

World Petroleum Council Guide

Careers in Oil and Gas



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Proceedings of the 21st World Petroleum Congress

15 - 19 June 2014, Moscow, Russia



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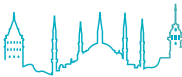
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Message from the Director General

Graduates and young professionals need to stand out in today's highly competitive oil and gas job market.



Dr Pierce Riemer, Director General, World Petroleum Council.

Our Education Series has proved very popular with students, graduates and young professionals, who represent the future of the oil and gas industry. They need to be equipped with all the tools required to succeed in a global economy. As such, we are delighted to present our inaugural guidebook, *Careers in Oil and Gas*.

In recent decades, the oil and gas industry has undergone sweeping changes. Technology has improved, making exploration, extraction and production more efficient. Safe working practices and environmental and social responsibility have become priorities for operators, and the oil and gas industry has become a leader in working towards a future with access to sustainable energy for all as the main driver for innovation. All these changes have happened against a backdrop of economic uncertainty – and of impressive resilience for many operators.

Understandably, it can be daunting for young people starting their careers in the oil and gas industry. The job market is competitive and job security can be uncertain – but there are also a lot of positives. New jobs have been created, largely thanks to the drive towards environmentally

sustainable operations, the development of renewable fuels and advances in technologies.

With the right guidance and access to clear information, young people can start their careers with the knowledge to stay ahead in the job market. That is where this guidebook comes in.

This latest WPC guidebook offers practical advice for those who represent the future of the industry and we hope it provides a beneficial tool to those embarking on a new career in oil and gas, as well as those considering a move.

We would like to thank our advisory panel for its support, comprising: Jim Andrews, Director of Talent & Leadership Development, Schlumberger; Brandon Bayles, Senior Director, Human Resources, Halliburton; Tommy Bumstead, Organizational Performance Specialist, Team Leader for Strategic Planning & Special Projects, Upstream Professional Development Center, Saudi Aramco; Julia Harvie-Liddel, Group Head of Resourcing, BP plc; Keith Kilgore, Careers Adviser, School of Engineering and Physical Sciences and the Institute of Petroleum Engineering, Heriot-Watt University; and Monique Simon, Head of University Relations, Total.



WPC vision, mission and values

The World Petroleum Council (WPC) is a non-advocacy, non-political organisation with charitable status in the UK and has accreditation as a non-governmental organisation (NGO) from the United Nations (UN). WPC is dedicated to the promotion of sustainable management and use of the world's petroleum resources for the benefit of all.

WPC conducts the triennial World Petroleum Congress, covering all aspects of the industry and its social, economic and environmental impact.

Vision

An enhanced understanding and image of the oil and gas sector's contribution to sustainable development.

Mission

WPC is the only organisation representing the global oil and gas community. WPC's

core value and purpose centres on sustaining and improving the lives of people around the world through:

- Enhanced understanding of issues and challenges.
- Networking opportunities in a global forum.
- Co-operation (partnerships) with other organisations.
- An opportunity to showcase the industry and demonstrate best practice.
- A forum for developing business opportunities.
- Information dissemination via congresses, reports, regional meetings and workshops.
- Initiatives for recruiting and retaining expertise and skills to the industry.
- Awareness of environmental issues, conservation of energy and sustainable solutions.

Values

WPC values strongly:

- Respect for individuals and cultures worldwide.
- Unbiased and objective views.
- Integrity.
- Transparency.
- Good governance.
- A positive perception of energy from petroleum.
- Science and technology.
- The views of all stakeholders.





- The management of the world's petroleum resources for the benefit of all.

Key strategic areas

- **World-class Congress** to deliver a quality, premier oil and gas congress.
- **Inter-congress activities** to organise forums for co-operation and other activities on specific topics; and to organise regional events of relevance to WPC members and all stakeholders.
- **Co-operation with other stakeholders** to add value by co-operating with other organisations to seek synergies and promote best practice.
- **Communication** to increase awareness of WPC's activities through enhanced communication, both internally and externally.
- **Global representation** to attract and retain worldwide involvement in WPC.
- **Youth and gender** engagement to increase the participation of young people and women in oil and gas issues, including the establishment of a dedicated Youth Committee for the development of active networking opportunities with young people.
- **Legacy** to manage a central WPC legacy fund to benefit communities and individuals around the world based on WPC's mission.

World Petroleum Congresses

2017 22nd WPC Istanbul

2014	21st WPC	Moscow	1979	10th WPC	Bucharest
2011	20th WPC	Doha	1975	9th WPC	Tokyo
2008	19th WPC	Madrid	1971	8th WPC	Moscow
2005	18th WPC	Johannesburg	1967	7th WPC	Mexico City
2002	17th WPC	Rio	1963	6th WPC	Frankfurt
2000	16th WPC	Calgary	1959	5th WPC	New York
1997	15th WPC	Beijing	1955	4th WPC	Rome
1994	14th WPC	Stavanger	1951	3rd WPC	The Hague
1991	13th WPC	Buenos Aires	1937	2nd WPC	Paris
1987	12th WPC	Houston	1933	1st WPC	London
1983	11th WPC	London			



WPC overview

Since 1933, the World Petroleum Council has been the world's premier oil and gas forum and is the only international organisation representing all aspects of the petroleum sector.

World Petroleum Council (WPC) was established in 1933 to promote the management of the world's petroleum resources for the benefit of all. It is a non-advocacy, non-political organisation and has received accreditation as a non-governmental organisation (NGO) from the UN. WPC's prime function is to catalyse and facilitate dialogue among stakeholders, both internal and external to the petroleum industry, on key technical, social, environmental and management issues in order to contribute towards finding solutions to those issues.

Based in London, WPC includes 65 member countries from around the world representing more than 95% of global oil and gas production and consumption. WPC membership is unique, as it includes both OPEC and non-OPEC countries with high-level representation from national oil companies (NOCs) as well as international oil companies (IOCs). Each country has a national committee made up of representatives of the oil and gas industry, the service sector, academia, research institutions and government departments. The governing body of WPC is the Council consisting of representation from each of the national committees. Its global membership

elects the President and an Executive Committee every three years to develop and execute its strategy. The Council also selects the host country for the next World Petroleum Congress from the candidate countries.

Every three years, the Council organises the World Petroleum Congress hosted by one of its member countries. The triennial Congress is also known as the 'Olympics of the petroleum industry'. It covers all aspects of oil and gas from technological advances in conventional and unconventional upstream and downstream operations to the role of natural gas and renewables, management of the industry and its social, economic and environmental impact. In addition to industry leaders and experts, outside stakeholders such as governments, other industry sectors, NGOs and international institutions also join the dialogue. To ensure the scientific and topical quality of the event, the WPC Council elects a Congress Programme Committee whose members are responsible for delivering the high-level content for these events.

Istanbul will be the host of the 22nd World Petroleum Congress in 2017 (www.22wpc.com).

Beyond the triennial Congress, WPC is regularly involved with a number of other meetings such as the WPC Youth Forum – the fifth edition of the Future Leaders Forum was held in Rio in 2016, the WPC-UN Global Compact Best Practice Forum, joint WPC/OPEC workshops and other regional and topical events on important industry issues. Since 2015, a new event was added to the WPC programme when the Norwegian National Committee hosted the first WPC Leadership Conference on 'Responsibility, Co-operation & Sustainability' in Tromsø, Norway.

Legacy

As a not-for-profit organisation, WPC ensures that any surplus from the triennial Congresses and other meetings are directed into educational or charitable activities, thereby leaving a legacy.

WPC has set up a dedicated WPC Legacy Fund to spread the benefits beyond the host countries and its members and alleviate energy poverty through carefully selected projects.

The concept of leaving a legacy in the host country started in 1994 with the 14th World Petroleum Congress in Stavanger, Norway. After this Congress, the surplus funds were put towards the creation and building of the state-of-the-art Norwegian Petroleum Museum in Stavanger.

The 15th World Petroleum Congress in Beijing adopted the issue of young people as a key aspect of its theme: 'Technology and Globalisation – Leading the Petroleum Industry into the 21st Century'. To support the education and future involvement of young people in the petroleum industry, the Chinese National Committee donated all computer and video equipment used for the Congress to its Petroleum University.

Profits from the 16th Congress in Calgary were used to endow a fund that gives scholarships to

post-secondary students in several petroleum-related fields. The Canadian Government Millennium Scholarship Foundation matched the amount dollar-for-dollar, creating an endowment which supported more than 2,000 students until its conclusion in 2010.

The 17th World Petroleum Congress was the first to integrate the concept of sustainability throughout its event, taking responsibility for all the waste it generated. The Congress and the Rio Oil & Gas Expo 2002 generated 16 tonnes of recyclable waste – plastic, aluminium, paper and glass. All proceeds of the recycling activities were passed on to a residents' co-operative with 6,000 inhabitants located in the port area of Rio de Janeiro.

But the sustainability efforts did not stop there – an army of 250 volunteers collected 36 tonnes of rubbish in 10 days in a special community effort to clean up the Corcovado area before the Congress, donating all proceeds to the rubbish collectors, some of the poorest inhabitants of Rio.



Social Responsibility Global Village at the 2014 World Petroleum Congress in Moscow and its interactive World CSR Map.



The WPC legacy initiative started in 1994 when surplus funds from the 14th World Petroleum Congress were put towards the building of Stavanger's Norwegian Petroleum Museum.

The Finlândia Public School also received a new lick of paint from our volunteers. The surplus funds for the Congress were used to set up the WPC Educational Fund in Brazil, which was further increased in 2005 with tax initiatives added by the Brazilian government.

The 18th World Petroleum Congress also chose a sustainability focus for the first-ever WPC to be held in Africa – ‘Shaping the Energy Future: Partners in Sustainable Solutions’. Education was the focus of the 18th World Petroleum Congress Legacy Trust, set up by the South African National Committee to provide financial assistance to needy young South Africans who wish to pursue a qualification in petroleum studies.

In 2008, with the 19th Congress in Madrid, the trend continued and the organisers selected a number of projects and foundations to receive

the surplus from the event for charitable and educational programmes in Spain and around the globe. The 19th Congress was the first one to offset all its carbon emissions and receive a certification as a sustainable event.

Qatar's 20th Congress also offset all of its carbon emissions and is establishing a gallery devoted exclusively to the country's oil and gas industry as an integral part of the future National Museum of Qatar (NMoQ). This gallery, dedicated to the story of oil and gas in Qatar, will educate Qataris and residents about the history of Qatar and the way the oil discovery shaped the nation since 1940, and in accordance with the legacy policy of the Congress will provide a project that serves the community.

Additionally, the most recently held 21st Congress in Moscow focused on the importance



WPC's first Youth Forum was held in Beijing in 2004.

of involving young people in the industry and managing the increasing talent gap. The WPC's Russian National established the Golden Legacy of WPC Scholarship, which is aimed at identifying the most talented and successful students and young professionals from Russia with a special interest in the petroleum sector and assisting them with educational opportunities.

Youth outreach

Youth is a critical factor in the sustainability of the oil and gas industry. Addressing and involving young people in the design of future energy solutions is therefore one of the major issues for WPC's 70 member countries. WPC recognises their significance to the future of the petroleum industry and the importance of giving the young generation scope to develop their own ideas,

talents and competencies to create viable solutions for the future of our world.

As part of its outreach to recruit and retain the next generation, WPC created its Youth Committee in 2006 to provide a channel through which young people have a direct involvement and say in the strategy and activities of the organisation. It aims to create and nurture a collaborative, global forum for young people to be heard, to champion new ideas within the petroleum industry, to promote a realistic image of the petroleum industry, its challenges and opportunities and to bridge the generation gap through mentorship networks.

In 2011, WPC launched a pilot Mentorship Programme to provide a bridge between international experts and the next generation of our industry. This programme is now in its third successful cycle and has already created 150 matches.







SECTION ONE

INTRODUCTION – INDUSTRY OVERVIEW



Oil and gas: their role in society

*By Nathan Meehan, President,
Society of Petroleum Engineers*

Without these vital resources,
the world would be a poorer place.
It is an industry to be proud of.

Improving people's lives is what we do as petroleum engineers, so our role in society is an important theme. The crucial point is: oil and natural-gas production raises the standard of living of people throughout the world.

But why choose to become a petroleum engineer? For decades, I have posed this question to students and young professionals and have received many interesting responses. All too often, the responses include, "I read that petroleum engineers have high starting salaries." There is nothing wrong with making money; highly skilled professionals who have invested time and effort in their education and work hard should be well paid. That being said, choosing petroleum engineering or going to work in the upstream oil and gas industry with an engineering, Earth science or technical degree should not be based solely on how much money one can make.

Imagine that a high-school student who respects and trusts you comes to you seeking advice – and we'll assume the person is female in this instance. Her first question is, "What are the most important things I should look for in deciding on a career?" Possible answers include enjoyable work,

career/life balance, stress and hours required on the job, financial security, the opportunity to make a lot of money, location, opportunities for travel, advancement or continuing education, types of personal interactions, reputation of the company/industry you work for or satisfaction that you are doing something important.

As our prospective college student learns these things, she will have a better idea about satisfying career choices. A friend of mine chose a high-stress Wall Street job that afforded him almost no personal life but a chance to make more money than most of his peers. His college roommate took a 40-hour-a-week job in his hometown and has no expectations of getting rich.

The oil and gas industry is a great place to work for technical professionals. It is challenging and rewarding. While a few achieve great wealth, hardworking engineers and Earth scientists do not have to 'strike oil' to do well in their careers.



The oil and gas industry is a positive force, improving the quality of people's lives and providing abundant and affordable energy.





American multinational Exxon Mobil Corporation, which owns the Esso brand, is featured in the Fortune list of most-admired companies.

There are many types of jobs in our industry, upstream, midstream and downstream, with varying levels of opportunities and risks. But what about the reputation of our industry? Are we doing something important?

The reputation of the oil and gas extractive industry is undeservedly low, typically among the lowest in any survey. Only Exxon Mobil Corporation appears on the Fortune list of the top-50 most-admired companies. Our industry's reputation is unfairly tarnished in part by rare, high-visibility oil spills and by a lack of understanding of the importance of energy. We really do something very important for the world. Our role in the world is often unappreciated.

Company mission and vision statements often include admirable phrases such as “delivering a sustainable rate of return”, “becoming the premier operating company”, “being most admired” or “achieving superior operating and financial results”. Instead of a mission statement, my

employer states a purpose: enabling safe, affordable energy. Improving people's lives.

This purpose rings true for me. I am not embarrassed to say that I work in the industry. I am not ashamed to help produce oil and gas that powers the world. Without oil and gas we could not feed half of the world's population. Every measure of quality of life such as gross domestic product per capita, infant mortality, education levels or access to clean water is correlated to modern fuels. An example of such an improvement is the lowering of death rate due to air pollution.

The World Health Organization identified air pollution as the No.1 source of avoidable deaths with household air pollution (HAP) the primary culprit. More than two people in five of the world's population rely on solid fuels (wood, coal, dung, crop waste and charcoal) for cooking and home heating. HAP was responsible for nearly 8% of all human deaths worldwide in 2012. More than 50% of all deaths of children under the age of five are





This North Sea FPSO vessel has a storage capacity of 380,000 barrels; oil and gas is a far cleaner energy alternative to solid fuels.

due to pneumonia from HAP. A majority of outdoor air pollution is caused by the use of coal and biomass energy sources, waste incineration and charcoal production. All told, air pollution causes 7 million deaths a year. These mostly arise from fuels that are less clean than oil and gas.

Safe and much cleaner energy from oil and gas is a more attractive option for power and energy. North American greenhouse-gas (GHG) emissions have been reduced as a result of increased use of natural gas. Most of that incremental gas production comes from wells requiring hydraulic fracturing. Anyone who believes that we need to reduce GHGs in the near term should be insisting on more hydraulic fracturing, not less.

Globally, electricity allows refrigeration for vaccines and other medicines as well as powering lights and hospitals. Modern fertilisers, transportation, irrigation and other relatively energy-intensive means of farming are responsible for an enormous part of the world's food supplies. Even with aggressive moves toward renewables, oil and gas will remain an important part of the world's energy sources for decades to come.

The historical evolution of energy has been to move to more concentrated forms. From wood to coal, from coal to oil. While nuclear might be seen as the next step in historical progression, realities

suggest that radical increases in nuclear power for electricity generation will not happen soon.

Biomass, wind and solar alternative fuel sources will increase in importance but are not an advance in concentration. While wind and solar are renewable, low-emission sources of electricity, they are intermittent and not inherently reliable. Their widespread use will require breakthroughs in energy storage, costs and efficiency.

We have chosen to work in this important field. Without energy from oil and gas, there would be millions of additional deaths annually. The world's quality of life is radically better due to energy from oil and gas. This quality of life continues to improve because of oil and gas. I choose to be a petroleum engineer because of the positive impact my job makes on the world. What you do is important. What we do improves people's lives.

This article is from the *Journal of Petroleum Technology*, 2016. JPT is an official publication of the Society of Petroleum Engineers.

Nathan Meehan is the President of the Society of Petroleum Engineers. SPE is the largest individual-member organisation serving managers, engineers, scientists and other professionals worldwide in the upstream segment of the oil and gas industry.





Medium-term outlook for oil

By the International Energy Agency

Why we must learn to live with the first fully free oil market.

Attempting to understand how the oil market will look during the next five years is a task of enormous complexity. Some certainties that have guided our past outlooks are now not so certain at all: that oil prices falling to 12-year lows will lead to a strong demand growth spurt; that oil prices falling to 12-year lows will lead to a mass shut-in of so-called high-cost oil production; and not least that oil prices falling to 12-year lows will



Oil demand will rise but technical innovation and the amount of oil still in the ground means that our future needs can be met.

force the largest group of producing countries to cut output to stabilise oil prices.

For some time now, analysts have tried to understand when the oil market will return to balance. It was widely believed that this would happen by the end of 2015 but that view has proved to be very wide of the mark. In 2014 and again in 2015 supply exceeded demand by massive margins, 0.9 Mbpd (million barrels per day) and 2 Mbpd respectively, and for 2016 we expect a further build of 1.1 Mbpd. Only in 2017 will we finally see oil supply and demand aligned but the enormous stocks being accumulated will act as a dampener on the pace of recovery in oil prices when the market, having balanced, then starts to draw down those stocks.

Unless we see an even larger than expected fall in non-OPEC oil production and/or a major demand growth spurt, it is hard to see oil prices recovering significantly in the short term from the low levels prevailing at the time of publication of this report.

Technical innovation

It is very tempting, but also very dangerous, to declare that we are in a new era of lower oil prices.

But at the risk of tempting fate, we must say that today's oil market conditions do not suggest that prices can recover sharply in the immediate future – unless, of course, there is a major geopolitical event. Further, it is becoming even more obvious that the prevailing wisdom of just a few years ago, that peak oil supply would cause oil prices to rise relentlessly as output struggled to keep pace with ever-rising demand, was wrong. Today we are seeing not just an abundance of resources in the ground but also tremendous technical innovation that enables companies to bring oil to the market.

Added to this is a remorseless downward pressure on costs and, although we are currently seeing major cutbacks in oil investments, there is



It's unlikely this is a new era of cheap oil. Companies are having to restructure but oil and gas will play a major part of the fuel mix for decades.



no doubt that many projects currently on hold will be re-evaluated and will see the light of day at lower costs than were thought possible just a few years ago.

The world of peak oil supply has been turned on its head due to structural changes in the economies of key developing countries and major efforts to improve energy efficiency everywhere.

In the meantime, our forecast for oil demand to 2021 is for annual average growth of 1.2 Mbpd (1.2%), which represents a solid outlook in historical terms. Oil demand breaks through the 100 Mbpd barrier at some point in 2019 or 2020.

