Maersk Oil operates production of about 600,000 barrels of oil equivalent per day from Denmark, the UK, Qatar, Kazakhstan, Brazil and Algeria. Exploration activities are ongoing in Angola, Norway, the U.S. Gulf of Mexico, Greenland, Iraqi Kurdistan and in the producing countries.

For more information about Maersk Oil, please visit the website at www.maerskoil.com
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Vision

Maersk Oil’s vision is to be: the natural upstream oil and gas partner; navigating complexity, unlocking potential.

THE NATURAL PARTNER

Maersk Oil recognises that its partners and partnerships are valuable. The company understands and appreciates its partners’ circumstances, needs and goals, and delivers on given promises. Maersk Oil respects the individual, helps others to succeed and contributes to a positive working environment.

NAVIGATING COMPLEXITY

Maersk Oil is dedicated to mastering its destiny through creative problem solving and innovative commercial solutions based on its values. The company’s strong, broad technical and commercial competencies will help it find simple solutions to complex problems.

UNLOCKING POTENTIAL

Maersk Oil will be the expert in recognising opportunities, and understanding and managing risks. The company’s teams and individuals are empowered to create, innovate and deliver within a framework of effective processes. The key to success is persistence, determination and commitment.

Maersk Oil’s strategy is: to reach an incident-free and sustainable entitlement production of 400,000 barrels a day by 2020.

Maersk Oil follows three avenues of growth to reach the target:
- Asset Management – maximise recovery from existing assets
- Deliver on our project portfolio
- Continue a balanced, global exploration programme
Values

As a member of the A.P. Moller - Maersk family, Maersk Oil lives by the values of the Group. The values are at the core of Maersk Oil, and are a key element of the company’s vision and way of doing business.

CONSTANT CARE
Take care of today, actively prepare for tomorrow

HUMBLENESS
Listen, learn, share, and give space to others

UPRIGHTNESS
Our word is our bond

OUR EMPLOYEES
The right environment for the right people

OUR NAME
The sum of our values: passionately striving higher
Maersk Oil in brief

**Turning marginal and challenging fields** into commercial successes has been the cornerstone of Maersk Oil’s business since 1962. Maersk Oil focuses on pioneering technologies and harnessing talent to continue to operate safely and successfully, creating value for partners and host governments.

To solve the puzzle of the tight fields in the Danish North Sea, its home for 50 years, Maersk Oil developed a suite of innovative tools and techniques, which it then adapted to the giant but complex Al Shaheen field, offshore of Qatar. Maersk Oil now produces 85% of Denmark’s oil and gas and over a third of Qatar’s oil output.

These experiences generated a spirit of creative problem solving and led to an innovative deployment of technology, which has helped Maersk Oil to spread its wings across the globe. In the past ten years, Maersk Oil has established a presence in seven new countries, and it now has a broad portfolio that stretches across a wide variety of geological, geographical and operational conditions.

Maersk Oil has experience in geological environments such as chalk and shelf carbonates, fluvio-deltaic and deepwater clastics, and presalt. Its operates in conditions ranging from the harsh Arctic climate and terrain of Greenland to the arid steppe of Kazakhstan. And the company is developing expertise in difficult operating conditions such as deepwaters, and High Pressure, High Temperature.

Maersk Oil is a fully-owned subsidiary of the global conglomerate, the A.P. Moller - Maersk Group.

**MAERSK OIL BOARD OF DIRECTORS**
Maersk Oil’s business is governed by its Board of Directors, which consists of:

- A.P. Moller - Maersk Chairman Michael Pram Rasmussen
- A.P. Moller - Maersk CEO Nils S. Andersen
- A.P. Moller - Maersk CFO Trond Ø. Westlie
- Frants E. Bernstorff-Gyldensteen

**MAERSK OIL EXECUTIVE TEAM**
Jacob Thomasen, CEO
Kenneth Murdoch, CFO
Kevin Manser, CCO
Troels Albrechtsen, Head of Corporate Technology & Projects
Mikkel Falkenberg, Head of Legal
Jón Ferrier, Head of Business Development & Strategy
Wells Grogan, Head of Corporate HSE
Lars Nydahl Jorgensen, Head of Exploration
Bruce Laws, President of Maersk Oil Inc.
Stina Bjerg Nielsen, Head of HR

**COMPANY DETAILS**
Mærsk Olie og Gas A/S, Esplanaden 50, 1263 Copenhagen K, Denmark.

Mærsk Olie og Gas A/S is registered as a Danish company, company no.: 22757318
## FINANCIAL HIGHLIGHTS

<table>
<thead>
<tr>
<th>USD million</th>
<th>Maersk Oil</th>
<th>A.P. Moller - Maersk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>10,154</td>
<td>12,616</td>
</tr>
<tr>
<td><strong>Profit/loss before depreciation, amortisation and impairment losses, etc. (EBITDA)</strong></td>
<td>7,156</td>
<td>10,015</td>
</tr>
<tr>
<td>Depreciation, amortisation and impairment losses</td>
<td>1,895</td>
<td>2,171</td>
</tr>
<tr>
<td>Gain on sale of non-current assets, etc., net</td>
<td>109</td>
<td>2</td>
</tr>
<tr>
<td>Share of profit/loss in associated companies</td>
<td>-42</td>
<td>-4</td>
</tr>
<tr>
<td><strong>Profit/loss before financial items (EBIT)</strong></td>
<td>5,328</td>
<td>7,842</td>
</tr>
<tr>
<td>Tax</td>
<td>2,884</td>
<td>5,730</td>
</tr>
<tr>
<td><strong>Net operating profit/loss after tax (NOPAT)</strong></td>
<td>2,444</td>
<td>2,112</td>
</tr>
<tr>
<td>Cash flow from operating activities</td>
<td>3,857</td>
<td>4,319</td>
</tr>
<tr>
<td>Cash flow used for capital expenditure</td>
<td>-1,959</td>
<td>-3,788</td>
</tr>
<tr>
<td>Invested capital</td>
<td>6,920</td>
<td>6,427</td>
</tr>
<tr>
<td>ROIC</td>
<td>36.6%</td>
<td>37.2%</td>
</tr>
<tr>
<td>Exploration expenses, net</td>
<td>1,088</td>
<td>1,056</td>
</tr>
<tr>
<td>Average share of oil and gas production (thousand barrels of oil equivalent per day)</td>
<td>257</td>
<td>333</td>
</tr>
<tr>
<td>Average crude oil price (Brent) (USD per barrel)</td>
<td>112</td>
<td>111</td>
</tr>
</tbody>
</table>

Additional financial information for Maersk Oil and the A.P. Moller - Maersk Group is available on www.maerskoil.com and investor.maersk.com.
As an onshore and offshore operator in both established countries and frontier regions, we recognise that our activities have the potential to have an impact on employees, the environment and local communities. Maersk Oil strives to have a positive impact where it operates through local employment, training, research and investment. In areas such as safety and the environment, Maersk Oil continues to improve its performance.

Demand for energy has increased significantly over the last 20 years and the drive to access new resources is taking Maersk Oil into challenging environments such as deepwater and the Arctic. In these areas, and at its established operating centres, Maersk Oil is committed to consistently identifying and understanding the impact of its operations, consulting with stakeholders, designing projects to avoid adverse impact and reducing waste, emissions and discharges.

Maersk Oil not only considers this the right thing to do, but also an essential course of action if it aims to be regarded as a natural partner by governments and peers.

HEALTH, SAFETY, ENVIRONMENT

Safety performance is a top priority for Maersk Oil. From top management to frontline staff, all employees are committed to an Incident-Free Maersk Oil. This principle is based on a belief that incidents are never inevitable and never acceptable.

Maersk Oil recognises that safety is not just influenced by human factors; it also requires systems and controls to be robust and effective to prevent any accidents. Assessments of process safety have been carried out in all oil and gas producing locations, and in 2012 Maersk Oil started implementing a comprehensive plan, further reinforcing its commitment to continuous improvement.

Maersk Oil uses established international impact assessment methodologies to understand and avoid any potential negative impact on the social and natural environment. It also adheres to certified management systems to control any such impact. All producing units are certified to the international standard ISO 14001. In terms of management of greenhouse gas emissions, in 2012 Maersk Oil achieved a target to reduce CO₂ emissions from flaring from operated facilities by 50% from the 2007 baseline.

An Incident-Free Maersk Oil

Maersk Oil started the journey to become incident-free in 2011. Around 6,000 employees and contractors attended workshops to establish a shared commitment to safety. Now the focus is on turning the Incident-Free mindset into actions and improved performance, which is an effort led by everyone within Maersk Oil at all levels.
Our world - Maersk Oil

CORPORATE SOCIAL RESPONSIBILITY
Maersk Oil is committed to conducting its business in a responsible, ethical and sustainable manner. It aims to create long-term value for its business and for host countries, and is committed to making a positive contribution to local communities. This commitment is underpinned by Maersk Oil’s support of the UN Global Compact and the Extractive Industries Transparency Initiative.

Maersk Oil aims to support host governments and local communities develop, both socially and economically, through supporting education programmes and by training local employees, contractors and students. It also invests socially to build capacity and improve living conditions. In 2012 a dedicated CSR function was established to support Business Units in managing and implementing CSR programmes. Maersk Oil also rolled out a new process for establishing social investment strategies, which are tailored to local socio-economic needs. The focus is on identifying and delivering value-adding projects that use the knowledge and skills of Maersk Oil and the entire A.P. Moller - Maersk Group.

RESPONSIBLE BUSINESS PRACTICES
Maersk Oil believes openness and collaboration are essential to being a responsible partner. As part of its global Compliance Awareness Drive, in 2012 Maersk Oil conducted training for employees at risk of being exposed to corruption. Mandatory e-learning for all employees was also tailored to the specific challenges in the oil and gas industry, and is ready to roll out during 2013.
Historic milestones

1962
Arnold Peter Møller is awarded the concession for Danish oil and gas extraction. Danish Underground Consortium (DUC) established.

1966
Kraka, the first oil discovery in the North Sea.

1968
Maersk Oil becomes operator of field developments and some exploration.

1972
First oil from the Dan field in the Danish North Sea.

1984
First gas from the Tyra field in the Danish North Sea.

1987
Breakthrough with horizontal wells.

1990
Maersk Oil is awarded a licence in Qatar, where the giant Al Shaheen field is later developed.

1991
Maersk Oil becomes operator of field developments and some exploration.

1992
Maersk Oil is awarded a licence in Thailand, withdrawn in 1997.
First oil from the Al Shaheen field in Qatar.

1994

Maersk Oil acquires Kerr-McGee’s assets in the UK.

2005

Maersk Oil acquires shareholding in Iraqi Kurdistan-focused company.

2011

Maersk Oil is awarded a licence in Kazakhstan.

2000

Maersk Oil is awarded licences in Angola and Norway.

1995

Maersk Oil is awarded licences in Indonesia, withdraws in 2001.

2005

Maersk Oil is awarded licences in the U.S. Gulf of Mexico.

2006

Maersk Oil is awarded a licence in Greenland.

2010

A.P. Moller - Maersk’s first ever Capital Markets Day giving a detailed picture of the Maersk Oil business.

2012
Maersk Group in brief

**A.P. Moller - Maersk is a worldwide group** of companies devoted to lasting success in shipping, and oil and gas. As well as being one of the world’s largest shipping companies, the Group is involved in a wide range of activities in the energy, transportation, offshore and retail sectors.

**STRATEGIC DIRECTION**
A.P. Moller - Maersk’s aspiration is to continue building a first class business. This will be achieved through continued investment in its four core growth businesses: Maersk Line; Maersk Oil; APM Terminals; and Maersk Drilling. The Group aims for long-term profitable growth, combining focused innovation, a performance-based culture and the philosophy of Constant Care to build and maintain leading positions in attractive industries and growth markets.

**LEADERSHIP**
The Executive Board handles day-to-day management and is responsible for the Group’s financial results and business growth. The Executive Board consists of Group CEO Nils Smedegaard Andersen; Trond Westlie, Group CFO; Kim Fejfer, CEO of APM Terminals; Claus V. Hemmingsen, CEO of Maersk Drilling; Jakob Thomasen, CEO of Maersk Oil; and Søren Skou, CEO of Maersk Line.

