Quest Masterclass

HSE Oil & Gas: Occupational Health Injuries & The Future of HSE Management

HSE Oil & Gas

HSE management systems is one of the most important areas where specialists in the Oil and Gas Industry need to focus. Most of the operational conditions, chemicals and end products (hydrocarbons and myriad compounds) pose a threat to the workers working in this industry. Companies need to develop principles that increase occupational and safety management processes. Not only Operational Risk Assessments (ORA) need to be conducted, but emerging risks such as cyber security and its impact on asset performance also needs to be taken into consideration. Furthermore, are companies following mandatory regulatory framework? And are they accrediting their HSE management systems to the new ISO standards for safety, quality and environment?

Topics to be Covered:

1. Managing Occupational Health Injuries
2. Managing HSE Regulatory & Compliance
3. The Future of HSE Management

Managing Occupational Health Injuries

1. Standards & Procedures for Managing Health Hazards

In the Oil and gas industry, health hazards can be sub-divided into 2 categories:

A. Safety and Injury hazards

Following is a list of the hazards that come under this category and their possible causes:

Safety & Injury Hazards & Their Possible Agencies

Motor Vehicle Mishaps
- Absence of firm shoulders on the roads leading to well sites.
- Extended working hours often lead to exhaustion.

Unexpected Accidents
- Onsite workers sabotaged and incapacitated because of being struck by heavy machines.

Unpresidented Blasts
- Existence of highly inflammable hydrocarbons.
- Existence of ignition source.

Slips, Trips & Falls
- Recurrent necessity of operating at high altitudes.
- Operating at slippery and uneven surface.
- Lack of professional training or unavailability of fall protection systems.

Restricted Space

- Small apertures for entry and exit.
- Adverse natural ventilation systems.
- Confined places like storage tanks and pipelines are not ergonomically designed.

B. Health and Illness Hazards

Following is a list of the hazards that come under this category and their possible causes:

Upstream
Exploration & Protection

Midstream
Transportation, Storage & Marketing

Downstream
Refining, Sales & Distribution

Streams	Vital Processes	Mediums	Potential Health Effects
Upstream	• Seismic Survey & Evaluation • Exploration & Drilling • Development & Production • Decommissioning	• Pathogenic Microbes • Infection Transmitting Viruses • Drilling Mud • Petroleum Products (Hydrocarbons) • Chemicals & Additives • Very High Temperatures • Silica / Asbestos • Noise / Vibration • Mechanical • Ergonomic	• Infectious & Parasitic Diseases (E.G., Hepatitis A, Cholera, Typhoid Fever) • Trauma Disorders • Chronic Obstructive Pulmonary Disease • Gastrointestinal Disorders • Dermal & Eye Issues • Spinal Disorders • Heat Stroke • Strain • Sleep Shortage • Noise Induced Hearing Loss
Midstream	• Pipelines • Transport & Storage • Marketing	• Petroleum Products (Hydrocarbons) • Accumulation of Dust in Pipes & Tanks	• Dermal & Eye Issues • Pulmonary Disorders • Gastrointestinal Disorders
Downstream	• Product Refining • Petro Chemicals • Sales & Distribution	• Petroleum Products (Hydrocarbons) • Treatment Chemicals • Silica / Asbestos • Solvents • Noise / Vibration	• Dermal & Eye Issues • Gastrointestinal Disorders • Noise Induced Hearing Loss

Companies should adopt proper risk management practices in order to cope with such issues. Assessing safety and health hazards at the workplace requires identification of risks, evaluation of risks, and implementing protective measures to curb those risks. For this, a strategic HSSE roadmap is necessary that determines the periodic targets which need to be achieved and a

workflow chart that clearly mentions the objectives, targets, and priorities that need to be met out. After determining a road map, companies need to train their workforce and meet the requisite compliance and regulations. After achieving the doable, organizations need to create certain performance indicators that are used for auditing the work done. If there are still any challenges, companies need to work on them and correct them before occurrence of any mishap, and if not, then organizations should persist with their actions for continuous improvement.

Below is a visual representation of Risk Management Process that a company should adopt:

Risk Management Process in the Oil & Gas Industry

Planning

- Recognize People Taking Part in The Risk Management Process
- Muster Health & Safety Information specific to Oil & Gas Industry
- Elucidate Strategy & Workflows As Per The Business and Legal Requirements

Risk Identification

- Spot Possible Safety And Health Hazards Within Workplace Through Inspections, Previous Accident/ ill-health Records, etc.

