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Analysis of sources of information about the accidents and incidents potentially dangerous to the marine exploratory – mining industry

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Abstract
Accidents, breakdowns or incidents threatening both human life and the environment are inherent parts in operating in the offshore sector. Regular monitoring and analysis of all kinds of events are important to isolate the most common and dangerous ones, to be able to prevent them in the future. The article summarizes the sources containing information regarding accidents occurred in the maritime offshore sector. Due to their widespread and easy access, the article is focused on electronically published databases and safety reports concerning the risk and dangers related to the implementation of marine exploration – mining projects. Based on these data, the authors made analyses, presented statistics and proposed ways to minimize threats in the offshore sector of the marine industry.

Introduction

Books and manuals on the assessment and management of risk are only a theoretical collection of information with limited analysis capabilities due to the lack of details available on the cases introduced. Most of them describe selected events that have taken place in the past and that serve as examples to be developed in the book.

Many publications only present data for illustration purposes; there are neither reference to specific events nor exhaustive commentaries, but only a summary of the criteria with which offshore installations should comply. The primary purposes of this type of data sources are, for example, the development of software architecture to be applied to this issue, creation of a system of offshore safety assessment, providing a support in maritime safety decision-making, or increasing the transparency of the decision-making and risk-evaluation criteria. In addition, this type of documentation allows to create the basis for consistency tests during the assessment of the consequences of events by providing reference materials for industry professionals, including those directly responsible for security matters. The data obtained from the sources described may be used where there are "gaps" in the guidelines, helping to determine the appropriate technical policies and good practices (Vinnem, 2007).

Of the many laws and regulations on the activities of the marine search and rescue and of the extractive industries, one is of particular importance: *The Offshore Installations* (*Safety Case*) *Regulations 2005*. This publication provides a set of guidelines aimed at reducing the risk of catastrophic failure and avoiding threats to the health and safety of workers employed in marine sectors. This is an implementation of the report issued following the public investigation into the Piper Alpha disaster, from which derive the obligations of the operator or owner of the

offshore installation to ensure complete security in any aspect, also within the framework of the fulfillment of the requirements to which typical vessels are subject (European Council, 1998).

Electronic sources of information – reporting systems and databases

In light of the legislation of the European Union concerning the offshore sector, an effective exchange of information is expected between all interested parties. In addition, effective preventive security measures are to be taken. In accordance with the relevant guidelines, the minimum information subject to HSE registration includes (HSE, 2015):

- hydrocarbon spills caused by accidents;
- loss of control over drilling or security failures of wells;
- failures of the essential elements of the security;
- lack of integrity of security systems against fire or explosion;
- collision of ships, offshore installations or situations that might lead to them;
- accidents involving helicopters;
- fatal accidents and other types of events involving five or more people;
- evacuation of the staff;
- important events to the detriment of the environment.

With the development of electronic means of information, information regarding the events of danger is increasingly available as remote access databases. To date there is no uniform base of information at the European Union level. There are, however, databases and reports created at the level of the individual Member States and their institutions, resulting mainly from the legislation and internal regulations of the country concerned (Fang & Duan, 2014). Offshore industry information is divided into the following groups:

- leak at the production stage:

In this group the primary data source are:

- *Leak and ignition data base, offshore hydrocarbon releases* – database created by the British institution of Health and Safety Executive (HSE) from 1 October 1992 with access allowed for registered users, the forms are shown on Figures 1 and 4;
- *Offshore QRA-Standardized Hydrocarbon Leak frequencies* – reports created by DNV;
- *Petroleum Safety Authority* (*PSA*) *Risk Level in Norwegian Petroleum Activity* – containing information concerning the Norwegian continental shelf in regard to the level of risk in the oil industry, for which a sample form is shown in Figure 2;
- *Annual Environmental Reports, The Norwegian Oil Industry Association* (*OLF*) – data on the impact of the oil industry on the environment.