**HERITAGE**
The Group was founded by Arnold Peter Møller in 1904. Following Arnold Peter’s death in 1965, his son, Maersk Mc-Kinney Møller, assumed leadership of the Group, which – thanks to his initiative, foresight and enterprise – has grown into a major player in global shipping and energy. Until he passed away in April 2012, Maersk Mc-Kinney Møller was the Chairman of the A.P. Møller and Chastine Mc-Kinney Møller Foundation, and he followed the business to the very end. During his career, Mr. Møller left an indelible mark on the Group, on Denmark and on the international business community. Ane Mærsk Mc-Kinney Uggla, his youngest daughter, continues to demonstrate the family’s commitment to the A.P. Moller - Maersk Group as chairman of the controlling shareholder and member of the A.P. Møller - Maersk A/S Board.

**VALUES**
A.P. Moller - Maersk’s deeply held values govern the way it deals with its employees, customers, and society in general. Employees come from every corner of the world and the Group works in many fields and business areas, yet everyone shares the same set of basic values: Constant Care; Humbleness; Uprightness; Our Employees; Our name. They are the same principles that Arnold Peter Møller and Maersk Mc-Kinney Møller relied on as they guided their family business through a century of success.

**OWNERSHIP**
A.P. Møller - Maersk A/S is listed on the NASDAQ OMX Copenhagen Stock Exchange and had more than 75,000 private and institutional shareholders at the end of 2012. The company’s controlling shareholder, however, is The A.P. Møller and Chastine Mc-Kinney Møller Foundation, which was established by company founder A.P. Møller in 1953 to ensure that his life’s work would always be owned by parties that held a long-term view of the company’s development, in the spirit of the founder and according to his principles.

The share capital is split between A and B-shares, and only the A-shares carry voting right. The Foundation holds more than 50% of the A-shares and consequently has the voting majority.

The Foundation is mainly funded by the A.P. Møller - Maersk Group, but the Group has no influence on the Foundation’s decisions regarding donations and investments. The Foundation aims to support Danish culture and heritage, Danish shipping, medical science and causes for the public good. Grants are only occasionally provided for non-Danish projects.

For more information about the A.P. Moller - Maersk Group, please visit the website at [www.maersk.com](http://www.maersk.com)
The A.P. Moller - Maersk Group operates in around 130 countries and has a workforce of some 121,000 employees.
A diverse group

Major activities in shipping and energy

The Maersk Group is a global conglomerate, operating mainly in the shipping and energy industries. Its shipping companies provide a comprehensive service, covering the world’s need for cargo, oil and gas transport, terminal services and on-land logistics.

The energy-related business units include drilling and platform service companies, as well as Maersk Oil, one of the world’s leading independent oil and gas firms.

The diversity of the A.P. Moller - Maersk Group has been a source of strength and success for more than a century.

Maersk Container Industry
Is a manufacturer of dry containers, reefer containers and refrigeration systems

Maersk Line
A fleet of around 600 vessels and a number of containers corresponding to more than 4.0m TEU (a 20 foot long container)

Maersk Oil
An average share of oil and gas production of 257,000 barrels of oil equivalent per day in 2012

AMP Terminals
Operates a global terminal network in 68 countries

SVITZER
Is a global market leader within towage, salvage and emergency response, with a fleet close to 500 vessels
Maersk Supply Service

A fleet of more than 50 vessels that provides worldwide services to the offshore and associated industries

Dammco

Is present in more than 90 countries and manages more than 2.7 million TEU of ocean freight and supply chain management volumes as well as more than 210,000 tonnes of airfreight annually

Maersk Tankers

Owns and operates a fleet of 162 crude oil carriers, product tankers, and gas carriers. The Maersk Tankers fleet is one of the largest, most modern and most diversified independent fleets in the world

Dansk Supermarked Group

Operates 18 Bilka supermarkets, 89 føtex supermarkets, 2 Salling department stores and 1,210 Netto discount supermarkets located in Denmark, Germany, Poland and Sweden

Danske Bank

A.P. Moller - Maersk owns a 20% stake in one of the biggest banks in the Nordics

Maersk Drilling

The company is a specialist in harsh and deep water environments operating 16 jack-up rigs and floaters

Maersk FPSOs

Owns and operates four offshore floating production storage and offloading units (FPSOs) servicing major oil companies
## Key figures

The Group’s invested capital was USD 55 billion at the end of 2012 and the annualised return on invested capital after tax (ROIC) was 8.8%. The Group’s ambition is to achieve a ROIC > 10%.

### A.P. Moller - Maersk Group

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>54,982</td>
<td>8.8</td>
<td>8.3</td>
</tr>
</tbody>
</table>

### Maersk Line

Global container services

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,649</td>
<td>2.4</td>
<td>-3.1</td>
</tr>
</tbody>
</table>

### Maersk Oil

Oil and gas production and exploration activities

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,920</td>
<td>36.6</td>
<td>37.2</td>
</tr>
</tbody>
</table>

### APM Terminals

Container terminal activities, inland transportation, container depots and repair of containers, etc.

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,284</td>
<td>13.6</td>
<td>13.1</td>
</tr>
</tbody>
</table>

### Maersk Drilling

Offshore drilling activities and operation of land rigs through 50% ownership of Egyptian Drilling Company

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,604</td>
<td>8.3</td>
<td>12.5</td>
</tr>
</tbody>
</table>

### Maersk Supply Service

Supply vessel activities with anchor handling and platform supply vessels, etc.

<table>
<thead>
<tr>
<th>Invested capital USD million</th>
<th>ROIC % 2012</th>
<th>ROIC % 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,206</td>
<td>6.1</td>
<td>11.2</td>
</tr>
<tr>
<td>Company / Activities</td>
<td>Revenue ratio</td>
<td>Invested capital ratio</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Maersk Tankers</td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Damco</td>
<td></td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>SVITZER</td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Dansk Supermarked</td>
<td></td>
<td>5%</td>
</tr>
<tr>
<td>Group</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>Maersk FPSOs and</td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>Maersk LNG</td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>Other businesses</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10%</td>
</tr>
</tbody>
</table>
U.S. Gulf of Mexico
Since entering the Gulf of Mexico in 2006, Maersk Oil has acquired over 200 licences and is a partner in the Jack development.

Greenland
Maersk Oil entered Greenland in 2010 and has been acquiring seismic in 2012. Together with all licence holders in Baffin Bay, it is part of a shallow stratigraphic coring project.

Brazil
Maersk Oil’s position in Brazil has been strengthened through its 2011 acquisition of SK Energy’s assets in the country, including access to prime subsalt acreage.

UK
Maersk Oil’s eight-year-old business in the UK has set ambitious growth targets of doubling production to 100,000 barrels of oil equivalent a day in the coming years.

Denmark
Maersk Oil’s homebase since 1962. The current focus is on getting the most out of existing assets in the Danish North Sea, which currently produce around 250,000 barrels of oil equivalent a day.

Angola
Maersk Oil has made three discoveries in Angola since coming to the country in 2005 – the Chissonga and Caporolo discoveries and the Azul discovery in Angola’s offshore deepwater presalt.
Global activities

---

**Iraqi Kurdistan**
In 2011 Maersk Oil entered Iraqi Kurdistan, which has an estimated prospectivity of 40-45 billion barrels of resources.

---

**Algeria**
Maersk Oil entered Algeria in 1990. It is a partner in the country’s second largest oil field and is participating in the large onshore El Merk development.

---

**Norway**
Maersk Oil is a partner in the giant Johan Sverdrup field. Since coming to the country in 2004, Maersk Oil has acquired 23 licences as a partner and operator with an active exploration programme.

---

**Kazakhstan**
Maersk Oil entered Kazakhstan in 2000 and now operates the Dunga field, which is undergoing a USD 1 billion field development to increase production significantly.

---

**Qatar**
Maersk Oil unlocked the Al Shaheen field – shunned by other companies – and with daily production of 300,000 barrels, has turned it into the largest offshore oil field in Qatar.

---

**Number of Maersk Oil operated fields**
23

**Maersk Oil gross acreage**
52,000 km²

**Maersk Oil operated production**
600,000 boepd

**Number of exploration and appraisal wells in 2012**
24
Danmark

Maersk Oil is the operator of all licences held by A.P. Møller - Maersk in Denmark. The joint venture Danish Underground Consortium (DUC), which comprises Maersk Oil as operator and Shell, Chevron and the Danish North Sea Fund as partners, now produces 85% of all oil and gas extracted in Denmark.

**MAJOR MILESTONES**

First oil production came from the Dan Field in 1972. Since then, 15 other fields have been brought on stream: Gorm, Skjold, Tyra, Tyra South East, Rolf, Krakå, Dagmar, Regnar, Valdemar, Svend, Roar, Harald, Lulita, Halfdan and Halfdan North East. A third-party field, Tryst, in the Norwegian North Sea, has been tied-in to Harald's infrastructure.

Maersk Oil has also acquired a number of licences outside the DUC, currently operating licences 9/95, 8/06 and 9/6. In July 2012, the state-owned Danish North Sea Fund entered the DUC with a 20% interest, diluting the shares of Maersk Oil (31.2%), Shell (36.8%) and Chevron (12.0%).

**DEVELOPMENT**

Material projects include the Tyra SE development, followed by the development of the Lower Cretaceous in Adda and Tyra. Longer-term projects include assessing the potential for novel hydrocarbon recovery in DUC acreage.

**EXPLORATION**

Dedicated studies and geological/geophysical assessments have led to the maturation of several opportunities. Focus has recently expanded from exploration and appraisal at the Upper Cretaceous level to the deeper stratigraphic intervals of primarily Jurassic age. Maersk Oil has committed to a programme with three firm wells to be drilled in the Contiguous Area during 2013 and 2014. Furthermore, a firm well targeting Upper Jurassic sands in the Maja licence is planned for spud in December 2013.

**MAERSK OIL ADDED VALUE**

Maersk Oil’s raison d’être was the need to develop Danish oil and gas after a discovery was made in 1966. Its production has exceeded total Danish consumption of hydrocarbons every year since 1992 and is a valuable contributor to the Danish state. Danish oil and gas reservoirs are characterised by high porosity, low permeability chalk. Faced with such tight fields, Maersk Oil developed technological solutions to raise the recovery factor from 10% to 30%. It has a leading-edge expertise in extended reach horizontal drilling and well stimulation techniques, thanks to its experience in the Danish North Sea.

---

### Overview*

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of entry</td>
<td>1962</td>
</tr>
<tr>
<td>First oil</td>
<td>1972</td>
</tr>
<tr>
<td>Acreage total</td>
<td>2,121 km²</td>
</tr>
<tr>
<td>Acreage operated</td>
<td>2,121 km²</td>
</tr>
<tr>
<td>Licences total</td>
<td>4</td>
</tr>
<tr>
<td>Licences operated</td>
<td>4</td>
</tr>
<tr>
<td>Production, 2012 total</td>
<td>258,500 boed</td>
</tr>
<tr>
<td>Production, 2012 operated</td>
<td>258,500 boed</td>
</tr>
<tr>
<td>Production, 2012 equity</td>
<td>91,400 boed</td>
</tr>
<tr>
<td>Production, 2012 entitlement</td>
<td>91,200 boed</td>
</tr>
<tr>
<td>Fields total</td>
<td>16</td>
</tr>
<tr>
<td>Fields operated</td>
<td>16</td>
</tr>
<tr>
<td>Development projects</td>
<td>3</td>
</tr>
<tr>
<td>Exploration and appraisal wells, 2012 total</td>
<td>0</td>
</tr>
<tr>
<td>Exploration and appraisal wells, 2012 operated</td>
<td>0</td>
</tr>
</tbody>
</table>

* See appendix page 78
Since Dan, Denmark’s first field, was brought on production in 1972, more than three decades of greenfield developments led to a peak oil rate of 350,000 barrels of oil a day in 2005. Today, production has declined to 258,500 barrels of oil equivalent a day, emphasising the need for a change from greenfield to brownfield management.

Maersk Oil operates three main hubs: Tyra, Gorm and Dan/Halfdan. An initial study of the facilities identified that the value for the remaining assets would be maximised by a step-wise reduction of systems in operation with the objective of keeping operating and lifting costs to a minimum. However, there is always a tension between decommissioning of equipment and the impact on possible near field developments and optimisations.

Following this overall study, a Rationalisation Task Force was established. The focus was initially on Tyra, which is predominantly a gas-processing hub. The Tyra East processing complex was de-manned, including decommissioning the majority of the gas-processing facilities and utilising those located on Tyra West. Structural improvements at both Tyra East and West are also required. A second stage of the study work concluded that reconfiguring the existing, as well as installing new, wellhead compression units would allow for higher production rates.

