



**Ministry of Energy and Mineral Resources  
Directorate General of Oil and Gas (MIGAS)**

**and**

**Royal Norwegian Embassy**

**Seminar on  
Field experiences in EOR –  
From pilot to full field implementation**

**19<sup>th</sup> – 20<sup>th</sup> March 2015 | ESDM | Jakarta, Indonesia |**

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In cooperation with:

**INTSOK**  
Norwegian Oil and Gas  
Partners





# Welcome

Welcome to this EOR-seminar.

This seminar is a follow up on the bi-annual Energy Dialog, which is the official cooperation on energy between the Republic of Indonesia and the Kingdom of Norway. Because of the situation of declining Indonesian oil production, Ministry of Energy and Mineral Resources has requested Norwegian assistance on how to lift the oil production. INTSOK, Petrad and Innovation Norway have together with Ministry of Energy and Mineral Resources developed and organized this EOR seminar, which covers both policy framework conditions and technology to increase the oil recovery rate.

Indonesia and Norway have enjoyed a long standing and good cooperation on energy, and especially on oil and gas. We hope that you find this EOR-seminar valuable and that it will contribute towards obtaining the desired results for Indonesia, as well as maintain and strengthen the relationships between professionals and between our two countries – to the benefit of all parties.

Please be proactive and also contribute in Q/A-sections and discussions, and by that making this EOR seminar successful: Spreading knowledge and sharing experience!

Ministry of Energy and Mineral Resources.

Royal Norwegian Embassy

INTSOK

Petrad

Innovation NORway

## Program Day 1 – Thursday, 19<sup>th</sup> March 2015

Ministry of Energy and Mineral Resources (MEMR) Office – 10<sup>th</sup> Floor  
 Jalan Medan Merdeka Selatan 18 Jakarta 10110

TIME	PROGRAMME
08.00	<b>Registration &amp; Morning Coffee</b>
08.30 – 09.00	<ul style="list-style-type: none"> <li>• <b>Welcome Remarks</b> by IGN Wiratmaja, Acting Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources (MEMR)</li> <li>• <b>Remarks</b> by <b>H.E. Stig Ingemar Traavik</b>, Royal Norwegian Ambassador to The Republic of Indonesia</li> <li>• <b>Keynote Speech</b> by <b>H.E. Sudirman Said</b>, Ministry of Energy and Mineral Resources of the Republic of Indonesia (TBC)</li> </ul> <p><b>Official Opening of Seminar &amp; Group Photo Session</b></p>
<b>Session 1</b>	
<b>Moderator: Mr. Claes Reksten, PETRAD</b>	
09.00 – 09.30	<b>Government of Indonesia’s Policy and Regulation on EOR</b> by <b>Dr. Naryanto Wagimin</b> , Director of Oil and Gas Upstream Business Development, Directorate General of Oil and Gas (DGOG), MEMR
09.30 – 10.00	<b>Policy Measures for a Successful Implementation of EOR/IOR</b> by <b>Bjarne Moe</b> , Advisor, former Director General for Ministry of Petroleum and Energy (MPE)
10.00 – 10.30	<b>Potential EOR Projects in Indonesia</b> by <b>Ira Miriawati</b> , VP Assessment and Development Divison, SKKMIGAS
10.30 – 10.45	<b>Q &amp; A (Led by Moderator)</b>
10.45 – 11.20	<b>What can Indonesia learn from the EOR white paper for the Norwegian Continental Shelf</b> by <b>Knut Åm</b> , Leader of the EOR commission
11.20 – 11.50	<b>Implementation of EOR in the Working Area of Pertamina</b> by <b>Syamsu Alam</b> , Director for Upstream, PT Pertamina (Persero)
11.50 – 12.20	<b>EOR in Norway, an Overview Methods and Field Applications</b> by <b>Trygve Maldal</b> , Advisor, Statoil
12.20 – 12.35	<b>Q &amp; A (Led by Moderator)</b>
12.35 – 13.35	<b>Lunch</b>

