An Analysis of Global Safety Trends in the Oil and Gas Industry - Impacts and Challenges in the Years Ahead
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Abstract

This paper examines the safety trends influencing and shaping the oil and gas industry. From rising local content requirements to increasing shortage of skilled workers, rise in unconventional Oil and Gas to an increasing number of frontier oil producing countries, the growing role of Operational Excellence and the most common causes of incidents in the Oil and Gas sector, this paper will discuss facts, figures and case studies from around the world.

The paper was developed using secondary research based on industry reports such as the International Association of Oil and Gas Producers’ (IOGP) Annual Safety Performance Indicators report to provide an analysis of fatal incident rates, total recordable injury rate, and lost time injury frequency. The research also referred to country profiles published by the US Energy Information Administration (EIA) including energy outlooks, analyses and projections. Information was culled from annual reports of international oil companies, technical papers published by the Society of Petroleum Engineers (SPE) as well as white papers by industry leaders, think tank groups and consulting firms.

While the presentation offers a bird’s eye view of the safety industry at large, it delves deeper into safety issues outlining the scope of the various challenges and how they influence Health, Safety and Environment (HSE) management. It highlights the importance of heeding lessons learned from catastrophic incidents as well as the adoption of industry best practices and integration of Operation Excellence into the core business operations to prevent disasters. Concerns on unconventional production and the need for regulatory frameworks in emerging countries indicate that regulatory bodies need to catch up and fast track research efforts to regulate the unprecedented growth and expansion of the industry. When taken together as a whole, the global safety trends indicate that investments on safety or the lack thereof has a huge impact on business continuity and sustainability.

This paper was developed to give safety practitioners a better overview of the challenges, opportunities, new developments and trends shaping the global Oil and Gas industry.

Introduction

In light of major accidents that have marred the history of the oil and gas industry in the last few decades, health and safety have become the top priority in the industry. These have highlighted the importance of considering human factors during design, construction, and installation stages. To enforce these, the Occupational Health, and Safety (OHS) focuses on protecting and providing regulatory and compliance measures promoting health and safety at the workplace.

In the UK, these measures and regulations were actively revised and enforced ever since the Piper Alpha disaster in 1988. Considered to be the world’s deadliest oil rig accident, various regulatory bodies and legislations were passed after the incident to mitigate risks and impose safety standards in the industry (Oilandgasuk.co.uk., 2015). The Offshore Installations
Regulations 1992 was one of the first legislations which made it mandatory for owners of offshore installation to prepare and seek an approval of the safety package (Turner, 2010). Other key legislations include Offshore Installations Regulations 1995 (PFEER) and Offshore Installations and Wells Regulations 1996 (DCR) [Oilandgasuk.co.uk., 2015].

In the US, the 2010 Deepwater Horizon blast at the Gulf of Mexico caused a major oil spill, for which BP paid $18.7 billion in damages (Gilbert and Kent, 2015), raised regulatory concerns anew. Minerals Management Services, the agency regulating oil and gas activity was split into three due to its passivity and poor performance (Edition.cnn.com, 2011). The three agencies, Bureau of Ocean Energy Management, Bureau of Safety and Environmental Enforcement and Office of Natural Resources Revenue would handle energy development, effective enforcement and revenue collection respectively, thereby tightening oil and gas regulations while focusing on safety (Ens-newswire.com, 2010).

Also following the Deepwater Horizon blast, the EU adopted the Offshore Safety Directive (2013/30/EU) which recognized the minimum requirements to prevent major accidents in EU’s offshore oil and gas operations and limiting the consequence of these accidents (BIO, 2014).

**Statement of Theory and Definitions**

Despite strict regulations, the oil and gas industry has been suffering from negative public perception due to economic and environmental concerns that are exacerbated by rare instances of catastrophic events that often lead to public protests, marches, and media backlash (Edman, 2013). To counter this negative perception, a consensus is that the oil and gas industry needs to increase reporting and communication efforts towards the public.