The major offshore activities of the Tyra Rationalisation Project are expected to be completed in 2016. The Dan complex is currently under investigation with the Gorm complex, the final processing hub to be addressed. It is envisaged that a continuous review of further options for decommissioning will be part of Maersk Oil’s objective of being a ‘second to none mature field operator’.
Qatar

Maersk Oil entered into an Exploration and Production Sharing Agreement (EPSA) with Qatar Petroleum (QP) in 1992. The EPSA included an oil-bearing reservoir – the Al Shaheen field – which had been deemed uneconomic by others as its reservoirs were extremely thin and stretched across vast distances. Despite these difficulties, Maersk Oil produced first oil just two years later and is now producing over one third of Qatar’s daily oil production, some 300,000 barrels of oil per day.

MAJOR MILESTONES
First oil from the Al Shaheen field was produced in 1994 from a well that was drilled during the field’s initial appraisal and exploration stage. A second Field Development Plan (FDP) was sanctioned in 1996, and the first permanent offshore facilities were inaugurated at the end of 1998. In 2001, the fields next FDP included additional production platforms, production and water injection wells, facilities for gas compression and a gas export pipeline to QP’s North Field Alpha Platform.

The single largest development plan to date, the 2005 FDP, comprised a major expansion of the field infrastructure with 15 new process and wellhead platforms, and more than 160 new production and water injection wells, increasing field production to 300,000 bopd.

In 2012 the most recent development plan was approved. The FDP2012 comprises an additional 51 new wells and debottlenecking of existing production facilities. The plan aims to optimise recovery and maintain a longer-term stable production plateau from the Al Shaheen field.

DEVELOPMENT
The Al Shaheen field contains a large number of further development opportunities and these are being evaluated with our partner QP.

EXPLORATION
The primary focus of exploration and appraisal activity is evaluating different stratigraphic intervals in the EPSA area.

MAERSK OIL ADDED VALUE
The Al Shaheen discovery, made in the 1970s, was well known to oil majors but thought to be impossible to develop commercially as the low-permeable reservoirs were extremely thin – down to 1-2 metres in some areas, and stretched across a wide area. A traditional development approach was out of the question due to the number of vertical wells and infrastructure that would have been needed.

The basis for developing these commercially and technologically challenging reservoirs has been the application of the drilling, stimulation and completion techniques that Maersk Oil developed intensively during the 1980s and 1990s to unlock the tough chalk reservoirs of the Danish North Sea.

Overview*

<table>
<thead>
<tr>
<th>Description</th>
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<td>Licences operated</td>
<td>2</td>
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<td>Production, 2012 operated</td>
<td>302,400 bopd</td>
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<td>Production, 2012 equity</td>
<td>302,400 bopd</td>
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<td>Production, 2012 entitlement</td>
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<td>Fields total</td>
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<td>Development projects</td>
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<tr>
<td>Exploration and appraisal wells, 2012 total</td>
<td>0</td>
</tr>
<tr>
<td>Exploration and appraisal wells, 2012 operated</td>
<td>0</td>
</tr>
</tbody>
</table>

* See appendix page 78
The Al Shaheen 2005 Field Development Plan (FDP) provided Maersk Oil with its first taste of a true mega project. With investment of USD 6.5 billion and work carried out over five years, the project was executed on time and on budget.

Considered by peers as one the most complex offshore projects in the region, the development entailed the building of 15 new platforms, the construction and installation of over 140,000 tonnes of new facilities, the drilling of more than 160 wells and the laying of 230 kilometres of pipeline and 55 kilometres of subsea cables.

Brownfield developments were mixed with greenfield projects, and hundreds of contractor agreements were signed, including multiple Engineering Procurement Installation and Construction (EPIC) contracts with contractors fabricating simultaneously in the UK, India, Abu Dhabi, Malaysia and Dubai.

Maersk Oil honed its skills in simultaneous operations – producing oil and, in fact, increasing production, while the development work continued around existing platforms.

During the 4 million man hours spent on expanding the existing infrastructure, the work was completed without a single fatality or serious incident. In that time, oil production was increased to 300,000 barrels a day, gas flaring was reduced to a minimum and production uptime was kept at over 99%.
United Kingdom

Maersk Oil firmly established itself in the UK in 2005 after the acquisition of Kerr-McGee’s UK assets for USD 2.95 billion. The purchase included offshore installations that produce from the Gryphon, Maclure and Tullich fields (Gryphon FPSO) and from the Janice, Affleck and James fields (Janice FSO). Maersk Oil has an ambitious growth target of doubling its UK production to 80,000 - 100,000 boed. In 2012, it invested USD 1 billion in the UK and is investing USD 1.5 billion in 2013 to help reach this target.

**MAJOR MILESTONES**

In 2007, Maersk Oil began producing from Dumbarton, a field that had been abandoned by BP, and by 2012 had sold over 40 million barrels. The Gryphon and Janice fields were in production when Maersk Oil acquired Kerr-McGee’s UK assets. In 2008 the significant Culzean gas condensate discovery was made and in 2011 an appraisal well was drilled on the Courageous discovery.

**DEVELOPMENT**

Maersk Oil is currently developing a number of projects. Operated projects comprise, among others, the Culzean, Courageous and Flyndre/Cawdor oil and gas discoveries, the latter straddling the UK and Norway border. Maersk Oil is investing USD 1 billion in the Nexen-operated Golden Eagle field with first production planned in late 2014.

**EXPLORATION**

Maersk Oil is notably strong in exploring the mature UK offshore area. In 2012, eight exploration and appraisal wells, of which three are operated, were drilled. Maersk Oil was active in the 27th Licencing Round with seven awards including three operated and four non-operated.

**MAERSK OIL ADDED VALUE**

Bucking the trend of many oil companies in the maturing North Sea, Maersk Oil aims to increase oil and gas production significantly in the coming years through efficient operatorship of its current assets and an active exploration and development programme.

Maersk Oil has gained significant expertise in High Pressure, High Temperature (HPHT) operations by operating the Culzean and Ockley discoveries in the UK, Luke and Gita in Denmark and participating in Jackdaw, Faraday and White Bear wells, also in the UK.

**Overview**

<table>
<thead>
<tr>
<th>Overview*</th>
<th>2005</th>
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<tbody>
<tr>
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<td>Exploration and appraisal wells, 2012 operated</td>
<td>3</td>
</tr>
</tbody>
</table>

* See appendix page 78
UK development projects

CULZEAN
The Culzean discovery was made late 2008 in the UK Central North Sea. The High Pressure, High Temperature (HPHT) discovery is located in a water depth of approximately 90 metres. Maersk Oil as operator holds a 49.99% interest in Culzean, with partners JX Nippon UK (17.06%), Eni UK (16.95%) and BP (16%).

The accumulation consists of two main reservoirs, the Middle Jurassic Pentland Formation and Upper Triassic Joanne Sandstone in the Skaggerak Formation. At a downdip location, further reservoir potential may exist in the Upper Jurassic Fulmar Formation.

Possible development concepts consist of one or more wellhead platforms tying back to third-party processing facilities or standalone gas-processing facilities if recoverable reserve volumes prove to be sufficiently large.

GOLDEN EAGLE
The Golden Eagle field was discovered in January 2007 with other fields discovered close by including Peregrine in 2008 and Golden Eagle in 2009. Hobby has now been included in the Golden Eagle field. The fields are operated by Nexen, with Maersk Oil holding a 36% share in Golden Eagle and 15% share in Peregrine.

Maersk Oil will invest about USD 1 billion of the USD 3 billion field development, which is expected to produce over an 18-year period. First oil production is forecast for late 2014 and the development is expected to have an initial gross production rate of up to 70,000 barrels of oil equivalent a day, adding 20,000 boed to Maersk Oil’s portfolio. The facilities built at Golden Eagle can act as a hub for future tiebacks.
Kazakhstan

Maersk Oil entered Kazakhstan in 2000, acquiring a 60% interest in the onshore Temir Block the same year and a 60% interest in the onshore Dunga field in 2002. The focus of Maersk Oil is now on new business in the Mangistau region, including the USD 1 billion field development that will more than triple production from the Dunga field.

MILESTONES
In 2002, Maersk Oil acquired a 60% interest and operatorship of the Dunga Block with Partex Corporation (20%) and Oman Oil Company Limited (20%). The acreage is operated under a Production Sharing Contract signed in 1994. The Dunga Phase I development began in 2007 and Phase II was approved in 2010. Average oil production from the Dunga field is currently some 7,000 barrels a day. Maersk Oil relinquished the Temir acreage in 2004 and sold the Saigak field in 2011.

DEVELOPMENT
Dunga Phase II began in 2012. Maersk Oil and its partners will drill 198 vertical wells over a three-year period to 2015 and undertake a major facilities upgrade.

EXPLORATION
Exploration wells drilled in 2012 discovered hydrocarbons at three stratigraphic levels within and outside the existing development area. Several well tests will take place in 2013 to further evaluate the potential of these discoveries.

MAERSK OIL ADDED VALUE
Since 2012, more than 2,000 employees and contractors have been working for the Dunga project. Everybody has been through Incident-Free orientations as part of Maersk Oil’s drive towards Incident-Free operations.

Maersk Oil has engaged with a local drilling contractor, who will be responsible for the drilling of all the wells with up to four rigs. This is believed to be the first such major contract that has been awarded by a western oil company to a local drilling contractor in Kazakhstan. Maersk Oil has assisted the contractor in meeting international HSE and operation standards, with procurement and in establishing a maintenance system. Furthermore, the company has put experienced staff in the field as coaches for the local crews and finally strengthened the HSE support to the drilling contractor. The first 20 wells have been drilled with zero Lost Time Injuries and within budget.

Overview*

<table>
<thead>
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<th>Date of entry</th>
<th>2000</th>
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</thead>
<tbody>
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<td>283 km²</td>
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<tr>
<td>Licences operated</td>
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</tr>
<tr>
<td>Exploration and appraisal wells, 2012 operated</td>
<td>4</td>
</tr>
</tbody>
</table>

* See appendix page 78
The Dunga field is an existing onshore development producing 7,000 barrels of oil per day. The 281 km² onshore block is situated some 50 km north of Aktau, western Kazakhstan.

During Dunga Phase II development, 198 wells will be drilled with pumping facilities at each well, capacity at the central processing facility will be expanded to 35,000 bopd, 135 kilometres of roads will be dug and 180 kilometres of pipelines will be laid.

The existing processing site will have a number of new facilities and buildings, including new oil storage tanks with capacity of up to 30,000 barrels, export facilities, gas compressors, a fuel station, a power plant and a water injection plant. First oil from the development was obtained in December 2012.

An appraisal programme of four wells was completed in 2012. The FDP drilling campaign started in August 2012 and will continue through to 2015. As part of this programme, 10 delineation wells have been drilled and data used for the update of reservoir model and reserves.

In 2011, Maersk Oil moved its headquarters 2,000 kilometres west from Almaty to Aktau to house its operations under one roof and streamline work on the Dunga Phase II and business development in the region.
Maersk Oil entered Algeria in 1990 through a joint venture that included Sonatrach. It currently retains interest in two blocks, which are situated in the Sahara Desert some 700-1,000 kilometres south of the Mediterranean. Maersk Oil holds an interest of between 4.589% and 12.25%.

**MILESTONES**

Exploration activities began in 1990 and over 30 exploration wells have been drilled, resulting in 16 field discoveries. The initial discoveries were the El Merk (EMK) and El Merk East (EME) fields in Block 208. These were followed by the discovery of three major oil fields in Block 404: Hassi Berkine (HBN), Hassi Berkine South (HBNS) and Ourhoud. Later, nine satellite fields were discovered in Block 404.

The HBNS field was brought on production in 1998 with an initial production capacity of 60,000 barrels of oil per day. In 2002, the central production facility (CPF), located at the HBNS field, was expanded to 285,000 barrels of oil per day to accommodate additional production from the HBNS, HBN and the Block 404 satellite fields.

The Ourhoud field, located in the southeastern corner of Block 404 and one of the largest oil fields in Algeria, was discovered in 1994. Development drilling began in 1998 and oil production in 2002. The field has a separate CPF with a capacity of about 250,000 barrels of oil per day.

Development of the El Merk project was sanctioned in 2009 and the final stages of development and commissioning work are ongoing. First oil was achieved in March 2013.