## Program Day 1 – Thursday, 19<sup>th</sup> March 2015

Ministry of Energy and Mineral Resources (MEMR) Office – 10<sup>th</sup> Floor

Jalan Medan Merdeka Selatan 18 Jakarta 10110

TIME	PROGRAMME
<b>Session 2</b> <b>Moderator: Dr. Bambang Widarsono, LEMIGAS</b>	
13.35 – 14.05	<b>CO<sub>2</sub> EOR and Sequestration Opportunities in Indonesia</b> by <b>Dr. Usman Pasarai</b> , Head of Program Division, Research and Development Centre For Oil and Gas Technology (LEMIGAS), MEMR
14.05 – 14.35	<b>Topside EOR Water injection Systems &amp; Polymer Back Production Challenges</b> by <b>Esther Lian</b> , Senior Product Engineer, Fjord Processing
14.35 – 15.05	<b>CO<sub>2</sub> EOR - Managing the Risks and Capitalizing on the Opportunities</b> by <b>Havard Brandt</b> , Business Development, DNV GL - Oil & Gas, South East Asia
15.05 – 15.20	<b>Q &amp; A (Led by Moderator)</b>
15.20 – 15.35	<b>Coffee Break</b>
15.35 – 16.05	<b>Use of tracer technology for improving EOR operations</b> by <b>Øyvind Dugstad</b> , Dr. Scient. CEO Restrack
16.05 – 16.35	<b>EOR research at NTNU with emphasis on nanofluids</b> by <b>Luky Hendraningrat</b> , Norges Teknisk-Naturvitenskapelige Universitet/Norwegian University of Science and Technology (NTNU)
16.35 – 17.05	<b>Improving EOR with Wireless Reservoir Surveillance by use of Intelligent Tracers</b> by <b>Brent Brough</b> , RESMAN
17.05 – 17.20	<b>Q &amp; A (Led by Moderator)</b>
17.20	<b>End of Session</b>

## Program Day 2 – Friday, 20<sup>th</sup> March 2015

Ministry of Energy and Mineral Resources (MEMR) Office – 10<sup>th</sup> Floor

Jalan Medan Merdeka Selatan 18 Jakarta 10110

TIME	PROGRAMME
08.00 – 08.10	<b>Opening Speech</b> by <b>Dr. Naryanto Wagimin</b> , , Director of Oil and Gas Upstream Business Development, Directorate General of Oil and Gas (DGOG), MEMR
<b>Session 3</b> <b>Moderator : Mr. Rivai Lasahido (SKKMIGAS)</b>	
08.10 – 08.40	<b>Policy Measures for a Successful Implementation of EOR/IOR - Continuation</b> by <b>Bjarne Moe</b> , Advisor, former Director General for Ministry of Petroleum and Energy (MPE)
08.40 – 09.20	<b>Minas Surfactant: From Field Trial to Full Field Implementation</b> by <b>Hendrik</b> , PT Chevron Pacific Indonesia
09.20 – 09.50	<b>Fishbones: From Pilot (Almost) to Full Field Deployment at the Norwegian Continental shelf</b> by <b>Yann Caline</b> , VICO Indonesia
09.50 – 10.00	<b>Q &amp; A – Led by Moderator</b>
10.00 – 11.30	<b>Panel Discussion – Led by Mr. Claes Reksten (PETRAD)</b>
11.30 – 11.45	<b>Closing Remarks</b> <ul style="list-style-type: none"><li>- Representative of Norway</li><li>- <b>Dr. Naryanto Wagimin</b>, Director of Oil and Gas Upstream Business Development, Directorate General of Oil and Gas (DGOG), MEMR</li></ul>

## Speakers Curriculum Vitae

<b>Dr. Ir. Naryanto Wagimin, M.Si, MIGAS</b>	<b>8</b>
<b>Bjarne Moe, Consultor Energy AS</b>	<b>9</b>
<b>Knut Åm, Independent Consultant</b>	<b>10</b>
<b>Ira Miriawati, SKKMIGAS</b>	<b>11</b>
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**Name: Dr. Ir. Naryanto Wagimin, M.Si**  
**Position: Director of Oil and Gas Upstream Business Development**  
**Company: Directorate General of Oil and Gas**

Website: <http://www.migas.esdm.go.id/>

**Presentation title:**

**Government of Indonesia's Policy and Regulation on EOR**

**Short CV:**

Naryanto Wagimin was born in Purworejo on 20 February 1961. He was appointed again as Director of Oil and Gas Upstream Business Development in 2014 and Acting Director General of Oil and Gas on November 2014. He received his Bachelor's Degree from Geological Engineering of Gadjah Mada University –Yogyakarta in 1988. He earned his Master's Degree in Environmental Study from University of Indonesia in 2001 and Doctor's Degree in Economics from University of Padjajaran-Bandung in 2011.

Previously, he was Director of Oil and Gas Development from 2013-2014, Director of Oil and Gas Upstream Business Development from 2012 to 2013, Deputy Director of Working Area from 2007 to 2011, Section Head of Exploration Business Services from 2006 to 2007, Section Head of Working Area Offer from 2003 to 2006, Section Head of Working area Planning from 2001 to 2003 and Section Head of Geology in 1997 to 2001.

