

OCEAN ENERGY SAFETY INSTITUTE

Inventory of Ocean Energy Safety Related databases

Ocean Energy Safety Institute

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Contents

- 1. Introduction 3
- 2. General Description of databases 4
 - 2.1 All databases 4
 - 2.2 Offshore specific databases 4
- 3. Description 7
 - 3.1 Reliability databases 8
 - 3.2 Lessons learned 11
 - 3.3 Key Performance Indicators (KPI) 13
 - 3.4 Near-misses 14
- 4. Reference websites of databases 15

1. Introduction

The second forum organized by the Ocean Energy Safety Institute, entitled “Eliminating Barriers to Data Sharing, and Solutions” was held at the University of Houston, 12-13 August 2014, with the objective of promoting dialogue and shared learning among academia, government, industry, and other non-governmental organizations. Topics such as equipment reliability, near-miss collection, lessons learned from accidents (High Value Learning Events (HVLE)), and barriers to data sharing were on the agenda.

With over 100 attendees, the Data forum was successful at bringing together industry, academia, and the government in an environment of dialogue and cooperation. As an end result of the forum a list of study opportunities for OESI was developed. The dialogue that took place in this second two-day forum on barriers to data sharing was very successful. One of the primary objectives of OESI is to promote dialogue, so that all stakeholders can meet together and talk about ocean energy safety related topics.

The discussion about data collection identified a need for clear objectives and industrywide accepted definitions and standards. Two views of data collection were presented; first, big data which collects everything and second, the problem oriented data collection that collects data to solve a specific problem or question. There was no consensus on which direction data collection should go, and therefore, more research on the optimum granularity of data collection is needed.

The two-day discussions in the forum “Eliminating Barriers to Data Sharing” identified main barriers as legal aspects of data sharing and the fear of litigation, marketing and commercial constraints. The audience commonly agreed that these barriers can be overcome if the data collection presents a return on investment (ROI) for the industry, will solve a real need or problem, can help in the decision making, and if the industry is ready to compromise.

As future work, the audience recommended that OESI first catalog the existing databases and list what problem each database is trying to solve and how the analysis of the collected data improves the decision making. This catalogue will also help to identify the gaps in the overall picture of data collection. From that catalogue, recommendations could be made on how existing databases could be improved in aspects like data quality, data validation, and on how to make them more accessible and searchable. It is important to learn from the successful data collection initiatives to see how they overcame the barriers.

This report presents the first version of the catalog of existing databases, built only from extensive literature review from reports, presentations and websites, and has identified 38 databases. This report provides a brief description of each database, together with some general statistics and description. But uncertainties still remain on the understanding of the databases, especially if the databases have taxonomy, an analysis of the uncertainty of the data collection, guidelines for the use and collection of data. The future work related to this topic is to dialogue with each of the database managers to improve the description.

2. General Description of databases

2.1 All databases

The literature search for databases identified 19 reliability databases where 6 of them are entirely dedicated to offshore equipment, 4 dedicated to the petrochemical industry in general, 2 for the nuclear industry, and 7 useful for all types of industry. The search also identified 13 lessons learned databases, 4 Key Performance indicators (KPI) databases, and two near-miss databases, as shown in Figure 1 left. The majority of the databases are private initiatives, mostly originating from a consortium of companies or from a trade group, as shown in Figure 1 right. It can also be pointed that the majority of the databases linked to a regulatory procedure focus on lessons learned and incident data collection. The remaining of the analysis on the databases will be dedicated only to offshore related databases, so looking at 25 out of the total 38.