Export of the produced oil takes place through a 30” pipeline linking with Algeria’s export infrastructure to the north and produced condensate and liquefied petroleum gas (LPG) will be exported through two 16” pipelines to Gassi Touil to the west.

**EXPLORATION**

At present, there are no exploration activities.

**MAERSK OIL ADDED VALUE**

Through its participation as a non-operator, Maersk Oil works with the operators to:

- improve HSE standards
- provide technical input to the development of the fields
- second staff into the operating companies
- participate in the sanctioning and management of new projects to optimise production and ultimate recovery from the fields

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**Overview**

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<thead>
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<th>Overview</th>
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<tbody>
<tr>
<td>Date of entry</td>
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<td>Acreage total</td>
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<td>Production, 2012 total</td>
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<td>Production, 2012 operated</td>
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<td>Production, 2012 equity</td>
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<td>Fields operated</td>
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<td>Development projects</td>
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<tr>
<td>Exploration and appraisal wells, 2012 total</td>
</tr>
<tr>
<td>Exploration and appraisal wells, 2012 operated</td>
</tr>
</tbody>
</table>

* See appendix page 78
The El Merk project is a large onshore development in the Berkine Basin of the Algerian Sahara Desert, approximately 260 km southeast of the town of Hassi Messaoud and close to both Tunisia and Libya. It contains the first discovery of the joint venture in February 1993, the EMK field. The project is designed to process and export reservoir fluids from four primary sources – the EMN, EME and EKT fields in Block 208 and the unitised EMK field in Block 208 and Block 405a. Production will not only come from the TAGI formation, but also from the RKF and Strunian formations.

Production will not only come from the TAGI formation, but also from the RKF and Strunian formations.

The project entails drilling up to 140 wells and construction of a CPF to process the oil and associated liquids, condensate and natural gas liquids (NGL). First oil was achieved in March 2013 with ramp up to plant capacity in late 2013.

The CPF consists of three trains – two oil/condensate and one NGL – to process, store, meter and export the hydrocarbon liquids. The export streams include: Sahara blend crude, light condensate and a mixed LPG stream of propane and butane. Anticipated peak production from the project is 160,000 barrels a day of hydrocarbon liquids with peak gas production and injection of 600 million standard cubic feet a day (MMscfd) and produced water treatment of 80,000 barrels per day.

In addition to the CPF, the facilities at El Merk comprise off-site fluid gathering and gas/water injection systems, oil, condensate and LPG export systems and infrastructure for both the construction and operating phases of the facility – i.e. roads, an airfield, waste disposal sites, living accommodation, administration, warehousing, maintenance workshops and storage facilities.
Brazil

Maersk Oil entered Brazil in 2001. Since then, Maersk Oil has expanded its footprint in the offshore Campos Basin through licensing rounds and acquisitions. Up to the first quarter of 2013, Maersk Oil has drilled four wells as operator and participated as partner in 13 other wells. The acquisition of SK do Brasil, an affiliate of SK Energy, provided Maersk Oil with access to exploration acreage, development opportunities and production.

**EXPLORATION**

Maersk Oil transferred the operation of two blocks, BM-C-37 and BM-C-38, in 2011, in a farm-out agreement. Two exploration wells were drilled in these blocks and up to three more exploration wells may be drilled in 2013. Maersk Oil now holds 30% interest in the blocks. In 2010, it acquired a 20% interest in Block BM-C-34. Both postsalt and presalt exploration is ongoing in this block with four wells drilled since acquisition and one more exploration well to follow in 2013.

The Brazilian assets of SK Energy, acquired in 2010, comprise a 40% interest in the Polvo field (BM-C-8), 20% in the Wahoo discovery (BM-C-30) and 27% in the Itaipu discovery (BM-C-32). Since the acquisition, one appraisal well was drilled in Itaipu and up to three appraisal wells may be drilled at Wahoo and Itaipu in 2013.

**DEVELOPMENT**

Maersk Oil currently has no fields under development in its Brazil portfolio.

**MAERSK OIL ADDED VALUE**

The 'Whale Park' complex of oil fields, located just north of Itaipu and Wahoo, illustrates the quality of the Brazilian presalt in this area. Any presalt acreage in Brazil will now be licenced under new and more onerous production-sharing arrangements. Therefore, through Itaipu and Wahoo Maersk Oil, has secured access to Brazilian presalt resource under legacy terms, with a significant potential for value creation.

There is also an opportunity for Maersk Oil to strengthen its deepwater experience and to transfer knowledge across the globe to Angola and the U.S. Gulf of Mexico, other regions where Maersk Oil has a deepwater presence.

**Overview**

<table>
<thead>
<tr>
<th>Overview*</th>
<th>2001</th>
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</thead>
<tbody>
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<td>Fields operated</td>
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<tr>
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</tbody>
</table>

* See appendix page 78
Maersk Oil gained access to the prolific presalt acreage in the Campos Basin thanks to its acquisition of SK Energy’s Brazilian assets.
Maersk Oil entered Norway in 2004. By early 2013 a portfolio of 23 licences had been developed, two operated wells had been drilled and Maersk Oil was a partner in the Johan Sverdrup oil discovery – the largest in the world in 2011 and one of Norway’s largest ever discoveries. By early 2013, the organisation had 77 employees in the Stavanger office.

MILESTONES
In 2005, Maersk Oil acquired a 60% interest and operatorship of the border-straddling Flyndre discovery on the Norwegian side as part of the Kerr-McGee UK acquisition. First oil is expected in 2016.

In 2008, Maersk Oil was awarded a 20% interest in the PL501 licence operated by Lundin Petroleum AS. Drilling in 2010 led to the giant Johan Sverdrup discovery. First oil is expected in 2018.

In 2010, Maersk Oil acquired a 20% interest in PL435. Later that year, operator RWE-Dea made the Zidane gas discovery. In early 2012, a second discovery was made. Licence studies are progressing towards a project sanction by the end of 2013. First gas is expected in 2017.

EXPLORATION
Maersk Oil holds interest in 23 licences acquired through licensing rounds and farm-in activities; 12 in the North Sea and nine in the Halten banken region of the Norwegian Sea.

Since 2004, Maersk Oil has participated in 19 exploration and appraisal wells in Norway: 14 of these have encountered hydrocarbons in commercial quantities.

In late 2012, Maersk Oil drilled its second operated well on the Albert prospect under licence PL513. The well encountered reservoir quality as expected, but was dry.

DEVELOPMENT
A pre-unification agreement for planning of the development of Johan Sverdrup was signed in 2012 with Statoil Petroleum AS as the development planning operator.

MAERSK OIL ADDED VALUE
With presence in the three sectors of the North Sea – Norway, the UK and Denmark, Maersk Oil is uniquely positioned to take advantage of its cross-border knowledge and experience.

As the only non-operating partner with experience from mega development projects, Maersk Oil is in a strong position to support the development of the Johan Sverdrup field.

| Overview*                                                                 |
|---------------------------|----------------|
| Date of entry             | 2004           |
| Acreage total             | 5,530 km²      |
| Acreage operated          | 1,255 km²      |
| Licences total            | 23             |
| Licences operated         | 7              |
| Development projects      | 2              |
| Exploration and appraisal wells, 2012 total | 5     |
| Exploration and appraisal wells, 2012 operated | 1     |

* See appendix page 78
Global activities

The giant Johan Sverdrup discovery – one of Norway’s largest ever discoveries – was a surprise to many geologists around the world. The field is located in a mature area that was considered to have low potential by oil companies after several dry wells were drilled in the 1960s and 70s. Many thought it was nearly impossible for oil to migrate from the prolific South Viking Graben to this area; however, they were proved wrong. The success of the Johan Sverdrup discovery has not only given a boost to the oil industry in Norway but also given new hope of finding more oil in unexpected and well-explored mature areas.

The first successful exploration well targeting the Johan Sverdrup field was drilled under licence PL501, operated by Lundin Norway AS and in which Maersk Oil has a 20% interest. It was named the Avaldsnes discovery. A year later under the neighbouring licence PL265, more oil was found by Statoil Petroleum AS in a discovery named Aldous. It was later proven that the two discoveries were linked and, in 2012, the new field was named Johan Sverdrup by the Norwegian Authorities. It is planned to operate the two licences as a single entity in the field’s development and operation. This will be submitted to the authorities late 2014. Currently a pre-unitisation agreement is in place to conduct joint development studies with Statoil Petroleum AS as the working operator.

The Norwegian Petroleum Directorate’s estimates for the field volume are between 1.3 and 2.5 billion barrels of recoverable oil, making it one of the largest discoveries ever in the Norwegian North Sea. The field is expected to have a production life of more than 50 years.

The timeline for Johan Sverdrup is as follows:
- Fourth quarter 2013: Concept selection
- Fourth quarter 2014: Plan for development and operation submission
- Second quarter 2015: Authority approval
- Fourth quarter 2018: First oil

The two licences involved in the Johan Sverdrup development are:
- PL501: Lundin Norway AS (operator, 40%), Statoil Petroleum AS (40%) and Maersk Oil Norway AS (20%).
- PL265: Statoil ASA (operator, 40%), Petoro AS (30%), Det norske oljeselskap ASA (20%) and Lundin Norway AS (10%).
Angola

Maersk Oil entered Angola in 2005 and has since made the Chissonga discovery, declared commercial in 2011, and the Azul discovery, which generated world-wide interest as the first positive deepwater presalt well in the Angolan analogue to the prolific offshore regions of Brazil.

**MILESTONES**
Maersk Oil bought a 50% interest in the deepwater Block 16 in 2005 covering some 4,900 km² and with water depths up to 1,500 metres. It currently holds a 65% interest, with partners state oil company Sonangol P&P (20%) and Odebrecht (15%).

In 2006, Maersk Oil entered into Production Sharing Agreements for Blocks 8 and 23 with an operated interest of 50%. Its partners are Sonangol (20%) and Svenska Petroleum (30%). The blocks lie in the offshore Kwanza basin and cover a combined area of 9,780 km² with water depth in Block 8 up to 500 metres and in Block 23 up to 1,500 metres.

Maersk Oil discovered Chissonga, in Block 16, in 2009 and Azul, in Block 23, in late 2011. Mid 2012 another discovery was made in Block 16 with the Caporolo-1 well.

**EXPLORATION**
The first well in Block 8 with a presalt objective is scheduled for late 2013. Exploration and appraisal drilling on all blocks will continue in 2013-2014 with an expected five wells.

**DEVELOPMENT**
Chissonga appraisal drilling activity is complete and a field development plan is being matured.

**MAERSK OIL ADDED VALUE**
Maersk Oil’s use of advanced seismic technologies enabled the discovery of Chissonga in a block that had been extensively drilled by previous operators without success.

Maersk Oil has drilled eight deepwater wells offshore Angola since 2009. In the Kwanza Blocks, Maersk Oil is the frontrunner in chasing the deepwater presalt play in the conjugate margin to Brazil.

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**Overview***

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</table>

* See appendix page 78
Maersk Oil expanded its exploration strategy in 2004 to include deepwater basins. In 2005 it bought a 50% share in Block 16 in Angola and in 2009 it drilled its first prospect in the block, which turned out to be a discovery. Two years later Chissonga was declared commercial.

The Chissonga field is located in the western part of Block 16, some 130 km offshore from the Soyo beach crossing, in a water depth ranging from 1,200 meters to 1,500 meters. The first appraisal well was completed in April 2010 and further appraisal wells were drilled in late 2011 and 2012 to define a more accurate resource range in the stacked turbidite sand reservoirs.

The Chissonga reservoir comprises four stratigraphic layers with the hydrocarbon accumulations covering an area of approximately 175 km². Following successful appraisal, the optimal development concept is currently being matured. Construction of major elements for production (FPSO, etc.) is currently planned to be initiated in 2014 and first oil is expected in 2017/18.

The Chissonga project is significant for Maersk Oil as the first project in Angola. It will establish Maersk Oil as a key player and be the foundation for future Maersk Oil activities in Angola.

The Chissonga project will also be the first project in the company’s history of operating a field outside Denmark throughout the upstream value chain – from exploration, appraisal, development to production.
Maersk Oil entered the U.S. Gulf of Mexico in 2006 when it acquired interest in just over 100 exploration licences and has since more than doubled that number to over 200. Maersk Oil is participating as partner in the Chevron-operated Jack development and Buckskin discovery.