**Company profile:**

Directorate General of Oil and Gas under the Ministry of Energy and Mineral Resources of the Republic of Indonesia has main duties to formulate and implement technical standardization and policy in oil and gas sector.



# Consultor

**Name: Bjarne Moe**

**Position: Advisor**

**Company: Consultor Energy AS**

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**Presentation title:**

**Policy Measures for a Successful Implementation of EOR/IOR**

**Short CV:**

Mr Moe has more than 35 years' experience from the oil and gas industry. He was with the Ministry of Petroleum and Energy since it was established in 1978. In 1988, Mr Moe was appointed Director General and head of the Oil and Gas department. Furthermore, Mr Moe has been a diplomat working for the Ministry of Foreign Affairs and been counsellor at the Norwegian embassy in Washington, D.C. Mr Moe has chaired several international commissions for solving questions regarding median line fields, and international gas and oil pipelines. He has also been heading delegations outside of Norway to solve specific questions and been a mediator for unitization of fields etc. Mr Moe has headed several delegations for OECD (IEA) and has been a member of the Petroleum Price board for 15 years.

Since 2011, Mr Moe has been chairman of Consultor Energy AS, an advisor to the oil and gas industry and has several large, international companies as clients.

**Abstract:**

The presentation addresses the problems and possibilities for the administration to pursue EOR/IOR. It is reflecting the technical possibilities but looking more in to the economic and legal possibilities and limitations.

**Company profile:**

Consultor is an advisory to the oil and gas industry and has several large, international companies as clients.



**Name: Knut Åm**

**Position: Leader of the EOR commission**

**Presentation title:**

**What can Indonesia learn from the EOR white paper for the Norwegian Continental Shelf**

**Short CV:**

**Knut Åm** is a retired oil company executive with more than 45 years of petroleum industry experience presently working as an independent technology and business development consultant in Stavanger, Norway.

He holds a masters degree in Geological and Geophysical Engineering with honors from the Norwegian Institute of Technology in Trondheim, Norway (1967).

Mr. Åm has held positions at the Geological Survey of Norway, the Norwegian Petroleum Directorate and Statoil, and several positions with Phillips Petroleum Company (now ConocoPhillips) both in Norway and in the United States, where he was senior vice president and head of worldwide exploration and production and E&P Technology at the time of retirement.

Mr. Åm has also been an adjunct Professor of Geophysics at the University of Bergen, President of the Norwegian Petroleum Society, President of the Norwegian Geological Council, Chairman of the Board of the Norwegian Oil Industry Association, and Chairman of the Industrial Council of the Norwegian Academy of Technological Sciences. Mr. Åm has held positions on the boards of companies like Statoil and Hitec (now part of National Oilwell), and is presently a member of the board of Wintershall Norway and sits on the board of several promising technology companies like Petrostreamz, IFRA (Integrated Field Reactivation Architects), EnVision, Sharp Reflections and Veritrack.



**Name:** Ira Miriawati

**Position:** Vice President of Evaluation & Development Division

**Company:** SKK Migas

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**Presentation title:**

Potential EOR Projects in Indonesia

**Short CV:**

Work Experience

- 1989 – 2000 Production Engineer & Reservoir Engineer - Pertamina E&P
- 2000 – 2004 Manager of Field Development - BPMIGAS
- 2004 – 2009 Senior Manager Field Economics – BPMIGAS
- 17 March 2009 – 13 June 2011 VP Oil & Gas Utilization
- 13 June 2011 – 02 Mei 2012 VP Representative Management of Chevron
- 02 Mei 2012 – Now VP Assessment & Development Management

Education

- Graduate: Petroleum Engineering, Trisakti University – Jakarta (1988)
- Post Graduate: Industrial Management, University of Indonesia – Jakarta (1995)

**Abstract:**

Indonesia's oil production has been continued to decline after reaching its peak in 1995. Although all efforts have been undertaken, it only ceased decline rate from about 12% to 3% in 2005. At the same time, the oil reserves also decrease because the new discovery cannot balance the oil produced. Based on current Oil Recoverable Reserve and Production Rate, the Reserve to Production Ratio is only about 13 years. Meanwhile there is 47 Billion of oil left underground which cannot be recovered by primary and secondary phases.

Therefore, EOR activity is a must to sustain the Indonesia's oil production. Indonesia has been implemented EOR with great success. Duri field once was the world's largest steam flooding and up to now have been significantly contributing to Indonesia's oil production. Currently, several chemical flooding pilot projects have been initiated and showed promising results.