Risk Assessment

- Assess The Risk Emerging From The Identified Hazard
- Locate Existing Precautionary Measures & Expected Failures
- Determine Different Kinds of Injury or ill Health Might Occur
- Rank The Risks Based Upon Extremeties of Working Conditions

Risk Recording

- Record the findings of risk evaluation for expounding control measures, audit, internal review, regulatory purposes

Risk Control

- Define And Implement Preventive Measures To Eliminate Or Minimize The Risk of An Incident / Accident

Follow on Assessment

- Ensure That Implemented Control Measures Are Effective
- Reassess The Efficiency of Preventive / Control Measures

Survey & Monitor

- Refurbishment & Updation of Risk Assessment

Managing HSE Regulatory & Compliance

Managing HSE Regulatory Compliance is of utmost importance but companies need to check whether the efforts are economical or not. Suppose, if a company spends $10 Million to prevent 50 employees suffering bruised knees, it is totally disproportionate. But if a company spends $10 Million to prevent an explosion that could have killed 200 people is obviously economical. Thus, companies should set up goals keeping the principle of "ALARP" (As Low As Reasonably Possible) into consideration. Moreover, companies need be accredit their HSE management systems to the new ISO standards for safety, quality, and environment.

There are 3 ISO standards that companies need to take into consideration:

ISO 9001

a. ISO 9001 certificate proves that your company follows the internationally accepted Quality Management Principles with prime attention on points like customer focus, involvement of stakeholders, systematic approach to processes and operations, good leadership, fact based decision making, good relationships with suppliers, and continuous improvement in operations. This certification enables you to demonstrate higher levels of service quality while bidding for contracts. The fifth edition of ISO 9001 i.e. ISO 9001: 2015 truly fulfils the requirements of the Oil and Gas industry as in the recent times, it has had increased risks, liabilities, and compliance issues which is why, a move from a 'trust' based model to a 'risk' based model is appropriate.

ISO 45001

b. ISO 45001 certificate proves the Occupational Health and Safety Management Systems (OHSMS) that a company engages in. This shows the resolve of the company in providing a framework to boost employee safety, curb workplace risks, and create safe working environment. The ultimate intention of this standard is to increase the overall health and safety performance of the organizations by focusing on reducing work-related mishaps and fatalities, and by building a more engaged workforce with increased health and safety performance. This will definitely increase the corporate responsibility but will also improve its brand perception exponentially.

ISO 14001

c. ISO 14001 certificate proves that an organization has the required environmental compliance and the company is ready to face major environmental incidents such as oil spill response etc. It certifies that a company complies with environmental aspects effectively. It provides improved compliance with environmental legislation and focuses on preventing pollution. The certificate advocates that the company minimizes energy and reduces resource usage by reducing the risk of penalties and circumvent litigation. Moreover, it reinforces stakeholder confidence and creates new business opportunities with environmentally aware customers. In summary, an ISO 14001 certification not only helps an organization to reduce the impact of environmental impact of daily operations but also helps you stand out from competition by showing your commitment to complying with environmental standards.

In The US, The Oil & Gas Industry occupational Fatality Rate Is 2.5 Times Higher Than The Construction Industry & 7 Times Higher Than General Industry