Division of electronic resources due to the nature of the event

Leakage from pipelines between drilling and drilling installation

This type of information has been collected in the following documents:

- *PARLOC – The update of loss of containment data for offshore pipelines, Advanced Mechanics and Engineering Ltd.* – a report on events in the area of the North Sea in the form of statistical analysis;
- *data collected from 1984 by the American Agency Office of Pipeline Safety* (*OPS*);
- *Pipelines – Incidents and damages from the CODAM database and Riser – Incidents and damages from the CODAM database*. Includes data from 1975 to the present.
- *EGIG – European Gas Pipeline Incident data Group* – the database includes information from 1970 to the present about safety levels in the European gas transmission systems; mainly concerned with land-based systems.

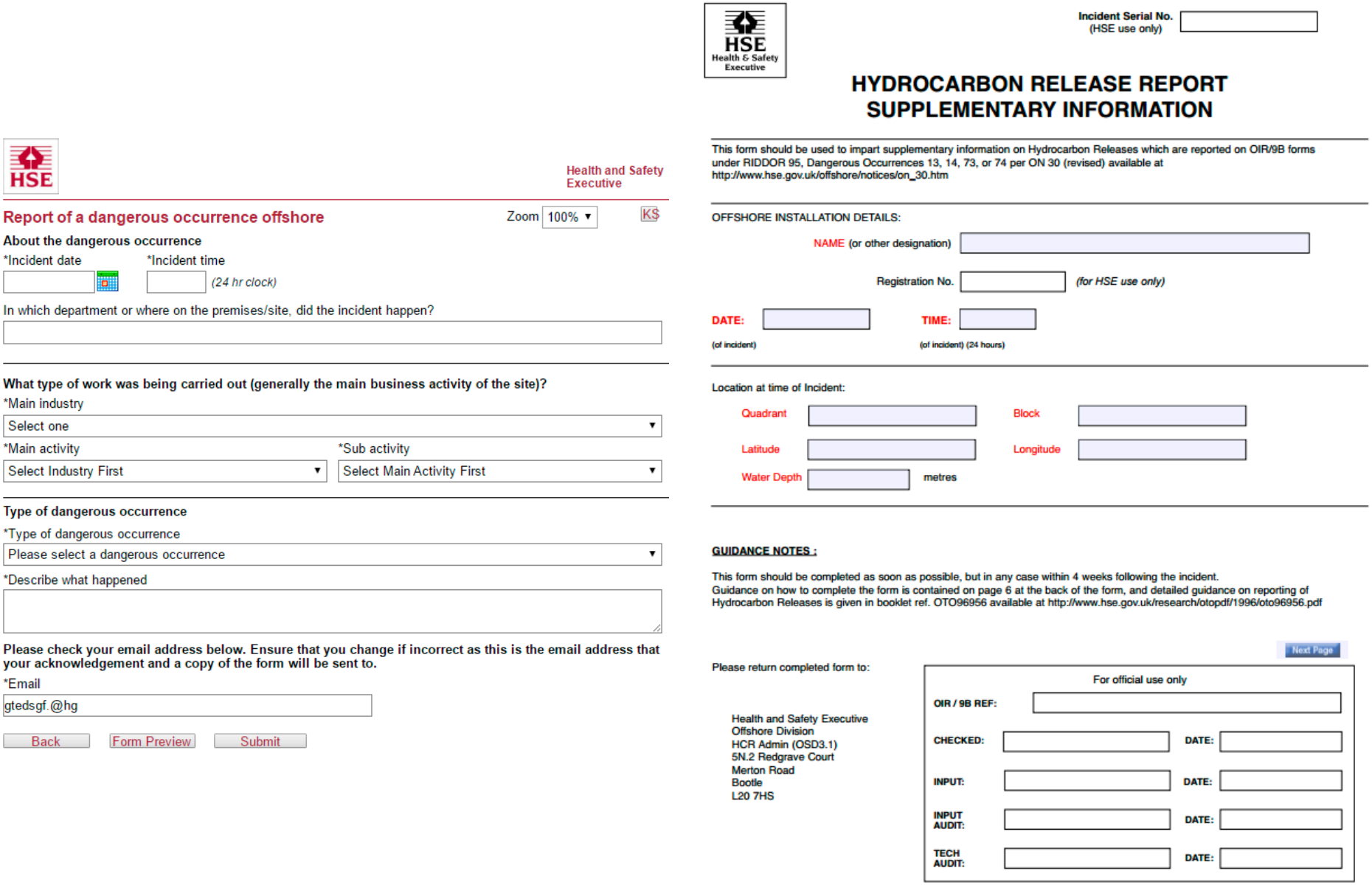
Explosions in offshore installations

For this group of accidents, the main source of information is a database containing details on SINTEF, recording 573 accidents that took place worldwide from 1955. Due to the nature of the data collected, this database is only available to the participants of this project, but they are open to new contributors. Fragments of statistics are available for the public in the form of studies and reports (HSE, 2013).

Collisions with offshore installations

The information has been gathered in the form of two databases **(**Christou & Konstantinidou, 2012):

- *Computer assisted shipping traffic* (COAST). System operator is a Norwegian company SAFETEC, which initiated the project in 1996 with the



HSE Health and Safety Executive

Report of a dangerous occurrence offshore

Zoom 100%

About the dangerous occurrence

*Incident date *Incident time (24 hr clock)