**Company profile:**

Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas) is an institution established by the Government of the Republic of Indonesia under Presidential Regulation Number 9 of 2013 on Management of Upstream Oil and Gas Business Activities. SKK Migas is assigned to manage the upstream oil and gas business activities under a Cooperation Contract. The establishment of this institution is purposed that the exploitation of the state's oil and gas natural resources will be able to generate maximum benefits and revenue to the state for the greatest welfare of the people.

In performing those tasks, SKK Migas performs the following functions:

- to proffer inputs for consideration to the Minister of Energy and Mineral Resources at its discretion in preparing and offering the bidding round of Working Areas and Cooperation Contract;
- to sign Cooperation Contracts;
- to review and submit the plan of field development to be the first production in a Working Area to Minister of Energy and Mineral Resources for obtaining approval;
- to grant an approval for the development plan other than as referred to in previous point;
- to grant an approval for the work programs and budget;
- to conduct monitoring and to make report to Minister of Energy and Mineral Resources on the performance of the Cooperation Contracts; and
- to appoint sellers of oil and/or gas of the state entitlement that may generate maximum profits to the state



**Name: Syamsu Alam**

**Position: Direktur Hulu**

**Company: PT Pertamina (Persero)**

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**Presentation title:**

**Implementation of EOR in the Working Area of Pertamina**

**Short CV:**

Syamsu Alam received his Bachelor degree in Geology in 1988 and Master of Science in Geophysics in 1994, both from Institut Teknologi Bandung. He then continued his study and earned his Ph.D. degree in Geophysics from Texas A&M University in 2001.

He began his professional career with Pertamina in 1989 as technical staff at Exploration Division, and since then has been exposed to multiple tasks and assignments within Pertamina. Starting in 2001, he has spanned a number of managerial roles - beginning with his task as Exploration Manager. In 2007, he took the position as General Manager at Joint-Operating Body Pertamina-Medco Tomori. In the following year, he assumed the position of Director of Exploration & Development at PT Pertamina EP (a wholly-owned subsidiary of Pertamina). He was then promoted to become the President Director of PT Pertamina EP until 2013, where he succeeded to further improve the performance of PT Pertamina EP. He was then assigned by the Board of Directors of Pertamina to take the position of Senior VP Exploration in 2013.

In December 2014, he was appointed by the Shareholders of PT. Pertamina (Persero) as the Upstream Director, responsible to oversee exploration, business development, technology, and strategic planning & operation evaluation in oil, gas and geothermal.

**Abstract:**

Implementation of EOR in the Working Area of Pertamina; Pertamina goals, strategy and expectation in EOR

**Company profile:**

As a state-owned company To carry out integrated business core in oil, gas, renewable and new energy based on strong commercial principles both inside and outside the country, Pertamina strives to provide the best and a real contribution to the welfare of the nation in utilizing every potential of Indonesia.



**Name: Trygve Maldal**

**Position: Advisor**

**Company: Statoil**

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**Presentation title: "EOR in Norway, an Overview of Methods and Field Applications"**

**Short CV:**

**Education: 01.08.1994 - 20.12.1996**

Dr. Scient Chemistry

University of Bergen, Norway

**01.08.1976 - 20.05.1984**

Higher Education (M.sc) Chemistry

University of Bergen, Norway

**At Present:**

**Role: Advisor Reservoir Engineering with following responsibilities:**

-Quality assurance and quality control for several Improve Oil Recovery (IOR) Projects and pilots (Polymer, Hot solvent, Microbial Enhanced Oil Recovery (MEOR), diversion, LowSal) as well as unconventional gas (CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>S) treatment, injection and storage projects.

-Advice and evaluations of water injection concepts and strategies for field development projects

-Contribute in planning and execution of research on IOR issues.

**Abstract:**

The average oil recovery for Statoil operated fields at Norwegian Continental Shelf (NCS) is at present close to 50% of STOOIP. The target oil recovery ambition for Statoil is set as high as 60% for the present producing oil fields. Basis for the obtained results and ambition was established already in the 1980's. Early in the Norwegian production history, the authorities set the ultimate high oil recovery as a leading principle for awarding production licences. This governmental push together with close collaboration between operators, service companies, research institutes and authorities on developing and implementing new technologies have been instrumental to the record-high recoveries.