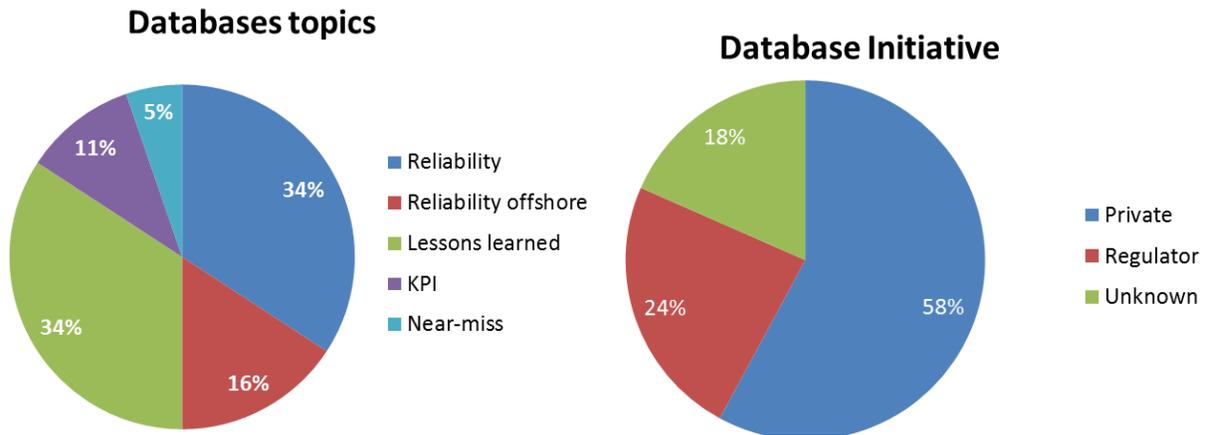


Figure 1 Left: Distribution of database topic, Right: Origin of data collection initiative

2.2 Offshore specific databases

The list of identified databases that are collecting offshore related equipment reliability, lessons learned, KPI, or near-misses are summarized in Table 1. As the table shows, the majority of databases are collecting incidents.

Table 1 Inventory of Ocean Energy Safety Related databases

| Reliability | Lessons learned | KPI | Near-miss |
|-----------------------------------|---|--|-------------------------------------|
| OREDA (Offshore Reliability Data) | DNV-WOAD (Worldwide Offshore Accident Databank) | Center for Offshore Safety (COS) SPI (Safety Performance Indicators) | IADC Near-Miss/Hit Report System |
| WellMAster ExproSoft | MAIB-Marine Accident Investigation Branch (UK) | The International Association of Oil & Gas Producers (OGP) | ABS Mariner Personal Safety Project |

| | | |
|--|--|---|
| SubseaMAster ExproSoft | COS (Center for offshore safety)- Learning from incidents program (LFI) | IRF Performance Measurement Project |
| Reliability of Deepwater Subsea BOP Systems and Well Kicks SINTEF Reports (PDS Data Handbook) PDS Data Handbook | ORION (the former Sun Safety System, from 2000 to ORION) HSE (Offshore Safety Division) Hydrocarbon release Database UK-Collision Incidents Database BSEE- TIMS SINTEF-Offshore Blowout Database HSE (Offshore Safety Division) OGP - WCID (Well Control Incident Database) Performance Measurement Project (International Regulators' Forum) RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) IADC Incident Learning Program ABS - Incident Database (The Mariner Personal Safety Database) | Danish Energy Agency -- Work-Related Injuries and Other incidents |

As observed in Figure 2, most of the databases collected can be used to assess the consequences of an event, which group both the lessons learned and the KPI databases. The couple of near-miss databases can help to assess the barriers that prevented an event from escalating to consequences, and the reliability databases can be used to assess the barriers that can prevent an event. Therefore, future data collection initiatives should focus on the barrier assessment.

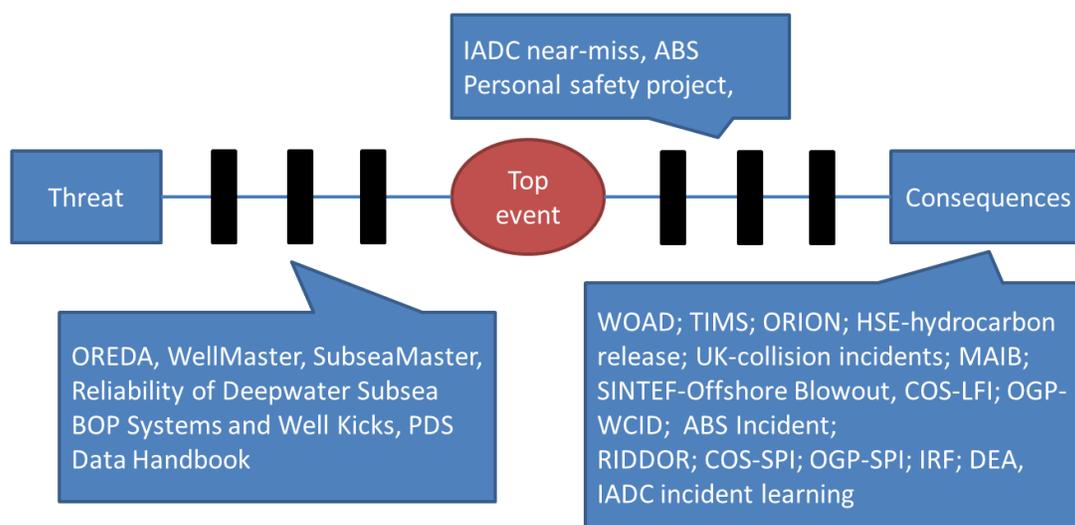


Figure 2 Importance of data collected represented in a bowtie

As illustrated in Figure 2, the majority of the databases are focusing on both the subsea and the platform equipment. Some databases are entirely dedicated to the well and subsea part of the operation and some others are entirely dedicated to vessel transportation.