**EXPLORATION**

Maersk Oil currently holds a 33% interest in around 80 leases in the western part of the Gulf of Mexico in water depths of up to 1,500 metres. It is working with operator Hess Corporation to define drillable prospects in these areas.

In the central U.S. Gulf of Mexico, Maersk Oil currently has a 20% share in some 32 leases, which were acquired through an exploration agreement with Chevron that started in 2008. Through this agreement Maersk Oil participated in six wells, one of which resulted in the Buckskin discovery in the Wilcox Formation. The second appraisal well on Buckskin is expected to be completed in the third quarter of 2013, and Maersk Oil will participate in the Chevron-operated Oceanographer exploration well in 2013.

Maersk Oil has been building a portfolio of leases via lease sales, as operator with 100% share. Some 62 leases were acquired in the Central Gulf of Mexico lease sale in 2010. A further 12 leases were acquired in the 2011 Western Gulf of Mexico lease sale, and an additional seven leases were acquired in 2012. Maersk Oil was high bidder on 14 leases in the 2013 Central Gulf of Mexico lease sale, and will be notified of awards by the end of the second quarter 2013. Prospect definition is ongoing and farm outs are in progress to build partnerships for drilling.

**DEVELOPMENT**

Maersk Oil has a 25% interest in the Jack discovery, in some 6,000 feet water depth, which is being developed by the operator, Chevron, and is expected to be on production in late 2014.

**MAERSK OIL ADDED VALUE**

Initially learning through non-operated ventures with Hess, ExxonMobil and Chevron, Maersk Oil has brought leading-edge geophysical techniques to enhance seismic imaging below salt layers.

By leveraging its cross-company expertise, Maersk Oil has been able to bring value-adding process-flow recommendations that operators have taken on board to achieve important imaging enhancements.

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<td>Exploration and appraisal wells, 2012 operated</td>
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* See appendix page 78
In February 2010, Maersk Oil acquired a 25% interest in the Jack development project in the central Gulf of Mexico from Devon. Chevron is the operator of the Jack field with a 50% interest. The field is located in the Walker Ridge area of the Gulf of Mexico in water depths of 2,100 metres. Chevron is also the operator of the nearby St. Malo field, holding a 51% interest.

Chevron is co-developing its Jack and St. Malo projects. The Stage I field development consists of the installation of a new semi-submersible Floating Production Unit (FPU) placed half way between the two fields. The Jack development consists of a single drill centre with four new wells producing into a four-slot manifold. The St. Malo development consists of two drill centres.

Both fields will be connected to the moored FPU with steel risers. The FPU design capacity is 170,000 barrels of oil a day and 42.4 million cubic feet of gas a day.

Enbridge will build, own and operate a new gas pipeline, termed the Walker Ridge Gathering System, serving the Jack and St. Malo fields as well as Chevron’s Big Foot field. The Amberjack Pipe Line Company will build and operate a 222-kilometre oil pipeline connecting the Jack/St. Malo FPU to the Shell-operated Boxer platform.

Production from Jack is expected to commence in the fourth quarter of 2014. Stage II development is expected to immediately follow the start-up of Stage I.
EXPLORATION

Maersk Oil reprocessed all 2D-seismic data available in Block 9. This data set formed the basis for the hydrocarbon evaluation of the block as well as giving insights into the geophysical challenges in both acquiring and processing seismic data in Arctic areas with hard glacial deposits at the seabed. This knowledge has been extensively used to optimise the preparation, planning and execution of the 2012 3D-seismic acquisition and processing projects in the block.

In early 2012, an Environmental Impact Assessment was carried out for the planned field work.

Prior to the seismic activities, Maersk Oil completed a comprehensive sea ice and iceberg study within the block to understand the local operational risks of acquiring seismic data in the open waters where sea ice breaks up and icebergs drift.

During the ice-free field season from June to September 2012, three operational activities took place in the block:

- Shallow coring project, in a consortium consisting of all licencees in the Baffin Bay:
  - Shallow stratigraphic coring was carried out in the area to gain knowledge of the subcropping rocks.
- 3D seismic survey:
  - 2,000 km² area of the block was covered.
- Hydrographic survey and geochemical sampling:
  - The seabed was mapped in detail by a multibeam survey within the 3D seismic area and seabed samples for geochemical analysis were collected over the block area.

Currently, these data are being processed and evaluated in order to update the hydrocarbon potential of the block.

In December 2010, Maersk Oil was awarded a licence in Baffin Bay, North Western Greenland. Maersk Oil is the operator and during 2012 it has farmed out a 40% interest to Tullow Oil. State oil company Nunaoil has an interest of 12.5%, leaving Maersk Oil with a 47.5% interest.

Greenland

In December 2010, Maersk Oil was awarded a licence in Baffin Bay, North Western Greenland. Maersk Oil is the operator and during 2012 it has farmed out a 40% interest to Tullow Oil. State oil company Nunaoil has an interest of 12.5%, leaving Maersk Oil with a 47.5% interest.
Maersk Oil is participating in a consortium of all licensees in Baffin Bay to conduct shallow stratigraphic coring in the area to gain knowledge of the sub-cropping bedrock.
Iraqi Kurdistan

Maersk Oil entered Iraqi Kurdistan in 2011 and currently holds a 30% shareholding in HKN Energy, a privately owned U.S. company whose sole asset is a 75% operated interest in the Sarsang Block. The remaining 25% interest is held by Marathon Oil.

Given its proximity to some of the largest recent oil discoveries in the region, such as Atrush and Shaikan, and the presence of several large surface anticlines, the Sarsang Block is considered highly promising. Iraqi Kurdistan has an estimated potential of 40-45 billion barrels, according to the U.S. Geological Survey, of which only 7 billion have been discovered to date.

MILESTONES
Swara Tika 1, the first well in the Sarsang Block, was drilled in March 2011 and flowed light oil from fractured Triassic carbonates. A second well, Swara Tika 2, was spudded in November 2012 to make a further appraisal of the discovery. Testing was completed in January 2013.

EXPLORATION
Exploratory drilling continues on the Mangesh and Gara prospects, and further exploration drilling is planned in the second quarter of 2013.

DEVELOPMENT
HKN Energy expects to determine if the Swara Tika discovery is commercial by the third quarter of 2013.

MAERSK OIL ADDED VALUE
Maersk Oil is able to support HKN Energy’s exploration and development activities based on its extensive experience of developing challenging reservoirs, integrated operations and large-scale project delivery.

Maersk Oil contributes experience in reservoir modelling, drilling, stimulating fractured carbonates, facility engineering and project management. In addition, drilling, production and engineering supervisory staff have been seconded to HKN Energy’s Erbil office to support Sarsang Block operations.

Overview*

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* See appendix page 78
** All data refers to HKN Energy’s interest in the Sarsang Production Sharing Contract, to which Maersk Oil has indirect exposure via a 30% shareholding in HKN Energy.
Iraqi Kurdistan has an estimated prospectivity of 40-45 billion barrels of resources, according to the U.S. Geological Survey, of which only 7 billion have been discovered to date.
Technical capabilities
Introduction

Maersk Oil has developed its technical capabilities on the back of its experiences unlocking the tight chalk reservoirs of the Danish North Sea – its home for over 50 years. To solve the puzzle of the high porosity, low permeability fields, it developed an expertise in extended-reach horizontal drilling, the techniques to complete such long wells and the experience of operating a complex network of 16 fields with almost 40 platforms standing in tough North Sea waters.

Maersk Oil’s beginnings have imbued it with a spirit of creative problem solving and a history of innovative deployment of technology. It has a track record of turning challenging fields into commercial success and seeing value where others did not.

It produced from the Al Shaheen field, offshore Qatar, in 1994, just two years after entering the country - even though many major oil companies shunned its thinly spread reservoirs as economically unviable. It turned around the abandoned Donan field in the UK, producing over 40 million barrels since 2007 in its new incarnation as Dumbarton. And it made the major Chissonga discovery in Angola after previous companies had drilled a number of dry wells over the course of 10 years.

Maersk Oil's expansion has accelerated in the past decade; it now has a broad portfolio and the capability to match it. It has experience in a wide range of geological environments: from chalk and shelf carbonates in the Danish North Sea and offshore Qatar, over fluvio-deltaic depositional environments in the North Sea, to clastics and presalt in Angola and Brazil.

The company’s portfolio of operational environments ranges from the Arctic in Greenland to onshore Kazakhstan. It has built significant experience in High Pressure High Temperature (HPHT) operations in the North Sea and working in deepwater operational environments in Angola, Brazil and the U.S. Gulf of Mexico.

Maersk Oil’s technical capabilities lie not just in the subsurface; its successful execution of the USD 6.5 billion five-year development of Al Shaheen gave it a taste for major projects and it is now working on 15 developments that will increase its entitlement production by 50% in the coming years.

In its quest to maximise the recovery from its existing assets, Maersk Oil has been building its portfolio of Improved and Enhanced Oil Recovery (IOR/EOR) technologies, such as waterflood and gas injection. It is also actively evaluating the potential of CO₂ injection and Water Alternating Gas (WAG) processes. Today Maersk Oil operates or is a partner in waterflood and gas injection projects in Qatar, Kazakhstan, Algeria and the UK, with massive scope for future developments.

Maersk Oil’s aptitude for learning, problem-solving and innovative deployment of technology to extract oil and gas from challenging fields has allowed it to adopt and develop new technologies as it expands rapidly into larger variety of geological and geographical areas.
Subsurface

Maersk Oil’s technical capabilities in the fields of geology, geophysics, geochemistry, petrophysics and reservoir engineering are key to unlocking the potential of its assets. The company’s experience covers the value chain from exploration to production, with techniques from geophysical data acquisition and processing to innovative interpretation workflows.

Maersk Oil has developed a range of in-house geophysical technologies and matured integrated subsurface workflows that make the most of the full range of available subsurface data. The applications of these tools range from the evaluation of the petroleum potential of basins to reliable pre-drill prediction of reservoir quality. Key to Maersk Oil’s success is the integration between the different subsurface disciplines and data types, as well as collaboration with research centres and technology providers.

Seismic acquisition

Maersk Oil’s seismic data acquisition team is responsible for the project management of the company’s geophysical data acquisition projects worldwide. It ensures that seismic data acquisition is tailored to the needs of the business unit and is executed efficiently:

- Prepares and sends out invitations to tender documents for 2D, 3D and 4D surface seismic data acquisition projects.
- Evaluates and prepares technical and financial award recommendations for seismic data acquisition contractors for the responsible asset team.
- Leads project management and execution of the seismic data acquisition survey, including:
  - Managing permits to shoot
  - Manning seismic vessels with company and fishing representatives
  - Arranging HSE audits of seismic vessels
  - HSE monitoring of seismic contractors and reporting of HSE statistics to each country’s relative HSE departments
  - Monitoring of budget and reporting budget to asset teams
**4D seismic data**

4D seismic data has consistently proven its value for increasing hydrocarbon recovery by improving decisions on infill well locations and reservoir management. Maersk Oil has applied 4D methods to multiple fields in the Danish and UK North Sea, with further projects in progress and planned.

4D is an integrated activity requiring the close cooperation of multiple disciplines. Maersk Oil staff have significant experience in all aspects of 4D, including rock physics, geophysics, geomechanics and reservoir engineering, and have developed proprietary tools to support 4D analysis.

The value of Maersk Oil’s 4D work can be seen in the Halfdan field, offshore from Denmark. Reservoir pressure maintenance and sweep of oil with water are the main objectives of waterflooding at the Halfdan field. In 2005 after five years of production, a repeat seismic survey was carried out covering the developed area. Analysis of the seismic data revealed a strong signature, reflecting the effect of the waterflooding of the reservoir. The seismic observations confirmed the modelled behaviour of the Halfdan Field waterflood. Prior to the 2005 4D seismic, the development of the Halfdan field had only been verified from indirect observations showing that production performance was in agreement with modelled expectations. The 2005 Halfdan repeat survey provided direct and independent evidence of parallel injection fractures formed across the field and aligned with the injection well pattern. The seismic signatures related to injection conform to the location of the well bores, thus confirming the validity of the survey data.

The fact that the injection signatures form parallel lines, which on the one hand align with injectors while on the other extend beyond the well and completion intervals, proves that the development pattern affects injection fracture propagation. The 2012 repeat seismic survey revealed the continued lateral movement of the waterflood away from the injectors and the injection fractures in the wells drilled post-2005. This data is being used to identify areas for well interventions and workovers to improve the oil recovery.

