

Analytical study on oil and gas field occupational injuries for high incidence of fatality, bodily injuries and measures of prevention

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Abstract

Oil and Gas, though is available in Earth is largely localized in Venezuela, Russia, US and Middle East and this sector employs a very large number of workers. Fatal and Non-Fatal Accidents though very common, only next to Construction and Transportation Industry, is seldom reported especially in Middle East Countries, where the workers are mostly expats, and where Civil and human Right issues of Expats is grossly neglected. Hence documents and publications about accidents and fatalities are grossly scant, incomplete and inadequate. Hence present analytical research study is based on piece meal reports from scanty publications, internet sources, newspaper, Insurance company claim reports, Bureau of Labor and Employment reports remain the sources for gathering Oil and Gas Field Occupational Fatal and Non-Fatal Injuries.

Keywords: Oil and gas well; drilling accident; oil platform falls; crush injuries, spinal cord injuries, toxic exposure; burn injuries.

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Introduction

“Occupational injuries constitute a major portion of the global injury burden, comprising almost 30% of all medically treated injuries to adults aged 18 to 64 years. The International Labor Organization (ILO) estimated that every year, about 2.2 million people die from work related injuries and work related diseases. Furthermore, there are around 270 million non-fatal workplace injuries occurring, where the victims miss at least three days off work. It is also estimated that 4% of the Gross Domestic Product (GDP) is lost due to workplace accidents and illnesses in the US. The majority of the global workforces are located in the developing countries where the rate of injuries is even 10 to 20% higher compared to developed countries” (1) .

“The oil and gas industry is one of the leading industries where a great portion of workforces are employed. The risks of injuries are higher in such industry compared to other sectors. According to the US national safety council, non-fatal work related injuries are 49% higher for the oil and gas field services industry than for all US industries combined, and these injuries are more severe” (1).

Petroleum in Earth remains the main source of Energy

Petroleum has remained the main source of Energy production all over the world. Petroleum is present in Earth as Oil, Liquid Gas, Oil Shale and Oil Sand. 88 Million barrel of Petroleum and Crude Oil is consumed to produce energy per day all over the world. Proven reserve of Petroleum in the earth is 1,726,685 Billion barrel. (US Geological Survey,2013). 52.2 Million barrel of *Crude Oil* is excavated per day world over and 890.4 Billion Standard Cubic Meter of *Natural Liquid Gas* extracted and exported per day world over (2).

The Activities in Oil and Gas Industry during which accidents may take place

In Oil Industry

The Upstream activities are: 1. Oil Extraction, 2. Drilling Oil Wells. This includes Oil Exploration, Oil Well drilling. The Midstream activities are: 1. Support Activities for Oil Operation. This includes Onshore and Offshore activities e.g. Separator activity, Emulsion breaking, Desilting. The Downstream activities are: 1. Refineries, 2. Associated Industries (3).

In Gas Industry

The Upstream activities are: 1. Extraction of Natural Liquid Gas and Sulfur, 2. Recovery of Hydrocarbon Liquids. This includes Gas Exploration, drilling. The Midstream activities are: 1. Support Activities for gas Operation. This includes Transport of Gas through Pipe line from Onshore to Offshore. The Downstream activities are: 1. Packaging, 2. Shipment of gases (3).

The Occupational Hazards, Fatality and Non-Fatal Body injuries in Oil and Gas Industry

It is estimated that out of 100 Laborer, 1 labor in 1 year suffers from Fatal and Non-Fatal Injury in Oil and Gas Fields world over (4). It can be due to Fall, slip and trip from height in 51% cases; Object falling and hitting in 33.4% cases; Electrocutation in 11% cases; Explosion - Blast-Burn in 6% cases; Injury during transportation in 5.9% cases and Crush-Squeeze-Trapping in 3% cases. The cause of bodily injury is Fire and Explosion in 14.3%; Confined Space fatality in 8.8% cases, rigging activity 6% cases, Gas Pipe Line Commuting in 4% cases, Rigger repair in 3% cases and Welding 2% cases. The body part being injured is Whole Upper Extremity in 38.8% cases, out of which Injury affecting Hand and Finger only in 32.17% cases. Eye injury in 19% cases, Lower Extremity injury in 18.2% cases, Head and Neck injury in 11.2% cases, Abdominal Injury in 11% cases, Chest- Trunk- Back injury in 2.4% cases and Spinal injury in 2.4% cases (4).

The present Analytical research study reviews all available sources to find out Fatality and Injury in Oil and Gas Industry based on 1. Mechanism as cause of injury, 2. Body part injured and 3. Industrial activity leading to injury.