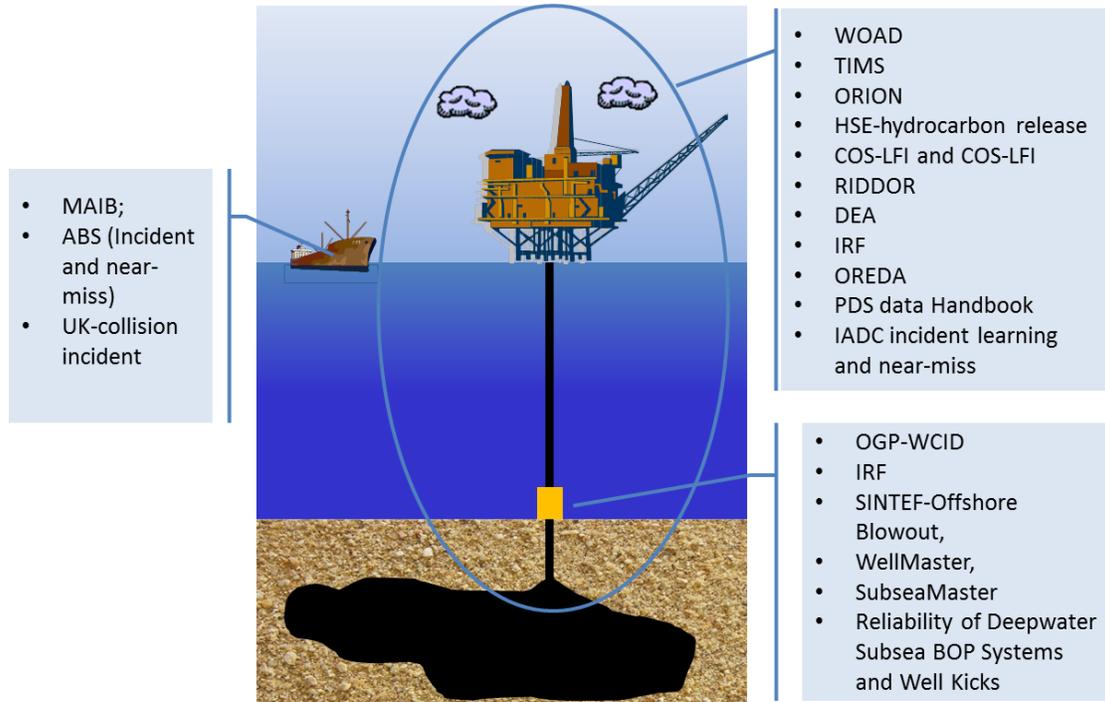
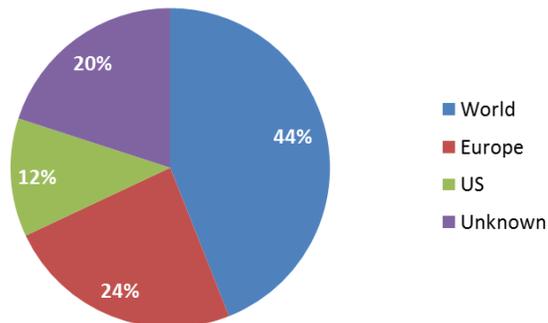


Figure 3: Focus areas of databases

As illustrated in Figure 3 left, the majority of the databases are collecting data from all over the world. A significant amount is collecting European data, either for the whole Europe or for a specific country, and a few are collecting US data only. Finally, 20% of the databases do not clearly specify the region of data collection. Concerning the duration of the data collection, even if the majority of the database do not clearly specify it, the majority of the information found locate the starting time of data collection between 1980 and 2000, mostly in the 90s, as observed in Figure 3 right.