Since 1985, the International Organization of Oil and Gas Producers (IOGP) has been collecting safety incident data from its Member companies. On an annual basis, they publish the Safety Performance Indicators report that aim to inform industry stakeholders and the public of the industry’s efforts to establish consistent approach to training, management and sharing of best practices throughout the world. Another source of information is the International Energy Agency (IEA) which publishes an annual energy market analysis and projections and a host of free publications such as their energy statistics, policy pathway series, country reviews and journal.

Professional organizations such as the SPE and ASSE conduct conferences, exhibitions and workshops to set policies, publish research and develop reports that showcase emerging technologies. While these conferences are mostly for members only, the organizations are pouring in more effort to get the rich information across the media and to the public.

In recent years, there has been a growing recognition that safety is as important as drilling and production operations. The lack of safety precautions or the deliberate violation of safety measures has a direct impact on cost and may in extreme cases put production to a standstill. It may even result in billions of dollars of losses for all parties. Disasters do not happen on a daily basis yet its impact extends beyond the project life. Day in and day out, personnel continue to work on oil rigs across the world without an incident. The public needs to know of industry standards, good neighbor practices and the innovations it is implementing. A report on the safety trends in the industry will help build positive public perception by sharing facts based on research, reports, project successes and safety performance.

**Description and Application of Equipment and Processes**

**Trend 1: Lack of skilled workers in the Oil and Gas industry**

In the last 20 years, technological innovations such as fracking and horizontal drilling have made shale, oil sands, high pressure and deep water extraction possible. The implementation of such breakthroughs, however, requires specialists. The Oil and Gas industry is now facing one of the largest skills gaps in any industry with 64% of all companies reporting concern over filling skilled job positions in 2014 (Low, 2013).

Another major concern is the departure of the senior workforce. Unlike most industries, the age of retirement in the Oil and Gas industry is 55. According to the Interstate Oil and Gas Compact Commission, the average age of industrial workers today is between 46 and 49. This leaves the industry with around 7 to 10 years before more than half the senior workforce leaves for retirement (Interstate Oil and Gas Compact Commission, 2015).

Owing to the drop in oil prices, there has been a drastic change in the industry between 2014 and 2015. This has had a number of effects on the workforce in the industry. While the industry already had an acute shortage of skilled workers before the oil price dropped, the problem has become even more complicated with the current situation.
With the downturn, the industry, especially in the American and European markets has trimmed its workforce massively. Up until now, around 75,000 workers have been laid off, with this number expected to rise by the end of 2015 (Helman, 2015). The big three oilfield service companies Halliburton, Schlumberger and Baker Hughes have laid off 22,000 within the first quarter of 2015, with further reductions expected to continue throughout the year. This gap in the skilled workforce is expected to widen in 2015, largely due to the increased number of layoffs experienced in this industry. The first quarter of 2015 witnessed around 45% decline in field service workers (Melilo, 2015).

Organizations have also been reducing their benefits structure to remain intact with the market conditions. For instance, one company would no longer provide health benefits to its 4,400 retired workers or those who would be retiring soon (Davidson, 2015). This squeeze was also felt in the European markets that have been considerably slow in the adoption of fracking and shale exploration (PennEnergy, 2015). Rigzone’s Global Hiring Survey highlighted that 62% of global hiring managers blamed market volatility for the reduction in their hiring plans (Melk, 2015), thereby freezing many training and recruitment programs.

On the other hand, the Middle East has been using this opportunity to recruit highly skilled people from the west who have lost their jobs and are more willing to relocate given the current economic climate. While there is still a fair amount of downsizing in the general labor market in this region within the industry, workers with critical skills are still in demand.

**How does this influence HSE?**

**Preparing for the great crew change:** The shortage of experienced workers in the field leaves the industry with a higher percentage of inexperienced workers who tend to take the easier (not necessarily safer) way of doing things. Industry reports have indicated that workers under the age of 25 are more likely to be injured on the job than older workers (Loughlin and Barling, 2001).