In 2015, world oil demand increased by 1.6 Mbpd (1.7%), one of the biggest increases in recent years stimulated to a large extent by the rapid fall in oil prices that began in the second half of 2014 and gained momentum in 2015. However, any expectations that the most recent fall in oil prices to \$30 a barrel will provide further stimulus to oil demand in the early years of our forecast and annual rates of growth above 1.2 Mbpd are likely to be dashed. In 2016, we have seen major turmoil in financial markets and clear signs that

almost any economy you care to look at could see its GDP growth prospects downgraded.

Since 2014, the non-OECD countries have used more oil than OECD countries and the gap will widen in years to come. However, the rate of demand growth in the non-OECD countries is vulnerable to being pared back as the cost of energy subsidies becomes a major burden and governments take action. This will probably not have an immediate impact on demand in the early part of this forecast but later on we might see that the reduction in expensive fuel subsidies in many countries, including the fast-growing Middle East, does have a significant effect on growth. Also, rising energy use has brought with it terrible environmental degradation, particularly in the fast-growing Asian economies, and oil's part in this is recognised by measures to limit vehicle registration and use.

Although reducing subsidies and tackling pollution will affect the rate of demand growth, non-OECD Asia will still remain the major source of oil demand growth with volumes increasing from 23.7 Mbpd in 2015 to 28.9 Mbpd in 2021.





OPEC's HQ, Vienna. OPEC states reached a record output of 33 Mbpd in 2016 but a cap may follow to mitigate market volatility.

Asia's key role in the future demand picture is reflected in the rise in the region's share of global oil trade. By 2021, non-OECD Asia will be importing 16.8 Mbpd of crude oil and products, a rise of 2.8 Mbpd compared to 2015. China remains central to this growth, partly because of the underlying rise of oil demand but also due to its build-up of strategic reserves which will reach at least 500 million barrels by 2020. A trade issue that has recently appeared on the agenda is the possibility of US crude oil exports. The US is already a major exporter of oil products (2.8 Mbpd in 2015) and the lifting of the crude export ban potentially opens up another trade opportunity.

Spare refining capacity

The continued rise in the global trade of oil will reach a peak at 37 Mbpd in 2017 with the long-term eastwards drift continuing. Crude oil will be processed through refineries in ever-rising volumes, although one of the most noticeable trends in the refining sector in the forecast period will be overcapacity.

Our report points out that it is in Asia where most of the 5.3 Mbpd of global spare refining

capacity will be found. Although products demand will continue to grow, it will not keep pace with the expected increase in investment in new plant. The Middle East will consolidate its place as a major refining centre and products exports will grow at a rate exceeded only by the US which will process rising volumes of domestic crude over the period of the forecast as a whole.

However interesting and important oil demand trends are, the major focus in the next few months will be on the supply side of the balance. Since 2015, the supply side has provided surprises. By far the most significant has been the resilience of high-cost oil production and in particular that of light, tight oil (LTO) output in the US.

As oil prices cascaded down from more than \$100 a barrel, it was widely predicted at various milestones that the extraordinary growth in total US crude oil production from 5 Mbpd in 2008 to 9.4 Mbpd in 2015 would grind to a halt and move rapidly into reverse.

Growth certainly ceased in mid-2015 but the intervening period has seen a relatively modest pullback and total US crude oil production in early 2016 was still close to 9 Mbpd, aided by expanding production in the Gulf of Mexico.

In our base case outlook, there is an element of the straw breaking the camel's back and we expect US LTO production to soon fall back by 600-800 Kbpd before a gradual recovery in oil prices, working in step with further improvements in operational efficiencies and cost cutting allows a gradual recovery. Anybody who believes that we have seen the last of rising LTO production in the US should think again; by the end of our forecast in 2021, total US liquids production will have increased by a net 1.3 Mbpd compared to 2015. Such has been the element of surprise provided by the resilience of US oil production, and the wide divergence of views as to the future, that we have added a high and low case to our non-OPEC production analysis and plotted the

impact on the global oil market balance of US LTO production falling by more than in our base case or, conversely, less. The eventual outturn is one of the most important factors – if not the most important – in assessing when the oil market will re-balance.

Elsewhere, the determination of members of the OPEC to maintain and expand their market share has clearly been shown by the fact that at two ministerial meetings following the historic 2014 decision not to cut production to support oil prices, ministers have resisted any temptation to change course. More recently, some OPEC members and Russia agreed to freeze production and they indicated that further policy initiatives may follow.

Rising oil production in 2015, notably from Iraq and Saudi Arabia, will now be joined by Iran, freed from nuclear sanctions.

Within the timeframe of this forecast, we do not expect a major increase in the production capacity of Iran or Iraq due to political uncertainties but this outlook could, towards the end of the period, be revised. In other OPEC countries we are seeing one of the downsides of low oil prices: massive economic retrenchment in countries such as

Algeria, Nigeria and Venezuela will reduce their ability to invest in the oil sector. It is not our role to analyse political issues but it is worth flagging up the potential implications for supply stability in countries that have seen their income collapse dramatically. For OPEC as a whole, oil export revenues slumped from a peak of \$1.2tr in 2012 to \$500bn in 2015 and, if oil prices remain at current levels, this will soon fall to approximately \$320bn.

Another downside to low oil prices is the impact on investment. The IEA has regularly warned of the potential consequences of the 24% fall in investment seen in 2015 and the expected 17% fall in 2016.

Potential destabilising factors

In today's oil market there is hardly any spare production capacity other than in Saudi Arabia and Iran and significant investment is required just to maintain existing production before we move on to provide the new capacity needed to meet rising oil demand. The risk of a sharp oil price rise towards the later part of our forecast arising from insufficient investment is as potentially destabilising as the sharp oil price fall has proved to be.

We are living in perhaps the first truly free oil market we have seen since the pioneering days of the industry. In today's oil world, anybody who can produce oil sells as much as possible for whatever price can be achieved. Just a few years ago such a free-for-all would have been unimaginable but today it is the reality and we must get used to it, unless the producers build on the recent announcement and change their output maximisation strategy. The long-term consequences of this new era are still not fully understood but this report aids the debate in shedding light on the outlook for the next five years.

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A gradual rise in oil prices is expected soon. Greater operational efficiency and lower production costs will also assist recovery.



Long-term outlook for oil and gas

*By The Global Agenda Council
on the Future of Oil & Gas,
World Economic Forum*

Meeting the energy expectations
and challenges beyond 2020.

Since the Industrial Revolution, oil and natural gas have played an instrumental role in economic transformation and mobility. Oil was so fundamental to the development of modern society in the industrialised world that the 20th century is often referred to as the Age of Oil.

Today, oil and natural gas play a pivotal role in the current global energy system. Approximately 31% of primary energy used globally is met by oil-based fuels while natural gas represents a further 21% of world energy supply. Since the 1980s, many oil-producing countries and oil companies operated from the assumption that the industrialised world would progressively use up its easy-to-access oil resources and become increasingly dependent on oil controlled by OPEC and in particular the vast reserves of the Middle East.

Under this long-prevailing view, which lasted from the 1980s until recently, OPEC's petropower would increase over time and therefore all the oil cartel really needed to do was wait it out for that day to come. Through the 2000s and up until 2015, OPEC took a revenues-oriented strategy, believing that this oil-constrained world had arrived and its oil was more valuable under the

ground than on the market. Oil companies, too, responded to this view by pursuing a business model that maximised adding as many reserves as possible to balance sheets and warehousing expensive assets.

However, the shale boom in the US and the 2015 Paris climate accords (COP 21) have changed the industry's outlook for oil and gas. With the prospect that major economies like the US, China and Europe will shift away from oil at a time when the cost of producing oil is declining through technological innovation, producers are coming to realise that oil under the ground might someday be less valuable than oil produced and sold in the coming years. In effect, perceptions have changed from believing a peak in supplies was possible to believing a peak in demand for oil is possible over the next several decades.

Some investors have also become concerned that oil- and gas-company shares may be overvalued, if warehoused high-cost oil and gas assets become stranded. This dramatic shift in expectations is changing the operating environment for the future of oil and gas. Moreover, policymakers, investors and scientists at COP 21 concluded that new efforts are needed if the planet is to avoid catastrophic climate change driven by the accumulation of greenhouse gases in the atmosphere. Under a scenario where fossil-fuel use is restricted to limit global warming to 2°C, oil use may still be stable, but certainly wouldn't expand to the same extent as business-as-usual expectations.

Expanding middle class

According to the central New Policies Scenario of the International Energy Agency (IEA), the need for oil and gas to fuel global economic wellbeing for an expanding middle class in the developing world will increase oil and gas demand significantly over the next three decades, despite improvements in energy efficiency. Given the natural decline that comes in operating the



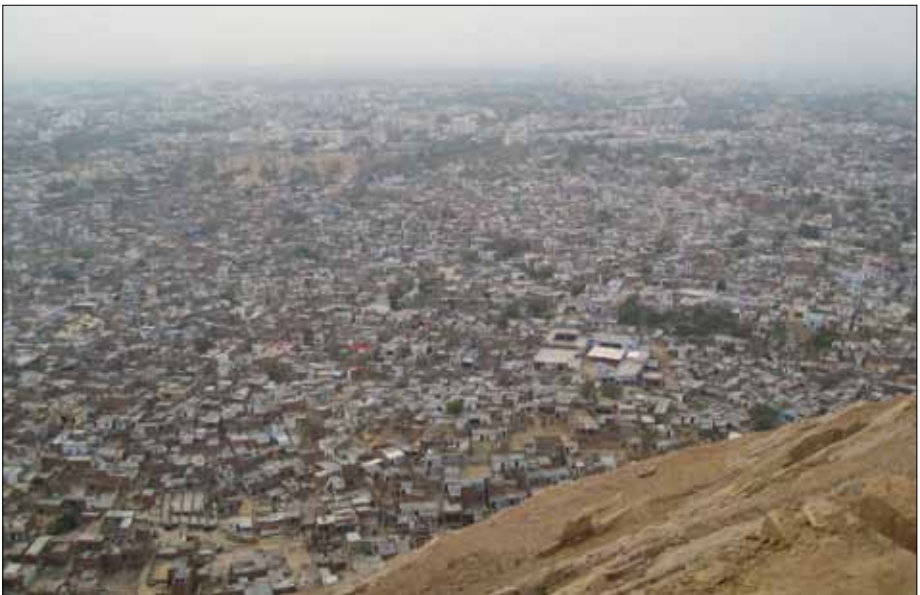
Statoil's Johan Sverdrup field in the North Sea starts production in 2019. It will operate within the scope of the 2°C scenario.

world's current inventory of producing oil and gas fields, the industry believes it can sustain its current business models. In its New Policies Scenario, the IEA projects that oil demand will rise by 14% from the 2014 demand of 90.6 million barrels per day (Mbpd) to 103.5 Mbpd by 2040. Overall, the global system will still be dependent

on oil and natural gas for the majority of the energy required to fuel economic activity, with fossil fuels generally representing roughly 75% of total primary energy use in 2040.

But this forecast is looking more questionable in light of changing economic conditions, technology innovation and shifting demographic trends. Under a scenario where fossil-fuel use is restricted to limit global warming to 2°C, oil use would be significantly more limited. The IEA's 450 Scenario (consistent with a 50% probability for less than 2°C global warming) projects oil demand to rise slightly to 93.7 Mbpd in 2020 but thereafter fall to 74.1 Mbpd by 2040. By comparison, coal consumption would fall 38% over that period and natural-gas demand would rise 16% (IEA, *World Energy Outlook*, 2015).

According to Norwegian oil firm Statoil's 2°C Renewal scenario, and assuming accelerated clean technology transitions, oil use would be about 15% lower than today at below 80 Mbpd by 2040



Slow economic growth in Asia (Jaipur, northern India, pictured) could produce a peak in transport oil demand around 2025.



The transport sector may require 60 Mbpd in the 2040s due to population growth and new wealth; today, it uses 52 Mbpd.

and coal use would drop precipitously to only 14% of primary world energy demand. Under the Statoil scenario, natural gas would rise to 24% of primary energy, up from 21% today.

A similar scenario study by the University of California, Davis suggested that several emerging factors – efficiency technologies for advanced vehicles, logistics planning and freight, changes in urban-transport patterns that cap personal vehicle ownership and congestion, and slower-than-expected economic growth in key Asian economies – could bring a temporary peak of oil demand in transport in the next decade. Population growth and expanding wealth effects, without strong policy interventions, will eventually overwhelm these improvements, allowing oil demand in the transport sector to reach 55 to 60 Mbpd by the 2040s, compared to 52 Mbpd in 2015.

This outlook contrasts with the IEA Current Policies Scenario of 75 Mbpd for transport oil demand by 2040 (based on today's policies) and ExxonMobil's 2015 base forecast of about 69 Mbpd by 2040.

Shifting strategies

To balance cost challenges against the possible need for new reserves, a leaner and more efficient industry is required. Companies will need to

deliver significant volumes of oil and gas at competitive returns, even if prices remain low and carbon externalities are priced more accurately. The industry will undergo a new technical revolution, with higher levels of artificial intelligence and automation and remote operation and management. The new leaner environment will impact the supplier industry, including local content in host nations, and adversely affect national revenues achievable from the oil sector.

The enormous economic contribution of the oil and gas industry to many national economies makes its future of critical importance. Although oil and gas are likely to be major sources of energy for decades to come, policymakers and the public are re-evaluating the central role they play in modern life. With rising concerns for future demand, climate change, the cost of project development, governance and community-level relationships, the industry currently finds itself in a delicate situation. Only by recognising the true scope of these ongoing challenges and addressing their implications can the industry continue to prosper in an increasingly complex world.

This article is taken from a white paper titled Future of Oil & Gas, published by the World Economic Forum in 2016. www.weforum.org



Effective safety and environmental management systems

By the American Petroleum Institute, IPIECA and the International Association of Oil & Gas Producers

The oil and gas industry has an ongoing commitment to its workforce and local habitat.

The oil and gas sector is a fundamental part of today's world, providing essential energy and raw materials for global development. A dynamic and innovative business, the industry constantly seeks to adapt to new situations and challenges. It invests not only in the search for new oil and gas, but also in facilities, infrastructure, technology, local communities, health and safety, and the environment. The sector continually examines opportunities to meet energy demand around the world, while seeking to mitigate adverse impacts of its activities as well as to address the potential risks associated with climate change.

However, in order to provide essential energy and raw materials, the oil and gas industry undertakes activities that are intrinsically hazardous, for example, the containment of flammable hydrocarbons at elevated temperatures and pressures, work at heights and in confined spaces, or helicopter transfers to offshore facilities. The health

and safety risks related to these hazards have to be managed systematically across a company's activities, including seismic and drilling projects, facility operations, maintenance, construction and marine and road transport.

Companies are encouraged to report on their overall approach to managing health and safety risks, including planned initiatives and measures to improve performance. The most common types of health and safety incidents occur in the workplace, and therefore, there should be a focus on the protection of the workforce, including measurement of incidents that can provide lessons for the future.

Less frequent, but potentially more severe, are failures of plant integrity or product-related hazards to third parties. Health and safety-related incidents can have multiple connections to environmental, economic and social issues. A balance needs to be struck between providing quantitative 'lagging' data on the outcomes and consequences of health and safety risks, and qualitative 'leading' information that focuses on the systems in place to continuously improve performance and reduce risk.

Protecting the workforce

The oil and gas industry has long experience in dealing with health and safety risks. Although significant progress has been made and rates of serious incidents reduced, accidents still occur. The primary impact is on employee or contractor members of the workforce engaged in routine or non-routine tasks (although third parties can be affected, for example, through road-traffic accidents). Providing adequate protection to all members of the workforce continues to be an important priority for the management of oil and gas companies. A company's record on workforce protection is often used as a barometer of how well a company is managing its operations.

The most established indicator across the industry is the record of injuries and illnesses that



Offshore helicopter transfer is just one of many potential hazards in the industry. This is BP's Mad Dog platform in the Gulf of Mexico.

are investigated to provide systematic learning on how to prevent incidents from recurring. The indicators on workforce participation and workforce health reflect longer-term inputs to ensure that people are aware of risks and take steps with management to improve controls to prevent injury and illness.

Biodiversity and ecosystem services

Onshore and offshore oil and natural-gas activities interact with the environment wherever such companies operate in the world. These activities can depend on ecosystem services and have the potential to cause direct and indirect impacts on biodiversity and ecosystem services (BES). Timely identification and appropriate management of operational dependencies and potential impacts on BES provide the basis for effective mitigation of associated potential risks as well as BES conservation opportunities.

Typically, oil and gas companies incorporate the identification and assessment of BES considerations into their environmental and social management systems, e.g. through environmen-

tal, social and health-impact assessments (ESHIA). Companies may also develop strategies and plans to ensure that BES management is implemented throughout the asset life cycle of their operations (including the supply chain), following the principle of the mitigation hierarchy.

Oil and gas industry activities have the potential to cause direct and indirect impacts on BES. A company's approach to assessing and managing impacts and dependencies should follow the principle of the mitigation hierarchy. The associated potential risks, management approaches and conservation opportunities vary geographically and with the type of activity or operation being conducted.

Water management

With population growth and continuing economic development, demand on freshwater supplies is likely to intensify. As a result, the need for effective freshwater management is essential, both in terms of the volumes of freshwater withdrawn or consumed and of protecting the quality of existing resources.

These factors, combined with increased awareness of supply, demand and water quality, are drivers of materiality for public reporting by many companies, particularly those with operations in locations where water stress and scarcity is recognised. While figures show that freshwater consumption by the oil and gas industry is much less than in other sectors such as agriculture, municipal water supply and thermoelectric power generation, water is an integral element in operations.

The importance of water-related risks has driven companies to focus on water-technology development, improved water management, utilisation of alternative sources and collective solutions. Additionally, the nexus between energy and water is gaining significance as countries look to increase energy supplies (including biofuels) that may require greater access to water.

Solutions need to take into account local constraints and the regulatory framework. Companies should assess whether a significant number of the company's facilities are impacted by water scarcity. If so, it is appropriate to add narrative to the company's approach to water management and to demonstrate responsible stewardship, especially in places where water stress is recognised.

Waste management

Effective waste-management practices are integral throughout operations to help minimise localised risks to the environment, communities or cultural heritage, to enhance resource utilisation and to potentially reduce costs. Waste is not defined consistently worldwide and its management often varies with local conditions.

Examples of events that can lead to short-term fluctuations in waste generated include shut-downs and periodic maintenance activities in downstream operations and, in upstream operations, some drilling operations that generate high volumes of aqueous wastes.

In areas of the world where no waste infrastructure exists, waste may need to be safely stored on-site for an extended period before final disposal or a recovery option can take place.

Companies usually report the quantity of waste in such storage if the amount is significant.

Good labour practices

Finally, companies are expected to treat all workers with respect and dignity and promote diversity in the workplace. The workforce is a key stakeholder group and underpins the success of a company. Engagement is a key tool to ensure that the company culture is positive, i.e. motivation is strong and workers are satisfied with their treatment, remuneration and conditions. It is essential that systems are in place to bring forward grievances without fear of retaliation. Fair and equitable treatment of workers is a basic expectation of society that needs to be approached systematically and underpinned with robust policies and procedures.

Taken from the Oil and Gas Industry Guidance on Voluntary Sustainability Reporting (third edition, 2015). The information contained here was developed jointly under the auspices of the American Petroleum Institute, IPIECA and the International Association of Oil & Gas Producers. It represents the work of a Reporting Working Group, composed of 80 representatives from 28 companies and four trade associations.



Onshore drilling can have direct and indirect impacts on the local ecosystem. Oil and gas companies have strategies to manage such risks.