1. Mechanism based fatality and injury in oil and gas industry

- **Man fall and slip was mechanism of injury** in 51% in UAE (2003-05), but only 11.8% in Oman (2007-09)
- **Object fall on man was mechanism of injury** in 33.4% in Saudi Arabia (1995), 15% in Dubai (2003-5), 5% in Oman (2007-9) 74.9% in Doha Qatar (2007-8) and 4000 Cases in Texas, USA (2003-17)
- **Object hit was mechanism of injury in 8 cases in Oman (2007-9)**
- **Electrocutation or powered machine** was mechanism of injury in 11% in Dubai UAE (2003-5),

- **Transport related Road Traffic Accident** was mechanism of injury in 5.9% in Oman (2007-9), and 8.2% Fatal in USA
- **Animal related Road Traffic Accident** was mechanism of injury in 7% in Dubai UAE (2003-5)
- **Explosion, blast and Burn** was mechanism of injury in 6% in Dubai UAE (2003-5) and 8.2% in Oman (2007-9).
- **Crush, Squeeze, Trap, Pinch and Penetrate** was mechanism of injury in 11 Cases in Oman (2007-9) 3% in Doha Qatar (2007-8)

Table1: Mechanism based fatality and injury in oil and gas industry

S. No.	Mechanism of Injury	KSA Am ong Insured	U AE	O MA N	DO HA Qa tar	BAH RAI N	IR A Q
		199 5	20 03 -5	20 07- 9	20 07- 8	2007	
1.	Human Fall-Slip-Trip		51%	11.8%	74.9%	7 per 100,000	
2.	Object Fall on man	33.4% (22,015)	15%	2.9%			
3.	Object hitting man			4.7%			
4.	Electrocutation		11%				
5.	Transport & Commuting			5.9%			
6.	Animal related		7%				
7.	Explosion		6%	8.2%			1.5%
8.	Crush-Squeeze			6.4%	40.3%		3.0%
	Total	100%	100%	100%	100%		
		(65,915)		(12,48)			

2. Body part-based fatality and injury in oil and gas industry

- **Extremities of the body sustained injury** in 55% cases in Dubai, UAE (2003-5), with Lower Extremity involvement in 18.2% cases and Upper Extremity involvement in 38.8% cases in Dubai UAE (2003-5)
- **Hand and Finger of the body sustained injury** in 32.1% in Saudi Arabia (1995)
- **Ankle of the body sustained sprain injury** in 14 Cases in Oman (2007-9)
- **Chest, Trunk and Back of the body sustained injury** in 13% cases in Dubai UAE (2003-5), and in 2.4% Cases in Oman (2007-9)
- **Head and Chest of the body sustained injury** in 12% cases in Dubai UAE (2003-5), and in 11.2% Cases in Oman (2007-9) and in 4% in Iraq.
- **Abdomen of the body sustained injury** in 11% cases in Dubai UAE (2003-5)
- **Face of the body sustained injury** in 9% cases in Dubai UAE (2003-5) (5).

Spinal injury in 2.4% cases in Iraq. (Table 2)

Table 2: Body part-based fatality and injury in oil and gas industry

S.No	Body Part Injured	KSA	UAE	Oman	Bahrain
		1995	2003-5	2007-9	2007
1.	Upper Extremity		55%	38.8%	
2.	Hand & Finger only	32.7% (21,158)		38.8%	
3.	Lower Extremity			18.2%	
4.	Ankle			8.3%	
5.	Chest Trunk & Back		13%	2.4%	
6.	Head & Neck		12%	11.2%	4%
7.	Abdomen		11%		
8.	Face		9%		
9.	Eye			19%	
10.	Spinal Cord				2.4%
	Total	100%	100%	100%	(168)

3. Industrial Activity based Fatality and Injury in Oil and Gas Industry

- **Rigging Sector** suffered 6 incidences of Fatal Injury in USA (2014)
- **Commuting-Transport sector** suffered 4 incidences of Fatal Injury in USA (2014)
- **Crane-Lift- Winch Truck sector** suffered 4 incidences of Fatal Injury in USA (2014)
- **Welding sector** suffered 4 incidences of Fatal Injury in USA (2014)
- **Repair Rigger sector** suffered 2 incidences of Fatal Injury in USA (2014)
- **Fire & Explosion in Gas Pipe Line sector** suffered 14.3% incidences of Fatal Injury in USA (2014); **In Saudi Arabia in Saudi ARAMCO on 18-11-2007 in Gas Pipeline Explosion** 28 workers Died (2007)
- **In Confined Space sector** due to - **Exposure to harmful Environment** 8.8% suffered incidences of Fatal Injury in USA (2014) (Table 3) (5).