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**Map of Upper Tor Formation relative acoustic impedance change from 1993 to 2005 (left) and change in absolute acoustic impedance from 2005 to 2012 (right). Wells in polygons were converted to injection post-2005.**
Dedicated Seismic Processing Centre

In 2010, Maersk Oil awarded a three-year contract to CGGVeritas to provide an in-house Dedicated Processing Centre (DPC) at its Copenhagen headquarters to strengthen and streamline its seismic processing capabilities.

The conventional way of processing seismic data is to define the technical scope of work on a project-by-project basis. Once this is done, an invitation to tender is sent to a list of external geophysical contractors, and the contract is awarded to the company offering the best combination of technical capabilities and price.

Although external projects remain an important component of Maersk Oil’s seismic processing strategy, the DPC provides a radically different framework. After a thorough selection process, a geophysical company is awarded a multi-year contract with staff, software and hardware installed within the premises to provide on-demand processing services.

At Maersk Oil headquarters, the four full-time CGGVeritas employees of the DPC are located next to the Geophysics group in the Corporate Technology and Projects department. This physical proximity is one of the major advantages of the DPC model, allowing for much closer interaction than is possible with external projects. Furthermore, the DPC contract, once set up, allows for processing work to start as soon as a need has been identified, reducing project turnaround times significantly. Through this close collaboration, Maersk Oil has access to the most advanced seismic processing technology and expertise CGGVeritas has to offer, as well as an ultra high-speed link to the world-class CGGVeritas computing hub in London.

The DPC allows for processing work to start as soon as a need has been identified, reducing project turnaround times significantly.

Time/Depth Conversion COHIBA – Co-developed Technology

COHIBA is an innovative depth conversion approach incorporating horizontal well data. Maersk Oil is working closely with the Norwegian Computing Centre (NCC) to develop depth conversion software that exceeds the capabilities of conventional applications. The accumulated positioning and zonation error of long horizontal wells can become significant, and the COHIBA approach is designed to work with these errors. Intelligent use of the information from multiple wells, and other sources, allows the depth conversion uncertainties to be minimised and quantified.

The name COHIBA was inspired by the keywords: COrrelation, Horizons, Intervals and BAyesian Kriging. The method poses the depth conversion problem in a robust statistical framework. Moreover, the collaboration with the NCC facilitates enhancements so that COHIBA generates depth models which simultaneously honour a variety of data observations: seismic interpretation, velocities, well trajectories, markers and zones. The data has associated uncertainties and, along with geostatistical constraints, COHIBA determines the resultant probability distribution of horizon depths.

Similarly to Jigsaw, Maersk Oil’s proprietary inversion software, a script-based approach automates the COHIBA process, and allows rapid and consistent updates of the depth model as new information becomes available through the life of the field. The technical advantages available to Maersk Oil through using COHIBA, in addition to commercially accessible packages include:

- The ability to calibrate to multiple horizontal wells in addition to other input data
- Explicit management of the interdependency of multiple surfaces
- The capacity to process structurally complex models, which may contain erosion, pinch-outs, thin layers and onlapping surfaces
- A choice between compatible deterministic and stochastic outputs, taken from the same probability distribution
- Robust quality control mechanisms analysing all input, filtering erroneous data and reporting potential inconsistencies between inputs
Technical capabilities

Seismic Inversion JIGSAW
– Proprietary technology

Jigsaw (Joint inversion of Geostatistics, Seismic and Wells) is an innovative and unique inversion tool for integrated geoscience, developed by Maersk Oil. Seismic inversion is a vital technology for incorporating highly heterogeneous parameters, such as carbonate porosity, into a reservoir model. Maersk Oil’s scheme has been designed from the base up in order to provide rapid, repeatable inversion of large datasets (both pre- and post-stack) while allowing for the integration of different data types (seismic reflection data, vertical, deviated and horizontal wells, stacking velocities, for example) and iterative workflows involving geophysicists and interpreters.

Jigsaw has, since its operational deployment in late 2010, revolutionised the way in which Maersk Oil performs seismic inversion, thanks in part to its class-leading speed. As an example, a single test run of post-stack inversion over the massive Al Shaheen field in Qatar used to take three weeks with commercial software; with Jigsaw, the same run takes only three hours on a standard PC.

This speed has been achieved without compromising on quality, through a completely new algorithm designed specifically to take advantage of modern, parallel multicore computer architecture and large memory capacities. Jigsaw is designed to handle extremely large problems, beyond the capacity of more commercial tools, such as joint pre-stack elastic inversion over a field the size of Al Shaheen, or regional surveys over numerous fields in the Danish North Sea.

Jigsaw offers Maersk Oil a number of capabilities not found in conventional seismic inversion software. A good example of this is the 4D geostatistical time strain inversion, which inverts repeat datasets that are misaligned owing to production-related seismic velocity changes. The Jigsaw time strain inversion not only aligns these images in readiness for further analysis, but also recovers the part of the 4D signal that occurs over longer vertical scales than conventional seismic methods can see. These long-scale features are combined with fine detail from the inversion of seismic reflections, optimising resolution, reducing artefacts and yielding a truly quantitative measure of 4D changes.

Jigsaw results are used extensively within Maersk Oil and by its partners for interpretation and geomodelling. The Jigsaw technology is owned exclusively by Maersk Oil and continues to be developed in house. Ownership of the software offers Maersk Oil the flexibility to tailor its functionality quickly and easily for the particular geoscience challenges it faces.

JIGSAW inversion results over the Chissonga discovery offshore Angola, showing sand presence at different reservoir intervals
Reservoir quality evaluation

Maersk Oil uses a multidisciplinary approach to Reservoir Quality (RQ) evaluations involving petrophysics, core analysis, petrography, sedimentology, basin modeling and diagenetic modeling. This approach has been highly successful, with pre-drill predictions accurately matching post-drill results.

RQ technologies provide solutions to pre-drill exploration challenges such as reserve calculations, flow rate estimates and risk analysis, and post-drill development and appraisal issues, such as rock/log/seismic calibration, pay definition, reservoir compartmentalisation, reservoir facies trends and formation sensitivity.

Given industry bias towards exploration and development of deep, diagenetically altered reservoirs including High Pressure, High Temperature (HPHT) targets, RQ predictions have become a critical component of reservoir risk analysis.

However, with the introduction of diagenetic modeling simulators, RQ specialists have been able to provide the oil and gas industry with predictive capabilities that did not exist a decade ago. Maersk Oil uses commercial RQ modeling software packages such as Exemplar™ and Touchstone™ for 1D modeling and Tmap™ for 2D and 3D modeling.

Maersk Oil has developed some unique and proprietary methods and workflows to ensure that RQ modeling software is able to provide accurate and reliable pre-drill predictions. Maersk Oil has successfully used the technology in a variety of settings, including the Gulf of Mexico, offshore Brazil, Angola and the North Sea.

Diagenetic alteration

Quartz Cement Map

Photograph of a thin section showing partial diagenetic alteration of a feldspathic sandstone reservoir by quartz cementation.

Lateral distribution of quartz cement is shown in map view.
The team developing Maersk Oil's first operated deepwater discovery, Chissonga, has established an industry best practice workflow that aims to define the full range of Stock Tank Oil Originally In Place distribution and recoverable volumes. Prohibitively expensive drilling costs prevent widespread appraisal of all potential reservoir compartments in a complex stratigraphic and structural system, ensuring that significant uncertainties remain in the current development planning phase.

The integrated workflow combines detailed observations of Amplitude Versus Offset (AVO) character, direct hydrocarbon indicators and geophysical rock properties with detailed stratigraphic and structural definition from 3D seismic interpretation, in order to define 3D geometric frameworks with integrated reservoir characterisation and ranges in fluid distribution. Reservoir model properties are derived from seismic and core-based facies determinations, in conjunction with well and core data. Reservoir model properties are also quantified using volume-based seismic conditioning from AVO-derived and probabilistic inversion techniques.

The aim of the workflow used on Chissonga is to quantify the ranges of recoverable volumes and predicted performance by varying all potentially uncertain reservoir parameters (such as net-to-gross, oil-water contacts, fault transmissibilities). In particular, the workflow addresses a major uncertainty in this type of depositional environment – the timing of the water breakthrough. The workflow also accounts for dependencies between individual reservoir parameters such as the impact of varied porosity on permeability and therefore hydrocarbon saturations. Static model-based uncertainty is tied to dynamic model-based uncertainties at a common scale through the use of software that ensures uncertainty ranges are consistently applied and varied throughout the workflow.
Petroleum systems analysis

The petroleum systems group in Maersk Oil uses industry standard workflows to assess the hydrocarbon potential of a sedimentary basin, with particular focus on source rock presence and quality, oil-source and oil-oil correlation and modelling of prospects’ access to charge. Geochemical data derived from source rock, and oil and gas analyses are interpreted to characterise and model the different petroleum systems elements and processes occurring in the subsurface over the geological history of a basin.

Maersk Oil uses modern techniques such as GC-MS-MS, GC-IRMS and multivariate statistical analysis in order to characterise or ‘fingerprint’ hydrocarbon liquids and gases. This allows it to accurately identify where the fluids came from in the subsurface to reduce the risk involved in finding hydrocarbons. Petroleum geochemistry is used across exploration, appraisal and development projects at Maersk Oil and is a major input to play analysis, production allocation, reservoir connectivity assessments and basin modelling.

Basin modelling allows Maersk Oil to understand the possible generation-expulsion-entrapment history of hydrocarbons in a basin by numerically assessing the quality and temperature history of one or more source rocks. To do this, basin models are calibrated to maturity parameters, such as vitrinite reflectance identified by analysis of rock samples from wells and to well temperature data. Currently Maersk Oil uses PetroMod and the Zetaware suite of products (Trinity, Genesis) for petroleum systems modelling.

Because basin modelling essentially creates a 4D (3D through time) model of the subsurface, it provides key inputs to prospect evaluation, play analysis, and pore pressure and temperature prediction thereby providing solutions to exploration and safety questions, both pre- and post-drill.

Non-equilibrium hydrocarbon traps

Maersk Oil developed the understanding and the modeling tools that predict the conditions and distribution of hydrocarbons in non-equilibrium hydrocarbon traps. This has allowed Maersk Oil to optimise appraisal programmes and develop reservoir simulation abilities used in the production of non-equilibrium hydrocarbon traps.

In the standard model for hydrocarbon traps, the contact between hydrocarbons and water is assumed to be relatively sharp and horizontal. The Pressure, Volume and Temperature (PVT) properties of the hydrocarbons are assumed to be relatively constant and in thermodynamic equilibrium. The assumption underlying the standard model is that the equilibration of hydrocarbons in the subsurface occurs at a speed similar to the imposed changes caused by geological forces over geological time.

In the case of very large or low permeability hydrocarbon reservoirs, hydrocarbons are left in a state of non-equilibrium as they adapt at a much slower rate relative to the changes affecting the hydrocarbon trap (imposed by burial, uplift, tilting, migration, delayed compaction of the aquifer, temperature gradients, change of aquifer salinity and so on). Maersk Oil’s home base, the North Sea Chalk reservoirs, is a prominent example of a region with non-equilibrium reservoirs caused by a combination of delayed compaction of the chalk aquifer, ongoing burial and local tilt of traps post early migration. The low permeability of the chalk causes significant transition zones above the oil-water-contact to develop. The value of these in-house tools was clearly demonstrated when Maersk Oil discovered the Halfdan field in the late 1990s using its understanding of non-equilibrium traps.

Maersk Oil also applied these tools on the giant Al Shaheen field in Qatar which had been shunned by other operators as economically unviable. Early studies established that the Al Shaheen hydrocarbon accumulations in low permeability carbonates were partly controlled by regional hydrodynamics and slow re-equilibration of the hydrocarbons in the trap imposed by regional burial/tilt of the Qatar Arch, causing the hydrocarbons to remigrate.
Drilling

**Driven by the need to develop a cost-effective solution** to produce from the low permeability chalk reservoirs in the Danish North Sea, Maersk Oil became a pioneer in applying horizontal drilling techniques. Extended reach drilling increases the effective surface area of the well and therefore maximises contact with the reservoir.

In order to position these long reach horizontal wells optimally, geosteering skills using biostratigraphic data, cuttings and Logging While Drilling (LWD) data were perfected in house. Multilateral wells helped to further reduce the number of well slots required to develop the fields. These skills complement Maersk Oil’s toolbox of well completion and stimulation technologies.