**Learning and development in the digital age.** The challenge that has become evident in recent times is the huge gap between safety training and the skills required for the young workers once they are at the worksite. The industry requires flexible and highly efficient training delivery options such as blended learning and social marketing to target the young, digitally savvy workers (Daher, 2014).

**Trend 2: Local content requirements are on the rise**

‘Local content’ refers to the added value brought to a host nation or region locally through workforce development (employment and training of local workforce) and investments in supplier development in terms of developing and procuring supplies and services locally (International Petroleum Industry Conservation Association, 2011).

It is becoming an increasingly important area of focus for Oil and Gas companies. About 90% of new hydrocarbon production in the next 20 years will come from developing countries that are introducing stronger requirements for ‘local content’ as part of their regulatory framework (Esteves, Coyne, and Moreno, 2013). Even in some oil producing countries where ‘local content’ is not mandated, non-official and ‘soft’ methods are used to motivate service providers into choosing local people and suppliers. When delivering services with tight margins, the sustainable success of any organization will be heavily dependent on local content factors.

Local content is becoming increasingly important in the more developed Oil and Gas regions of Africa like Angola, Congo, Nigeria, South Africa, Libya, Tunisia, and Egypt. It is also gaining much traction in oil-producing regions in the Middle East like Saudi Arabia, Iraq, and Oman.

The key objectives of local content requirements are to ensure job creation, talent and skill enhancement, and the transfer of technology to the host country and its local citizens. For international operators, the local content offers an opportunity to help develop local businesses and personnel while running operations in a more cost-effective manner. For host nations, it opens up a wide range of opportunities to develop local infrastructure and related industries. On the flip side, drawbacks include unrealistic expectations and targets that could make an operation unsustainable. To ensure a successful local content strategy, long-term commitment is essential.
How does this influence HSE?

Skilled labor. One of the key challenges of local content is to find suitably skilled labor. If there is a legal requirement for a certain percentage of people from the workforce to be local, there has to be a strong system in place to ensure that the local components of the safety team are trained to perform at the same level of skill and expertise as the expatriate workforce. Onboarding and on-the-job training play a vital role. Any compromise in quality of the local people hired for safety roles will immediately result in a reduction of safety standards on the job site.

Education levels. Local education standards may vary and may not be at the same level of the expat. This has to be taken into consideration and clear, focused training materials with the local population in mind have to be designed. Training can range from short-term language and technical courses to advanced scholarship schemes and provision of schooling facilities.

Language and cultural differences. The expat workforce needs to ‘understand’ the local culture and put things into the local context. This is a slow process of immersion that takes place at various levels over a long period. Expat managers need to understand clearly that their attitudes towards safety could be completely different from that of the locals that they are working with; clear expectations and ground rules for mutually accepted safety behavior need to be set and continuously taught, encouraged, embraced and adhered to. Language barriers also need to be navigated, understood and taken into consideration to ensure that there is no misunderstanding between what is being said and what is being understood (Daher and Critchley, 2013).

Supplier development. Safety isn’t just the responsibility of a safety officer; it is the responsibility of everyone involved in a project. With this in mind, including local firms in the supply chain is an integral aspect of the local content. Procurement strategies need to be modified to foster the development of local suppliers where possible and applicable. This will ensure that foreign companies can tap into the suppliers’ firsthand knowledge of issues and standards of safety equipment while making them partners in championing safer and profitable operations for all concerned.

Trend 3: Rise in Unconventional Oil & Gas

Spurred by growth in Asia and Middle East, the US Energy Information Administration projects that liquid fuel consumption will rise 38% by 2040 from 87 million barrels per day (MMbbl/d) in 2010 to 119 MMbbl/d in 2040 (EIA, 2014). Technological innovation has allowed the oil and gas industry to improve its performance. While new technologies like fracking and the shale gas revolution have provided the USA with an opportunity to boost domestic production, the current low prices of oil have put a check on the explosive growth of the industry.