Table 3: Industrial activity based fatality and injury in oil and gas industry

S.No	Industrial Activity	KSA(ARAMCO)		USA
		2007		2014
1.	Rigging			06
2.	Commuting-Transport	Gas Pipeline Explosion-28 Deaths		04
3.	Crane-Lift-Winchtruck			04
4.	Welding			02
5.	Rigging Repair			03
6.	Fire-Explosion			14.3 % Fatal 85.7% Non-Fatal Burn
7.	Toxic Gas in Confined Space			8.8%

4. Injuries and Illness Fact Sheet in Drilling oil well and gas well - USA Bureau of Labor Statistics (2007)

Table 4: The top 15 countries having proven oil reserve in world (In Billion barrel)

Sr.No.	Country	Oil reserve	Comments
1.	Venezuela	298.40	
2.	Saudi Arabia	268.3	(undiscovered areas not d)
3.	Canada	171.0 (2014)	
4.	Iran	157.8	
5.	Iraq	144.2	
6.	Kuwait	104.0	Burgan oil field of Kuwait 2 nd largest in world)
7.	Russia	103.2	
8.	UAE	97.8	(40% of countries GDP)
9.	Libya	48.36	(98% of Govt. revenue in 2012)
10.	Nigeria-	37.2	(14% of Nigerian economy)
11.	USA-	36.52	
12.	Kazakhstan-	30.0	
13.	China-	24.65	
14.	Qatar-	25.24	
15.	Brazil	15.31	
Total World	Estimated in	1,726,685 Billion Barrel	

Struck by object 32.5%, caught in object, equipment and material 21.2%, overexertion 11.3%, fall on same level 9.3%, fall to Lower Level 5.3%, struck against object 3.3%, exposed to harmful substance 3.3%, transportation accidents 2.0%, slips, trips 1.3%, all others 10.6%.

5. Proven oil and gas reserve in world (in billion barrel) (2)

Proven reserve for Oil and Gas in world is estimated to be around 1,726,685 Billion Barrel (US Geological Survey, 2013), The top 15 Countries are: Venezuela, Saudi Arabia, Canada, Iran, Iraq, Kuwait, Russia, UAE, Libya, Nigeria, USA, Kazakhstan, China, Qatar, Brazil. (Table 4)

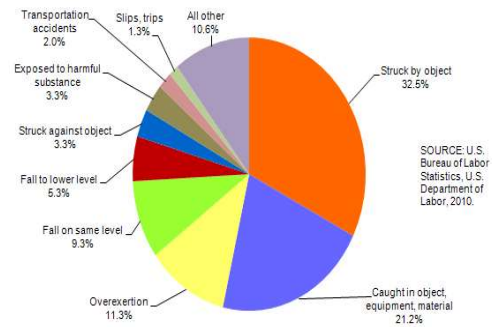


Fig. 1. Distribution of injuries and illnesses with days away from work in drilling oil and gas wells by event 2007 (3).

6. Oil Excavation in World. (in Million barrel per day)

In Excavation of Oil the ten top countries are: Russia, Saudi Arabia, USA, Iraq, Iran, China, UAE, Kuwait, Brazil and Venezuela. (Table 5)

Table 5: Excavation of oil– world production as reported by OPEC in 2017.

Oil Excavation. (Million barrel per day)			
	COUNTRY	CRUDE OIL PRODUCTION	PERCENT OF WORLD
1.	Russia	10.3	13.9%
2.	Saudi Arabia	10.0	13.3%
3.	USA	9.4	12.5%
4.	Iraq	4.5	6.0%
5.	Iran	3.9	5.2%
6.	China	3.8	5.1%
7.	UAE	3.0	4.0%
8.	Kuwait	2.7	3.6%
9.	Brazil	2.6	3.5%
10.	Venezuela	2.0	2.7%

7. Natural Gas Extraction and Export in World (in Billion Standard Cubic Meter) (2)

In excavation and Export of Natural Liquid Gases the topmost 10 countries are: Russia, Qatar, Norway, USA, Canada, Australia, Algeria, Netherland, Turkmenistan and Malaysia. (Table 6)

Table 6: Excavation of natural gases – world production as reported by OPEC in 2017; natural gas export (billion standard cubic meter)

COUNTRY	NATURAL GAS EXPORT	PERCENT OFWORLD
Russia	212.5	18.0%

Qatar	128.6	10.9%
Norway	122.5	10.4%
USA	89.7	7.6%
Canada	84.7	7.2%
Australia	74.7	6.3%
Algeria	53.9	4.6%
Netherland	48.0	4.1%
Turkmenistan	39.0	3.3%
Malaysia	36.8	3.1%

Preventing oilfield injuries

There could be five recommendations for Oil and Gas industry to prevent and decrease Oil field Fatal and Non-Fatal Accidents and Injuries.

1. All tools, materials, and other debris always be put away and secured, after they have been used. This will prevent the risk to co-workers, causing them to trip, slip, or fall.
2. To wear protective gear and clothing e.g. safety goggles or an eye mask, a helmet or hard hat, sturdy boots, long pants and sleeves, and protective gloves, of proper size when on the job.
3. Monthly and quarterly safety training or programs be arranged for workers to sensitize for need to follow all safety procedures and policies at workplace.
4. At the earliest opportunity accidents any unsafe conditions be reported to suitable authority and co-workers. This will help them addressed timely to prevent further future injuries.
5. No untrained person be allowed to

handle machinery, equipment, and tools

Conflict of interest

None

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