Impact of climate-change policies on the industry

*By Brian Sullivan,
Executive Director, IPIECA*

Industrial development and population growth are inevitable but stringent measures mean we can limit harmful emissions.

Over the past two centuries, oil and gas have become central pillars of the global energy system and the main drivers of economic development. Today, oil production alone keeps one billion cars on the road, 20,000 airliners in the air and at least 50,000 trading vessels at sea. Natural gas provides almost 40% of residential heating, 22% of electricity generation and offers heat and motive power to a significant portion of the world's industrial base.

Oil and gas are essential feedstocks for many manufacturing processes. Together, they currently provide over 50% of global primary energy supply. The widespread use of these two resources arises from their many important benefits, including energy density, storability, transportability, flexibility of use and affordability.

Demand for oil and gas continues to rise in tandem with population increase and the industrialisation of developing economies. Given the primary role of energy in raising living standards, access to energy is widely recognised as a funda-

mental priority. As such, the UN has listed “access to affordable, reliable, sustainable and modern energy for all” as goal No.7 in the UN Sustainable Development Goals.

As the industry focuses on providing access to affordable, reliable, sustainable and modern energy for all through a number of initiatives, exciting opportunities are on offer for those wanting to focus on a career path around social responsibility and climate issues.

Emissions and their effects

While enabling over 200 years of industrialisation and development, the use of coal, oil and gas has contributed substantially to the rise in atmospheric carbon dioxide (CO₂), from 275 parts per million (ppm) in 1750 to 400 ppm today.

This, in turn, has contributed to a warming of the climate system. Non-energy sectors such as cement calcination, agriculture, farming, forestry and land-use change are also major contributors to greenhouse-gas (GHG) emissions, and are equally or more difficult to mitigate. In order to stabilise atmospheric GHG concentrations and global temperature, the world will need to transition to a lower-carbon energy system.

IPIECA recognises that a low-emissions global energy system would look significantly different from today and that such a transformation would be a major challenge to accomplish.

Presently, global CO₂ emissions from all anthropogenic sources stand at 40 billion tonnes per annum. Energy use and CO₂ emissions occur far beyond the power generation and transport sectors, and are associated with the manufacturing or provision of almost everything we use, buy, wear, eat and do.

Recently, the concept of net-zero or near-zero CO₂ emissions has been put forward by stakeholders and proposed as a possible long-term goal under the UN Framework Convention on Climate Change (UNFCCC). Net-zero CO₂ emis-



Global oil production keeps 20,000 airliners in the sky, as well as 50,000 vessels at sea and a billion cars on the road. Consumers should accept that shifting to a low-carbon system will require a re-setting of society's trends and expectations.

sions means the sum of all emissions, including those from fossil fuels and various land-use sources, would match the emissions removed by carbon capture and storage and sinks including land and forestry.

The achievement of a net-zero emissions goal would be extremely challenging. Transforming the global energy system to be low-carbon would require extensive changes to many parts of society and economies. Significant support for mitigation technologies and approaches would be needed, energy economics and consumption patterns would need to change substantially, and consumers would need to accept these shifts.

Whatever the final destination, society, policy-makers, business and civil society should start now in making the long transition.

The oil and gas industry must be a key part of the climate-change solution. The industry's history of innovation, global reach, knowledge

and technical expertise uniquely positions it to help develop and provide credible future energy solutions. The industry is already addressing many of the pieces of the puzzle.

Energy conservation and managing emissions

Finding ways to conserve energy can make a major contribution towards a low-emissions pathway. Since the 1970s, energy efficiency measures across the world's largest energy consuming countries have reduced energy consumption by an amount equivalent to the annual energy usage of the EU. To meet the challenge, the industry is investing heavily in new technologies and research, including energy efficient plant design, advanced computer controls, advanced modelling of reservoirs to increase production efficiencies, new extraction and processing methods, and improved technologies for monitoring the efficiency of equipment in the field.



The oil and gas industry's innovation is providing credible solutions to combat the associated effects of climate change including the disappearance of ice and rising sea levels.



Energy costs account for a large proportion of the total cost of operating oil and gas facilities; consequently, there is a strong financial incentive to save energy. While many technological innovations have reduced the cost of finding and producing oil and gas, overall, the difficulty of producing from current fields and therefore the associated energy consumption has increased. Notwithstanding the strong efforts on energy efficiency, oil and gas production and oil refining have become progressively more energy intensive since the 1990s.

Emissions from oil and gas production, transport and refining between 2005 and 2030 could be reduced by 14% from the business-as-usual case through measures such as process changes and improvements, energy efficiency improvements and CCS.

For example, the industry has made substantial improvements in reducing the gas associated with oil production that is flared. Flaring can occur in the oil and gas industry for many reasons, ranging from initial start-up testing of a facility to unplanned equipment malfunctions, and where the gas flared cannot be sold or re-injected into a

well. To assist companies in these efforts, IPIECA has produced guidance on reducing flaring in oil and gas operations.

Efforts are underway to continue to reduce gas flaring, for example through the World Bank's Global Gas Flaring Reduction (GGFR) partnership.

Many IPIECA members are working with GGFR and local governments to foster policies and mechanisms to promote infrastructure development, regulations, availability of finance and other factors critical to large-scale energy conservation. Global gas flaring has been generally declining over time, despite an increase in oil production.

Conserving energy also means reducing atmospheric emissions of usable hydrocarbons.

A focus has recently been placed on methane emissions. This is because methane is both the principal component of natural gas and a powerful GHG. Companies are taking a range of actions to reduce methane emissions, including replacing and upgrading field equipment, improving leak detection and employing new techniques for production.

Everybody has a part to play

Consumers are a critical part of the energy life-cycle. When oil and gas are used to make transportation fuel, 80% of the total GHG emissions from the use of these fuels come from vehicle exhaust. Similarly, when gas is used for power generation, 90% of its associated GHGs are emitted during conversion to electricity.

The industry works extensively with motor-vehicle manufacturers to create products that help increase engine performance. This includes participating in vehicle engine research and design to produce gasoline and diesel formulations that increase modern engine efficiency while lowering emissions.

It also involves supporting partnerships such as the Global Fuel Economy Initiative, which IPIECA engages with through membership of the UN



Many of today's tankers are diesel-powered but future models will be dual fuel, powered by diesel and LNG, with lower emissions.



Carbon capture and storage facilities compress and liquefy CO₂ before injecting the liquid into underground geological formations.

Environment Programme Partnership for Clean Fuels and Vehicles. Oil and gas companies are also producing new, advanced lubricants that reduce engine friction and increase fuel economy.

The industry also supports consumer education to achieve more efficient energy use. An example of this is the 'Save more than fuel' campaign, sponsored by European fuel producers in conjunction with the European Commission. This campaign provides drivers with tips to improve their fuel efficiency and save money while reducing their GHG emissions.

Developing and using lower-carbon fuels is also an important way to reduce overall emissions, with natural gas producing around 50% less emissions than coal when used for power generation. The industry is continuing to explore and develop new natural-gas resources and technologies to help lower its costs and emissions. Beyond this, companies are also continuing to invest in low-carbon and alternative fuels and technologies, including biofuels, solar and wind power as well as developing CCS.

The oil and gas industry will continue to strive to reduce GHG emissions while expanding its energy supply portfolio to meet the world's energy needs. It is committed to reducing energy required for its operations and working with end users to improve efficiency in the use of its products. Through new technologies as well as established practices, there are opportunities for both the industry and energy consumers alike.

Oil and gas: energy for development

As energy consumption in the developed world nears a plateau, developing countries will account for most future energy demand growth. While China's economy may slow down, India, the rest of Asia and portions of Africa are at, or near, an inflection point similar to China's 30 years ago.

In the next 25 years, hundreds of millions of people in these countries will buy their first refrigerators, air conditioners and vehicles. Regardless of the energy source these will use, producing them will require new factories, power plants and infrastructure, and expanded global supply chains.





This entails energy for construction, manufacturing and processing, transport of heavy goods, and delivery to consumers. As evidenced by China's example, and despite a clear and increasing role for renewables, much of this energy is predicted to come from oil and gas.

Since 1990, China has added as many passenger cars as the combined fleets of France, Germany, Italy and the UK. Appliance manufacturing has soared, with refrigerator production increasing nearly twentyfold, pushing cumulative sales over 600 million. Overall, the country's industrial output increased by more than the current GDP of US manufacturing and its electricity generating capacity grew from the size of Spain's to exceed that of the EU-27. China now leads the world in energy demand, consuming 12% of the world's oil and 5% of its natural gas.

In future decades, the development of other countries, coupled with population growth, could

increase energy demand equivalent to two or three times that of China. Growing vehicle use in developing countries is expected to double the world's light-duty passenger car fleet by 2040. Plug-in electric vehicles and fuel-economy improvements should save millions of barrels of fuel per day.

However, oil and gas, which supply more than 90% of today's transportation energy, are expected to be the dominant transport fuels for many years. The trends are similar for heavy goods transport, aviation and marine navigation.

As the world's economies develop, so will their non-fuel consumption of oil and natural gas. Lubricants, plastics and a vast range of advanced materials cannot be manufactured with today's technologies at the scale or cost required without oil and gas. Nitrogen fertilisers used for high-yield agriculture are based on chemical feedstock derived mainly from natural gas and other fossil fuels. Energy consultancy IHS has estimated that



Beijing in 2015; in the last 25 years, China has added as many cars to its roads as the total fleets of UK, Germany, France and Italy combined.



in 2010, hydrocarbon inputs to the global petrochemical industry were equivalent to 8 million barrels per day, or 5-7% of global fossil fuel use. That is six times the scale of today's global biofuels industry.

Meeting the world's growing demand

Under its central-projection New Policies Scenario, the International Energy Agency (IEA) expects low-carbon energy production – consisting of hydropower, nuclear, bioenergy and other renewables – to grow by 90% between 2012 and 2040, rising from supplying 18% to over a quarter of global energy needs.

Up to a third of global electricity by 2040 may be generated from renewable sources, including wind, solar power and advanced biofuels, which are all essential for meeting growing demand while managing GHG emissions. There is also an important role for energy efficiency – improvements in production and end-use efficiency are projected to account for an almost 15% reduction in energy demand in 2040.

Nevertheless, IEA's New Policies Scenario projects that oil and gas will remain the majority source of energy supply, meeting growing demand in the developing world and with gas partnering with renewables for power generation. Combined oil and natural gas demand is projected to grow globally by 30% from 2012 to 2040.

Access to affordable, reliable energy is essential to the growth of strong economies, sustained improvements in the quality of life and the eradication of poverty. To ensure these benefits for today's and future generations alike, GHG reduction and climate-change adaptation objectives must balance the need for development, economic growth, environmental protection and energy security. Oil and gas have a continuing role to play in a future of increasingly diverse energy sources, steadily improving energy efficiency and new technologies to minimise emissions.



Today, India finds itself in a similar position to China in 1990; there will be rapid energy demand growth to meet the nation's needs.

Brian Sullivan joined IPIECA as Executive Director in 2011, following a 23-year career in BP. He graduated in metallurgy and materials science from Imperial College London, UK and was recruited into BP's Refining and Marketing international graduate programme in 1986.

Over the course of 23 years, his career included assignments in London, Copenhagen, Budapest, Athens and Johannesburg, and business experience in over 60 countries. During his time with BP, he has had a varied career of technical, commercial, financial and leadership roles across the downstream value chain including crude and products trading, marine fuels, lubricants and alternative energy.



Gender and generation gaps: the way forward

By Katie Mehnert, CEO, Pink Petro

The oil and gas industry is diversifying, which is good news for newcomers.

It's been the perfect storm coming together since the bust of 1985. Fast forward and oil prices are hovering in the \$45 per barrel range. In the two years since its peak above \$100, sharp declines have cost our industry an estimated 400,000 jobs. This was all brought on by the American shale revolution, which created innovative, cost-efficient technologies in the oilfield between 2007 and 2012 that flooded the global oil market with supply.



Started in 2016, Pink Petro's HERWorld Energy Forum is a biannual event, with workforce diversification high on the agenda.

Adding to the pain of downsizing are the looming retirements of thousands of older workers, often called 'the great crew change', which leaves many companies trying to balance by plugging the gap through a combination of training the next generation, recruiting outside the industry and encouraging veterans in key positions to stay at their desks for longer.

The oil ice age, 1985-2000

From 1985 to 2000, not many people entered the industry. That hiring freeze, post-1980s bust created a huge gap in knowledge between older workers and the next generation. By the early 1990s, oil looked like a less appealing career path for new graduates in the cohort known as Generation X – those born between the mid-1960s and mid-1980s. Layoffs in the late-1980s also forced many young engineering graduates to flock to other industries including automotive and aerospace, creating shortages of qualified, capable people.

The female factor

While companies grapple with talent shortages due to this generational problem, the gender gap is another opportunity for new joiners to the sector. Gender diversity is not a new challenge to the industry. For nearly 40 years, oil companies like Shell, BP, Chevron and ExxonMobil have been working to drive diversity into the workforce and supply chain. Companies have formed university recruitment strategies, leadership-development programmes and women's affinity networks to help attract, develop and retain women. These same organisations have also formed supplier diversity programmes to encourage spend with women, minorities and veterans.

In 2016, Catalyst, a non-profit organisation that promotes gender equality for women in the workplace, released its latest numbers on gender diversity in some of the leading mining, quarrying



and oil-and-gas extraction companies. Despite years of high commodity prices caused by the shale boom and a concerted effort to increase the number of women entering the sector, only 3.3% hold CEO spots, 14.4% are in executive and decision-making roles, 18% in supervisory roles and 21% in the sector as a whole.

Walk, not talk

A 2015 report and survey from The Gulf Intelligence, a United Arab Emirates-based strategic communications consultancy, found that nearly half of all participants thought that despite four decades of struggle, equal opportunities remained a distant idea for women in the energy industry. Of those surveyed, 48% voted that, despite a lot of talk, the sector wasn't even close to offering equal opportunities, while 35% thought more needed to be done despite some achievements on this front. Only 7% of respondents expressed the view that equal opportunities exist in the energy sector today.

It is a widely held view by female energy executives that the sector needs to do more, such as offering greater flexibility in the workplace, battling discrimination and harassment, educating young female students about the sector's career prospects and highlighting the role of technology as a game-changer.

"While there is a lot of recognition at the senior level that women are important and that diversity in general is important, the day-to-day isn't quite there yet," said Dr Katharina Gruenberg, Chair of the World Petroleum Council's Young Professionals Committee, who participated in the Gulf Intelligence & Qatari Businesswomen Association (GI & QBWA) poll.

World leaders want to end the gender gap

Outside oil and gas, the pressure to see change in the gender agenda globally has been mounting in recent years across many industries. From the



In the oil and gas sector, there is still a lack of employed women. In 2016, 22 companies started an initiative to end the gender gap.

United Nations to the World Economic Forum, industry leaders, governments and NGOs are calling on the end of the gender gap across the board. The proliferation of social media and the transparency it's bringing to social inequalities is causing world leaders to take note and action. It is also calling on more companies to be open about gender-diversity efforts. Most public companies report specific workforce and gender data in annual or sustainability reports and in some cases shareholder activism is gaining popularity in driving corporate boards and institutional investors to take action.

Additionally, in 2016 at the World Economic Forum, 22 oil and gas CEOs declared a call to action to end the sector's gender gap. Chiefs from companies including Amec Foster Wheeler, BG Group, BP, Crescent Petroleum, Eni, EnQuest, Essar, Fluor, Maire Tecnimont, Mitsui & Co, Repsol, Royal Dutch Shell, Vopak, Sasol, Saudi Aramco, Statoil and Total signed the call to action.





The petroleum industry will require 30,000 new employees a year until 2025. Women with degrees will be well-placed for positions.

The call to action singles out seven areas for focus: leadership; aspiration and goal-setting; the STEM pipeline; clear responsibility; policy; inclusive culture; and work-environment/work-life balance. Pink Petro, an online business community aimed at disrupting the gender gap in oil and gas is responding to the World Economic Forum's call to action and working with energy companies to address these gaps. Members hope to tackle the gender imbalance through two specific aims: individual workplace culture change and an industry-wide global communication and recruitment campaign to promote the benefits of working in the oil and gas industry.

Opportunities on the horizon

While all of these facts may seem challenging, there's great opportunity on the horizon for the sector. Clean technologies, such as natural gas to liquids (LNG), are coming onstream, and oil and gas is a necessary part of the conversion to new energy sources.

As of late 2015, the oil, natural-gas and petrochemical industries employed 1.4 million people according to the American Petroleum Institute and companies will need to hire almost 30,000 workers annually over the next two decades to

replace departing and retiring employees. Here are its key points:

- API's study on minority and female employment from 2015-2035 says at present there are more than 237,000 women working in the oil, natural-gas and petrochemical industries. Nearly half of those women (over 114,000) work in management and professional occupations.
- Fifty-seven per cent of the job opportunities up to 2035 are projected to be in blue-collar occupations. This suggests tremendous opportunity for workers with a high-school diploma and some post-secondary training (e.g. certificates and community college).
- A third of the job opportunities are projected to be in management and professional fields such as engineering, geoscience, management, finance and as technicians. African Americans, Hispanics and women who successfully complete college degrees in these fields would be highly competitive for workforce placement.

While it is difficult to foresee the future, when the industry stabilises, companies will need qualified, capable people and the shortage of talent will be significant. This is an opportunity for anyone who wants to build a career in a fascinating industry looking for new ideas, innovation and people to lead us into the next era in oil and gas.

Katie Mehnert is the Founder and Chief Executive Officer of Pink Petro, the global community and career resource aimed at disrupting the energy gender gap. Supported by Shell, Halliburton, KPMG, and JIVE Software, Pink Petro has a growing list of international accolades including members in over 30 countries and 500 companies. Mehnert serves on the Board of Directors of Junior Achievement, Offshore Energy Center and Ellevest Network. She is a graduate of Louisiana State University in Communications, Rice University's Executive Energy programme and The Center for Houston's Future.



SECTION TWO

OIL AND GAS INDUSTRY STRUCTURE AND TALENT ACQUISITION

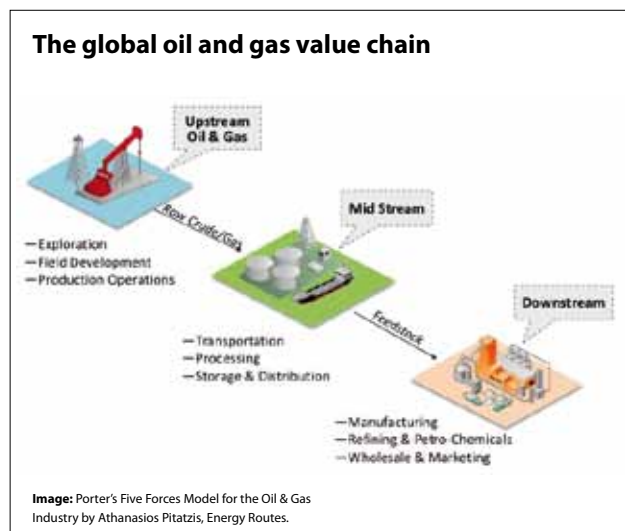
Upstream, midstream and downstream

By John Reeder, Founder, Petroplan

The oil and gas industry's three-tier structure in a nutshell.

The oil and gas industry is usually categorised into three major sectors – upstream, midstream and downstream. There is some flexibility in the use of these three terms and actual scope within each of them can be dependent on project type, company philosophy and geographical region.

Typical usage is as follows:



Upstream

Upstream activity includes exploration for, and extraction of, crude oil and natural gas. This sector is also known as the exploration and production sector. The upstream sector involves the search for prospective oil and gas fields, drilling of exploration wells and the operation of wells that retrieve the crude oil and/or natural gas. It is common for upstream projects to include preliminary facilities for the separation, stabilisation and sweetening of the produced oil or gas together with the first stage of transportation, especially if this is by pipeline.