This squeeze is evident as organizations cut back on their budgets thereby maintaining efficiency. Apache reduced its rig count from 90 to 17 (Parshall, 2015). Unconventional onshore operations budgets have been cut by 30%-60% in comparison to the unconventional offshore operations whose budgets were cut by 12%-20% (Rassenfoss, 2015), largely due to the fact that many onshore fields are fairly developed and harvested.

Organizations within the shale industry are working on controlling their cost structure. While technological innovation has eased the process of extraction, it is the employment of these capital resources which is difficult. In light of the economic conditions, shale firms have now selected only those wells to drill which would surely provide them with good returns. Importantly, the shale industry has shown great potential, with shale firms having the ability to adapt to prices. However, with oil prices predicted to remain flat for a longer period, this adaptability is currently a slow process due to the lag in injecting capital investment.

How does this influence HSE?

Regulating a rapidly evolving industry. Shale gas extraction operations are often in remote rural areas. As such, worksites are required to be fully capable of handling emergencies such as fires, blowouts, and hydrogen sulfide exposures. Occupational hazards include exposure of truck drivers to large amounts of silica. Studies by the Center for Diseases Control and Prevention’s National Institute for Occupational Safety and Health (NIOSH) show that high exposures to silica may cause silicosis and lung cancer in the long term. Employers are required to control dust exposures by improving existing engineering controls and safe work practices. Recommended practices include wetting the sand, enclosing points where dust is released including cabs, booths and vehicles and providing respiratory protection when necessary (OSHA, 2012).

There is also a heightened risk factor associated with exposure to Hydrochloric Acid (acid fracking) and the potential for fire due to large volumes of diesel fuel required to operate the fracking equipment. Given the young age of the industry (about 20 years old in the United States and ten years in Canada), frameworks for managing the risks posed by shale gas development are now being developed in these countries (Council of Canadian Academies, 2014).

The importance of monitoring and research. Oil sands worksites present potential risks because people operate heavy equipment and may be exposed to hazardous substances (CAPP, 2014). The Canadian industry created ENFORM to provide safety alerts, assist in the development of industry-recommended practices and audit the safety practices of companies. Most
oil sands products are transported via pipeline. However, a sharp increase in the use of rail and marine transport is expected while new pipelines are constructed increasing the risk of oil spills during transport (Crosby, Fay, Groark, Kani, Smith, Sullivan, and Pavia, 2013).

**Improved offshore safety.** The biggest risk in deepwater production comes from unplanned discharges. Malfunctioning valves, corrosion, blowouts and human errors can lead to fatalities and oil spills (Martin, 2012). Due to the isolation of deep water rigs, blowouts and spills take longer to control. In 2012, the American Petroleum Institute (API) created a center for safety to ensure rigorous audits and enforcement of best practices in offshore operational integrity (API, 2013). Well design practices that were previously voluntary have become mandatory. Third-party inspections and certifications are also necessary for every stage of the drilling process, and blowout preventers have to be certified to meet new standards for testing and maintenance (Bromwich, 2011).

**Tapping into the last frontier.** Greenland passed its first offshore drilling legislation in 2010 to set higher requirements for offshore drilling in Arctic waters. Greenland’s requirements include ice handling programs and an exceptional two rig policy that demands companies install two drilling rigs for every well. The purpose of the second rig is to reduce the time needed to mobilize a rig to drill an emergency relief well (Martin, 2012).

Care should be taken that cost pressures do not compromise safety standards in unconventional oil and gas.

**Trend 4: Increased proximity between Oil and Gas facilities and communities**

One of the most concerning issues deriving from the proximity between Oil and Gas facilities and the population is unplanned exposure to potential wellbore effluent. During the drilling and production process of Oil and Gas, toxic gas may be released into the atmosphere. When operating critical wells (high pressure and H2S content), there is always a risk of uncontrolled sour gas releases. When H2S escapes to the surface, it has the potential to disperse quickly, reaching nearby worksites and communities. Exposure to H2S can have serious effects ranging from lasting physiological and neurological impairment to death (OSHA, 2015).