Region for data collection (offshore)



Start time of data collection (offshore)

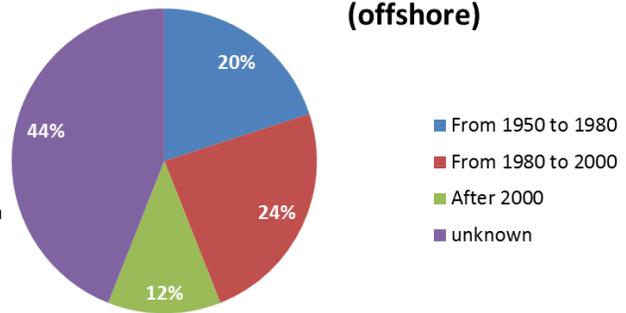


Figure 3 Left: Region of data collection, Right: Duration of data collection

The uncertainty on the accessibility of data is also quite high, and also leads to uncertainties on other questions, one of them being, if there is an analysis provided, as observed in Figure 4. From the known information, data will usually be available to the member companies that provide data, and for most of the databases related to a regulation, an analysis of the database results such as number of spill per year, or number of fatalities per year, will be provided to the public. Finally, when the information on whether an analysis of the data was provided with the database, the answer was found to yes for at least 48% of the databases.

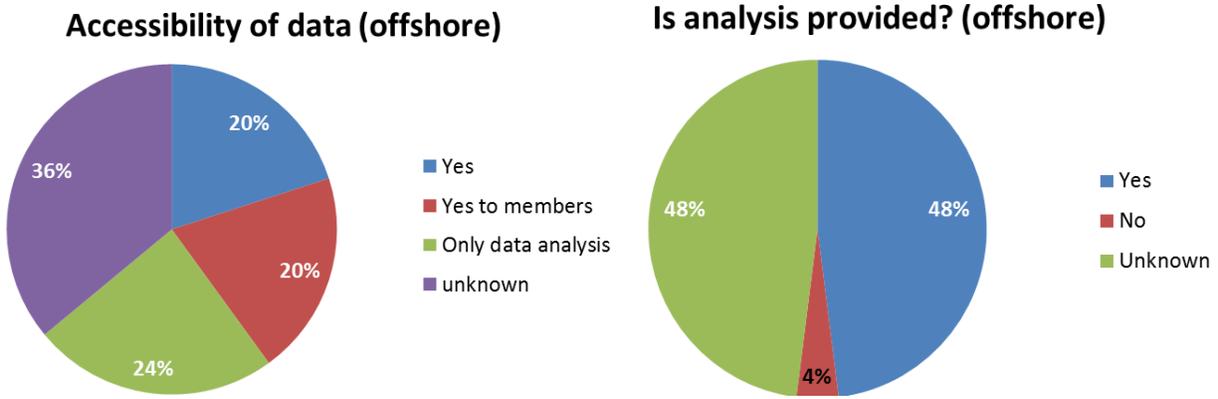


Figure 4 Left: Accessibility of data, Right: Is an analysis of the database is provided?

3. Description

The following tables provide, for each database, a description of the targeted facility; collected data (equipment or incident); objective of the data collection; and if the return on investment is specified. The OESI Data Forum indeed identified that one path forward in the future of data collection and sharing was to identify the Return on Investment (ROI) for companies who share the data.

3.1 Reliability databases

| Failure Reporting Systems | Targeted Facility | Targeted equipment | Objective of database specified? | Return on Investment specified? |
|--|---|---|--|--|
| Offshore Facilities | | | | |
| OREDA (Offshore Reliability Data) | Primarily Offshore, but also onshore facilities | Offshore subsea and topside equipment and onshore equipment | Collect and exchange reliability data among the participating companies, act as The Forum for co-ordination and management of reliability data collection within the oil and gas industry. | No |
| WellMAster ExproSoft | offshore facilities (Components in oil wells) | Well Reliability and integrity | risk and reliability studies | No |
| SubseaMAster ExproSoft | offshore facilities (Components in oil wells) | Components in subsea oil/gas production systems | risk and reliability studies | No |
| Reliability of Deepwater Subsea BOP Systems and Well Kicks | Offshore facilities | BOP (Blowout Preventer) systems | - | 259 wells |
| SINTEF Reports (PDS Data Handbook) | Primarily Offshore, but also onshore facilities | Offshore subsea and topside equipment and onshore equipment | No | Data source from OREDA database and handbook |
| PDS Data Handbook | Offshore & Petroleum Industry | components of control and safety systems; field devices (sensors, valves) and control logic (electronics), data for subsea equipment, drilling related equipment, New topside equipment | No | No |