Midstream

The midstream sector includes the storage, marketing and transportation of crude oil, natural gas and ethane, propane and butane. Until recently, midstream activity was often included in the downstream sector.

Downstream

The downstream sector is focused on refining crude oil and processing natural gas. It includes the retail and distribution of processed gas and the products derived from crude oil including LPG, petrol, jet fuel, diesel, asphalt and coke. The petrochemical industry is often considered to be part of the downstream sector or a sector in its own right.

John Reeder is the Founder of Petroplan, the global recruitment specialist for employers and professionals in the oil, gas and energy sector, with over 40 years' industry experience.
petroplan.com



COMPANY STRUCTURES IN THE OIL AND GAS INDUSTRY

The difference between integrated, national and oil service companies

Most oil and gas companies are organised according to business segment, assets or function. Company structures include **integrated oil companies (IOCs)** – both independents and majors – **national oil and gas companies (NOCs)** and **oil service companies**.

The majors

While independents focus solely on exploration and production, IOCs also have assets in the downstream sector such as refineries and service stations that bring the products to the end-user customers. As vertically integrated companies with global operations spanning the entire oil and gas value chain, the majors rank among the world's largest corporations in terms of revenue.

Government-owned operations

Many producing countries have NOCs that are owned and managed by their governments. They are responsible for managing production and representing their national interests in the oil and gas sector. Some of these also operate in other countries where they compete with other IOCs for the development of resources.



A purpose-built floating production storage and offloading vessel owned by service company MODEC.

Assisting production

Oil service companies build the infrastructure and provide products, services and technology for upstream and downstream operations. They typically do not produce oil and gas or own the assets that contain them.

All of these provide a variety of structures and pathways for a challenging and fulfilling career in the oil and gas industry.

The world's biggest oil and gas companies

	Mbpd
1 Gazprom (Russia)	8.4
2 Rosneft (Russia)	5.1
3 ExxonMobil (USA)	4.1
4 PetroChina (China)	4.1
5 BP (UK)	3.2
6 Royal Dutch Shell (UK/Netherlands)	3.0
7 Chevron (USA)	2.6
8 Petrobras (Brazil)	2.6
9 Lukoil (Russia)	2.4
10 Total (France)	2.4

Source: Forbes (2016)



Gazprom's 1,860-mile (3,000km) Power of Siberia gas pipeline takes gas from Irkutsk and Yakutia to consumers in eastern Russia and China.



Paths to success in an international oil company

*By Andrew Ditty,
Head of Downstream HR, BP*

Downstream requirements and routes to leadership positions.

The downstream segment is the product and service-led arm of BP, made up of three businesses: Fuels, Lubricants and Petrochemicals.

The Fuels business includes refineries, fuels marketing and convenience retail businesses, together with global oil supply and trading activities. Through Fuels, BP sells refined petroleum products including gasoline, diesel and aviation fuel.

The Lubricants business is our global manufacturing and marketing arm for Castrol and related products and services. Within Lubricants, we build relationships with equipment and manufacturing partners and work on new and innovative technologies.

Last but not least, our Petrochemicals business manufactures, sells and distributes products which can be used to make essential consumer products such as paint, plastic bottles and textiles. We also license our technologies to third parties.

Career opportunities in downstream

With such a wide range of businesses and disciplines, downstream offers a breadth of roles to match. Engineers and scientists are, of course,

crucial to the success of what we do in downstream, creating the most efficient fuels and most advanced petrochemical technologies, but we equally need commercial, business-minded people to help market and sell our products.

Future Leaders Programme

The downstream market is highly competitive and our ability to remain an industry leader is linked to our investment in people. We need the best people to guide our business. This is why we developed the Future Leaders Programme (FLP), a tailored leadership programme that takes talented people from a range of professional backgrounds and gives them the skills and opportunities to drive our business forward and build successful, long-term careers at BP.



An operator walks an elevated platform at BP's Whiting Refinery in Indiana. Refining is part of BP's downstream Fuels business sector.



The FLP is an accelerated development programme within downstream which runs over two 18-24-month rotations, the second of which is normally international. It offers access to tailored training and exposure to senior leaders. You will be in a real job, delivering genuine value to the business from day one. For those at an early- to mid-career point, the programme provides a wide range of opportunities and the support of a global network to help navigate it.

The FLP provides a pipeline of talent into BP. Many of the participants we expect to become leaders in the organisation. Bringing talented individuals at an early stage of their career into BP allows us to help them develop their careers in a structured way, and ensures we harness the power of globally-minded employees.

Who can apply?

To apply for the FLP you need to meet certain minimum criteria, including having a postgraduate degree (MBA, PhD, MSc or MA) in a relevant subject, appropriate professional experience and a flexible approach to work, location and placement. Further details about the minimum criteria and other requirements are available on our website.

We look for people who have a strong technical or functional background in the area in which they want to work – all great leaders need expertise in their area. Just as importantly, we look for individuals who can demonstrate the potential to be strong leaders. By this, we mean individuals who are able to motivate, energise and empower others to succeed, and are not absorbed in themselves – BP works as one team.

While it is important to be tenacious, so you can take on tough challenges and have the courage to speak out when you don't think something is right, this shouldn't be confused with being aggressive. The most successful candidates are those who are able to demonstrate both ability and humility in the way they conduct



In the competitive downstream market, BP requires motivated and talented people to join its Future Leaders Programme.

themselves and interact with others. We believe teams perform best when people are able to be themselves, so as a leader you need to be able to respect people's differences.

Indeed, BP is a large organisation, so we need people who understand the scale and breadth of the business, and can work well with people at all levels across the organisation. Being able to build and maintain relationships is a must, both with your BP colleagues and externally with customers and suppliers, as these long-term partnerships are important to us. If you can do this, and are looking for a career which will stretch you by combining hands-on learning with the opportunity to try new things and make a difference, you could be on track to becoming one of BP's future leaders.

Andrew Ditty graduated from Queen's University Belfast in 1989 with an honours degree in history. Upon completion of his professional human resource management qualification in 1990, he joined BP. Ditty's career has given him exposure to upstream and downstream and has covered areas including HR, industrial relations and leadership development, and HR activities associated with acquisitions and divestitures. He was the HR Director for Global Refining before moving to his current position, Head of HR for Downstream.



Creating leaders in an international oil company

By Diána Muller, Learning & Competency Development Manager, MOL Group

MOL Group's talent commitment.

MOL Group is an integrated, international oil and gas company with its headquarters in Budapest, Hungary. It is active in over 30 countries, with a dynamic international workforce of 26,000 people. Its business activities range from exploration of hydrocarbons to retail sales of petroleum products and petrochemicals.

MOL Group businesses

MOL Group has over 75 years' experience in exploration and production and its diverse portfolio includes oil and gas exploration assets in 13 countries, with production activity in eight countries. Beyond its core region of central and eastern Europe, MOL has a well-established presence and thriving partnerships in the CIS region, the Middle East, Africa and Pakistan. In 2014, MOL Group also entered the UK and later Norway to increase its reserves and enhance its offshore experience.

MOL Group's Downstream division operates four refineries and two petrochemicals plants and is made up of different business activities that are part of an integrated value chain. This value chain turns crude oil into a range of refined products, which are moved and marketed for household,

industrial and transport use. The products include gasoline, diesel, heating oil, aviation fuel, lubricants, bitumen, sulphur and liquefied petroleum gas. In addition, it produces and sells petrochemicals worldwide and holds a leading position in the petrochemical sector in central-eastern Europe. MOL Group owns a retail network of nearly 2,000 service stations in 10 countries.

MOL Group careers

MOL Group provides a wide range of technical and non-technical positions in its companies for both graduates and experienced employees. In order to build a long-term supply chain of talent, MOL Group targets secondary school students in order to encourage students to pursue subjects that could ultimately lead to oil and gas jobs. MOL Group established an award to recognise the best secondary school teachers in mathematics, chemistry and physics based on student votes.

To recruit graduate talent, MOL Group is using two tools: Freshhh, an international online student business competition to promote the company and the industry in general (winners are offered positions in MOL Group); and the Growww graduate-recruitment programme to enrol, develop and deploy the right talent.



MOL Group's Danube refinery near Budapest employs 1,200 people. The company has a workforce of 26,000 in 13 countries.



MOL Group employees can develop their skills by pursuing leadership or expert career paths. Those employees who are identified as having leadership potential through the Performance & Career Management system, and express strong motivation and willingness to pursue a leadership career path, are continuously assessed and developed to be ready to take over potential managerial roles when the opportunity arises. To support this, individual development plans and activities are defined and set up to ensure a smooth transition into the new position or assignment as required.

LEAD is MOL Group's Leadership Talent Development Programme, designed to challenge the participants and expand their skills through world-class learning curricula and stretching individual and team project assignments.

Excellent performers and those keen on developing expertise are steered towards expert career paths, with constant improvement of skills.

Diána Muller is a HR professional with experience in strategic HR, talent acquisition and employer branding. At MOL Group, she is involved in the design and implementation of the corporate HR strategy.

Employee stories

How have Growww and LEAD helped you?

"I started my career with MOL in Romania in 2011 as part of the Growww programme and a year later, I joined the Group Supply and Sales organisation in Budapest. Now I'm taking part in the MOL Group LEAD programme, Emerging Global Leaders stream. In our operations, speed to market is a critical success factor, which starts with customer needs. Fast decision-making, creativity and passion are key attributes for success. Both the Growww and LEAD programmes have helped me develop skills and knowledge necessary to make a positive impact."

Daniela Gagea, Group Fuel Supply & Sales Team Lead, MOL Group

"The LEAD programme is a journey of self-enlightenment. The comprehensive feedback we receive helps us to understand our strengths and weaknesses, while developing the cultural awareness and leadership skills required to thrive in MOL's diverse work environment. The opportunity to interact with emerging leaders has proved instrumental in my transition from Pakistan to an international assignment at the Group HQ."

Babar Ali, Group E&P Category Manager, Well Equipment and Materials, MOL Group

"I believe that if you choose the Growww programme, you're choosing a career path – building your professional life with a great company that offers wide opportunities to improve, gain experience and broaden your scope. Plus, in the Growwwer group, you really extend your network during a one-year period in addition to training and exercises. The programme has given me the chance to immerse myself in a multinational company and its operations and gain experience managing complex business situations."

Péter Tarr, Export Customer Management Growwwer, MOL-LUB Kft



Péter Tarr is currently following MOL Group's Growww programme, gaining valuable business experience.



Talent acquisition in a national oil company

By Sultan Sevgül Erkiş and Ayşe Kalaycı, HR Specialists, Turkish Petroleum

Recruit staff as an investment.

Every organisation has a unique strategy to stay competitive in the talent market and this strategy dictates whether to 'buy', 'borrow' or 'build' the talent that the organisation needs. Ever-changing technology, strategic alliances, oil price, along with other economic factors, have a direct impact on workforce planning. Succession plans, technical and behavioural competencies and the different needs of employees at the workplace intro-

duce yet another level of challenge to recruitment and retention efforts. Turkish Petroleum (TP) adopted two distinct talent-acquisition practices to match supply and demand. The first is a traditional interview and selection process; the second is a scholarship programme for graduate students.

Every year, department leaders at TP come together with mid-level managers to create workforce plans for the following year. The quantity component of the plan is mainly determined by the workload, so the primary objective of this component is to maintain an optimum headcount to perform operations smoothly across the organisation. Mostly, the majority of these positions are performed by blue-collar employees, however some of the positions are performed by white-collar employees. Once senior-level managers agree on numbers, human resources posts vacancies on the Turkish Employment Agency's website (www.iskur.gov.tr) to attract applicants. Candidates, who take a nationwide standardised test on different subjects, apply for positions and the Turkish Employment Agency lists applicants based on their test scores. This is considered to be the first round on TP's traditional recruitment process.

Candidates who make it to the list are then invited to TP headquarters for a panel interview. Structured interviews are designed to test candidates' technical knowledge, ability to perform the job and behavioural competencies to fit in the corporate culture. 'Buying' the talent for core positions is cost and time efficient.

The quality component of the plan focuses on strategic positions and competencies that are not easy to 'buy' or 'borrow'. Although TP has strong relationships with academia, some positions are so specific that new college graduates are not equipped with the minimum knowledge and experience requirements of the job. To overcome this, TP recruits for potential and then 'builds' the talent that is required to perform the job. Since the late 1970s, TP has sponsored the brightest



Turkish Petroleum sponsors talented students to gain master's degrees in subjects like petroleum engineering and geoscience.



A training programme on energy transition: development of soft skills is deemed vital at Turkish Petroleum so employees can remain open to new ideas.



students to earn master's degrees in subjects such as petroleum engineering, geoscience, petroleum chemistry, finance and supply chain management. Every student is assigned to a thesis adviser from the department he or she is going to work for upon graduation. This helps students to focus on issues that TP faces the most, so they can contribute in a more meaningful way when they return.

Although it's nearly impossible to calculate the return on investment of the scholarship programme, TP has benefited tremendously from the results. Today, 350 of those students, who graduated between 1981 and 2016, are proud members of TP's workforce and relentlessly lead the way to develop new ideas.

Some of these ideas have turned into profitable projects. Their efforts contributed to building the first natural-gas storage and processing facility in Turkey. Today, this facility is going through the third phase of an extension project. For sustainable and self-sufficient data acquisition, TP has bought the first seismic vessel in Turkey, making it possible to explore the Black Sea and Mediterranean Sea. TP's Supply Chain Department has a unit dedicated to domestically producing vital and expensive devices. Partnering with local producers, our engineers utilised their expertise to build devices that are necessary for in-house operations and ultimately help TP save money.

Studying abroad boosts technical competency and changes a person's mindset. Living abroad for any length of time means exposure to a variety of cultures and work styles, and helps employees develop vital soft skills such as teamwork, communication, keeping an open mind to new ideas and working outside your comfort zone. They tend to make evidence-based decisions since they are eager to conduct research on pressing issues. They are also inclined to challenge the status quo, helping TP reach its potential.

One obvious risk of the scholarship programme is the turnover rate of well-trained employees.



Turkish Petroleum's acquisition of seismic vessel *Barbaros Hayreddin Paşa* means that nearby seas can be explored for oil.





Until 1983, Turkish Petroleum was an integrated oil company but since has focused on exploration, drilling, wells and production.

Overall, the turnover rate of these employees is not alarming so TP will continue to invest in talent via scholarships. TP owes this low turnover rate to its strong employer brand in Turkey. In addition to the compensation package, non-monetary benefits such as boarding in rural areas, sport complexes, flexible work hours, health-care benefits, academic leave option and many other perks, help TP retain the best talent.

Change to survive

"If the rate of change on the outside exceeds the rate of change on the inside, the end is near."

*Jack Welch, former Chairman
and CEO of General Electric*

As Jack Welch put it, change is a must to survive. It is not a surprise that globalism is continuously affecting each of us more and more. There is an acronym, 'PESTLE', that explains how organisations are surrounded by six environments: political, economic, sociocultural, technological, legal and environmental. For instance, technological innovations are far quicker than they used to be. Political changes in one country affect a number of countries in many ways, especially economically,

and economies rapidly become more fragile when they are compared with the past. All these effects are the result of living in a global society. PESTLE has particular relevance in the oil and gas sector.

TP's change of approach

TP was founded in 1954 as an integrated oil company but since 1983, it has been a purely upstream company. Change has taken place through the needs of adapting and competing within a global economic world. During its history, TP has evolved and the transformation process still continues.

During a transformation process, a holistic approach is required, with different departments all working together as part of a whole system. The reasons for change directly affect the company structure and career roles. During any transformation, HR is focused on two sides: employees and the organisation itself.

A new organisational structure, and how and why it is designed, provide HR with important tasks. A structural evolution will cause changes in HR areas such as selection and recruitment, training and development, conditioning, succession planning, performance assessment, retention and rewarding. Revisions and changes in these areas will necessitate some legal, economic, technological and sociocultural changes, too. Re-organisation is not only about the company but also the existing and future workforce.

Employee development

In parallel to the transition the company has undergone, a competency management system is in use to provide a base for determining, developing, tracking and moving skills forward. According to the new strategy and organisation structure, there will be flexible and diverse methods for employee development. For an active, global and diverse workforce, leaders will need to be able to adapt to continuously changing work environments. In this sense, line



managers become the responsible partners of the organisation.

With skills developed according to the needs and goals of the company, employees are assessed to determine if there is a difference between current and expected levels of competencies. Training programmes are prepared and development observed. It is seen that the competency management system is beneficial for both employees and managing units. At present, there is an ongoing project for this system's foundation in the company.

There are numerous paths for promising talent to become leaders. However, there is a leader growth programme to meet the needs of high-priority business units. Using the competency management system and support of relevant stakeholders, development programmes for different career roles are to be designed. Selection and recruitment will fill the needed competencies that sector and jobs require; training and development will not be an obstacle for the future any longer.

In addition, employees should know whether they are profession-, management- or project-oriented. There should be different approaches for the competency gap found between today's workforce and required workforce. Also, there should be other methods for new recruits. Therefore, personal-development plans are needed to handle succession.

Today, career paths to leadership roles in TP include five stages until the candidate reaches the five-year service presidency. Although requirements for those roles are defined in terms of year and education level, these restrictions are not enough to have competent leaders. Consequently, together with new structure and the requirements of the outside world, our paths are being redrawn.

In order to align organisations to constantly evolving environments, change needs to be managed effectively. In TP, transition work is ongoing and its effects on HR functions require comprehensive changes. To be able to compete in different locations with a diverse workforce, it is important that organisations and leaders invest in their employees and their leadership competencies. This will help overcome the current uncertainties of the oil and gas sector.

Sultan Erkilic received her human resources degree from The Ohio State University in 2012 and holds a degree in business from Istanbul University. Erkilic has been an HR Specialist at TP since 2012. Ayse Kalayci gained a BSc in political science and public administration from the Middle East Technical University and, being a scholarship student of TP, gained an MSc degree in human resource management from the University of Southampton. Kalayci has been in TP's HR department since 2014.



In Turkey, 72% of oil production is in the Batman region (pictured); Turkish Petroleum also has services in the Middle East and South America.





Demographic challenges of a national oil company

By AAA Indira Pratyaksa and Syahid Deradjat, Human Resource Development, PT, Pertamina (Persero)

As older managers retire, Pertamina has developed its own programmes to discover future leaders.

The sharp decline in global crude prices presented a considerable challenge to oil and gas companies, including Pertamina. In order to maintain operational stability in these challenging times, Pertamina embarked on its five Strategic Priorities working programmes, namely expansion in upstream, efficiency in all lines of activity, increasing refinery capacity, development of infrastructure and marketing, and improvement of the financial structure.

Pertamina is committed to developing talent in order to support sustainable business management with a focus on safe and reliable operations, engaging and developing employees, and increasing the diversity of workers. However, Pertamina is facing a demographic challenge: 30% of its employees will be retiring in the next five years, leaving only 20% of mid-level employees to fill these strategic leadership positions.

To resolve this demographic challenge, Pertamina created a Talent Management & Succession Planning (TMSP) project, with several objectives:

- To ensure that talent is selected in accordance with the system framework.

- To implement a talent-development acceleration programme.
- To develop an excellent Talent Management Information System, which will assist the decision-making process with reliable data.

Talent selection

The first step of talent management is to develop a talent-management system framework that will identify high-potential talent. Employees are reviewed based on a yearly performance score and assessment results. Those who have distinct results are included in the talent pool.

Mid- and high-level employees in the talent pool are indexed based on the job ladder, career path and skill group to create a list of successors for each critical position. The list is then brought to a talent-review meeting, where the evaluators matching up profiles establish a shortlist of successors who will participate in a Talent Development Acceleration programme (TDA).