In which department or where on the premises/site, did the incident happen?

What type of work was being carried out (generally the main business activity of the site)?

*Main industry

Select one

*Main activity: Select Industry First

*Sub activity: Select Main Activity First

Type of dangerous occurrence

*Type of dangerous occurrence

Please select a dangerous occurrence

*Describe what happened

Please check your email address below. Ensure that you change if incorrect as this is the email address that your acknowledgement and a copy of the form will be sent to.

*Email

gtedsgf.@hg

Back Form Preview Submit

HSE Health & Safety Executive

Incident Serial No. (HSE use only)

HYDROCARBON RELEASE REPORT
SUPPLEMENTARY INFORMATION

This form should be used to impart supplementary information on Hydrocarbon Releases which are reported on OIR/9B forms under RIDDOR 95, Dangerous Occurrences 13, 14, 73, or 74 per ON 30 (revised) available at http://www.hse.gov.uk/offshore/notices/on_30.htm

OFFSHORE INSTALLATION DETAILS:

NAME (or other designation)

Registration No. (for HSE use only)

DATE: (of incident) TIME: (of incident) (24 hours)

Location at time of Incident:

Quadrant Block

Latitude Longitude

Water Depth metres

GUIDANCE NOTES :

This form should be completed as soon as possible, but in any case within 4 weeks following the incident.
Guidance on how to complete the form is contained on page 6 at the back of the form, and detailed guidance on reporting of Hydrocarbon Releases is given in booklet ref. OTO96956 available at http://www.hse.gov.uk/research/otopdf/1996/oto96956.pdf

Next Page

Please return completed form to:

Health and Safety Executive
Offshore Division
HCR Admin (OSD3.1)
5N.2 Redgrave Court
Merton Road
Bootle
L20 7HS

For official use only

OIR / 9B REF:

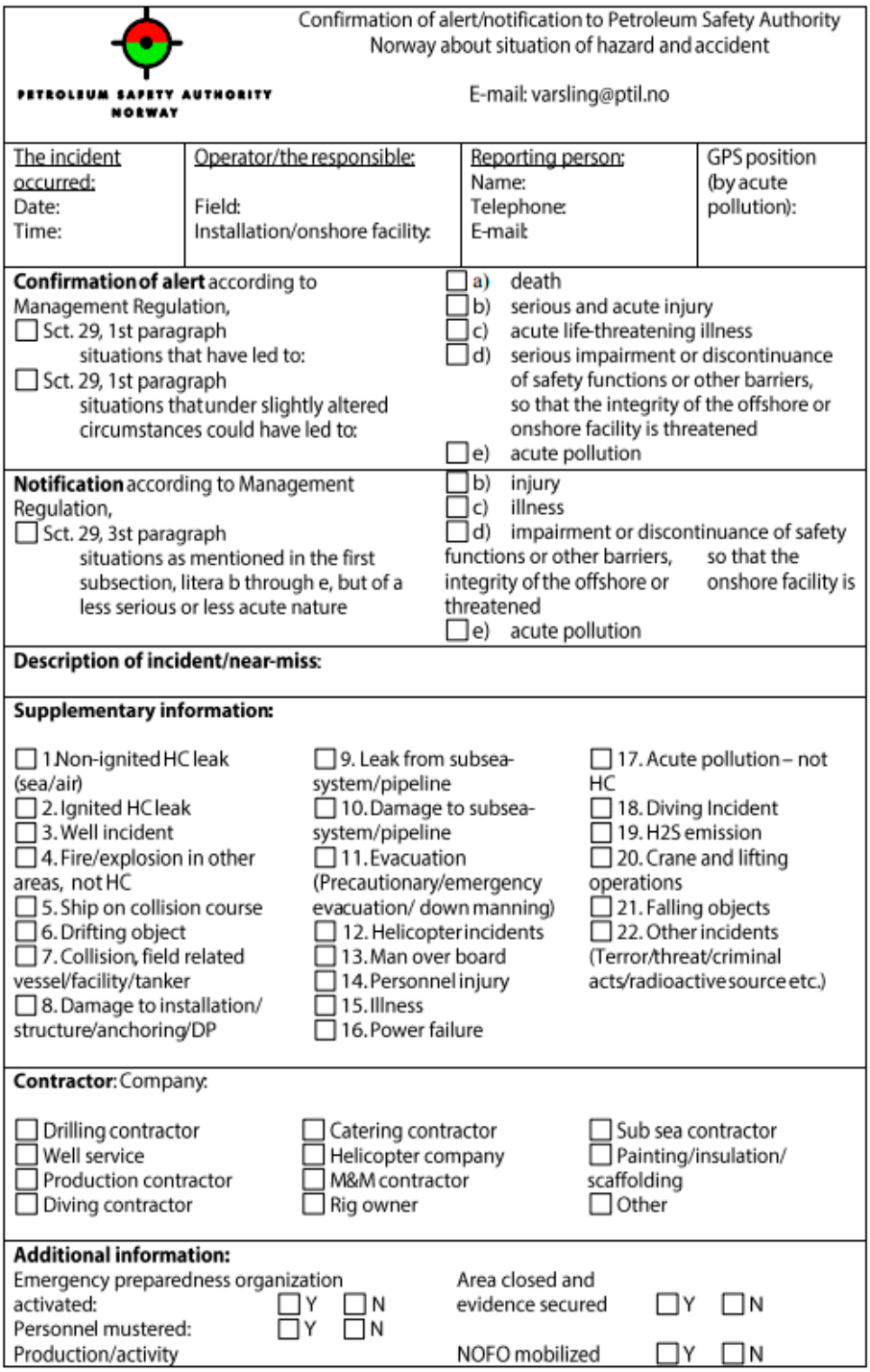
CHECKED: DATE:

INPUT: DATE:

INPUT AUDIT: DATE:

TECH AUDIT: DATE:

Figure 1. Extract from OIR9B forms – request to HSE hazardous situation and OIR12 – a detailed report on the leak of hydrocarbons HSE (HSE, 2015)



PETROLEUM SAFETY AUTHORITY NORWAY

Confirmation of alert/notification to Petroleum Safety Authority Norway about situation of hazard and accident

E-mail: varsling@ptil.no

The incident occurred: Date: Time:	Operator/the responsible: Field: Installation/onshore facility:	Reporting person: Name: Telephone: E-mail:	GPS position (by acute pollution):

Confirmation of alert according to Management Regulation,
☐ Sct. 29, 1st paragraph situations that have led to:
☐ Sct. 29, 1st paragraph situations that under slightly altered circumstances could have led to:

☐ a) death
☐ b) serious and acute injury
☐ c) acute life-threatening illness
☐ d) serious impairment or discontinuance of safety functions or other barriers, so that the integrity of the offshore or onshore facility is threatened
☐ e) acute pollution

Notification according to Management Regulation,
☐ Sct. 29, 3st paragraph situations as mentioned in the first subsection, litera b through e, but of a less serious or less acute nature

☐ b) injury
☐ c) illness
☐ d) impairment or discontinuance of safety functions or other barriers, so that the integrity of the offshore or onshore facility is threatened
☐ e) acute pollution

Description of incident/near-miss:

Supplementary information:

☐ 1. Non-ignited HC leak (sea/air)
☐ 2. Ignited HC leak
☐ 3. Well incident
☐ 4. Fire/explosion in other areas, not HC
☐ 5. Ship on collision course
☐ 6. Drifting object
☐ 7. Collision, field related vessel/facility/tanker
☐ 8. Damage to installation/ structure/anchoring/DP
☐ 9. Leak from subsea-system/pipeline
☐ 10. Damage to subsea-system/pipeline
☐ 11. Evacuation (Precautionary/emergency evacuation/ down manning)
☐ 12. Helicopter incidents
☐ 13. Man over board
☐ 14. Personnel injury
☐ 15. Illness
☐ 16. Power failure
☐ 17. Acute pollution – not HC
☐ 18. Diving Incident
☐ 19. H2S emission
☐ 20. Crane and lifting operations
☐ 21. Falling objects
☐ 22. Other incidents (Terror/threat/criminal acts/radioactive source etc.)

Contractor: Company:

☐ Drilling contractor
☐ Well service
☐ Production contractor
☐ Diving contractor
☐ Catering contractor
☐ Helicopter company
☐ M&M contractor
☐ Rig owner
☐ Sub sea contractor
☐ Painting/insulation/ scaffolding
☐ Other

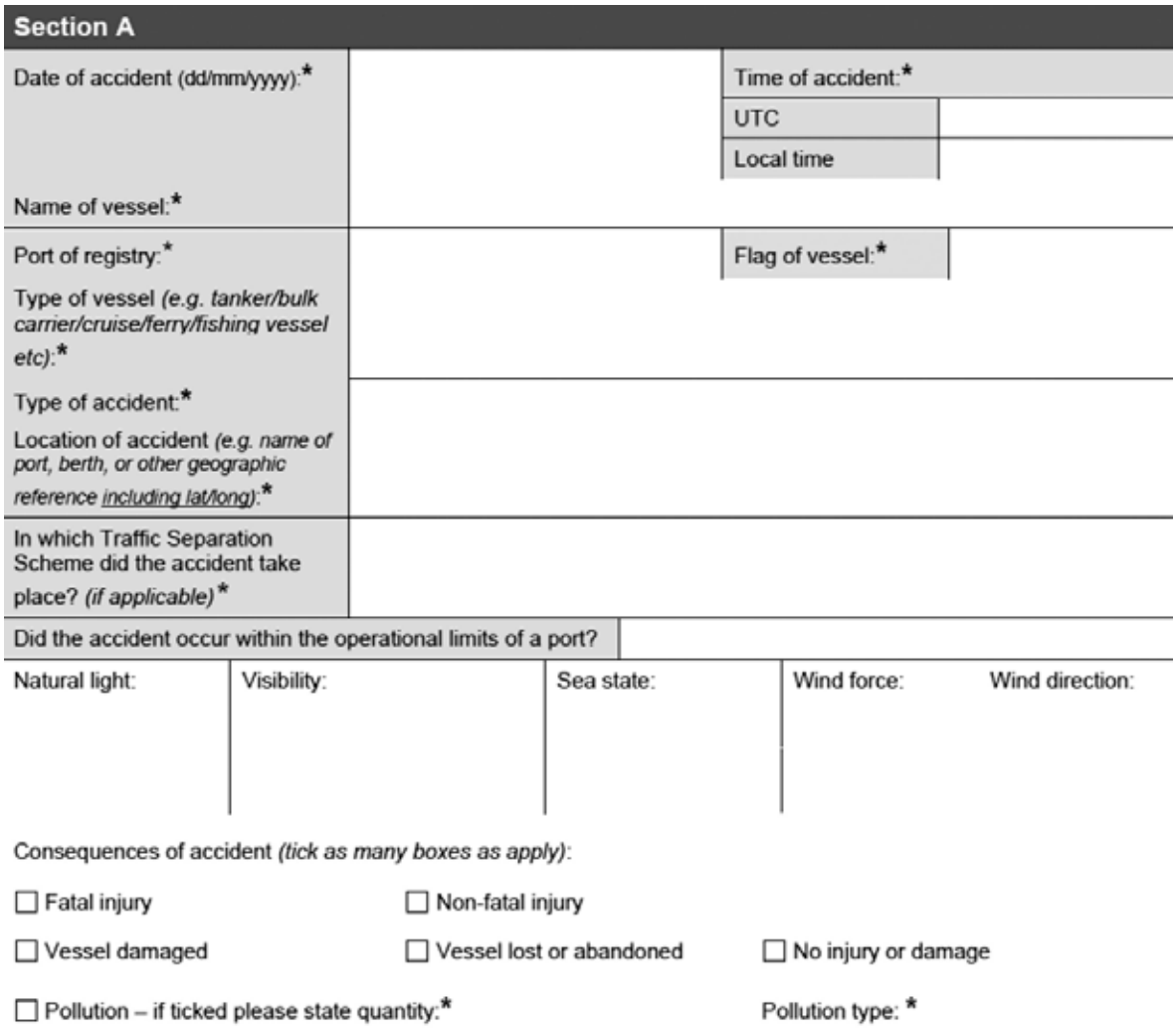
Additional information:

Emergency preparedness organization activated: ☐ Y ☐ N
Personnel mustered: ☐ Y ☐ N
Production/activity
Area closed and evidence secured ☐ Y ☐ N
NOFO mobilized ☐ Y ☐ N

Figure 2. Part of the form of Petroleum Safety Authority (American Petroleum Institute, 2015)

support of the HSE and OLF. The database covers the sectors of the British and Norwegian analysis of maritime traffic.

- *Ship/platform collision incident database*. Includes a collection of data from the years 1975–2001 developed by the HSE. It provides information about the collision of ships with fixed and mobile installations, exploration and mining. Databases are not available publicly, except for statistic reports created by the HSE.
- *UK-MAIB* (*Marine Accident Investigation Branch*) – Since 1991, creates a database of marine accidents on ships with British flag around the world and ships of other flags in British waters (in the zone of 12 nautical miles from the British coast). In also includes information about offshore installations in the same range. On the basis of data collected in MAIB, a document entitled „Accident statistics for floating offshore units on the UK Continental Shelf 1980–2005" was



Section A

Date of accident (dd/mm/yyyy):*		Time of accident:*	
		UTC	
		Local time	
Name of vessel:*			
Port of registry:*		Flag of vessel:*	
Type of vessel *(e.g. tanker/bulk carrier/cruise/ferry/fishing vessel etc)*:*			
Type of accident:*			
Location of accident *(e.g. name of port, berth, or other geographic reference including lat/long)*:*			
In which Traffic Separation Scheme did the accident take place? *(if applicable)**			
Did the accident occur within the operational limits of a port?			

Natural light:	Visibility:	Sea state:	Wind force:	Wind direction:

Consequences of accident *(tick as many boxes as apply)*:

☐ Fatal injury ☐ Non-fatal injury

☐ Vessel damaged ☐ Vessel lost or abandoned ☐ No injury or damage

☐ Pollution – if ticked please state quantity:* Pollution type: *

Figure 3. Report form to the MAIB (MAIB reports database, 2015)

prepared and published by the DNV. Example form shown on Figure 3.

- *EASY* – electronic system for reporting accidents at work to the DEA (Danish Energy Agency).