| Chemical & Petro refinery | | | | |
|---|---|--|--|----------------|
| PERD (Process Equipment Reliability Database) by CCPS | Hydrocarbon and chemical process industries | Relief Valves | Ability to quantify risks and measure the reliability and availability of plants, systems, and equipment, Ability to benchmark plant performance internally and externally, Enable improved maintenance optimization, Support of risk based maintenance planning insight for improvement in the design of new systems/ equipment, Support optimization of life cycle costs, Provide a foundation for the improvement of existing data management systems | - |
| IRN (Instrument Reliability Network) by MKOPSC | Hydrocarbon and chemical process industries | Equipment | Share historical information and lessons learned to minimize environmental harm, improve industry safety, maximize asset performance, and reduce maintenance costs through better lifecycle management of instrumentation and controls applied in the process industry. | Starting phase |
| HSE UK HID CI5 | Onshore Facilities | Equipment | The failure rates quoted within this document were derived and are intended for use on Land Use Planning cases. | No |
| EXIDA (SERH) | Chemical | Sensors, Logic Solvers and Interface Modules, Final Elements | No | No |
| Nuclear Industry | | | | |
| SRDF (Systeme de recueil de donnees de fiabilite) | Nuclear Industry | electrical, mechanical, and electronic equipment | To enable the in-service behavior of a certain number of items of equipment, chosen according to their importance with respect to safety or perhaps the availability of particular units, to be monitored in as much detail as possible | No |
| European Industry Reliability Data Bank EIREDA | Nuclear Industry | electrical, mechanical, and electromechanical equipment | No | No |

| All domains | | | | |
|--|---|---|---|--|
| MIL-HDBK-217F | All industries | Failure rate models for the various part types used in electronic systems (integrated circuits, transistors, diodes, resistors, capacitors, relays, switches, and connectors) | No | No |
| FARADIP (Failure Rate Data In Perspective) | Military, telecommunications, offshore operations, process and aerospace industries | Electrical, electronic, mechanical, pneumatic, instrumentation and protective devices | No | No |
| GIDEP (Government-Industry DataExchange Program) | All industry | Failure Experience, Suspect Counterfeit, DMSMS (Diminishing Manufacturing Sources and Material Shortages), Engineering, Metrology, R&M | a cooperative activity between government and industry participants seeking to reduce or eliminate expenditures of resources by sharing technical information essential during research, design, development, production and operational phases of the life cycle of systems, facilities and equipment. | Yes, participants have reported over \$2.1 BILLION in prevention of unplanned expenditures |
| SPIDR (System and Part Integrated Data Resource) | numerous industry and government test and field sources | field failure, maintenance, and test data for commercial and military systems/components | No | No |
| FIDES | All domains using electronics | Electronic components | Develop a new reliability assessment method for electronic components which takes into consideration COTS (commercial off-the-shelf) and specific parts and the new technologies. | Around 200 recommendations |
| RIAC (Reliability Information Analysis Center) | All domains using electronic, electrical, electromechanical and mechanical components | Electronic, electrical, electromechanical and mechanical components | - | - |
| IEEE 493-1997 (Design of Reliable Industrial and Commercial Power Systems) | Industrial and commercial electric power distribution systems | Mechanical and electrical equipment | - | - |

3.2 Lessons learned

| Failure Reporting Systems | Targeted Facility | Targeted equipment | Objective of database specified? | Return on Investment specified? |
|---|---|--|---|---------------------------------|
| Offshore Facilities | | | | |
| DNV-WOAD (Worldwide Offshore Accident Databank) | Offshore | Insignificant events; Near-misses; Incidents /Hazardous situations and Accidents | Offshore risk assessment, emergency planning and lessons learnt from accidents | - |
| BSEE- TIMS | Offshore specific. | Some of the areas supported by TIMS: Lease Sale, Lease Adjudication, Environmental, Wells, Platform, Plans, Geologic Interpretive Tools (GIT) and Pipelines. | The critical computerized information system that automates many of the business and regulatory functions of BOEM and BSEE. Utilizing rugged laptop computers, inspectors will be allowed to access critical data while conducting inspections, enhancing productivity, reduce data entry errors and ensure safe operations and environmental protection within the OCS | - |
| HSE (Offshore Safety Division)-ORION (the former Sun Safety System, from 2000 to ORION) | Offshore | Incident | The main source for accident and incident information for the UK Continental Shelf offshore industry | Unknown |
| HSE (Offshore Safety Division) Hydrocarbon release Database | Offshore | Offshore releases of hydrocarbons | Offshore releases of hydrocarbons reported to HSE-OSD under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) and prior offshore legislation | - |
| UK-Collision Incidents Database | Offshore | Incident (Impact between a vessel and a fixed or mobile installation) | Impact between a vessel and a fixed or mobile installation | - |
| MAIB-Marine Accident Investigation Branch (UK) | All UK registered vessels and other vessels within the 12-mile zone of the UK territorial waters. For offshore floating | Incident (vessels) | Contribute to safety at sea by determining the causes and circumstances of marine accidents and working with others to reduce the likelihood of such accidents recurring in the future. | - |