Talent Development Acceleration programme

The TDA programme aims to establish a path of development for employees at entry-level, mid-level and high-level. Every programme involves three pillars of progress – for the line manager, the employee and the human-resource management. Each pillar has its own role and responsibility:

- The line manager is entitled to receive adept staff who can forward business needs.
- The employee has the responsibility to participate in a designated development programme.
- Human-resources management facilitates the acceleration of a high-performance organisation and improves employee performance.

The development programme is divided into four sections.

1 Entry-level programme

The objective is to develop and certify a person's technical competency so that employees can



prove successful in each position. Participants have to complete Early Professional Development modules, consisting of three steps in three years. At the end of the programme, participants take a test and are expected to excel in technical competency and project assignments.

2 Mid-level programme

This targets shortlisted operational leaders and the talent pool of team leaders, aiming to develop technical competency as well as business-management and leadership capability. The method includes project assignment, on-the-job teaching and coaching, job exposure and training.

3 High-level programme

Successor readiness is the main objective of this programme. The participant is selected through a talent-management system framework to confirm that the employee has high-potential talent to be a critical-position successor. The aim is to prepare the participants' leadership competency. Development Action Plan (DAP) modules consist of relationship-based methods such as coaching, mentoring and experience-based methods such as job assignment and on-the-job teaching.

4 General programme

Any employee who is not categorised as having high potential and does not participate in entry-, mid-, and high-level development programmes, is assigned into the Individual Development Program (IDP). The IDP increases individual skills through training activities, coaching and mentoring.

Talent-management infrastructure

To support the success of this selection and development programme, Pertamina's Human Resources department is strengthening its infrastructure, focusing on career paths, technical and soft skills, MyCV Online and Talent Management Application.



Upskilling sessions for coaches and mentors are part of Pertamina's Early Professional Development (EPD) programme.

Immediate results

The project has seen significant achievements. In its first year, entry-level programme participation reached 12% of the figure of total new employees, while participation rates for the mid-level and high-level programmes are 75% and 23%. With a comprehensive talent-selection and development framework, employee development is expected to accelerate, helping us to solve the upcoming leadership gap. Foresight is a powerful tool.

AAA Indira Pratyaksa has been with Pertamina since 2003. She is a Senior Analyst in Leadership Development in the People Management team of the HR department. Pratyaksa graduated as a psychologist from Gadjah Mada University in Indonesia and is now involved in various breakthrough projects for Pertamina. Syahid Deradjat joined Pertamina in 2010 and is currently Assistant to the HR & GA Director. He graduated with a degree in environmental engineering from the Institut Teknologi Bandung in Indonesia.

Service company career management

By Ryan Rasmussen, Global Recruiting Manager, Schlumberger

Promoting innovation and creativity.

When Matheus completed his interview with Schlumberger, he never would have imagined that within three years, he would be a member of an in-house development team conducting field tests on new drilling technology. A few years later, he would manage 200 people developing the next generation of this same technology, which we successfully applied for a customer in Sakhalin, Russia and achieved a drilling world record for an 8-mile (13km) horizontal well.

While this characterised the first six years of Matheus' career, he went on to manage the team that redefined the way Schlumberger supports its operations for North America.

It is our people, our technology and our record of strong financial results that have differentiated Schlumberger within the oil and gas services industry. People, ultimately, determine success. Our commitment to people begins with the way we recruit the best graduates. We recruit where we work and offer our people borderless careers. This approach encourages adaptability and fosters new ways of thinking. Our commitment continues with well-defined training and development programmes that combine practical

learning and hands-on experience in the field and are unique to Schlumberger. By exposing our new employees to different environments and locations during the early stages of their careers, we fast-track progression. They acquire skills more quickly, which benefits them throughout their entire career.

Borderless careers

When Patricia, a mechanical-engineering graduate, joined Schlumberger in 1996 as a field-engineer trainee in Argentina, she followed a three-year training programme. This programme blends technical, safety, personal development, business and managerial courses, and on-the-job training so that new employees can develop skills and subsequently progress to positions with increased levels of responsibility. Within five years, Patricia had held two other positions in the US before she became an operations manager in Jakarta.



Working for a service company such as Schlumberger offers rapid career development and advancement – and travel opportunities.



Next, Patricia worked in France, Canada and again in the US, during which time she held positions as a training and development manager, and increasing responsibilities in line management. Patricia plays an active role in her career, through the preparation of annual training and development plans with her managers, where they agree upon actions for the next year. Training includes traditional classroom settings, self-training options using the latest interactive technology, on-the-job training, coaching and mentoring. Today, Patricia is one of 35 GeoMarket Region Managers within Schlumberger.

While some of the roles Patricia filled may have been predictable, some presented opportunities to assume positions that were not obvious in terms of a linear career progression. These opportunities challenged Patricia, while training honed her expertise at an intensity that is unique to Schlumberger. In short, career planning at Schlumberger is all about developing people and their skills rather than adhering to a routine ascension through various business divisions.

Performance-based opportunities

Schlumberger looks for candidates who show the potential to thrive in our unique culture, but it is performance and willingness to take on positions of responsibility that opens up progression. The company's ability to adapt to business challenges and technology needs is tied to the ability of our people to develop their competencies.

As another example, Adi who has a skill set in management, started his career in supply chain services as a buyer and progressed through a variety of positions such as a customer-service manager, manufacturing manager, HR manager and GeoMarket region manager. Now, 25 years on, Adi is President of a Schlumberger region.

The career stories of Matheus, Patricia and Adi offer insights into the breadth and depth of career progression within Schlumberger. Common to all



Early responsibility is a major aspect of recruitment, whether in the field, office or lab, coupled with thorough on-the-job training.

our employees' career stories are a well-defined training and development programme, a wide variety of career opportunities and the benefit of acquiring responsibility early in their career.

Our borderless careers policy means that, based on our business objectives, we support an employee's progression in whichever direction an individual's talents and ambition evolve. We pay attention to adapt opportunities to an employee's circumstances and, of course, our business requirements. Our culture-defining diversity offers our employees the opportunity to interact with people with a broad range of backgrounds. Ultimately, our diverse business environment opens the door to a myriad of opportunities for a challenging and fascinating career, and helps us maintain our competitive edge.

Ryan Rasmussen heads Schlumberger's Recruiting Organization. Currently Paris-based, he joined Schlumberger as a Field Engineer in the US. Since then, he has worked across four continents in technical and managerial roles.





SECTION THREE

SELECTED JOB PROFILES

Technical and non-technical roles

Edited by Lesana Kurbonshoeva, Student, Vlada Streletskaia, Executive Assistant to the Rector, both at Gubkin Russian State University of Oil and Gas (National Research University), and Nihad Kasraoui, Project Engineer, International Petroleum Investment Company

From field engineers to IT experts and traders, the oil and gas industry is a multiskilled sector.

The oil and gas sector is a major employer with a wide range of projects around the world. It offers technical as well as non-technical career paths and a broad range of opportunities. Some jobs require specific trade or scientific qualifications, others a degree background. There are many different types of candidates required to keep this complex business running and the entry qualifications for oil and gas industry jobs differ considerably depending on the tasks to be carried out.

A wide range of roles exist in the oil and gas industry across the upstream, midstream and downstream sectors, not only in the large companies with household names but also in many medium and small enterprises across the value chain. In the upstream sector, employees will typically work for operators (who run projects from start to finish), contractors (who provide specific

services to operators, e.g. well services) or engineering companies (who specialise in particular areas, e.g. flow-assurance calculations or geological analysis). Employers in the midstream and downstream sections include refineries, contractors, suppliers and engineering companies (who provide specific expertise, e.g. on refinery projects).

This chapter provides details of a selection of the jobs available for career opportunities in this diverse industry.

TECHNICAL ROLES

Upstream

Chemists play a key role in the oil and gas sector, as the use of chemical products is essential to the development and future of the oil and gas sector. A chemist in the oil and gas industry has the opportunity to work in a range of roles within operators, specialist chemical companies, well-services companies, consultancies, etc, and can be based onshore or offshore. They enhance production performance, prevent corrosion and support exploration activities.

Construction workers perform a wide range of tasks relating to the construction and maintenance of structures, facilities and systems in the oil and gas sector. They may operate hand and power tools of all types, as well as surveying and



At the Wayne Technology Center in New Jersey, USA, a chemist is isolating a polymer as part of analysis of Castrol Edge engine oil.



A drilling engineer will plan and supervise drilling activities, such as these on board BP's drilling rig *Deepsea Aberdeen* in the North Sea.

measuring equipment, and a variety of other equipment and instruments, and may also clean and prepare sites, dig trenches, set braces to support the sides of excavations, erect scaffolding, and clean up rubble, debris and other waste materials.

The **drilling engineer** plans, develops and supervises all the operations required for drilling a

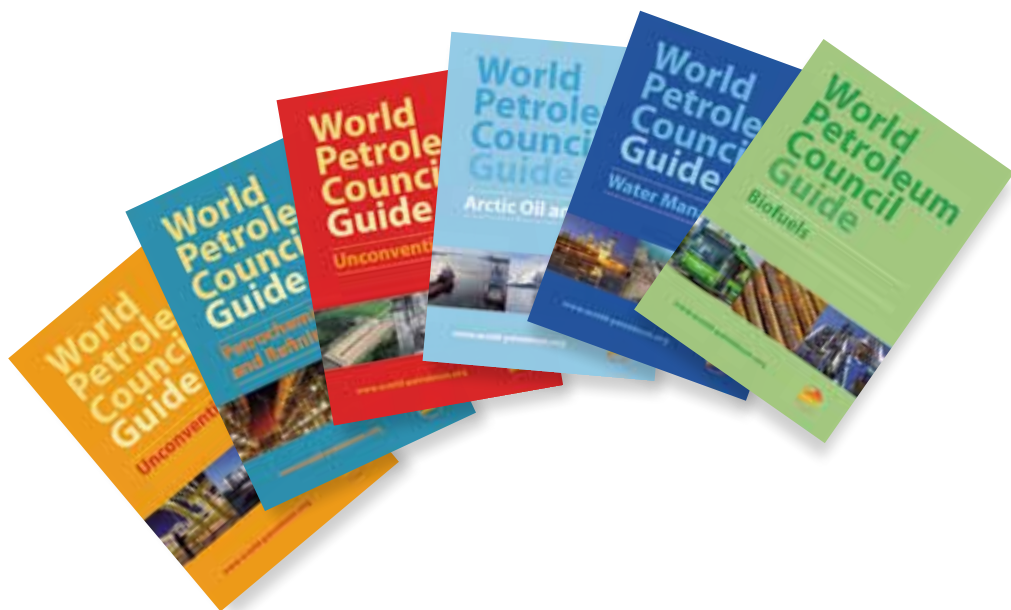
well. The work of the drilling engineer starts from implementing initial stages of designing and testing wells and ends with their completion and abandonment. The drilling engineer can be based in an office or out in the field, either on or offshore and is responsible for planning and executing drilling operations.



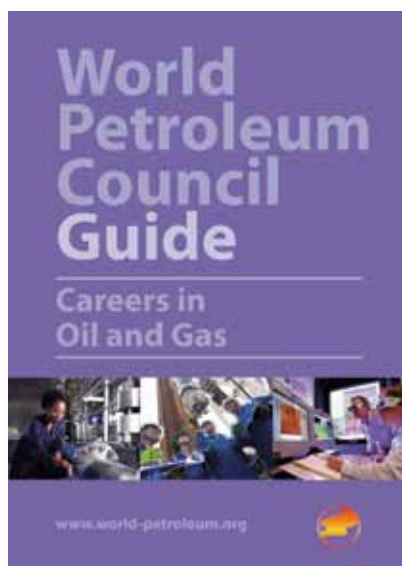
A platform crew awaits transfer to a helicopter before a flight to the mainland. For some, helicopter travel is second nature.



Oil and gas work often means employment in harsh conditions; this is Gazprom's Bovanenkovskoye gas facility in Yamal, Russia.



A GROWING SOURCE OF REFERENCE



The *World Petroleum Council Guide to Careers in Oil and Gas* is the latest in a special series of twice yearly publications being produced by WPC to act as a definitive source of reference on the most pressing matters affecting global energy markets.

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Published by award-winning International Systems and Communications in both print and digital formats, all titles in the series can be viewed online via the following link:

is.gd/wpcguides



A joint Sovcomflot and Marine Arctic Geological Expedition team begin a seismic survey on the Sea of Okhotsk, off the Russian east coast.

Electricians install, maintain and repair electrical wiring, equipment and fixtures in all areas of oil and gas operations such as oilfield installations or plants. They carry out planned or unplanned maintenance and repair activities on a wide range of equipment e.g. power generation and distribution systems, motors, control systems and elec-

trical equipment and ensure that work is in accordance with relevant codes.

Facilities engineers have a very diverse role and are involved in creating the various systems that help to drive production. Duties include the supervision and management of the technical staff and management of all operations and main-



The *Maersk Inspirer*, the world's largest jack-up drilling rig, was built for North Sea conditions and accommodates 120 staff.



Case study: overseas opportunities

By Stephane Rousselet, Logistics Superintendent, TOTAL E&P Nigeria, and Vice Chair, WPC Young Professionals Committee
Employment in oil and gas can be a ticket to see the world.



The oil and gas industry provides unique opportunities to discover the world. After three years spent in Total's headquarters, co-ordinating transformation projects, I joined our Nigerian affiliate as logistics superintendent.

The portfolio of operated and non-operated assets of Total Exploration and Production is diverse. From the brown field of the North Sea to the deep offshore of the Gulf of Guinea, not forgetting the arctic conditions of Russia or the unconventional developments in South America, the opportunities of working overseas are multiple. My priority was Africa for several reasons: the perspectives of the continent, the density and dynamism of the oil and gas activities, and the importance of the offshore development in the group strategy. Nigeria was, despite all the security challenges, a great opportunity.

After two years in the northern part of the Niger Delta, the main learning point is that working abroad is a life experience, a radical transformation of personal and business lives.

Although the headquarters of a major oil and gas company offers visibility, networking and conceptual responsibilities, the oil and gas industry is field driven. As such, the credibility of our professionals often relies on the number of years spent close to operations. Working overseas is therefore not only an opportunity but a must in the industry career path. As the interface between drilling, field operations, the HSE material superintendent and our offshore sites, I quickly developed a better understanding of the Upstream operations from the exploration survey campaigns to the export of crude oil and gas.

You also learn a lot from the local culture. Though the security of the subregion restricts the movement of personnel – all movement must be

performed under armed escort – working with our Nigerian colleagues offers a taste of the country's cultural richness and diversity. With around 500 communities and languages, the country fosters adaptation and opens the mind to succeed. With 17 people working directly for me and around 50 indirectly, the cultural diversity has given me new management skills to be leveraged in my future career.

I believe that working overseas is a win-win situation and should be seen as a catalyst to building shared values. Indeed, you will learn new practices, business models, operating philosophies and management skills. You will build a new set of competencies which will make you a more efficient worker or executive. This learning experience is also true for the locals. We have our own background and experiences to share with them and when the job ends, a small part of us will remain in the country.

Obviously, from a family point of view, the work/life balance is at stake. As a rotational, I had the chance to return to Paris every 28 days for 28 days. The month of separation requires constant communication, supported by social networks or virtual communications tools like Skype or FaceTime. Some of my colleagues also choose to live there with their families.

In conclusion, I would emphasise the importance for students and young professionals to consider their first career steps abroad, to discover the world and build their own career track. I believe that the complexity of our industry and the acceleration of globalisation requires the development of new skills to be able to analyse and resolve the problems faced by our companies.





It's March 2016 and drilling gets underway at Statoil's Johan Sverdrup field onboard the *Deepsea Atlantic* drilling rig.

tenance activities. To produce oil and gas requires a broad range of operations and a large team are involved in the production process, so this role covers project planning and management for safe execution of projects within budget and on schedule.

Field-development engineer is a multidisciplinary occupation and can be very challenging. Field-development engineers work closely with colleagues in engineering, marketing and with clients as they are involved in almost all stages of petroleum business. They may be involved in the installation of equipment or maintenance and repairs in the field, or could be supervising all engineering operations at any location. To succeed in this role requires technical, business and communication skills.

Geologists in the oil and gas sector focus on searching for new deposits and hydrocarbon reserves. The geologist will determine and advise on where hydrocarbons are situated. This is a very detailed task involving various fields of science and a variety of techniques to gather the data required, including geochemical analysis, ground-based sonar and satellite mapping.

A **geophysicist** is a professional who studies the physical parameters of the Earth using electrical, magnetic and seismic methods. Data gathered using these methods enables the geophysi-

cist to locate oil and gas formations and the majority of geophysicists are employed in the petroleum industry. Some geophysicists work outside studying different features of the Earth while others are based indoors calculating and modelling borehole environment and reservoirs conditions. This role can involve a lot of travelling and working in hard climatic conditions.

Maintenance and repair workers perform work involving the skills of two or more maintenance or craft occupations to keep machines, mechanical equipment or the structure of an establishment in repair. Duties may involve pipe fitting, boiler making, insulating, welding, machining, carpentry, repairing electrical or mechanical equipment, installing, aligning and balancing new equipment, or repairing buildings, floors or stairs.

The **petroleum engineer** is required at almost all stages of the development and production of oil and gas fields. The main function of the petroleum engineer is to calculate the effectiveness of field development as well as to find the best method of exploration, which will minimise cost but maximise hydrocarbon recovery. A petroleum engineer is required to understand all the technical and economic aspects of development and production.

A **petrophysicist** helps geologists and reservoir engineers to better understand the properties of the reservoir. The petrophysicist will review the porosity, lithology, permeability and density of the rock properties in reservoirs using data received from the geologists and geophysicists. To study and determine all these properties, petrophysicists use rock samples, electrical tools and software to analyse and integrate certain data. Petrophysics is the study of the physical properties and the rock and fluid interaction in petroleum systems.

The **production engineer** is also a key occupation within the upstream sector and focuses on the daily management of oil and gas production operations. Production engineers monitor and



evaluate the production and efficiency of an oil or gas well. A main responsibility of this role is to assess the flow between the reservoir and the wellbore. Production engineers also design completion systems and choose the best equipment to increase production rates.

A **reservoir engineer** is a specialist who analyses data using special software and reviews specific data gathered during drilling, seismic surveys and core analysis. This specialist function requires detailed knowledge of scientific principles and geology as well as computer simulation and modelling. It is the responsibility of the reservoir engineer to discover how much oil or gas exists in a field and then calculate how long the field's supply will last for. The work of the reservoir engineer is challenging and consists of many aspects and nuances.

Roustabouts work on many oil and gas projects both onshore and offshore, e.g. oil and gas

rigs and drilling platforms. They assemble or repair oilfield equipment and operate hand and power tools. It is an entry level position to support oilfield operations and includes basic labouring tasks such as helping to keep the drilling area in good working order.

A **software engineer** is an IT specialist who designs and processes software to solve information-technology problems. In the upstream sector, software engineers develop programs to control pore pressure, calculate oil and gas production, record data and for many other areas including geological survey, drilling, development and exploration.

Welders can work in all operational areas within the oil and gas sector. They use hand-welding, flame-cutting, hand-soldering or brazing equipment to weld or join metal components or to fill holes, indentations or seams of fabricated metal products. They set up, operate or tend welding,



Process engineers begin a night shift at BP's Whiting Refinery. These employees need excellent analytical, IT and communication skills.





Welders can find jobs across all sectors of the oil and gas industry; this employee is working on Statoil's Polarled gas pipeline project.

soldering or brazing machines or robots that weld, braze, solder or heat-treat metal products, components or assemblies. This includes workers who operate laser cutters or laser-beam machines.

