meeting global demand for oil and gas, increased recovery from producing fields could seem like a low-hanging fruit compared to moving into frontier basins or achieving significant productivity improvements. Multiple sources state that the world average recovery factor from hydrocarbon reservoirs is in the mid-30 per cent range, and it might seem to have been stuck there for a while.

The Society of Petroleum Engineers (SPE) defines three stages of recovery:

Primary recovery (<30% recovery rate) based on natural flow and artificial lift

Secondary recovery (30-50% recovery rate) targets mobile oil and is based on water flooding and pressure maintenance. Infill drilling, advanced well design (multi-lateral, inflow control etc.) and well maintenance/intervention are often also considered part of secondary recovery methodology, although those can also be viewed as part of the primary recovery strategy.

Tertiary recovery (>50% recovery rate) targets immobile oil based on thermal injection, gas injection, chemical injection and other technologies in combination with water flooding and pressure maintenance.

IOR methodologies are primarily developed for secondary recovery stage, but are utilized also for tertiary recovery facilities might drive cost due to increased topside weight and deck space. In particular, retrofitting of such older platforms for gas or water injection could be costly. In an offshore field, typical well cost would be around 75 MUSD (NCS average), and a retrofit cost could be in the range of 100 MUSD.