Accidents associated with helicopter transport:

The information has been collected in the form of statistics developed by the:

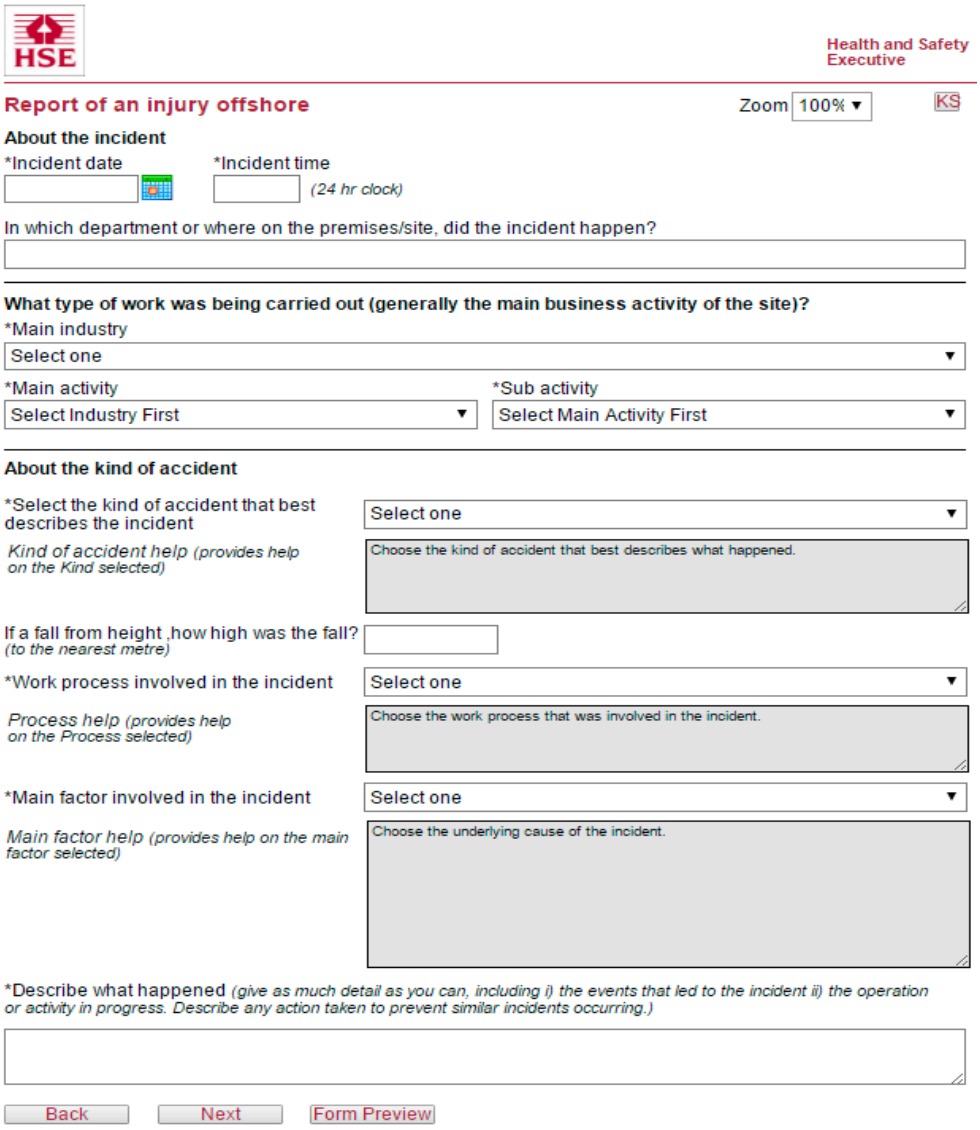
- *HSE, as the UK Offshore Public Transport Helicopter Safety Record report, containing data from the years 1976–2002*.
- *Helicopter Safety Advisory Conference* – information collected since 1998.