Midstream

Energy trader is a highly stressful job but as with many oil and gas careers, it can be very



Oil trading requires negotiation and analysing skills, but soft skills and the ability to form working relationships are beneficial too.

rewarding. The role of the energy trader is to buy or sell shares in energy, which can be in petroleum, electricity or natural gas, to make a profit. To assess where the energy price is, a trader will analyse potential market drivers which include weather predictions, anticipated increase or decreases in supply and demand and economic conditions.

Pipeline operators control the flow of oil, gas and other industrial materials within a power plant or refinery. Their responsibilities include monitoring instruments and regulating the flow from storage tanks and other operational systems. They may be based at a computer station or out in the field directly checking pipelines for leaks or other damage.

The **shipping manager** manages the shipping and distribution operations focusing on logistical solutions and must calculate the practical and legislative regulations. The shipping manager is responsible for achieving targets and deliveries to customers.

Supply chain managers focus on keeping shortages to a minimum and keeping costs down. This role not only covers logistics and purchasing inventory, the supply chain manager may also make recommendations on how to improve productivity, quality and efficiency.

Downstream

Business managers focus on developing and managing business opportunities within the company and team's business plan. They are also responsible for nurturing and maintaining client relationships with new and existing accounts.

Chemical (process) engineers are responsible for developing new processes to transform raw materials to valuable products or revamping existing ones. They can work in plants, laboratories or engineering offices. Their responsibilities can include ensuring compliance with health, safety and environmental regulations, process design





and optimisation and monitoring plant operations and their performance. Good communication, IT and analytical skills are important for this role.

Electrical engineers design, develop and monitor the manufacturing of electrical products and systems. They can be involved in all stages of a project from the design and conception to development and implementation. Their responsibilities can include ensuring the compliance of

the design with the specifications and codes and monitor the manufacturing of electrical systems.

Environmental engineers are responsible for developing solutions to environmental issues such as water pollution, recycling and waste management. Their duties include conducting environmental studies, such as hazardous-waste management studies and ensuring compliance with environmental regulations.

Case study: an industry of variety

By Katharina Gruenberg, Senior Commercial Advisor, Brunei Shell Petroleum and Chair, WPC Young Professionals Committee
Team skills, hard work and a willingness to travel will pay off.

Joining the oil industry was a lucky coincidence. For my studies, I completed a four-year master's programme in the Netherlands in econometrics and quantitative economics, followed by a PhD in the UK in applied social statistics, looking at the global comparison of homicides. At that time, I did not consider the oil industry as a potential employer but became interested during a statistics conference; Shell was looking for researchers.

All of a sudden, a world of opportunities lay before me. I started with the Statistics Consultancy unit within Shell Research in the UK, even before I had finished my PhD. The variety of projects, ranging from modelling metocean extreme conditions to ensuring platform safety to supporting the design of experiments for alternative fuels in the bio-domain, made me appreciate just how versatile the energy industry is.

About a year after joining Shell, I transferred to the Netherlands with its business environment team Shell Scenarios, which needed an econometrician to analyse global long-run energy demand. This team looks at the links between food, water and energy and the impact of energy on climate change to underpin the companies' strategy. It was also during this time that I finished my PhD and I remain grateful for all the support I received from Shell around flexibility of working

hours and priorities.

After two years of broad thinking about the next

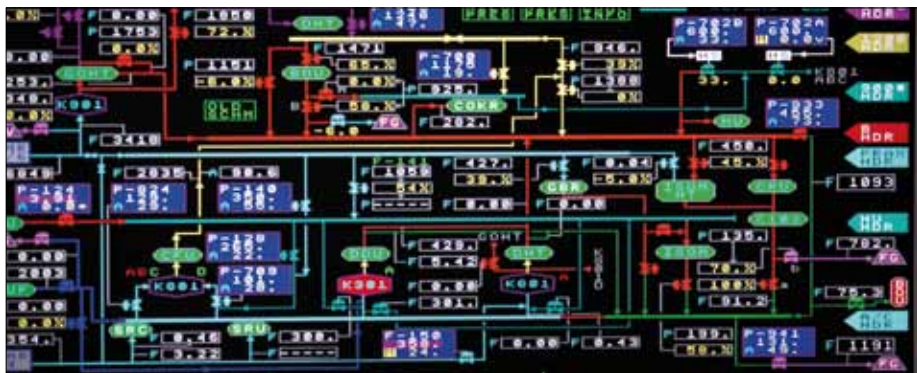
50-100 years, I had the fantastic opportunity to join a project working with part of the Chinese government on energy scenarios to support Chinese policymaking.

Following this project, I joined the Upstream new business development team as an economist to evaluate investment opportunities. Working on different projects gives a good understanding of value drivers in the Upstream industry.

In late 2014, I joined the asset commercial team in Brunei Shell Petroleum, a joint venture between the government of Brunei and Shell. Asset commercial teams manage and negotiate the major agreements (whether concession/unitisation and infrastructure or hydrocarbon sales/purchases) with other companies or the regulators. It's great to work for an operating asset where the money is earned and life is driven by the operations after all my earlier HQ experience.

The downside is that my husband and I only see each other once every two months for a few days, as he didn't want to give up his job. So, as with most opportunities, there are pros and cons but as you can see there are lots of exciting possibilities in the oil and gas sector.





Systems engineers play a crucial role in downstream activities. This is a data screen at BP's Whiting Refinery in Indiana, USA.

Laboratory engineers are responsible for the proper functioning of laboratories and lab experiments and can be based in a fluid dynamic lab, chemical lab, mechanical lab or any other engineering discipline. They design pilot plants inside the laboratory and conduct experiments and tests. Duties can also include checking and setting up tools, materials and equipment, and ensuring experiment protocol and technical procedures are adopted and followed.

Mechanical engineers are responsible for the design of mechanical systems such as engines and machines. They can work on all stages, from research and development to manufacture, and projects can be very varied from improving

production processes in large oil refineries to designing new production processes.

A **systems engineer** is responsible for the company's information system. It is their role to install, configure, test and maintain operating systems, application software and system-management tools. They may also be involved in the development and testing of software.

Technical sales engineers use their technical background and sales skills to advise and support the clients before and after a sale. They also assist sales teams to fully understand the needs of the customers in order to provide appropriate solutions. The job requirement may vary depending on the product or service. For instance, a company selling pumps is likely to hire a technical sales specialist with a chemical or mechanical engineering background.

NON-TECHNICAL ROLES

The technical side of the oil and gas sector is supported by a number of non-technical roles offering additional opportunities to those who wish to join the industry in areas such as finance, marketing, design, legal or administration.

Accountants and auditors examine, analyse and interpret operational and business accounting records to prepare financial statements, give



Dennis Braaten (right) is BP's Maintenance Analyst for Gulf of Mexico Operations, with a superb knowledge of financial processes.

advice or audit and evaluate statements prepared by others. They install or advise on systems of recording costs or other financial and budgetary data.

Architects are responsible for planning, designing and overseeing the construction of buildings and structures, but their main goal is to build a structure as efficiently and safely as possible. They are most notably involved in the initial design and construction phase but will stay involved throughout the course of a project. In the oil and gas industry, architects are involved in the construction of buildings and other civil projects where they will work with structural and civil engineers and designers, as well as construction managers and engineers.

A **catering manager** is the person who manages the day-to-day function of providing a catering service. A very specific career path for catering managers within the oil and gas sector is to work on an oil rig, catering to the offshore team and taking responsibility of food preparation, supervising the chefs and other catering personnel in the galley.

Commercial divers often work in the oil and gas industry as it is currently the largest employer of this role. Inshore work around harbours and onshore work on oil rigs is available but most divers will work in diverse locations around the work. The job can involve inspections, repair, removal or installing equipment on varying structures. As a commercial diver, you may be required to train in the use of a variety of power and hand tools, such as drills, sledgehammers, torches and welding equipment.

Commodity traders collect, analyse and negotiate prices with suppliers and conclude market transactions for crude, petroleum and petrochemical products. They build relationships and develop, manage and monitor a pipeline of opportunities for both new and existing customers that have the potential to achieve or exceed the agreed growth targets.

Communications managers develop and implement media and communications strategies. They often work with external agencies to distribute the communications agenda on behalf of their organisation.

Contracts and procurement managers have a very busy and varied job. They will be responsible for the delivery and execution of all contracting and procurement activities, while carefully adhering to global policies, practices and project requirements.

Environmental project managers will analyse, monitor and manage environmental project impacts, ensuring that technical excellence, cost, schedule and contractual requirements are achieved for upstream and downstream oil and gas assessment and remediation projects. They will be responsible for developing work plans and execution strategies, assisting in the decision-making process and providing project staff with mentorship and guidance on environmental regulation and compliance.

Finance managers manage the day-to-day operations of the finance team to guarantee the accurate preparation of financial reporting and accounts. This role includes implementing accounting policies, internal and external financial



An oil rig provides an alternative career path for catering staff.



A helicopter is refuelled on BP's Mad Dog platform in the Gulf of Mexico. Helicopter pilots rarely lead a normal nine-to-five day.

reporting, financial analysis and internal controls and procedures.

Graphic designers will work on artwork including animation, interactive design, software interface and web-design projects and need to have a good understanding of interactive design principles, usability and branding issues. They may focus on web design, corporate materials, branding or exhibition-stand design among other corporate items.

Health and safety managers are responsible for providing advice and guidance to their organisation to help avoid accidents and health issues in the workplace and to ensure that safe working practices are followed on and offshore. They will also work with the industry and regulators to

monitor and understand the safety and environmental impact of oil and gas operations.

A **helicopter pilot's** task is to transport rig crew between the mainland and offshore oil rigs or drilling ships. This is not a traditional nine-to-five role. Some pilots work traditional five-day weeks but the majority do not.

Human-resources managers provide the service of recruitment, selection and induction processes, using best practice and company policy to ensure recruits have the required skills and are developed and retained within the business. The HR manager will also provide support to line management to maintain high levels of employee performance and, where necessary, assist when performance-related issues may arise.

An **IT manager** is responsible for the smooth running of the organisation's computer systems and works within a set framework of specifications, costs and timelines. This role can involve managing the implementation and maintenance of a company's computing requirements.

Lawyers may choose to specialise in the oil and gas industry, which is not a separate legal system but rather a combination of various areas of law applied to this specific industry. This may involve acting for a client during the sale or merger of an offshore asset or advising on a particular contract.

Marketing managers focus on supporting sales and commercial strategies through various marketing tools including websites, corporate literature, social media and press conferences. They may also assist with the develop of sales and commercial strategies set up to develop the growth of the oil and gas industry.

Medics are responsible for providing medical care for offshore staff and may be designated to a particular plant or worksite. This is a vital role as the medic is responsible for the safety, health and well-being of staff working offshore or on a worksite.

A **petroleum economist** produces risk-based business and economic evaluations for new busi-



ness ventures and existing operations in order to support and assist their organisation with strategic decisions.

A **production manager** manages the department's resources to meet customer commitments and expectations. This involves having an overview of all resources including personnel, equipment and capital. Collaboration with external and internal peers is important for the success of this role.

Public-relations manager is an important role and would work alongside one or multiple business lines of an organisation to plan, implement, and evaluate media communications which support business objectives. It is also the role of the PR manager to protect and build the company reputation and handle the media during a range of topics from new-product promotions to crisis incidents.

The **research and development manager** is responsible for researching and developing new products and technologies to improve existing products in accordance with the organisation's as well as the client's objectives.

Risk-management specialists analyse and oversee risk management issues by identifying, measuring and making decisions on operational or enterprise risks for an organisation.



Accidents are rare in the industry but trained medics are required onshore and offshore to provide attention to injury and illness.

Strategy analysts provide analytical support for strategy and business development, including analysis of different markets and business areas which then support the building of financial and market models.

Supply chain managers co-ordinate production, purchasing, warehousing, distribution or financial-forecasting services or activities to limit costs and improve accuracy, customer service or safety. They collaborate with proposal, project and category teams to determine necessary items for procurement during the project and implement effective sourcing strategies to ensure that suppliers have the capability and capacity to meet current and future business requirements.

Surveyors make exact measurements and determine property boundaries in oil and gas operations. They provide data relevant to the shape, contour, gravitation, location, elevation or dimension of land or land features on or near the earth's surface for engineering, mapmaking, mining, land elevation, construction and other purposes.

Technical writers extract technical information from vendor-supplied drawings and manuals to create maintenance or operations manuals on specific equipment.

A **training facilitator** designs and conducts training and development programmes to improve both the performance of individuals and the organisation, and will also analyse the organisation's training needs.

Nihad Kasraoui is a member of the WPC Young Professionals Committee – United Arab Emirates. Lesana Kurbonshoeva is a member of the Russian WPC Young Professionals Committee. Vlada Streletskaya is a Russian WPC Young Professionals Committee representative.

Additional resources: IHS/API report Minority and Female Employment in the Oil & Natural Gas and Petrochemical Industries, 2015-2035, 2016



Case study: upstream career path

By Jaime Turazzi Naveiro, Upstream Project Manager, Petrobras

We focus on one employee's journey from graduate trainee to Petrobras project manager.

As a graduate student finishing university, there are plenty of possibilities available to choose from. It's common that we, at that stage in life, are academically capable but know little about the business that we are opting to specialise in and how things operate in reality.

So, the first thing to know about the oil and gas industry is that it's an industry! A very large one indeed! It has a global presence, with offices and facilities in almost every country, from major cities to remote towns, including forests, deserts, offshore and the Arctic. In terms of diversity, it also employs people from all over the world. It's common to work in multiethnic teams, with different origins and religions.

The oil and gas industry is also highly complex and a world leader in applied technologies, with cutting-edge equipment and at the frontier of many fields of work.

As an industry, there is a strong safety culture, which is embedded in every decision taken. This is

not only in business but also in our personal lives, as we incorporate the culture and become increasingly aware of hazards and take preemptive measures and analysis to mitigate them.

Finally, it's life-changing for the communities where we operate. The oil and gas industry leads other segments in terms of local engagement and social projects.

A foot on the ladder

My first job upon graduating in Brazil in 2004 was in a business-consulting firm that specialised in the energy sector, where I stayed for two years. I got my first insights of what the industry was like. It was a time of great learning but I soon felt it was necessary to position myself closer to the industry's core activities. So, in 2006, as a production engineer, I joined Petrobras, Brazil's leading petroleum company.

My initial assignment was to conduct technical and economic feasibility studies for upstream business opportunities worldwide. As the trips to different countries accumulated, my awareness of the global aspect of our industry and its social impact became more apparent. In 2008, I was allocated to work in Petrobras' branches in Angola and Nigeria, helping the units in their



At the 2008 WPC Congress, Jaime was already making his mark, winning the Young Author award for a paper he'd written on gas.





operations, which included exploratory blocks and non-operating development projects.

In that period, Petrobras began a major shift in its business plan due to the discovery of the pre-salt province, which opened a prospective frontier in the company's own backyard and very close to its refineries and consumer base. Currently, only 10 years after the initial discovery, the pre-salt reservoirs have reached 1 million barrels per day (bpd) of oil production.

Taking that into account, in 2009, I decided to join a small group responsible for development of the pre-salt projects as a Project and Interface Engineer. It was a fantastic experience, being tutored by senior specialists within the company, working with cutting-edge technology and leading engineering solutions in order to achieve our production goals. Our job was to carry out conceptual and basic design of the Lula Northeast (LL-NE) pilot project, a 120,000 bpd floating production, storage and offloading (FPSO) vessel and 15 deepwater wells, from reservoir drainage planning to the well's design, subsea engineering and technical specification of production facilities.

In 2012, I was promoted to project manager of the Sapinhoá Pilot development, LL-NE's twin. It was a major assignment. I was responsible for its execution and offshore implementation. It was further challenging due to the innovative design of its subsea scope and compressed schedule, which demanded a great deal of integration from several units within the company and the contractors. The hard work paid off as the project reached plateau in mid-2014 and its technology won OTC's Distinguished Achievement Award the following year.

After delivering the project to the operational unit in 2014, I wanted to remain in deepwater production development projects. The learning possibilities, working with leading specialists, the responsibility and exposure were all motivating factors. Hence, in mid-2014, I was reallocated as project manager of Lula Central development, where I am today. As an integrated team, we



On-site at Petrobras' Lula Central project in the Atlantic, which started operation in 2016.

manage to achieve great results, from the FPSO construction to well design and execution. Currently, the project has started production and the ramp-up seems promising.

In parallel to daily activities, I would like to emphasise the importance of continuous learning as a young professional, independently of the field of work, in order to make the transition from junior employee to a company's specialist or manager. I've completed several on-the-job training programmes, dedicated time to make in-house courses and a master's degree, as well as writing a few papers. The effort pays off, as you progress in the learning curve and make an impact in your organisation.

Finally, I truly believe the oil and gas industry offers career opportunities for everyone. Look for engaging and challenging activities that are out of your comfort zone but within your mentor's radar, be mobile, search for learning jobs, preferably work for a while in the industry's core activities, and lastly, be responsible for something and show results. With those drivers in mind, you should be fine.



Case study: building a career and having a life-long adventure

By David Ngu, Commercial Manager, Uganda Integrated Project Group, Exploration and Production, Total

For Australian David Ngu, his career has been an adventure. For him it has been an unwritten story taking him across the world through many different roles.



While at university at Melbourne in Australia, I thought that I had to choose a career. But I thought it better to follow my interests. And my interests were quite varied as I studied civil engineering and law at the same time. I was more interested in travelling, though, and when I got the opportunity I went on an exchange to the University of British Columbia. I've always been interested in seeing the world and meeting people from different cultures.

After graduating from university, I found that I was asked again to make a choice: lawyer or an engineer? Would it be good if I could combine both in a single job, I thought? Hence the strategy to first build a competency in one domain and then branch out into the other.

At first, I started work as a lawyer, in a corporate resources and energy practice group at the firm Corrs Chambers Westgarth. Then, after qualifying over the next three years as a barrister and solicitor in the supreme court of Victoria and High Court of Australia, I looked to move overseas into a different cultural environment.

David moved to Paris and joined an international arbitration practice, first with Coudert Brothers and then White & Case.

I worked mainly on private investment disputes against states; mainly in oil and gas or in other technical disputes where I started to really use my engineering background to cross-examine expert witnesses before international arbitral tribunals. Each case was like a detective novel needing to be explained. The cases were the stories running behind the newspaper headlines. If I stayed in private practice, this is what I would have done for many years. But I had not finished trying something new just yet.

During this part of my career, I was making a bridge between the legal and technical worlds, and being the connection for people between different cultures. I was based in Paris but I was doing arbitration in lots of different countries, working with translators, looking at alternative perspectives and seeing how things appeared from the other side – all important skills.

When I arrived in Paris, I did not speak any French. I had never studied French law or civil law for that matter. I was working long hours in New York law firms and preferred to explore Europe and pursue my interests in France more than learn the language. During these years, I learnt enough to get by and thankfully had some very understanding French friends.

I got my first chance to really learn French when I started working for Total in 2006. I took a position as a lawyer but instead of doing dispute-related work, I worked in a mergers and acquisitions team setting up joint ventures and negotiating entries into various projects. Having seen what could wrong over time from my dispute resolution experience helped to set up better alignment between the parties through the contractual framework.

The acquisitions were all over the place and this meant lots of travel: Russia, Alaska, Papua New Guinea, Azerbaijan, Kazakhstan, Sao Tome et Principe... Beyond visiting the places, the role involved working with people from lots of different backgrounds, often to try to reach a common objective. This was extremely rewarding although the transactional nature meant that it was very intense for periods during the year.