Given the leading principle of high oil recovery, practically all oil fields at NCS have been developed and produced with pressure maintenance, either by water and/or gas injection. All gas- and oil fields were

thoroughly evaluated and tested with pilots to consider optimal oil recovery strategy. The companies' willingness for testing new and challenging well- and completion solutions, made it possible to develop thin oil rims as to example in the huge Troll field. Also, thorough monitoring and data acquisition, and developments of these tools, were important measures for optimising the oil recovery. The 4D seismic method was first used and matured on the NCS, and later implemented in a large scale at most of the largest oil fields. The main objectives of 4-D seismic were to follow flood fronts and to identify the remaining oil pockets.

Research and piloting of several tertiary EOR methods have been executed more or less continuously since the late 1980's. Large activities on other technologies have provided learning and understanding, and especially "Water alternating gas" and also for example MEOR, have been field implemented successfully. Currently, several other EOR technologies are being researched and field tested, including polymer flooding and flow-diversion by chemicals. A number of projects to methods reduce and mobilize residual oil by surfactant flooding and CO<sub>2</sub> for EOR have been evaluated, but to date, none of these have been found economical for offshore fields. Limiting factors are low residual oil saturation after extensive water and gas injection and lack of a sufficient CO<sub>2</sub> source nearby the offshore clusters. On the other side, Statoil is operating several projects for CO<sub>2</sub> storage.



**Name: Dr. Usman Pasarai**

**Position: Head of Program Division**

**Company: Research and Development Centre for Oil and Gas Technology “LEMIGAS”**

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**Presentation title: CO<sub>2</sub> EOR and Sequestration Opportunities in Indonesia**

**Short CV:**

Dr Usman Pasarai is a Senior Researcher and Head of Program Division at the Research and Development Centre for Oil and Gas Technology (LEMIGAS). He has been engaged as a researcher on a variety of projects from 1994 to the present and involved in a number of CCS projects associated with the oil and gas industry. From 2004-2007 he was a Research Associate at Waseda University. In addition, he is a Lecturer at Trisakti University. Dr Usman Pasarai has qualifications in petroleum engineering from Waseda University, Tokyo and Bandung Institute of Technology, Indonesia.

**Abstract:**

In South Sumatera excellent opportunities exist for CO<sub>2</sub>-EOR application or CO<sub>2</sub> storage because of the availability of many depleted oil reservoirs. The opportunities may take advantage of the fact that in time part of the existing gas infrastructure may become available for transport of the captured CO<sub>2</sub> from the industrial sources. However, not all oil reservoirs are suitable for CO<sub>2</sub>-EOR for various technical and economic reasons. Although the EOR technology is readily available, preliminary issues that need to be addressed include: 1) screening for EOR suitability; 2) oil recovery and CO<sub>2</sub> storage capacity estimates and; 3) technical ranking of suitable reservoirs. The study rendered a lot of valuable information about the potential application of CO<sub>2</sub>-EOR including the suitability of oil fields, oil recovered, and CO<sub>2</sub> storage opportunities. Pendopo area which has been selected as the location of industrial sources will be the main source of CO<sub>2</sub>. Oil fields within 100 km radius from this area, most of which are in an advanced stage of production, constitute a prime target for CO<sub>2</sub>-EOR and storage. An investigation was carried out that focused on the technical ranking of suitable reservoirs, injection profiles determination, cluster principle of oil fields that can accommodate the amount of CO<sub>2</sub> supplied for a number of years, planning and realization of trunk pipelines and the possibility to reuse the major part of the present infrastructure, i.e. interfield pipelines.

**Company profile:**

LEMIGAS is the Research and Development Center for Oil and Gas Technology under the Agency of Research and Development for Energy and Mineral Resources within the Department of Energy and Mineral Resources of the Republic of Indonesia. Its main activities are to apply sciences and develop technology, particularly for oil and gas, and to provide consulting and technological services to the industry, as well as to assist the government in establishing oil and gas regulatory.