During recent years new frontier areas have been added to Maersk Oil’s portfolio, setting new challenges. These include deepwater operations and also the ability to handle higher pressures and temperatures than ever before.

**Deepwater (DW) capability**

Maersk Oil has ongoing exploration and appraisal drilling programmes in West Africa in water depths of up to 1,500 metres, and interests in the U.S. Gulf of Mexico. In such water depths, dynamically positioned (DP) drilling rigs are used. Some rigs have dual derricks to maximise operational performance.

Drilling and evaluation of a DW well can take over 100 days depending upon the depth of the well, the pressures that will be encountered and the amount of evaluation that is required. The evaluation programme can involve logging while drilling, taking surface samples of drilled cuttings and taking core samples from the reservoir sections of the well. To prove that the oil and gas from the reservoir is mobile, a production test is performed which involves flowing the hydrocarbons up to the rig.

The cost of DW wells is significant and can exceed USD 100 million. Operations require long-range logistical support from boats and helicopters, often in isolated regions of the world.

Enormous efforts are taken to ensure that the plan is thoroughly prepared and safely executed. At the same time contingencies are put in place and people are trained to react decisively if a problem occurs.

A formal planning tool called the Well Delivery Process (WDP) has been established to ensure that DW well design and execution plans are optimised. The WDP involves specific stages where reviews are required. The reviews involve close collaboration between subsurface, drilling and logistics teams at each stage of the planning process.
Maersk Oil has gained significant experience from operating HPHT drilling programmes in the UK and Danish Sectors of the North Sea. Reservoir pressures of up to 15,000 psi can be encountered during drilling operations.

HPHT wells are designed using the latest well design software. Expertise in the knowledge of materials and metallurgy is essential to ensure that extremely high pressures can be safely contained by the multiple steel casing and wellhead systems at elevated wellbore temperatures. Some reservoir fluids can have corrosive properties and the wells must also be designed to withstand deterioration when they come into contact with corrosive elements from the well.

Well bottom hole temperatures over 200 deg C create enormous challenges for reliability of electronic equipment used for reservoir evaluation.

A team of HPHT well design experts work closely together in the UK and Copenhagen to ensure that appropriate assurance of the well designs is performed, thus providing the safe operating envelope for the entire lifetime of the wells.

Maersk Oil has become an industry leader in extended reach horizontal well drilling by developing superior skills in geosteering, well bore positioning and surveying, well completion and stimulation. Maersk Oil pioneered the application of horizontal drilling techniques in the North Sea and has become expert in the development of closely spaced long horizontal well line drive patterns. Its expertise and capabilities in this area has enabled Maersk Oil to unlock oil and gas from tight fields.

Horizontal wells were introduced in 1987 in the tight chalk of the Dan Field, offshore Denmark. Since then, horizontal drilling technology has been adopted by the industry as the preferred technology for developing tight reservoirs. The Halfdan field, offshore Denmark, and the Al Shaheen field, offshore Qatar, were both developed using horizontal wells which included several dual lateral wells. This enabled the wells to cover a larger amount of the reservoir and saves a number of slots on the platforms.
Maersk Oil has been an industry leader in geosteering through complex carbonate reservoirs for 25 years. It has developed a high level of in-house experience in geosteering using high-resolution bio-, litho- and sequence stratigraphy combined with fine-scale layering models. The workflows include rigorous integration of stratigraphic information, cuttings data and when available, logging while drilling (LWD) data.

The quality and value of information gathered along horizontal wells while drilling requires detailed preparation, discipline integration and experience since the data is crucial for optimising well steering and positioning.

To ensure the necessary flexibility and the ability to make rapid decisions, Maersk Oil makes sure that a high level of empowerment and decision making takes place on the rig during drilling. This allows the drilling and optimal positioning of very long horizontal wells and is an important prerequisite for an effective appraisal of flank areas or thin oil columns using horizontal wells.

For the record-breaking 12.3 kilometre well in the Al Shaheen field, geosteering was applied throughout the entire reservoir section with assistance from LWD data. A complete suite of formation evaluation information such as gamma ray, azimuthally-focused laterolog resistivity, bit resistivity, porosity and bulk density was utilised to make real time geosteering decisions.

In the Al Shaheen field, Maersk Oil succeeded in placing 95% of the ultra-long reservoir sections in targets less than 10 feet thick. Some wells we turned some 90 degrees while geosteering within the 3-6 feet thick target.
Multilateral wells

Multilateral well technology is nothing new to the oil industry but the level of complexity has increased, especially in the functionality of wells. Many operators will have good production rates without performing a stimulation of their reservoirs and therefore Multilateral wells can increase reservoir contact significantly. In Maersk Oil Qatar, several Multilateral wells were drilled where barefoot holes have been stimulated prior to running the actual completion. However, with the extended reach wells drilled here, the reservoir contact is somewhat maximised by different means.

Most Maersk Oil Multilateral wells in Denmark are dual-laterals. The main reason for this is to manage the risk versus reward as for each junction, the complexity increases. This is evaluated for each project or well independently. The increased cost and risk exposure are rewarded by the increased reservoir contact, which has been as much as twice the size of reservoir sections measuring around 13,000 feet.

Another reason for choosing a Multilateral design could be a limitation in surface footprint or, as for Maersk Oil, a limited number of slots from a certain location. It can also be a conscious economic decision when designing offshore facilities for a field development plan as was the case with Halfdan North East. This field is a thin chalk gas reservoir that was developed with a mixture of single and dual-laterals in a spiral pattern for optimal reservoir contact. Here, Multilateral technology, together with the CAJ stimulation technique was applied to target the entire reservoir from a single location. The Multilateral systems are RAM level 5 which ensures pressure integrity at the junction so each lateral can be stimulated individually.
Production technology

Drilling extended reach horizontal wells was not enough to unlock challenging fields such as those found in the Danish North Sea and offshore Qatar. The tight reservoirs required tailored completion and stimulation technologies. The extreme lengths of the wells, meanwhile, needed a new approach to well monitoring and intervention. This prompted Maersk Oil to create a suite of innovative tools, many patented, which have improved the reservoir contact and increased well productivity significantly.

Perforate, Stimulate, Isolate

In cooperation with a service company, Maersk Oil developed a well completion system and installation technique that perforates, stimulates and isolates a well zone in one single operation, thus saving time and money.

PSI comprises a cemented liner, multiple packers and sliding sleeves to divide the horizontal well into typically 10-20 zones. Each zone can be open and closed using coiled tubing or wireline tractors allowing for individual stimulation treatment, chemical conformance treatments or closing of water or gas producing intervals.

While the main purpose of this system was to enable multiple stimulation treatments along the horizontal well bore, it also proved beneficial in reservoir management because zones could be opened and closed for production or injection.

The system is today being combined with remotely operated sliding side doors, moving the control of the zone isolation system to the surface, saving money on production logging and interventions. The intelligent operation of the sleeves provides individual zone quality data which is used to optimise well performance.

Sand-propped hydraulic fractures

Maersk Oil began using sand-propped hydraulic fractures in horizontal wells in the late 1980s as an alternative to acid fracturing, which sometimes led to a collapse of acid fractures. The technique has allowed other low permeability reservoirs than carbonates to be developed.

The technique involves filling hydraulic fractures with sand to prohibit a collapse. The tail of the sand being pumped into the fracture contains resin to solidify the sand and to prevent it from being produced back. Alternatively, ceramic screens can be used. Up to two million pounds of sand is pumped into one fracture. A normal horizontal well may contain up to 20 propped fractures along the well bore. The open fractures are typically 400 feet in diameter and, combined, they create a large drainage area within the reservoir.
Controlled Acid Jet

Controlled Acid Jet (CAJ), a well completion system, has helped Maersk Oil access reserves that would have been otherwise uneconomic using conventional horizontal well technology. Examples include the Al Shaheen field, offshore Qatar, and flanks of the Dan, Halfdan and Tyra fields, offshore Denmark. CAJ has been developed and patented by Maersk Oil.

Long horizontal wells in thin tight carbonate reservoirs are efficiently stimulated by injecting acid into the formation, creating a few “wormholes” as the acid dissolves and thereby increasing the reservoir contact area. CAJ is implemented through a non-cemented liner, with a number of unevenly-spaced perforations that ensure efficient acid stimulation of the complete reservoir section.

The CAJ liner has in several ways set new standards for the completion and stimulation of long horizontal wells. The most significant is the remarkably effective acid coverage with efficient stimulation of reservoir sections up to 14,400 feet in a single operation. This is more than 20 times the interval length covered during matrix acid stimulation in a traditional cemented and perforated liner.

The CAJ liner completion and stimulation concept has proved efficient, simple to install and very cost effective. The production performance of the wells completed with the CAJ system is superior to the performance of wells completed with conventional systems.

Ceramic Screens™

Maersk Oil recently developed novel ceramic screens for horizontal well completions, eliminating the need for resin-coated proppants and so reducing the environmental impact of fracturing operations. The ceramic screens are resistant to erosion even when placed across a short perforation interval the fractures are created.

The PetroCeram™ screen, developed by Maersk Oil and a technical ceramic specialist company, offered a breakthrough in sand control technology, especially under demanding conditions where abrasion is a major challenge. The screen is effectively a stack of ceramic rings packed tightly enough to keep sand out but loosely enough to let oil through. The solution’s novelty comes from the choice of technical ceramic, rather than metals, whose unique properties make it so robust it is normally used in bulletproof armour.

PetroCeram™ screens help reduce the need for workovers and have already been responsible for the restart of one well that had been previously chronically affected by erosion and shut for years.
The Fracture Aligned Sweep Technology (FAST) concept, developed by Maersk Oil, optimises water injection in dense well patterns by raising its efficiency and reducing the risk of short circuiting between long and very closely spaced development wells. Maersk Oil has seen an increased oil recovery rate and decreasing gas-oil ratio at fields where FAST has been applied.

The FAST concept was first implemented on the Halfdan chalk field in the Danish North Sea with horizontal wells drilled 600 feet apart in a parallel pattern of alternating producers and water injectors within 10-15,000 feet long reservoir sections. Fracturing of the injector wells is key to the process of voidage replacement, due to the low mobility of water compared to oil and gas.

FAST uses the principle that fluid flow in low permeability rocks affects reservoir stresses. The horizontal section is preferentially drilled in the direction of the maximum horizontal stress. Before propagating a fracture, the prevailing pressure field is manipulated through a period of injection below fracture propagation pressure and simultaneous production from the neighbouring wells. At slow propagation rates, the pressure diffusion from the fracture itself increases the alignment of the fracture with the injection well; the technique works because the injection rates are actively controlled.

Confinement of injection fractures along horizontal injector wells is verified by production data from areas where FAST has been implemented. After several years of injection, water breakthrough to the neighbouring producers has not been observed.

**Fracture Aligned Sweep Technology**

FAST uses water injection to force oil in the reservoir towards a producing well.
Around 50 wells in Denmark and Qatar have been completed with smart well technology – remote-controlled valves that regulate the inflow of fluids from the reservoir to the well and soon, downhole sensors that monitor well and reservoir conditions. The main driver for choosing smart wells is the ability to open and shut zones which are producing too much water or gas without the need for well intervention. Another benefit of smart wells is the possibility of stimulating each zone individually without the requirement for bringing coiled tubing to the rig.

Maersk Oil will soon be using distributed temperature sensing and pressure and temperature gauges in individual zones to help its downhole stimulation and production monitoring. Various types of permanent chemical production tracers have been evaluated for use in the UK, Denmark and Qatar, and several trials are ongoing. Chemical production tracers are installed as part of the original completion and surface samples (oil and/or water) are taken during the initial production phase to verify that all parts of the well is contributing to the production. This limits the need for well interventions as it eliminates the need for running a production logging tool.

Tracers are also pumped into water injectors to look for shortcuts to other wells. A long well conformance team has been established to investigate solutions to water shortcuts, working across borders to create conformance treatment designs and establish best practices. These technologies are used as part of the holistic well and reservoir management strategy.
Improved and Enhanced Oil Recovery

The vast majority of Maersk Oil’s fields are geologically challenging, marked by characteristics such as low permeability chalk offshore Denmark or thin and extensively spread carbonates offshore Qatar. To improve the oil and gas recovery factor, Maersk Oil has long applied Improved Oil Recovery (IOR) techniques such as waterflood operations. It has also initiated Enhanced Oil Recovery (EOR)-focused research and development projects in its quest to keep producing from its assets as they mature.