Then, in 2011, I took a very different role; my first technical role as a development engineer. I came in



working on pre FID development studies (FID: financial investment decision) ranging from prospect studies to support exploration, preliminary studies to support appraisal and delineation programmes, conceptual studies and pre-feed studies.

I managed studies for a range of onshore and off-shore oil and gas projects mostly in Africa, in places like Nigeria, Angola and Congo. I was totally amazed at the sheer size of the structures – like floating football fields – and the complexities of putting something together 3,000 metres under the sea, or in a well a further 2,000 metres under the seabed. This is not to mention the wonders of geology or geophysics, or tracing the story of what happened hundreds of millions of years ago in order to try and find oil.

I changed roles again in 2014 to a commercial function, when I took a role as a business manager for new ventures in specific countries in Africa. In many ways, this was like changing seats at a dinner table as I was now organising transverse teams of primarily lawyers and development engineers for specific projects.

I have since moved to my current position as commercial manager for Total's Uganda Project. It's amazing to be part of a project that will change a country. Over a billion barrels of oil in a landlocked country which does not yet produce any oil or gas. And the construction of 1,500 kilometres of pipeline to build across two countries to bring the oil to the international markets.

You become safety conscious in oil and gas, especially in Africa, and Total has strong rules and procedures in place. I was very impressed by Total's security presentation when I first arrived in Uganda – which is obviously mandatory. The depth that they conveyed in terms of history, politics and security issues, in a one-hour session, was

brilliant. It was ideal for people coming into the country for the first time and needing to understand the country risks.

The first career advice I'd give to anyone in the industry is to follow your interests. Obviously, it's better to do something which is needed within an industry but the more that you can add value and develop skills that increase your personal value, the better. If you can find a niche, then great, but beware the world changes fast and niches can disappear. It's best to first become an expert in something and then expand your competency base. And jobs often have many dimensions so think about developing soft skills at the same time as a technical competence.

While it's good to be ambitious and to have well-defined objectives, it's more important to have a good work ethic no matter what you are doing and to be doing something that you enjoy. You'll probably do better at things which you enjoy. But don't stay doing something just because you are good at it. Never be afraid to branch out and learn new things. The world and workplaces continue to change at an increasingly rapid pace. Embrace challenges and seek out opportunities which are outside of your comfort zone. Learn from everyone around you and don't be afraid to ask questions. Everybody is different – and you are too. So make your own adventure. Best of luck.



Foreign travel is a constant factor in David's job at Total so he spends much time travelling to and from Paris Charles de Gaulle Airport.





SECTION FOUR

**SKILL
REQUIREMENTS
AND FURTHER
DEVELOPMENT**

An example of education requirements

*By Priscilla G McLeroy, Director
of Undergraduate Advising,
Texas A&M University*

Preparing future leaders for
petroleum engineering.

Well known for its facilities and faculty, the undergraduate programme at the Harold Vance Department of Petroleum Engineering at Texas A&M University is grouped with The University of Texas at Austin and Stanford University as the best in the US in *US News & World Report*, which ranks colleges and schools. The faculty is comprised of over 40 professors and lecturers, with three members of the prestigious National Academy of Engineering and 15 who are Distinguished Members of the Society of Petroleum Engineers.

The mission of the Petroleum Engineering department is to create, preserve, integrate, transfer and apply petroleum engineering knowledge and to enhance the human capability of its practitioners. Retaining this status requires innovative research and teaching of the core elements for next-generation petroleum engineers. Top-tier schools such as Texas A&M voluntarily seek accreditation by the Accreditation Board for Engineering and Technology (ABET) to find excellence in programmes of engineering.

Based on ABET's evaluation of student-learning, successful petroleum engineers outperform if they are proficient in mathematics through differ-

ential equations, probability and statistics, fluid mechanics, strength of materials and thermodynamics; design and analysis of well systems and procedures for drilling and completing wells; characterisation and evaluation of subsurface geological formations and their resources using geoscientific and engineering methods; design and analysis of systems for producing, injecting and handling fluids; application of reservoir engineering principles and practices for optimising resource development and management; the use of project economics and resource valuation methods for design and decision-making under conditions of risk and uncertainty.

Success as a petroleum engineer begins before entering university. Since admission to a petroleum-engineering programme is highly competitive, applicants should take, if available, advanced-placement high-school mathematics and science coursework. These courses prepare students for the more challenging university mathematics and sciences required in the first year of engineering. Other fundamentals include geology, engineering science, petroleum-engineering principles and practise, petroleum-engineering electives, electives from outside fields of study and liberal arts.

Foundation courses are intended to prepare students for the complex engineering science and petroleum-engineering courses that will follow. The courses general to all engineering fields include calculus, differential equations, numerical methods, mechanics and heat physics, electricity and magnetism physics, inorganic chemistry, statics and dynamics, thermodynamics, transport phenomena, strength of materials and computer programming. These courses are the building blocks necessary to perform in any advanced engineering curriculum. Petroleum engineering students are further required to take physical and petroleum geology, grounding them in critical subsurface concepts for the petroleum-engineering curriculum.



The petroleum engineering curriculum is designed to ensure that students understand and are able to perform in all major areas of petroleum engineering: reservoir engineering, drilling engineering, production engineering and petroleum economics. The latter helps students segue to careers in industry by gaining an appreciation of investment decisions and risk management for engineered projects. Courses in all of these headline areas culminate with a capstone design project. The design project is structured for integrated teams of students to solve a practical petroleum-engineering problem using industry real-time asset data with current evaluation tools.

Petroleum-engineering electives are intended to allow students the opportunity to increase their knowledge and learning in more specific areas of petroleum engineering. Examples include enhanced oil recovery, advanced drilling, advanced production and reserve estimation. Students are also able to take electives in courses outside of petroleum engineering in order to expand their education. These can be courses from other engineering departments or from departments outside of engineering. Examples of typical non-petroleum electives include finance and engineering project-management courses.

Students are also required to take liberal-arts courses in order to make them well-rounded individuals and better citizens of a global community. Students take courses in writing and composition, technical writing and presentation skills, citizenship, social science, fine arts and ethics. Students have the option of studying a minor as well in order to supplement their education and increase their knowledge of the field. Common minors include geology, mathematics and business administration.

Petroleum engineering students at most top-tier universities require an 'industry summer practice'. Summer practicals (or 'internships') give students a chance to put their coursework to test under the direction of practising engineers. This combination of classroom instruction and real-world experience produces graduates who are successful professionals early in their careers and are ready to rise to positions of leadership.

Priscilla G McLeroy is the Director of Undergraduate Advising and Professor of Engineering Practice at Texas A&M University. She has an MS in petroleum engineering from Stanford University in California and a BS in biophysics from the University of Houston, Texas.



Petroleum-engineer students in the lab at Texas A&M University. They will also gain valuable industry experience as part of their course.

UNIVERSITIES: WORLD-CLASS PLACES FOR PETROLEUM COURSES

You've made your career choice, now find the course to build your skills.

Although there is no definitive league table of universities offering petroleum qualifications, some institutions are regarded as exceptional. Here are a few to consider.

Colorado School of Mines, US

Founded in 1874, 'Mines', as it is known, has expertise in resource exploration and extraction, with environmental protection high on its agenda.
www.mines.edu

Curtin University, Australia

The Department of Petroleum Engineering places an emphasis on developing graduates with skills that the industry needs, using real field data.
www.scieng.curtin.edu.au

Delft University of Technology, The Netherlands

The performance criteria is high and the workload is heavy, but its MSc in petroleum engineering and geosciences is tailored to individual needs.
www.tudelft.nl

Gubkin Russian State University of Oil and Gas (National Research University), Russia

The leader in the Russian professional education system assimilates the best traditions of domestic higher-education institutions. Graduates work in all leading Russian oil and gas companies.
www.en.gubkin.ru

Heriot-Watt University, UK

Its Institute of Petroleum Engineering was awarded the Queen's Anniversary Prize in 2015 in recognition of its innovation and research.
www.hw.ac.uk

Institut Français du Pétrole, France

In total, 13,000 former students now work in the oil, gas and motor industries in over 100 countries.
www.ifp-school.com

King Fahd University of Petroleum & Minerals, Saudi Arabia

The highest-ranked university in the country. Its Center of Research Excellence in Petroleum Refining and Petrochemicals focuses on olefin, aromatic and polyolefin catalysis.
www.kfupm.edu.sa

Politecnico di Torino, Italy

The Petroleum Engineering programme is offered in English with frequent visits from experts.
www.pep.polito.org

Robert Gordon University, UK

Home to the DS-6000 drilling simulator. Courses are directed and staffed by industry experts.
www.rgu.ac.uk

Texas A&M University, US

Produces 200 graduates a year, providing a solid foundation in petroleum-engineer fundamentals.
www.engineering.tamu.edu/petroleum

Universidade Estadual de Campinas, Brazil

Based in São Paulo, Unicamp's Center for Petroleum Studies was founded in 1987 with Petrobras' support. Today, courses are available in petroleum sciences, engineering, production and resources management.
www.unicamp.br

Universiti Teknologi Petronas, Malaysia

A private university in collaboration with Petronas. There is a focus on niche areas such as enhanced oil recovery and carbon-dioxide management.
www.utp.edu.my

The University of Adelaide, Australia

Courses include petroleum engineering, geoscience and management.
www.asp.adelaide.edu.au

University of Petroleum & Energy Studies, India

Established in 2003, a wide variety of undergraduate and postgraduate courses are now available in oil and gas, including energy economics and oil and gas marketing.
www.upes.ac.in

University of Stavanger, Norway

Its MSc in petroleum engineering allows students to specialise in well engineering, natural-gas engineering or reservoir engineering.
www.uis.no

The University of Texas at Austin, US

The Department of Petroleum and Geosystems Engineering is the US's most efficient in granting degrees per faculty member and lecturer.
www.pge.utexas.edu

University to your first job: BP perspective

By Suzy Style, Head of UK University Recruitment, BP

Read up on the industry, take time over your application and be ready for a steep learning curve.

At BP, we look for people who are passionate about their subject and who share our values as an organisation. This means we are looking for people who strive for excellence, are respectful of their colleagues and are capable of working effectively in a team. It takes drive, hard work and



When interviewing graduates, BP will assess previous work placements and a candidate's ability to operate within a team.

talent to do well at BP, but we also value a person's courage, curiosity and an eagerness to learn and get involved.

While for most roles you need a strong academic record, either having or being set to achieve a good degree, we also look for well-rounded individuals who can show an involvement and interest in other things besides their studies. For example, being part of a society could demonstrate how you work well in a team, or being captain of a sports team would demonstrate your ability to lead one.

Pre-application: how to develop the right skills and experiences

While we look for evidence of work experience and internships on a prospective candidate's application form, work experience within the oil and gas industry is by no means a prerequisite. BP is conscious that when recruiting for graduate roles, unlike experienced recruits, it is not possible and therefore unnecessary to have the exact work experience to do the role. What really matters to us is any experience you have that shows that you are able to work as part of a team and that you are driven for excellence – it all counts.

That said, when it comes to the interview stage, it is important to demonstrate an interest in BP and the energy sector, so read up on the industry and keep up to date with the latest industry news.

We consider the interview process as a two-way experience, so while we want to know all about your skills and experience, we also expect you to use the opportunity to ask us questions.

Applications and interviews: what to expect

The application process differs in each country so please check your local www.bp.com website for the most up-to-date details. For the UK, our graduate application process starts with an online application form looking at a student's academic background, your motivations for wanting to

work for BP, any work experience you might have and any extracurricular activities you take part in. It's an opportunity to highlight your achievements, both academic and non-academic alike. Make note of any application deadlines to allow yourself enough time to go through all parts of the form thoroughly and submit the application on time – the sooner the better.

At this stage, we also have a situation judgement test where we will ask you a number of questions based on situations that recent joiners have found themselves in. This is designed for us to get a sense of your values and see if they match the values and behaviours of BP.

If you are successful at that stage, you will move on to the online numerical and verbal reasoning tests. The key to succeeding here is practice – even people who are naturally good at these tests could probably improve their accuracy and timing through practice.

Once you pass the online test stage, you will have a series of technical and personal interviews and attend an assessment-centre day. During your interview, try to be clear on your motivation for wanting to join BP and be ready to explain why the energy sector is for you. Be prepared to speak about the significant achievements in your life, both academic and personal, and how these demonstrate that you have the right skills to be successful at BP.

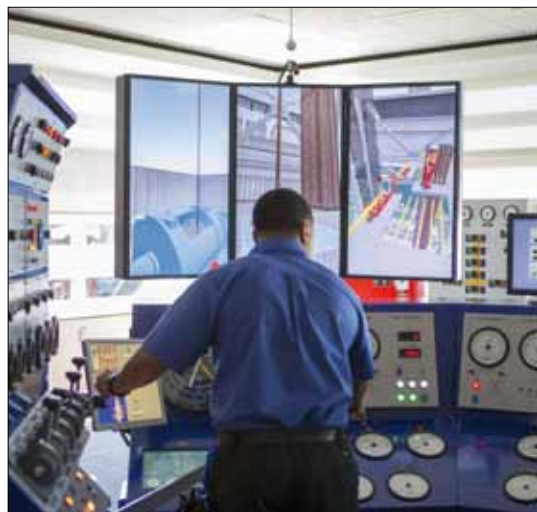
Preparing for the first year in your new role at BP

If you are successful and are offered a graduate position at BP you will join and work with expert teams and will be given real responsibility from day one. You will also have access to training and mentors which will help you build a successful and long-lasting career. BP has a Universal Graduate Scheme, where the training is designed to support students make the transition from studying to the world of work. Areas covered

include: navigating the organisation; collaborating and networking; and presenting yourself and information powerfully.

Depending on the area you join, there may also be opportunities to do rotations, meaning you will get different experiences within your chosen field. It will be a real and steep learning curve, with the opportunity to make an impact from day one. Be enthusiastic, respect your colleagues, ask questions and, most importantly, don't be afraid to speak up. At BP your opinion will be respected and valued.

Suzy Style is Head of UK University Recruitment for BP. Style's role is to develop and deliver the UK graduate and intern strategy, ensuring that BP attracts and recruits diverse, best-in-class graduates. Prior to this, Style worked for Grant Thornton LLP as Head of Experienced Hire Recruitment for the UK and, before this, Style served as Director of UK and Ireland Recruitment at Accenture. She has much expertise in both graduate and experienced hire recruitment.



Learning is a continuous process. Here, a driller controls a Rig Floor Simulator at BP's Helios Center in Texas.



University to your first job: Heriot-Watt University perspective

*By Keith Kilgore, Careers Adviser,
Heriot-Watt University*

Training and skills are crucial,
but so is a positive attitude.

Given the variety of roles, companies and opportunities across the international oil and gas industry, the paths that people will take into and throughout their careers will all be different. However, there are things that you can do in order to have some control in the route that path takes.



Make the most of your university projects and volunteer for tasks, whether in the classroom or your part-time job; positivity is a skill.

Proactivity will be key in making best use of the time spent in higher education to understand and match the expectations of graduate recruiters.

We need to consider what these expectations might mean irrespective of the role or path you are considering, whether focused on science and engineering or commercial and other supporting roles and how to maximise your ability to meet them. I have split my thinking into three areas.

1. Relevant subject, academic and technical knowledge and understanding

When you are studying or working in a field where specific engineering, scientific, business awareness or professional understanding is a natural expectation for future roles, your study will have been designed to underpin your knowledge needed for success. You can see this in the requests made by companies for minimum level and specification of qualifications needed for positions.

It is also important to interpret and explain clearly how what you have studied relates to the role. What key topics have you studied that relate to the role for which you are applying?

This is more important when considering a role which is not specific in terms of subject area or where you are considering moving from one field to another. It will be important to think about how the analytical, communicative and problem-solving-based aspects of your studies can be of relevance.

2. Skills to be effective in the workplace

Terms like employability skills, soft skills, etc, are used to categorise lists of skill words like communication, teamwork and problem-solving, all designed to encourage thinking around the skills required. But without the labels, what does all of this mean? For me, these are simply the skills that allow you to be effective in the workplace, to use the knowledge you have developed and to add value to the company you join. But it still takes a depth of thinking to interpret effectively!



Can I build and maintain effective relationships with others? Can I contribute to a team to help a project move forward? Can I organise my time so I can meet goals and deadlines that I have been set? And, if I think I can, where is my evidence?

Well there are a range of ways to get evidence, especially during time at university:

- Work experience.
- Volunteering, joining clubs and societies inside or outside university and many others.

But there is a piece of the jigsaw which I think goes a long way in bringing all this together.

3. Attitude

Messages I hear from colleagues across the industry are tied up in this last area. The industry is embracing constant change. So what sort of attitude will you need to be successful?

Energy, drive and motivation are three which spring to mind. But also, given the challenges faced, there is a need for resilience. Being able to adapt to change, taking responsibility for your development, being willing to push yourself beyond your current level of experience and having professional integrity in all you do.

As before, though, where is your evidence for this? How can you prove to an employer that you are able to rise to challenges? How can you show that you are driven to succeed? Have you faced challenges but overcome them?

These are not things you can just 'pick up' at the last minute! That is why, at the very outset, I mentioned being proactive and making the most of your time in higher education, both in and out of the classroom.

Get involved

Put your hand up when asked to take responsibility, whether it is a university project or extra responsibility in your part-time job. Try things you have never done before. If it doesn't work, try again, or try something different.



A petroleum-engineer student learns the skills of surveying; Heriot-Watt teaching and research is carried out around the world.

Develop your understanding of the workplace. If you can find work experience, that is fabulous. Also, speak to oil and gas professionals at university or industry events. Use alumni networks to get in touch with graduates who are already on the path you hope to take and don't be shy asking for advice. By taking action early, you can build evidence which will prove that you possess the will-to-succeed attitude that the industry requires.

Develop a profile that shows you have the right blend of subject knowledge and technical skills to be effective in the workplace and a positive attitude which will allow you to make an effective contribution. Whatever you do, though, start now!

Keith Kilgore has been Careers Adviser at the School of Engineering and Physical Sciences and the Institute of Petroleum Engineering at Heriot-Watt University since 2005. He has a PG diploma in careers guidance from Edinburgh Napier University and a BSc in geography from Ulster University.





University to your first job: Shell perspective

*By Jack Dodd,
Graduate Recruiter, Shell*

Tips to standing out from the crowd.

Choosing a job in the energy sector can propel your career in many ways and while it may seem that the industry should be avoided at the moment, it could offer many opportunities on the horizon. Oil and energy companies understand the nature of their business and take a long-term view on the talent pipeline.

Graduate programmes and internships are a way to provide high-quality talent to companies that are preparing for a rise in future energy

demand. Places on these programmes are highly sought-after with challenging responsibilities and rapid progression. It's little wonder that it can still be difficult to land that first role – the all-important foot in the door.

While university is a time to enjoy yourself, meet new people and focus on your studies, it is also the place to prepare for your first job after you graduate. The process of applying for your first full-time job may seem daunting but there are steps that you can take to make it a smooth and ultimately successful process.

It is important to know that companies are looking for more than just academic achievement in a successful applicant. If you think of the number of students at university who are all working towards a degree, companies need proof that you are different from the many other students. Taking leadership opportunities within societies, gaining work experience and volunteering are just some examples of ways of effectively managing your time and demonstrating to your future employer that you are the candidate they need. By taking opportunities and pushing yourself to develop skills, you are gaining experience and collecting key pieces of evidence to bolster your application.

Alongside taking opportunities and getting involved in extracurricular activities, it is helpful to reach out to your university's careers service. Many resources will be available here to help you perfect your CV and provide guidance on which opportunities may match your interests and ambitions. Crucially, careers advisers will not do everything for you and you must be prepared to research and work hard alongside their help.