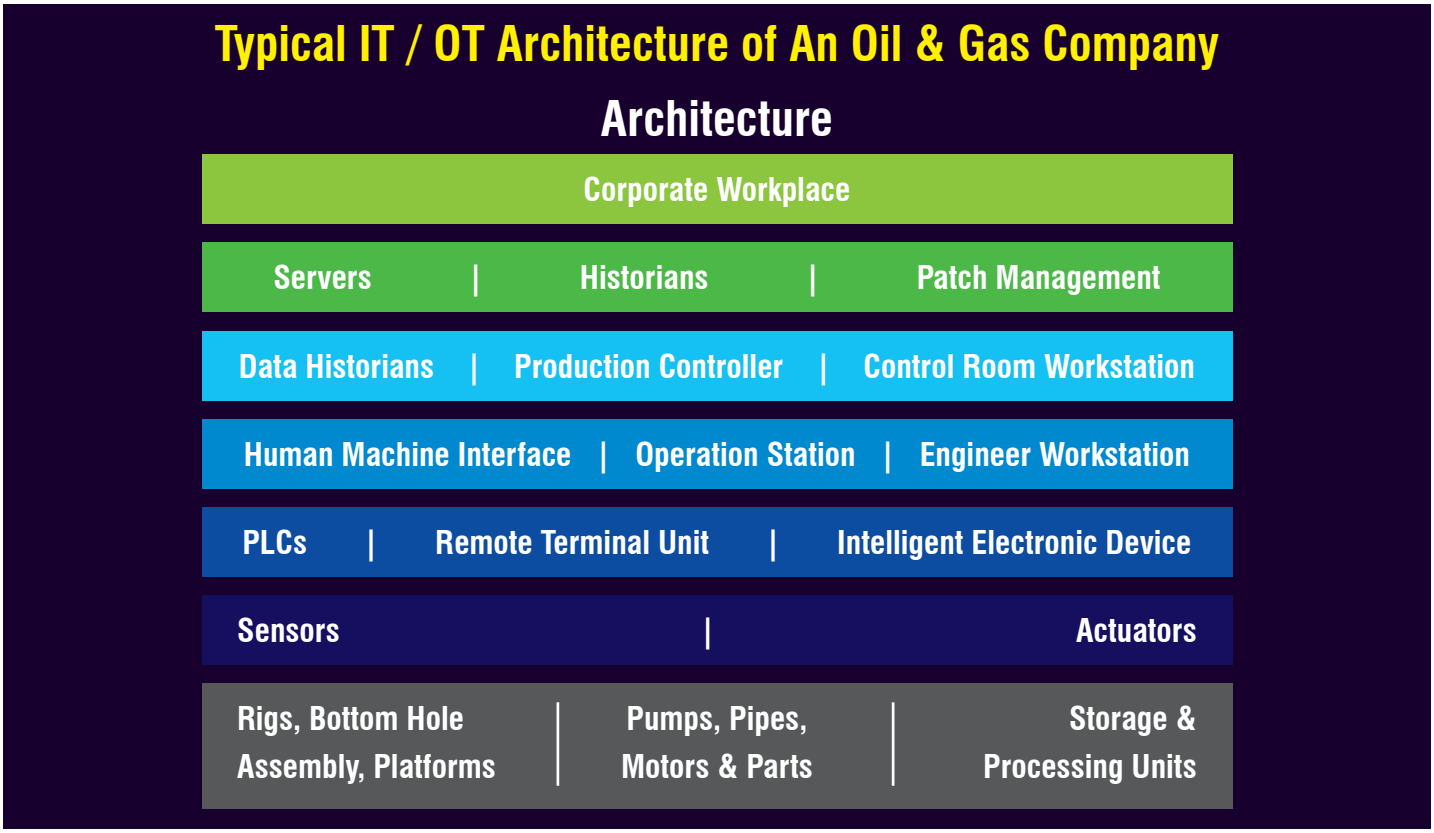
The Future of HSE Management

In the coming times, a single risk management framework will be required to explore, control, and curb hazards. Intertwined layers of complex cultural and political issues need to be dealt carefully to attain corporate social responsibility. But this system will function properly, only if, its constituents namely, health and safety, IT and cyber security, environment, Finance etc. work in tandem with each other. The future of HSE management depends upon the right mix of these elements, and such a framework is known as Enterprise Risk Management.

A. Emerging Cyber Security Risks In The Oil & Gas Industry

People engaged in Oil and Gas exploration generally feel that they are unlikely targets for cyber-attacks. But with hacker's motives of stealing field data, and causing disruptions in the company through industry espionage, risks are escalating fast. Among the upstream operations that includes exploration activities, development drilling and production are open to cyber-attacks. Other activities like seismic image have low probability of such attacks but by increasingly feeding the seismic data into other disciplines, its risk profile is bound to increase in the near future. Also, O&G industry creates and transmit petabytes of sensitive field data using half a million processors that spread across vendors, geographies, and service providers. But unfortunately, it is not limited to just stealing information. Hackers can also play with the lives of the workers, working in the industry. For example, a hacker, using internal optimization controllers, can vary the thermal capacity and motor speed of an integrated sucker rod pump. Thus, companies need to come up with a holistic risk management programme for curbing cyber-attacks. Below is a typical IT/OT architecture consisting of the cyber concerns of an Oil & Gas organization.