To limit the risk of such an incident, safety personnel ensuring compliance with safety policies and adequate safety equipment need to be on site. If there is toxic gas present in drilling, production or refining operations, companies need to ensure all workers are oriented on site-specific hazards, emergency muster points, evacuation procedures, and that only properly trained people can access critical zones within the facility (OSHA, 2015).

Even with precautionary measures in place, unplanned releases may still happen. To minimize external impact, companies need to work on community protection. Companies determine the reach of a potential release through dispersion modeling. As toxic gas leaks in the air, solar heating/radiative cooling determined by cloud coverage and latitude from the equator, wind speed and direction, surface roughness, terrain and height from the ground are all factors that affect where the plume is headed and whether it will reach a populated area with a concentration that is harmful to the community (Daher, 2012). The result of the dispersion study determines an Emergency Planning Zone (EPZ). This area has to be carefully delineated to ensure the safety of the public near the site.

**How does this influence HSE?**

**Gas monitoring and public protection.** An emerging trend in community protection is the integration of communication technology such as wireless, GPRS or Wimax to gas monitoring systems and public alarm systems to get the right information at the right time to the right people. Data such as gas readings, wind speed, wind direction, GPS coordinates, identification (location) and distances from project/work site or other designated points are transmitted through wireless technology to the base which in turn processes and averages data to help well site safety supervisors make well-timed decisions (Daher, Dowd, Pye, and Wicker, 2014).

**Early warning and notification.** In the event of a release, the ERP will be executed. The ERP contains details on emergency levels and required actions, responsibilities of the company and local authorities, evacuation and sheltering places, ignition procedures, resident information, maps and more. Additionally, warning and public alarm systems that are both visible and audible ensure early notification so a timely community evacuation can be performed (Daher, Dowd, Pye, and Wicker, 2014).

**Public relations and evacuation.** Drilling any critical sour well within a relatively densely populated area poses daunting community relations issues. Before a crisis occurs, it is important to establish good internal and external relationships with employees, the public, and stakeholders. A crisis communications plan is required and tested during drills. It is important that communities receive air monitoring data and activities schedules regularly, establishing confidence in the functionality of the safety program (Smith, 2012). Another best practice identified is a Resident Information Package with a brief summary of the proposed activities, evacuation and ignition procedures, emergency telephone numbers and a description of the hazards of the toxic gasses present (Daher, Dowd, Pye, and Wicker, 2014).
Trend 5: Rising number of frontier oil producing countries

Over the last few years, new Oil and Gas reserves have been discovered in East and West Africa, as well as Latin America and Southeast Asia. Powered by advances in technologies, business processes, and the pressure to supply increasing demand, Oil and Gas operators are now looking at countries previously regarded as too difficult or too politically unstable.

Across Africa and Asia, governments are stepping up efforts to formulate regulatory frameworks for their Oil and Gas industry. Tanzania plans to present a new natural gas bill to parliament in November 2014 while Uganda is gearing up for the next oil licensing round in 2015 after an 8-year freeze to draw up a legislative framework for its Oil and Gas industry (Bariyo, 2014a,b). Last year, with U.S. and the European Union sanctions, lifted and political and economic reforms underway, Myanmar awarded ten deepwater and ten shallow-water offshore blocks to several foreign and domestic companies (Eia.gov, 2015). After months of street protests in Thailand that ousted the elected government, the ruling military is offering new concessions for 29 exploration areas (Chomchuen, 2014).

How does this influence HSE?

Workforce development. When required, a nationalization program can be put in place with a strong emphasis on training the local workforce to practice international safety standards. Through a rigorous process of recruiting, competency assessment, training, and coaching, companies can ramp up the national workforce. Where the lack of education is a concern, personnel can be selected based on attitude instead of experience and education. To do this, a competency testing is conducted to ensure that personnel are a match for the job.

Understanding the local context. Language barrier is a prominent challenge when recruiting and starting up operations in frontier countries. It is recommended that training materials be redesigned to suit various levels of knowledge with an emphasis on visual aids and practical exercises. Care should be taken to ensure that basic communication levels are established between management and personnel. It is critical to ensure that company standards and safe work practices are adhered to irrespective of differences.