Once you have decided which career path you would like to take and where to apply, it is imperative to know what your potential employers are looking for. Every company will vary slightly in the skills that they have identified as necessary for successful applicants. Thus, it is important to research these using company websites as well as



In the first weeks of your job, take in as much information as you can. This Shell recruit is learning 3D seismic techniques.





Once you have secured a foot on the ladder, the hard work begins. Never be afraid to ask plenty of questions



Working for Shell gives global opportunities for employment. This is the Bintulu laboratory, a gas-to-liquid facility in Malaysia.

speaking to campus ambassadors at recruitment fairs. Using this information, you can prepare the best application possible by showcasing how your experiences and skills match what companies are looking for.

Online assessments are a popular way to help determine the best graduates for jobs. It's important to practice for these as they are meant to be testing and aim to only allow top talent to proceed. There are many online resources for practice purposes; your careers service can again point you in the right direction. The next likely step will be an interview. At this time, companies will ask for specific examples of instances where you have behaved in a way that demonstrates the skills they are looking for. After all, past behaviour predicts future performance. Interviewers are not interested in what your collective group or team did. Tell them what you did; it's *you* who they want to employ and they can only do that based on the evidence that is provided.

Fast forward a few months and by now you've landed the job, graduated from university and are preparing for life in full-time employment. First, give yourself a pat on the back and take the time to acknowledge how much you have achieved. Also, be aware that there is plenty of hard work ahead. Before you start, read up on the company you are joining and familiarise yourself with the organisation using their website and any other resources available. In your first weeks, be a sponge and absorb as much information as you can. Be prepared to ask questions when you are unsure and don't expect to know everything at the beginning! Take deep breaths; your career is just beginning. Enjoy it – it's an exciting time!

Jack Dodd studied psychology at the University of Birmingham in the UK prior to joining Shell's HR graduate programme. Currently, he is working as part of a recruitment team searching for top graduates to join Shell's IT graduate programme.

Transferable skills

By Agnieszka Kmieciak, Talent Planning and Career Planning Director, Schlumberger

In the oil and gas industry, set your targets high and meet your career dreams.

In the eight seconds it will take you to read this sentence, the world has used 8,000 barrels of oil at a rate of 1,000 barrels per second.

According to the International Energy Agency, oil and gas will continue to fulfil half of the world's growing primary energy demand through to 2040. This will require increasing oil production by 12 Mbpd (million barrels of oil per day) and replacing the 47 Mbpd of supply that will be lost to decline over the same period. It will also require increasing natural-gas production by 47%.

That's sort of a tall order.

So how can the oil and gas industry achieve these increases? The answer is simple: by tapping into the expertise and ingenuity of the people who work in the industry. Let me explain why you might want to be one of these people.

In 2016, the oil and gas industry was in the midst of the most severe downturn in 30 years. A consequence of this was that every sector – upstream, midstream and downstream – was compelled to optimise its intrinsic performance by rethinking its strategies and operating models. In this environment, the oil and gas industry will enable you to perfect your technical skills, enrich

your soft skills and reduce your time to autonomy. You'll do this in an industry with a global reach that includes people from diverse cultures who work in a team environment based on a multi-disciplinary approach to the tasks at hand.

It might surprise you to know that arriving at where you want to be in your career often has as much to do with what are called 'soft skills' as your technical skills. While both types of skills are important, soft skills include your abilities to navigate interpersonal communication, analyse problems, learn new technical skills, manage people, be a productive member of a team project and deliver results by a certain deadline. Sometimes the soft skills required for a position aren't listed in the job description, such as presentation skills, yet they are part and parcel of your success in the role and your overall career development. Like many technical skills, soft skills are transferable from one industry to another.

Technical skill in accounting, chemistry, human resources, IT, project management, sales, business development and the engineering disciplines are readily transferred to positions in the oil and gas industry. Within Schlumberger, one important aspect of moving up the career ladder is not merely by becoming a technical expert but



In the oil and gas industry, you will mix with a diverse workforce. Developing your soft skills will prove as useful as technical skills.

sharing that knowledge with others. This includes writing technical papers and presenting them at external conferences as well as presenting projects and ideas to internal audiences. Are you familiar with the saying, “If you don’t use it, you’ll lose it”? In the oil and gas industry you’ll use it all and acquire new skills in a technically challenging environment that is equally fun and rewarding.

By way of example, at Schlumberger we created an internal Shared Services Organization (SSO) consisting of eight functional teams that span the globe to carry out support activities. The SSO is primarily focused on procurement and sourcing but includes supply transactions such as IT, HR, finance and contracts. Whether or not you work in a technical profession, Schlumberger employees take part in a career-progression programme. Our programmes guide the training and experiences that strengthen an employee’s technical level of expertise and also stretches their capabilities to obtain new skills.

Wherever you are on your career journey, you should make choices that will cultivate your technical and soft skills. There is no rule that says you have to limit yourself by working in one industry in your career. So why not expand your horizons by working in the oil and gas industry?

Consider that at mid-career you have gained a relevant amount of experience that has perfected your technical skills but also honed your soft skills. By now, you can identify your achievements and the impact your involvement had on the results. Combining the achievements connected to your technical skills with your soft skills makes you a sought-after candidate in the oil and gas industry. They also serve you well should you wish to transfer to another industry thereafter.

If you are at the beginning of your journey, the industry offers a borderless career and continuous improvement. The earlier you join us, the more time you will have to advance as the industry sets about rethinking its operating models.



At Schlumberger, you will become familiar with technology lifecycle management, an industry-leading maintenance process.

Imagine yourself on a rig platform in the North Sea where ballast control operations rest squarely on your shoulders. This means you are responsible for moving water in the hulls to ballast the platform so it stays upright. Or perhaps your rig is in the Gulf of Mexico, where 150 crew members live onboard for two weeks at a time. Maybe the Amazon forest is more your style, working in Brazil as the lead contracts attorney for South America.

Those who test their mettle in the industry will discover that they’ll work hard and learn that the fast-track to responsibility is the industry norm rather than the exception. Oil and gas reserves exist in all of the world’s biomes from Arctic seas and tundra to deserts, grasslands and forests, and the oceans in-between. Where would you like to go?

Change is part of a career whether you plan for it or not. Your ‘transferability acumen’ points to your willingness to offer up the skills you possess for what you could become with new ones.

Agnieszka Kmieciak heads Schlumberger’s Talent Management and Career Planning. She joined Schlumberger in 2000 in Paris as a personnel manager. She has worked in various roles in HR, operations and consulting.



Technical and soft skills

By The Forum and Soft Skills teams of The Way Ahead, the official publication of the Society of Petroleum Engineers

With a willingness to learn, your career will flourish.

The value of soft skills can't be underestimated. The results of the inaugural *Global Oil and Gas Training and Development Survey*, conducted in 2012 by the Society of Petroleum Engineers (SPE) and BP, show that soft skills are regarded as more important than technical skills in sustaining and progressing a career in the oil and gas industry. In total, 773 oil and gas professionals across 24 countries were surveyed. Topping the list of all-important skills was 'the ability to learn'.

In contrast, the industry feels that the next generation requires more development in soft skills during university years. Initiative and work ethic were found to be weak in new hires from university compared with their technical skills.

With non-technical skills as important as ever for career growth, the tools at our reach today are vast and of high quality. Websites such as www.mindtools.com and www.forbes.com can give you a start in developing managerial skills. Massive open online courses, some of which are free, are available through MIT OpenCourseWare, Coursera and other venues for learning the basics of self-management. These skills can be directly applied

in the workplace through involvement in SPE and other societies and through community outreach.

The first career move after graduating

Are your palms sweaty? Has your mind gone completely blank, not even able to remember your name, let alone your work history? If so, chances are that you are nervously preparing for an interview or have already started the process. Either way, the experiences outlined here can serve as guidance for landing your dream job.

"Ten years ago, armed with my freshly minted university degree, I thought I had all I needed to get and retain my dream job in the oil and gas industry. I was in for a surprise to learn that I needed more than just good grades to advance my career and stay motivated. Since graduating from university, I have evolved by making mistakes and learning from them. The victories I have gained are all thanks to soft skills, the cluster of personal qualities, habits, attitudes and social graces that make someone a good employee and easily compatible to work with."



The oil and gas industry believes that new employees need to improve their soft skills, personal initiative and work ethic.





How did it all begin?

"I had to start by preparing a résumé and cover letter in response to a job application for trainee engineers. As the cover letter was just an icebreaker, I ensured it was succinct, grammatically flawless and did not exceed one page. I ensured that my cover letter highlighted, in a visually appealing manner, two or three of my key strengths that I felt emphasised how I stand out from the other candidates and how those strengths were relevant to the specific position available.

"I recommend that résumés skip details related to hobbies as they tend to consume valuable space. However, you definitely should not hide any breaks or gap years in your experience. Having been on the other side of the desk interviewing candidates, I have found that a break with a good story can be very insightful into the personality of the interviewee and for that reason, should not be something from which to shy away."

If you have had some work experience, like a summer internship or relevant university research, remember that your prospective employer wants to see an explanation of your experience beyond your day-to-day responsibilities. They are interested in your achievements and the impact you had based on your direct involvement. It is vitally important to quantify your impact (e.g. saved one hour per day for each report generated, or designed and coded VBA macros saving two hours a week generating data files) rather than writing in generic terms like 'grew sales' or 'good teamwork'.

Your résumé should also include your accomplishments regarding extracurricular activities such as sports, clubs or societies. A high level of achievement and/or senior positions held in these aspects of your life is evidence of your commitment and motivation, which can help offset a lack of work experience.

Getting a chance to be heard

"In preparing for my interview, the first step I took was to brush up on fundamental technical theory,

practical equations and hand calculations. I reviewed aspects specific to the position that I applied for, such as reservoir flow, separator sizing, hydraulic-pump requirements, well-testing analysis and discounted cash flows. Having a bit of cross-discipline knowledge can help bridge competency gaps when solving problems. My second step was to practice, practice and further practice responses to behavioural questions."

The most likely interview assessment you could face is the STAR technique, which stands for situation, task, activity and response. While this technique has drawbacks in that it can be impersonal, the benefit is that it helps provide a universal benchmark between candidates. There is nothing stopping you from steering your answers in the direction best suited to what you want the interview committee to see.

Interviewers may ask you to describe a situation where you produced work under a tight deadline, had to influence senior management or your professors on an unpopular project, worked through an ethical dilemma or interacted with other disciplines on a common project. Key behaviours that interviewers are looking for are performance, collaboration, growth, and authenticity.

Remember to keep your answers specific, concise and upbeat.

Assuming all goes well, as a new proud professional with an excellent job offer, what do you have to look forward to?

Joining the industry

The beauty of the oil and gas industry is the team environment that you will be exposed to. The interesting things about these teams are their multidisciplinary nature and often diverse multicultural members.

Some cultures bring an aggressive approach to problem solving, while others preach a more traditional, conservative approach. Recognising when an aggressive, conservative or mixed approach to





Employees in oil and gas will be regularly assessed but assessing your own strengths and weaknesses is also key to improvement.

problem solving is required is a valuable tool. For example, when a plant production impact is imminent, a mix of both approaches should be used so as to decrease the production impact while keeping the safety of workers a No.1 priority.

As you grow in experience from a new hire to highly experienced and beyond, chances are that there will be personal and cultural dimensions that will need to be addressed, as well as assessments of your soft skills.

Bridging the gap between where you are today and where you want to be calls for a continuous improvement on multiple fronts: people, time (experience) and place (cultural).

Continuous improvement

In order to advance and accelerate your career and remain self-motivated, it is also important to know what your innate soft skills are through self-assessment and by being open to constructive feedback from others.

"Everyone has some idea of what his or her strengths and weaknesses are. I knew that I enjoy taking responsibility and this turned out to be one of my soft skills. Another way of identifying soft skills for the knowledge of one's self is to have a personal self-evaluation during or after a project. A person who always uses his strengths in a team makes for a good team player."

In her book *The Hard Truth About Soft Skills*, Peggy Klaus identifies that what keeps people from getting where they want to go in their career is rarely a shortfall in technical expertise but rather a shortcoming in their social, communication and self-management behaviours, such as soft skills.

Bridging the gap

Bridging the gap may sometimes mean teaming up with someone whose strength is your weakness. For example, if you are great at brainstorming ideas and putting together a plan but not in its implementation, it is advantageous to collaborate

with someone who is focused on action and delivering on the details.

Bridging the gap may also require you to challenge yourself to develop new skill sets. Since every task has an associated soft skill set, by taking on new roles you are able to develop, expand and broaden your capabilities.

“Variety in tasks can help improve or strengthen your skills. I have developed my public speaking ability on the job, delivering presentations to management, attending and observing well-done presentations in external courses, educating elementary schools about the petroleum industry with a local SPE outreach committee and attending my local Toastmasters chapter.

“Regularly presenting both formally and off the cuff will help build confidence in your ability to engage people across differing industries, demographics, cultures and authorities.”

As you grow within the oil and gas industry, you will be exposed to professional training (external and internal organisation-specific) that will help develop your key soft skills required for your current role and future positions by developing core communication, leadership and interpersonal skills.

Soft skills are a mandatory capability where you need to take initiative to get results, whether it is through formal training or being self-taught or a combination of both.

This valuable skill set will have an effect on your technical delivery and performance in the long run.

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Evidence of sport participation and roles of responsibility within societies will be seen favourably during the interview process.



Further development and career planning

By Tommy Bumstead, Team Leader for Strategic Planning & Special Projects, Saudi Aramco

Narrowing the experience gap.

The oil and gas industry faces a developmental gap with many of the senior professionals now nearing retirement and a lack of experienced personnel readily available to step in and fill the void (in 2011, a Schlumberger Business Consulting benchmark survey predicted a global loss of experienced technical staff by 2014). Young professionals typically require anywhere from six to 10 years of experience, depending on the complexity of their job, before acquiring the necessary skills to be independent contributors. Saudi Aramco identified this industry-wide experience gap early on and decided to address this issue through internal development.

Saudi Aramco is the state-owned oil company of the Kingdom of Saudi Arabia and a fully integrated, global petroleum and chemicals enterprise. Over the past 80 years, it has become a leader in hydrocarbons exploration, production, refining, distribution and marketing. In 2010, Saudi Aramco opened the Upstream Professional Development Center (UPDC) to ensure employees continue to meet the world energy demand.

For many oil and gas professionals seeking development opportunities to close this exper-

ience gap, the answer may be to explore the internal opportunities that are readily available to them within their own organisation. Most oil and gas companies have well-established professional-development programmes that can provide employees with the necessary skills to both meet their current development needs as well as prepare them to grow into productive senior professionals. At Saudi Aramco, the UPDC provides upstream oil and gas professionals, representing nine job families, with the necessary skills to be independent contributors within the first three to five years of employment and ongoing development for senior professionals for the remainder of their careers.

The curriculum for each of these programmes is designed using a performance-based approach to learning. Performance-based training utilises the top performer as a model for training. The content of the training focuses on relevant job knowledge and outcomes from these top performers. It also involves using materials similar to those used on the job and activities that simulate, as closely as possible, the tasks that are performed on the job.

At Saudi Aramco, all professional employees, within each of the nine upstream job families, have individual development plans that identify the training and development requirements associated with their specific job role. For upstream professionals, there are fully established development curricula that encompass both classroom training and work assignments. These curricula were developed using the Performance DNA (PDNA) approach to curriculum design. The PDNA process involves interviewing the top five to seven performers currently working in each job family. The interviews isolate the key outcomes (typically eight to 10) that these top performers produce to meet the overriding business goal for their department. The work process for each of these outcomes is then identified and mapped.



The work processes contain the major steps produced to meet each outcome. This is followed by having the top performers identify each task that must be completed to accomplish each step of the work processes.

Using the information from the interviews, a job family curriculum is designed based on the outcomes that the top performers produce. The curriculum includes courses that are produced for each of the outcomes identified. In each of these courses, the steps of the key work process for that outcome are the modules within the course. The tasks involved in each step of the key work process and how to accomplish each of these make up the activities within the training.

The courses integrate both technical and soft-skills tasks into the course design to simulate the actual work environment as closely as possible. By developing the courses based on each outcome, employees are trained on exactly what they need to produce to be successful within their job based on the workflows of the top performers. After completing a course, employees are

required to complete a work assignment that provides proof of application back on the job.

The UPDC performance-based approach to learning has dramatically reduced the time for employees to become independent contributors. For some job families such as geophysics, this reduction has been five years. The other eight job families have witnessed similar reductions in their employees' time to development as well. By implementing a performance-based approach to learning, the UPDC has reduced training time by focusing on the information needed to produce the relevant outcomes for each job.

This has led to a time reduction to productivity and an improvement in performance by designing our training on the workflows of the performers. It's a win-win for the company and employee.

Tommy Bumstead is a Team Leader at Saudi Aramco's Upstream Professional Development Center. His team is in charge of on-boarding all upstream young professionals and developing new and innovative approaches to learning.



Saudi Aramco's recently-opened Upstream Professional Development Center is helping the company steer through its 'big crew change'.



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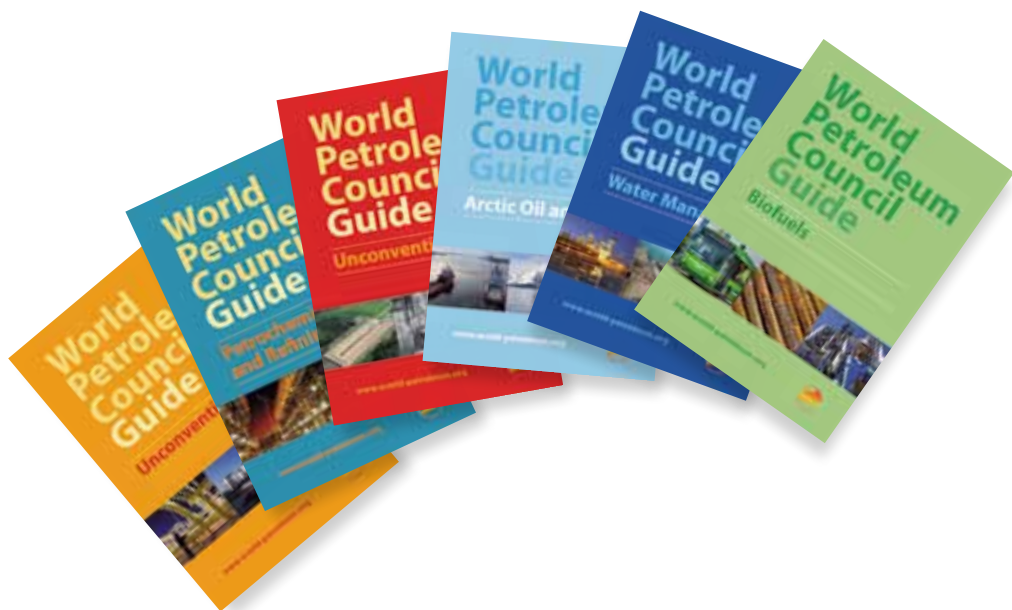
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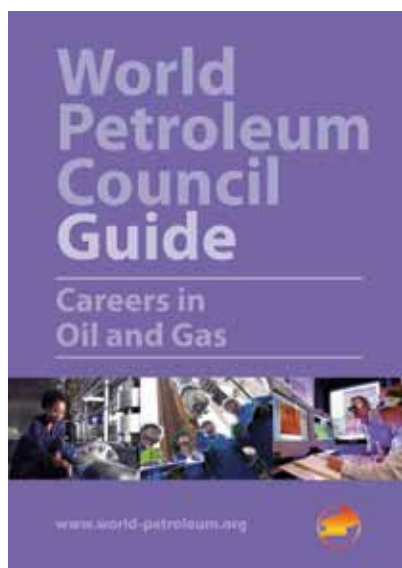
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