Typical IT / OT Architecture of An Oil & Gas Company



There are different strategies that an Oil & Gas company can opt for building a secure, vigilant, and resilient cyber security strategy.

a. Exploration: Malware enters through storage nodes into high performing computing systems after an offshore seismic imaging project using a data management system approaches completion. The malware loots the seismic data without causing any impact on operations. Companies can deal with this type of data-theft by replacing every seismic data element with a non-sensitive equivalent, known as token, and executing applications on it instead of actual data. This technique will offer hackers to exploit data that has no value, as the actual seismic data will be stored in an encrypted format with strong access controls in reliable hands.

b. Development: A wretched software programme can enter the drilling control system through a network loop. This may lead to an unexpected influx of fluid into the well, or a slight deviation in the geometric angle of the well. Such kinds of bad instructions can lead to injuries, deaths and loss of capital. O&G companies can deal with such kinds of issues by deploying an operator in a rig who could identify existing malware and check whether the system is able to maintain the minimum cyber-security standards. Companies should note that securing each and every drilling asset is unfeasible and may also slow down decision making process. Companies should think of developing quarantine systems and cyber-playbooks for both onsite and offsite stakeholders.

c. Production: Onshore control systems can be hacked by disrupting and bypassing the controllers and gearbox operating the motor pumps. This can randomly increase the oil production, can significantly increase the erosion of pumps, and can even rupture wells. O&G companies can avoid such a scenario by following a risk based approach. They can perform a systematic assessment of critical assets by prioritizing updates for such machines. Organizations can also build a strong cyber vigilance system by accumulating necessary information from both, external (including social media) and internal sources.

According to IBM

The Average Cost To A Company For Each Compromised Record With Sensitive or Personal Information Was

$237 for The Oil & Gas Industry in **2014**

$33.9 bn of Security Spending by 2020 due to Oil & Gas Cyber Attacks

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68% Oil Companies Have Experienced An Online Breach

B. Increased Use of Remote Operations to Make Plant Inherently Safer

The developments in the oil and gas industry requires organizations to set oil platforms in farther off isolated regions. This creates intense pressure on oil companies to manage such operations efficiently, so that no harm is caused to the workers working in such hazardous regions. O&G companies have an added advantage of carrying out remote functions because they can institute unmanned operations through which they can achieve noteworthy safety improvements along with augmenting control functionality at an integrated onshore location. This strategy will significantly lower down the cost of traditional routine inspections and equipment repair costs, by shifting the strategy towards condition based maintenance. New and improved data visualization techniques help control room personnel to easily monitor and control a wide range of production processes. Live visual feed provide a 360 degree view of team members that are stationed on the oil platform. Remote operations also help create operations hub where experts of varied fields can have access to strategic data, troubleshoot machines and optimize production, all from an isolated spot. Moreover, through an Ethernet based industrial network, O&G companies can connect various offshore facilities through a distributed control system (DCS). Experts have envisaged creation of Industrial Internet of Things (IIoT) systems, especially for encouraging remote operations in heavy duty industries like O&G. IIoT will have the following benefits:

a. It will enable maintenance of device calibrations without the need for trips to the field by making use of smart digital communication systems.

b. It will allow to prevent failures through on-site monitoring applications and reduce poor performance in heavy equipment.

c. It will help provide worker mobility solutions through closed-circuit television systems. These systems will have nonvisual spectrums like thermal and night vision analytics, that will provide real time data to engineers and keep automation systems off the critical path.

Conclusion: The above eBook explains the importance of having Enterprise Risk Management practices, regulatory compliances, and a future plan for the company at place. Companies need to understand that defining the Key Performance Indicators (KPIs) for HSE and the integration of HSE KPIs with strategic business KPIs is of utmost importance. Also, organizations need to upgrade by accrediting themselves to various ISO Certification Standards like ISO 9001, 14001, 45001. Moreover, companies need to actively maintain global safety and health standards for their employees by investing on digital technologies and remote applications. Furthermore, a good understanding of risk barriers, organizational competency for high risk operations will help the organization to stand visibility ahead of its competitors.