Maersk Oil collaborates with premier academic institutions around the world including the University of Texas in Austin, Texas A&M University, the University of Houston, the University of Wyoming, the University of Calgary, the University of Stavanger, the Danish Technical University and the University of Copenhagen.

Maersk Oil’s EOR research includes the Nanochalk project, which looks at the way fluids and rock interact on a nanoscale; joint industry project BioRec, which aims to enhance the performance of Microbial EOR; Advanced Water research, which investigates various formation wettability conditions; and a joint industry project to develop an EOR Knowledge Base.

**Focus:** Large scale studies, pilots are ongoing.

**Monitor:** Techniques are being researched but to a level where large scale commitments have yet to be undertaken, or that good potential lies and requires further work is required.

**Investigate:** Techniques where potential could lie, but further screening work is needed prior to evaluation.
Maersk Oil’s IOR learning curve was first established within the marginal oil development of the Dan field, offshore Denmark, during the 1980s. This experience was then adapted in the 1990s to the adjoining Halfdan field and later to Al Shaheen, offshore Qatar.

Maximising the waterflooding sweep efficiency in low permeability, low porosity and heterogeneous types of reservoir has been key with a focus kept on injectivity and well conformance issues. However, the typically closely spaced extended reach wells drilled in a line drive pattern facilitate waterflooding sweep efficiency.

Maersk Oil conducts large scale waterflooding operations offshore Denmark, Qatar and the UK, and has developed a unique experience in this area

<table>
<thead>
<tr>
<th>Operated assets</th>
<th>First oil</th>
<th>IOR technology</th>
<th>Injector wells</th>
<th>Oil production</th>
<th>Water injection capacity</th>
<th>Volume of oil recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td>1994</td>
<td>Waterflooding since 1996</td>
<td>111</td>
<td>300,000 bpd</td>
<td>1,350,000 bpd</td>
<td>1,061 million barrels</td>
</tr>
<tr>
<td>Denmark</td>
<td>1972</td>
<td>Waterflooding since 1986 and gas injection</td>
<td>135</td>
<td>212,000 bpd</td>
<td>1,070,000 bpd</td>
<td>2,029 million barrels</td>
</tr>
<tr>
<td>UK</td>
<td>1993</td>
<td>Waterflooding since 1994 and gas injection</td>
<td>9</td>
<td>50,000 bpd</td>
<td>N/A</td>
<td>235 million barrels</td>
</tr>
</tbody>
</table>

Production and water injection profile of Maersk Oil’s Danish fields
Gas injection

In addition to increasing oil production through the waterflooding of a reservoir, Maersk Oil is involved in gas injection projects across the world. In the Al Shaheen field in Qatar, there has been an active hydrocarbon gas injection programme since 2008 and to date over 57 billion standard cubic feet of associated gas have been injected. Significant expansion is due to start up later this year with the commissioning of a new 100 million standard cubic feet a day compressor. Under current development scenarios, Al Shaheen has the potential to become one of the largest offshore gas injection projects in the world.

At Maersk Oil’s Kazakhstan asset, injection of liquefied petroleum gas (LPG) is currently taking place in order to enhance oil recovery beyond that achievable by waterflood alone. Maersk Oil is also a non-operating partner of an active hydrocarbon gas EOR programme in Algeria.

In the Gryphon field in the UK North Sea, associated gas injection has been ongoing for many years as part of the reservoir management strategy. Here, injection into the gas cap is performed to control the oil column at the producing wells and limit water production from the strong underlying aquifer.

Looking to the future, a number of new field developments show major potential for enhanced oil recovery with gas injection. Maersk Oil will be looking to leverage its existing experience in this area to create world-class field developments and realise maximum value from the projects.

Enhanced Oil Recovery

Leveraging its experience in IOR, Maersk Oil is seeking to position itself as the leader in EOR on a large scale offshore. Its early adoption of IOR techniques to the Halfdan and Al Shaheen fields have enabled economic development, higher recovery, and faster time to reach peak oil than would have been achieved using more conventional development approaches.

Maersk Oil is seeking to build capability within Gas/WAG-based EOR, in particular, CO₂-based EOR.

Maersk Oil is also researching EOR methods that use substances such as microbes, steam, polymers, surfactants, water, or energy, such as magnetic, electric, heat. These can be produced commercially on a large industrial scale with little regional limitation.

Two emerging EOR methods that Maersk Oil is currently trying to mature are Smart Water and Microbial EOR.

SMART WATER

Advanced Waterflooding that uses ‘smart water’ includes all techniques that modify water chemistry to achieve surface chemistry reactions between fluid phases and/or formation, changes to advective flow properties and reduction of residual oil saturations.

MICROBIAL EOR

This process involves the use of reservoir microorganisms or specially selected bacteria to produce specific metabolic events that lead to EOR. There are many advantages in the use of this technology such as the low energy input requirement for microbes to induce EOR and its efficiency when applied to carbonates.
Maersk Oil has built up its experience in Water Alternating Gas (WAG) at Al Shaheen over the past few years and is ahead of competitors operating in similar offshore environments. For WAG to be successful, the ability to predict incremental recoveries relies heavily on robust fluid models and, in particular, a good ‘equation of state’ (EoS) model with an ability to describe the full range of oil properties in combination with a range of injection gases. Maersk Oil has demonstrated superior capability in EoS modelling, supported by a state of the art laboratory study focusing on gas injection in the Al Shaheen field.
Research and innovation
Maersk Oil works with more than 15 universities and technology institutes, dozens of service and peer companies, resulting in about 50 current research projects, which help the company access and develop the technology it requires. Subjects cover the whole range of upstream technologies and capabilities, ranging from basic fundamental research to applied technology.
Maersk Oil is collaborating with U.S.-based Clean Energy Systems (CES) and Siemens on a unique combustion technology that could unlock stranded gas fields or provide CO₂ for Enhanced Oil and Gas Recovery (EOR/EGR), while producing clean energy.

The technology, TriGen™, is derived from the space industry and involves burning gas together with pure oxygen to produce power, water and carbon dioxide. The resulting high purity CO₂ is captured – making the power generation emission-free – and can be transported to fields for EOR/EGR.

Maersk Oil is currently exploring opportunities in the Middle East and South East Asia that have different value chains and benefits, yet can be made commercial through the implementation of the TriGen™ technology. TriGen™ technology complements Maersk Oil’s current work and studies on CO₂-based EOR in Denmark and Qatar, enabling the company to offer integrated field development solutions in this area.

In the Middle East, TriGen™’s low-cost CO₂ can enable EOR projects especially in Gulf countries where many oil and gas reservoirs are well-suited to CO₂-based EOR and nitrogen or CO₂-based EGR. Here, gas would be burned to produce clean power and water for households. Nitrogen, a by-product from the production of pure oxygen, and CO₂ would be supplied to oil fields.

In South East Asia, the value chain starts at a different point – at large but CO₂-contaminated gas fields. Such stranded gas fields could now potentially be produced economically because the TriGen™ technology can burn gas contaminated with up to 90 per cent of CO₂ without requiring any costly pre-treatment for CO₂ removal.

Maersk Oil is engaged with several operators to study how the TriGen™ concept can be used to create value in their portfolio of oil and gas fields.

Maersk Oil acquired the rights to CES’s combustor in January 2011. CES, Maersk Oil and Siemens, with the help of U.S. Department of Energy funding, are maturing the technology after CES proved it on a smaller scale over the last 15 years. CES and Siemens are working on the conversion of a conventional gas/air turbine to an oxy-fuel gas turbine for commercial application in a range of projects.
Maersk Oil entered a collaborative four-year research project in 2011 that aims to increase oil recovery and prolong operations in the Danish North Sea by using biotechnology to create efficient, viable and environmentally safe solutions to the challenges of maturing oil and gas fields.

BioRec is a joint industry project with Maersk Oil, the Danish Advanced Technology Foundation, global biotech company Novozymes, oil company DONG E&P and three institutions – the Technical University of Denmark, the Danish Technological Institute and Roskilde University.

Maersk Oil, Novozymes, DONG E&P and the Danish Advanced Technology Foundation will contribute funds, expertise and materials to the academic institutions, which, in turn, will carry out research on several predefined issues and find commercially viable solutions. BioRec’s ultimate aim is to be technically able to implement pilot tests at relevant reservoirs in the Danish North Sea at the end of the four-year period based on the results of its research.
Can microbiologically induced corrosion of pipelines be stopped by fighting bacteria that causes the damage with other bacteria or enzymes?

Can enzymes and bacteria be used for Enhanced Oil Recovery (EDR) by feeding and growing in the reservoir to change the oil’s ability to flow?

Can proteins produced by coldwater fish or Scandinavian beetles to stop the creatures from freezing be replicated and used as a hydrate inhibition tool to stop ice from forming inside pipelines and wells?

Three topics will be initially researched by the BioRec project:
Maersk Oil opened its USD 100 million Research and Technology Centre (MO-RTC) at the Qatar Science & Technology Park, pictured below, in 2011. The MO-RTC focuses on research that creates practical and applicable solutions to clearly-defined problems in oil and gas production.

The MO-RTC looks into three broad research and technology development themes. The first will further develop horizontal well applications to improve oil recovery. The second theme investigates Enhanced Oil Recovery methods with main focus on gas injection and chemical flooding. The last will research Qatar’s marine ecosystem to help reduce Maersk Oil’s environmental footprint and contribute to the environmental pillar of the Qatar National Vision 2030.

The MO-RTC has already begun work, initiating field trials of acoustic sensing in wells with fibre optical cables, electron microscopy on cuttings while drilling and of a patented technology for measuring water injection profiles in horizontal wells. To date, the team has already notched up four patents with some 20 inventions in the pipeline.

In addition to in-house technology developments, the centre has established research collaboration agreements with a significant number of top-tier research institutions around the globe. Furthermore, the centre has reached out to the local research community in Qatar, particularly at Texas A&M University Qatar on EOR-related topics. Maersk Oil has established a ‘Maersk Oil Chair in Environmental Engineering’ at Qatar University, a faculty position that supports offshore environmental studies.

The MO-RTC is an open work space with ‘study cells’, seminar rooms and an M-PACT style room. The centre also houses a laboratory containing a core display area and a room with advanced core scanning equipment that forms the Digital Core Laboratory.
**Nanochalk**

Maersk Oil, Copenhagen University and the Danish Advanced Technology Foundation are close to finishing a five-year USD 10 million research venture, called Nanochalk, which aims to investigate what stops the growth of organically-formed calcite particles in chalk when normally, inorganic calcite particles grow continuously over time, sometimes as wide as a metre across.

In particular, the team has been investigating whether there is a way of ‘tricking’ the organic calcite particles to grow, after managing to engineer inorganic calcite of the same tiny dimensions as those in the North Sea and seeing them grow when exposed under North Sea geological conditions.

The team hopes that between finding out how the engineered inorganic calcite particles grew under such conditions and what restrictions on growth there are on organic calcite particles in the same condition, a solution can be applied to organic calcite particles that would force them to grow. Their growth would increase the permeability in chalk and, as a consequence, oil recovery.

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**COMPAS**

Maersk Oil continues to support IFP Energies Nouvelles’ COMPAS study, which has now attracted support from 11 companies. This study focuses on the Yacoraite Formation of NW Argentina. This formation represents the final stage of filling of a rift that initially formed in the Early Cretaceous and consists of outstanding outcrops of microbial limestones that are a possible analogue for the prolific presalt reservoirs offshore Brazil.

The aim of the study is to develop a three-dimensional model for the distribution of the various rock types present, ranging from a basin to field scale, to define the controls on deposition and stratigraphic architecture and to characterise the changes undergone by the various rock types subsequent to their deposition, a processes called diagenesis. The results from year 1, which concentrated on regional relationships, were presented at a field seminar held in October 2012. The consortium has decided to refocus the study and continue regional work during year 2 and incorporate sub-surface data from the Lomas de Olmedo Basin, adjacent to the main study area, where there is oil production from the Yacoraite Formation. It is hoped that this will improve understanding of controls on the distribution of quality reservoir facies.
Appendix to country overviews

- Production: Production of 2012
- Fields: Producing fields in April, 2013
- Development projects in April, 2013
  - Sanctioned development projects
  - Development projects in select/define stage
- Exploration and appraisal wells: Exploration and appraisal wells to define commercial discoveries, completed in 2012