Conducting responsible business. Frontier countries are often in transition and do not have clear frameworks to govern the industry. International companies will do well by bringing with them responsible business practices and company policies. A strong commitment to regulations such as the U.S. Foreign Corrupt Practices Act or the UK Anti-Bribery Act can become an effective risk mitigation strategy. This may mean initial delays in obtaining licenses and going through a painful process of developing and vetting local suppliers, but the long term benefits of transparent business transactions far outweigh the initial cost.

Creating sustainable social investments. Political and social instability is a feature of many countries where there are large Oil and Gas resources. Building strong stakeholder relationships and initiating strategic social investment programs in immediate communities can become a way to combat risks and build a sustainable business in frontier countries (IPIECA, 2013).

Trend 6: Operational Excellence becoming increasingly institutionalized

The Oil and Gas industry has faced a number of major incidents over the years. Between 1955 and 2010 there were more than 44 notable blowouts worldwide (Davis, 2012). A number of factors and chain of events can lead to disasters. These range from reckless safety practices or non-compliance, lack of government oversight, and human or technical errors. Clearly, the best time to prepare for a disaster should be before it happens with a strong emphasis on preventing it from happening. Lessons learned from these incidents indicate the growing need to implement Operational Excellence, a higher order of operational safety that complements productivity, cost efficiency, and continuous improvement.

Regulators, as well as operators, have embraced Operational Excellence. After the 2010 Deepwater Horizon accident, the American Petroleum Institute created a center for safety to ensure rigorous audits and enforcement of best practices in offshore operational integrity (API, 2015). The European Commission proposed a Regulation on safety of offshore Oil and Gas prospecting, exploration and production activities (Popovici, 2012). Oman and New Zealand passed legislation to strengthen their standards on critical safety and environmental regulations (Rose, 2011 and APN New Zealand, 2011).

International oil companies such as Chevron and ExxonMobil have pioneered the adoption and implementation of Operational Excellence. Chevron supports a culture of safety and environmental stewardship and uses the stop-work authority; by which every employee and contractor have the right and responsibility to stop work upon noticing an unsafe act or condition (Chevron, 2012). ExxonMobil reports that since implementing their Operational Excellence framework, their SSH&E performance has improved substantially reducing industry-leading lost-time incident rates, environmental risks, marine spills and emissions (ExxonMobil, 2009).
How does this influence HSE?

**Strict regulatory regime.** Already, governments across the globe are creating regulatory bodies dedicated solely to monitoring the Oil and Gas industry encompassing all stages of operations. Regulators are involved in the review and approval or disapproval of permits. At any time, they may inspect operations and audit operator HSE management systems to ensure structural integrity and workplace safety (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011). Critical to this heightened role is the need to analyze leading and lagging safety metrics that could prove crucial in preventing disasters and update regulations.

**Operational safety and integrity.** It is recommended that operators apply rigorous safety in design through multi-barriers. Safety experts also recommend adopting a life cycle-based, or risk-based performance approach using only best-in-class certified equipment and promoting high safety culture through continuous improvement (Christou and Knonstantinidou, 2012).

**Reliable emergency response.** In the context of blowout incidents, regulators should be at the helm reviewing and approving the safety and feasibility of spill response and containment plans. A strong recommendation in the USA is the need to elevate the commitment to scientific research among regulators and increase consultations with scientific bodies (Binecke, 2013). Having seen the huge impact of oil spills on the environment and communities, operators need to substantiate emergency or contingency plans by allocating resources and capacities before a disaster happens.

**Adopting Operational Excellence.** The need to develop and implement regulatory policies and guidelines using industry-recognized standards and the urgency to adopt operational excellence (OE) has never been greater. Projects will be executed through a structured approach to adopting an operational excellence framework. Founded upon a continuous cycle of improvement, OE will help the industry achieve sustainable improvement, develop organizational leadership and commit towards long-term safety culture change.