Information about health in the workplace:

- *Facts and statistics from the Petroleum Safety Authority Norway* – includes reports and statistics about accidents at work for the period 1997–2006.
- *UK-ORION database* (*before year 2000 "The Sun Safety System"*) – data collected by the HSE since 1991, based on "The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995". The database is not available to the public. Data developed statistically are presented annually in the form of reports and newsletters. Examples – Figure 4.

All categories of accidents and incidents in the offshore sector

- *WOAD, Worldwide Offshore Accident Data* – the largest database of information collected and developed by DNV (Figure 5). Includes events since 1970 and is regularly updated. Contains detailed information about more than 6000


HSE

Health and Safety Executive

Report of an injury offshore

Zoom 100%

About the incident

*Incident date

*Incident time (24 hr clock)

In which department or where on the premises/site, did the incident happen?

What type of work was being carried out (generally the main business activity of the site)?

*Main industry

Select one

*Main activity

Select Industry First

*Sub activity

Select Main Activity First

About the kind of accident

*Select the kind of accident that best describes the incident

Select one

Kind of accident help (provides help on the Kind selected)

Choose the kind of accident that best describes what happened.

If a fall from height ,how high was the fall? (to the nearest metre)

*Work process involved in the incident

Select one

Process help (provides help on the Process selected)

Choose the work process that was involved in the incident.

*Main factor involved in the incident

Select one

Main factor help (provides help on the main factor selected)

Choose the underlying cause of the incident.

*Describe what happened (give as much detail as you can, including i) the events that led to the incident ii) the operation or activity in progress. Describe any action taken to prevent similar incidents occurring.)

Back Next Form Preview

Figure 4. One of the OIR9B forms to report accidents at the workplace (HSE, 2015)

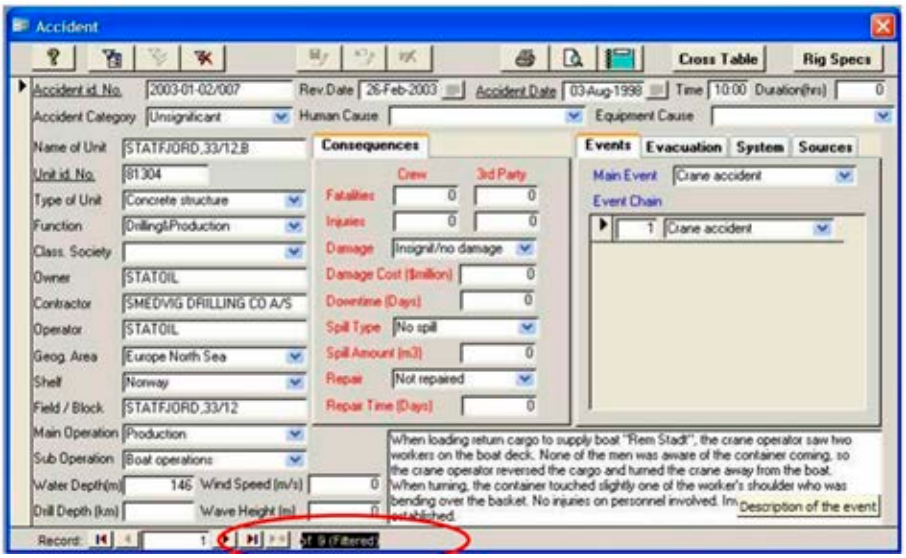


Figure 5. Example of data in WOAD database (WOAD, 2014)

accidents and dangerous situations in the exploration – mining industry.

Conclusions

Analysis of the source material clearly highlights the lack of a uniform system for collecting information about dangerous situations in the offshore sector. The institutions that gather the most information are primarily the governments of individual countries, in accordance with the local regulations. In the European Union countries, this data is largely unavailable to the public. The only form of their presentation is through reports and statistics. The lack of a common format for reporting of events certainly makes the mutual exchange of information between interested parties more difficult. Concluding, there is a need to collect safety information in the offshore sector. Authors find a common data exchange format should be developed and that transparency and access to information should be increased, even while maintaining the right to protect confidential information.

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