	
<p><b>Name: Esther Lian</b>  <b>Position: EOR Technology Leader (Topside Seawater Treatment System)</b>  <b>Company: Fjords Processing AS</b></p> <p>Address: Snarøyveien 36, 1364 Fornebu, Oslo, Norway  Email: <a href="mailto:esther.lian@fjordsprocessing.com">esther.lian@fjordsprocessing.com</a>  Mobile: +47 454 70 957  Website: <a href="http://www.fjordsprocessing.com">www.fjordsprocessing.com</a></p>	
<p><b>Presentation title:</b>  <b>Overview of Topside EOR Water injection System &amp; Polymer Back Production Challenges</b></p>	
<p><b>Short CV:</b>  8 years intensive Seawater Membrane Treatment System design experiences. Mainly focusing on SRU and low salinity water treatment for injection purpose.</p> <p><b>EOR Studies/ Project:</b>  2014 Statoil Johan Sverdrup Polymer EOR Study  2012 Statoil Heidrun Low Salinity Water &amp; Polymer EOR Study  2011 Statoil Grane Polymer Study- Selective Desalination by Membranes  2008-2011 BP Clair Ridge Low Salinity Water Injection Project – Conceptual to Detailed Design  Also participated as Process Lead in several SWT system tender preparations.</p> <p><b>Offshore experiences:</b>  Several offshore trips to Fjords SRU installation for inspection, maintenance and troubleshooting of water injection system.</p>	
<p><b>Abstract:</b>  The presentation will cover a brief introduction of Fjords Processing and our offering follow by the area of discussions below:-</p> <ul style="list-style-type: none"> <li>• Water based EOR solutions overview</li> <li>• Seawater salinity &amp; hardness control concept using different range of NF/RO membranes</li> <li>• Fjords SW treatment system standard component design</li> <li>• Fjords references on SW treatment system installations</li> <li>• CAPEX &amp; OPEX comparison with various pre-treatment technology for SRU/RO membranes</li> <li>• Aspects of polymer flooding</li> <li>• Fjords competency &amp; understanding on polymer back production</li> <li>• A brief overview of Fjords' JIP polymer back production test studies</li> </ul>	
<p><b>Company profile:</b>  Fjords Processing provides world-class wellstream processing technology, equipment and expertise to the upstream oil and gas industry. The company delivers market-leading solutions for separation of oil and gas, based on innovative technology and extensive competence accumulated over the last 40 years.</p> <p>With a comprehensive product portfolio, Fjords Processing delivers unique solutions across all oil and gas treatment segments. The product range includes fluid stream separation, gas processing, oil processing and</p>	

water treatment. Market leading technology and expertise are combined to create tailored solutions to meet all customer specifications and on-site conditions within this product range. Fjords Processing ranks among the few companies in the industry that are able to offer complete processing systems for onshore and offshore installations.



**Name: Håvard Brandt**

**Position: Business Development Manager - Drilling & Well Services**

**Company: Business Development Manager**

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**Presentation title: CO<sub>2</sub> EOR - Managing the Risks and Capitalizing on the Opportunities**

**Short CV:**

Håvard has been working with business development for the last six years in DNV GL. In 2012 he took a Business Development Manager role with the new Deep Technology Centre in Singapore, with a focus on developing the Drilling and Wells advisory services in South East Asia.

He has eighteen years of experience in the oil and gas industry, and has worked on a number of project assignments around the world. Håvard started his carrier in risk management including qualitative and quantitative risk assessments with a strong focus on operational aspects and technical and economical evaluations. He has for more than fifteen years been working actively in the area of subsea systems and drilling and well operations.

His experience covers qualitative and quantitative risk analysis of drilling and well operations, well integrity assessments and audits. Håvard has been actively involved with new technology developments, including Dual Gradient Drilling, Managed Pressure Drilling and application of surface BOP operations from floating drilling rigs. Following the well incident on Statoil's Gullfaks C in 2010, Håvard was involved supporting Statoil in developing a systematic process for assessing integrity of the wells and checking safety critical elements for all drilling and well operations. He has been involved in auditing and assessing well integrity systems, and has particular experience related to addressing and evaluating integrity issues.

Career: Stavanger (1996-2000), Houston (2000-2006), Høvik (2006-2012), Singapore (2012 - present)

Education: M.Sc. from Norwegian Institute of Technology, with final Master Thesis from Technical University in Delft, the Netherlands

**Abstract:**

A recent study conducted for the Norwegian Oil & Gas authorities has assessed and evaluated the application of EOR in the North Sea, KonKraft (2013). The study identifies a number of challenges related to EOR, including reservoir uncertainties, qualification of the technology and costs. In this presentation, DNV GL will present how our systematic process for Technology Qualification, defined in the DNV RP A-203, can be applied to reduce the risks and uncertainties related to an EOR projects, focusing on CO<sub>2</sub> EOR. Further, the presentation will elaborate on how risk based models can be used to address the uncertainties related to the effect on the reservoir and optimize decisions. The method provides a powerful tool in capitalizing on good opportunities related to CO<sub>2</sub> EOR, and helps operators make value-added-decisions.