**Trend 7: Downward trend of fatalities and incidents but common causal factors prevail**

Overall, reports suggest that fatalities and incidents have reduced over the years. The International Association of Oil & Gas Producers (IOGP) in its 2012 Safety Performance Indicators report showed that the Fatal Accident Rate has fallen in the last ten years (IOGP, 2013). IOGP also highlighted that since 2007, lost time injury frequency has plateaued (IOGP, 2013).

IOGP’s 2013 Safety Performance Indicators report that the number of fatalities has decreased from 120 in 2004 to 80 in 2013, which is a decrease from the Fatal Accident Rate (FAR) of 5.24 in 2004 down to 2.12 in 2013 (IOGP, 2013). The most number of fatalities are due to transportation accidents such as helicopter crashes, vehicle collisions, and water transport. Technical advances have curbed gas leaks and explosions from happening but when it does, it causes tremendous loss of life among the workforce. Exposure to toxic gas during maintenance, inspection and testing activities are also a leading cause of fatalities. Terror attacks such as the incident in Algeria in 2013 are a possible threat to the industry.

Comparative data in Lost Time Injury Frequency from 2004 to 2013 also showed that there is a general trend towards lesser incidents both onshore and offshore. In 2005, for the first time on record, the overall Lost Time Injury Frequency fell below 1.00 (IOGP, 2005). This has been carried on in the succeeding years confirming the industry-wide effort to provide safer workplaces and the strict implementation of safe work practices. Cases of ‘Struck by’, ‘Caught in, under or between’, and ‘Slips, Trips and Falls’ on the same level cause the most number of lost time incidents. In 2013, for example, these top three common incidents accounted for 69% of all lost time incidents.

**How does this influence HSE?**

**Target zero harm.** A look at the ten-year Total Recordable Injury Rate indicates that International Oil Companies, wherever they operate or in partnership with National Oil Companies, have been able to implement their HSE management systems. In recent years, the industry has expanded in regions and remote areas where even the most basic infrastructure to support safety systems are not in place. To successfully operate in these areas, large capital investments are required from the operators including investments in HSE.

**Safety performance and the bottom line.** By developing and sharing good industry practices and being transparent in areas that need to be improved, the industry continues to take steps forward towards sustainability. As any industry expert would know, there is a direct positive correlation between investment in safety, health, and environmental performance and its subsequent return on investment (ASSE, 2014). Safety investments pay off in the long run. However, investments alone are not enough; a shared safety culture that’s driven by the top management and embraced by the entire organization is the true key to improving the industry’s safety performance over time.
Presentation of Data and Results

Countries around the world have introduced initiatives to encourage greater involvement of local content in oil and gas industry. Figure 1 above illustrates examples of a few countries who have taken initiatives and measures to ensure efficient utilization of available resources.

Meanwhile, companies also need to watch out for changes in talent availability across the globe. In a publication entitled Global Talent 2011, Oxford Economics warns companies undergoing a shift in business will also have to contend with the “reskilling” of their workforces and prepare for long-term, permanent structural shifts in demand for labor. Table 1 below depicts the predicted changes of workforce availability across the globe over the next five to ten years.

<table>
<thead>
<tr>
<th>Energy</th>
<th></th>
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<tbody>
<tr>
<td>Western Europe</td>
<td>-11.3%</td>
</tr>
<tr>
<td>North America</td>
<td>22.7%</td>
</tr>
<tr>
<td>Developed Asia</td>
<td>8.0%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>8.7%</td>
</tr>
<tr>
<td>MENA</td>
<td>12.2%</td>
</tr>
<tr>
<td>Latin America</td>
<td>-11.9%</td>
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<tr>
<td>Emerging Asia</td>
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</table>

Table 1. Talent Availability Between 2011-2021 (Oxford Economics, 2011).

Factors such as demographic growth rate of the working population, aging population, employment opportunities, educational qualifications, technological innovations and social changes would influence talent availability in the above regions.
As global gas demand grows, reservoirs with sour contaminants (up to 40% of the world’s untapped gas reserves hold sour gas) are now being developed. Canada was the leader of sour gas field development for years. Taking stock of recent technological developments, sour gas field developments are now underway in the Middle East. Russia, Kazakhstan, China and Europe also have sour gas reservoirs.

![Figure 2. Main sour gas regions around the world (C. Verlaan and G. Zwet, 2012).](image)

Meanwhile, there is also a drive to utilize the discovered resources efficiently by establishing regulatory frameworks. Table 2 below depicts the current Petroleum and Natural Gas Reserves in frontier countries.

<table>
<thead>
<tr>
<th>Southeast Asia</th>
<th>Petroleum Proved Reserves (Billion Barrels)</th>
<th>Natural Gas Proved Reserves (Trillion Cubic Feet)</th>
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<tbody>
<tr>
<td>Vietnam</td>
<td>4.40</td>
<td>24.7</td>
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<td>Malaysia</td>
<td>4.00</td>
<td>83.00</td>
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<td>Thailand</td>
<td>0.46</td>
<td>8.41</td>
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<tr>
<td>Myanmar</td>
<td>0.05</td>
<td>10.00</td>
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<tr>
<td><strong>East Africa</strong></td>
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<td></td>
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<tr>
<td>Uganda</td>
<td>2.50</td>
<td>0.5</td>
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<td>Tanzania</td>
<td>0.00</td>
<td>0.23</td>
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<td>Mozambique</td>
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<td>100.00</td>
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<td>Ghana</td>
<td>0.66</td>
<td>0.80</td>
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<tr>
<td><strong>South America</strong></td>
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<td>Argentina</td>
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</tr>
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<td>Chile</td>
<td>0.15</td>
<td>3.46</td>
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<tr>
<td>Peru</td>
<td>0.74</td>
<td>15.05</td>
</tr>
</tbody>
</table>

Table 2. Frontiers Countries and their Proved Reserves
Note: The above figures have varied slightly over the past year, and the numbers have been adjusted according to current data available.

The increased adaptation and awareness of safety initiatives have led to a steady decline in accidents, injuries and fatalities over the years. Figure 3 depicts the Fatal Accident Rate (FAR) by regions between the years 2009-2014, with the reducing numbers showing a considerable improvement across all regions based on IOGP’s Safety Performance Indicators 2014 Report.
There has been a steady but moderate improvement in the Lost time injury frequency (LTIF) across all regions as illustrated in Figure 4 below.

There has been an overall reduction in Total Recordable injury rate (TRIR) of 4% in 2014. Figure 5 shows reduction in TRIR across all regions between the years 2009-2014.
Figure 5. TRIR by region between 2009-2014 (IOGP, 2014).

5-Year rolling averages were computed in order to even out the variability, as well as provide a better indicator of the performance trend over the years. Figure 6, 7 and 8 illustrate the FAR, LTIF and TRIR 5-Year Rolling Averages respectively.

Figure 6. FAR 5-year rolling average (IOGP, 2014).
Figure 7. LTIF 5-Year Rolling average (IOGP, 2014).

Figure 8. TRIR 5-Year Rolling Average (IOGP, 2014).
Conclusion

This report aims to provide businesses with an overview of the current trends impacting the oil and gas industry. It is important for businesses to have an awareness of the potential challenges in terms of safety, thereby allowing for the necessary initiatives undertaken to mitigate these risks. Hence, to maintain business continuity in this changing economic environment, there must be a strong contingency planning in order. This provides organizations with capabilities and readiness to deal with any major accident that may or may not have been foreseen. Since it is difficult to predict every possible incident in this industry, it makes it viable for companies to plan its contingency initiatives to ensure the maximum safety for its workforce and the environment.

While this report discusses the safety measures, companies can take, it also highlighted incidents where critical business functions failed unexpectedly, leading to difficulties for oil companies to maintain its foothold in the industry. In light of these situations, companies must be strong with its recovery process. It is also deemed necessary for organizations to be resilient to weather the changing trends of the industry. Employers must ensure that their critical business functions are designed in a manner that are not just resilient, but are also safe for the workforce.

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