**Company profile: DNV GL**

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. DNV GL is the leading technical advisor to the global oil and gas industry. We provide consistent, integrated services within technical and marine assurance and advisory, risk management and offshore classification, to enable safe, reliable and enhanced performance in projects and operations. Together with our partners, we drive the industry forward by developing best practices and standards. Our people combine industry expertise, multi-disciplinary skills and innovation to solve complex challenges for our customers.



**Name: Øyvind Dugstad**

**Position: CEO**

**Company: Restrack AS**

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Mobile: 00 47 91335919

Website: [www.restrack.no](http://www.restrack.no)

**Presentation title: Use of tracer technology for improving EOR operations**

**Short CV:**

Øyvind Dugstad holds a PhD in Reservoir physics from University of Bergen from 1992. He has had various positions as research scientist and research leader at Institute for Energy Technology from 1985 to 2013 and has been project leader for a large number of research and development projects. He also has extensive experience in field operations and practical use of tracer technology for international oil companies. In 2013 he started the company Restrack which carries out field studies and provide information about EOR processes and reservoir properties world-wide.

**Abstract:**

To increase the oil recovery it is crucial to have a reliable reservoir model. To monitor communication, channeling and sweep volumes, tracer technology is used. Reservoir models are improved by history matching of tracer production curves. The results are important to design placement of new wells and to optimize production/injection rates in order to increase the oil recovery.

To increase areal sweep efficiency, diverging fluids such as polymers, gels and bright water can be used. In order to plan operations, measure improvement and optimize the use of such EOR chemicals tracer technology will give crucial information.

Use of EOR chemicals that reduce the residual oil saturation such as CO<sub>2</sub>, alkaline solutions, surfactants and LowSal (low salinity) are discussed in numerous papers. In order to obtain successful field operations it is crucial to verify the methods in field pilots. Tracer technology are use to evaluate field pilots and to measure the effect on reduction of residual oil saturation.

The paper will present field cases and discuss possibilities, challenges and weakness of using tracer technology in IOR operations.

**Company profile:**

Restrack is a leading tracer service provider to oil companies world-wide. Our field-demonstrated technology is used to give information on reservoir heterogeneity, assess the effect of water & gas injection and determine the amount of remaining oil in the near-well & inter-well zone.

Restrack delivers a full portfolio of integrated tracer services, including inter-well gas & water tracing, single well tracer tests (SWCTT) and partitioning interwell tracer tests (PITT). Restrack focuses on providing reservoir information which enabled our customers to improve oil recovery. We deliver an integrated service that include planning, field operation, analyses and interpretation. Our ISO 9001 and 14001 certified service is based on unique & proprietary chemical tracers that are added to reservoir fluids. Tracer content is measured in more than 10000 samples yearly in our state-of-the-art laboratory using our proprietary, ultra-sensitive laboratory techniques. To turn tracer data into reservoir information we use industry-standard simulators & our in-house ARTSim tracer simulator.



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**Presentation title: EOR research at NTNU with emphasis on nanofluids**

**Short CV:**

*Educational background:*

2004: Bachelor of PetroleumEng. (Bandung Institute of Technology (ITB), Indonesia)  
2010: Master of Science in Reservoir Engineering (Norwegian University of Science and Technology (NTNU), Trondheim-Norway)  
2015 (expected): Ph.D in Nano-EOR (Norwegian University of Science and Technology (NTNU), Trondheim-Norway)

*Professional background:*

11.2014 – present: Senior Reservoir Engineer, ConocoPhillips Indonesia  
10.2011 – 10.2014: EOR Research Fellow at Department of Petroleum Engineering and Applied Geophysics, NTNU, Norway  
03.2005 – 09.2011: Reservoir Engineer at PT. Medco E&P, Indonesia

**Abstract:**

Nanoparticles, as part of nanotechnology, offer several benefits such as their size is much smaller than common reservoir rocks pore throat. Hence they have ability to propagate in reservoir rock. In addition, nanoparticles have a good degree of control or manipulates of their physical-chemistry properties that might help to reduce residual oil in reservoir rocks. The laboratory experiments were designed to unlock the potential of nanoparticles as a new method in enhanced oil recovery (EOR). The overall investigations from our research show that nanoparticles have a great potential for EOR in sandstones rock and offers some benefits toward limitation of current chemical EOR methods. These results are the first stage to reveal a potential way to use nanoparticles for enhanced oil recovery purposes for a wide range of reservoir rock wettability at a given reservoir temperature, rock permeability, salinity and ionic composition. Wettability alteration plays a dominant role in the possible oil displacement mechanism using Nano-EOR.

**Company profile:**

ConocoPhillips has had a presence in Indonesia for more than four decades, and is now a leading partner in the development of the country's vast oil and gas resources. ConocoPhillips continues to grow its role in Indonesia to help meet increasing energy demands by leveraging existing areas and exploring new reserves. ConocoPhillips strives become the leading sustainable oil and gas company in Indonesia, further improving their position and maximizing the benefits to their employees, partners and other stakeholders.



**Name: Brent Brough**  
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**Presentation title: Improving EOR by means of measuring Effectiveness through the use of Wireless Reservoir Surveillance (Intelligent Tracer Technology)**

**Short CV:**

Brent joined RESMAN in 2011 and manages the company's regional offices globally. He carry's 15 years of subsurface, oilfield experience; prior to joining RESMAN Brent worked for Schlumberger serving as Operations Manager for Russia, New Technology Business Development for Europe, North Sea & Russia based in the UK, and has several years of working on EOR projects within North America through the use of downhole reservoir surveillance to evaluate effectiveness of EOR applications and field wide stimulation projects. Brent holds an MBA in Global Energy from Warwick Business School in the UK and prior to that his undergrad studies in Chemical Engineering and Project Management from York University, University of Lethbridge, and Southern Alberta Institute of Technology in Canada.

**Abstract:**

EOR applications are implemented to enhance the extraction of residual hydrocarbons in place, and in many cases Enhanced Oil Recovery is also discussed as IOR (improved oil recovery). Any such project to increase hydrocarbon recovery requires significant investments, reservoir modeling, and operational planning. A key metric to understanding the effectiveness of EOR/IOR projects is the increase in oil recovery, yet diving even deeper it is important to understand the reservoir characterization of where the hydrocarbons are coming from. This discussion will review a cost effective means of permanent reservoir surveillance at the sand face to enhance an EOR projects ability of understanding effectiveness of such operations and also the ability to monitor any changes to implemented EOR techniques over the life of the project.

**Company profile:**

RESMAN is the industry leader in wireless reservoir surveillance within the oil and gas industry with the focus on extracting valued data from the reservoir / well behaviours. The cost-effective Chemical PLT™ technology developed by RESMAN has been adopted worldwide with over forty O&G Operators being valued RESMAN customer in 20 countries, on every continent. The technology was founded in Norway with support from Statoil Technology Invest which invested in the companies formation in 2005. The Headquarters and Technology Center of RESMAN is based in Trondheim and the company holds an additional 6 regional offices located in Aberdeen, Abu Dhabi, Houston, Kuala Lumpur, Stavanger, and Rio Janeiro.



**Name: HENDRIK**  
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**Presentation title:**  
**Minas Chemical EOR - “From Field Trials to Full-Field Implementation”**

**Short CV:**

Facility Engineer background with more than 15 year experience with Chevron. >6 year experience in Minas CEOR project execution (engineering, construction and business).

**Abstract:**

Minas Chemical EOR – A Journey from Field Trials to Full Field Implementation. Starting with Minas field Overview, CEOR potential, a staged development approach to mitigate risk, focus area for commercializing, chemical supply and logistics challenges, developing CEOR within an existing operation, engagement plan to build in-country capacity and path forward.

**Company profile:**

Chevron is a major partner in Indonesia's economy and has been an active member of the community for more than 80 years. We are the largest producer of Indonesia's crude oil, accounting for approximately 40 percent of Indonesia's national production.



**Name: Yann Caline**

**Position: Fracturing Manager**

**Company: VICO Indonesia**

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**Presentation title:**

**“Fishbones – From Pilot (Almost) to Full Field Implementation”**

**Short CV:**

**Current:**

BP Secondee to VICO Indonesia, Fracturing Manager.

**History:**

Senior Well Stimulation Engineer, North Sea, for BP Norge A/S (2005 – 2014).

Well stimulation Field Engineer for Schlumberger (1998 – 2005), in various locations in Western Siberia and West Africa.

**Education:**

Mechanical Engineer from National Institute for Applied Sciences (INSA), Lyon, France (1997)

**Abstract:**

The concept of using jetting nozzles to deploy a large number of long, thin laterals from a main bore was presented to an operator in the Norwegian North Sea in 2007. This would massively increase the formation contact area, potentially replacing multi-zone acid fracturing on some wells. The intention was to reduce cost and risk, and open for the development of previously uneconomical reserves. Working with a multi-disciplinary team, the idea was progressed from concept to prototype and full-scale testing over a five-year period. The project was then handed over to the Joint Chalk Research group, a North Sea industry consortium, to further progress from prototype to a three-well pilot trial (currently underway). This presentation will describe the maturing process, hurdles cleared and milestones.