| | | | | |
|--|---|---|--|---|
| | vessels, all accidents and incidents occurring in transit | | | |
| SINTEF-Offshore Blowout Database | Offshore | offshore blowouts/well releases | Blowout risk assessment | The SINTEF Offshore Blowout Database is open to new participants. |
| COS (Center for offshore safety)- Learnig from incidents program (LFI) | Offshore | Incident | Provide COS members a mechanism for sharing safety incident or event related information which can be used in decision-making regarding standards and practices; complement the information from the COS SPI Program to include analytical information such as areas for improvement and lessons learned | Key benefits: Guide and lead direction of COS Programs; Benchmark Company SEMS performance; Attain COS SEMS Certification; Collaborate on and develop industry solutions for improving SEMS with all stakeholders; Interface with Regulators |
| OGP - WCID (Well Control Incident Database) | Oil & Gas industry | Incident | Strengthen the long-term health of the oil & gas industry across the whole cycle of well planning, construction, operation and abandonment | - |
| Performance Measurement Project (International Regulators' Forum) | Offshore | Incident | Measure and compare offshore safety performance among participants by collecting and comparing incident data based on a common set of criteria. Data include fatalities, injuries, gas releases, collisions, fires and losses of Well Control. | - |
| RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) | All | Report certain serious workplace accidents, occupational diseases and specified dangerous | The information enables the HSE and local government authorities to identify where and how risk arise, and to investigate serious accidents | - |

| | | | | |
|--|----------------------|---|---|---|
| | | occurrences (near misses) | | |
| Lamar University and ABS - Incident Database (The Mariner Personal Safety Database) | Vessels and Mariners | Injuries and close call (near misses) | Obtain and review incident and close call reports; Identify trends; Creat benchmarking statistics; Identify potential corrective actions; Identify potential lessons learned; Develop and share results | Access to analysis of database performed by Lamar |
| IADC Incident Learning Program | Offshore drilling | Safety and accident information for the drilling industry | To record data reflecting accident experience which can be compared to other industries, To identify causes and trends of drilling industry injuries, To provide a means of recognizing rig crews for outstanding safety performance. | - |

3.3 Key Performance Indicators (KPI)

| Failure Reporting Systems | Targeted Facility | Targeted equipment | Objective of database specified? | Return on Investment specified? |
|--|--|---|--|---------------------------------|
| Offshore Facilities | | | | |
| Center for Offshore Safety (COS) SPI | offshore facilities | Well pressure containment system; Christmas trees; Downhole safety valves; Blow out preventer and intervention systems; Process equipment/pressure vessels, piping; Automated safety instrumented systems / shutdown systems; Pressure relief devices, flare, blowdown, rupture disks; Fire/gas detection and fire-fighting systems; Mechanical lifting equipment/personnel transport systems; Station keeping systems; Bilge/ballast systems; Life boat, life rafts, rescue boats, launch and recovery systems | Collect standardized COS SPI from COS members, and learn from safety performance | No |
| The International Association of Oil & Gas Producers (OGP) | worldwide exploration and production (E&P) operations, both onshore and offshore | Fatalities, Lost time injury, Causal factors, Restricted work day cases | Record the global safety performance of the contributing OGP member companies | - |

| | | | | |
|--|--|--|---|---|
| IRF Performance Measurement Project | Fixed or mobile drilling and production facilities, Accommodation "Flotels", pipelines or flow lines at their offshore locations | Fatalities, hours worked, gas released (number of releases and amount of releases), BOE gas production, collisions, fires, and losses of well control, and well related activities | To measure and compare offshore safety performance among IRF participants by collecting and comparing incident data based on a common set of criteria | - |
| Danish Energy Agency -- Work-Related Injuries and Other incidents | All offshore installations | Accident or fatality, significant damage to the structure or equipment, near-miss incidents | Required by regulation | DEA provides statistics on reportable accidents and near miss incidents annually, and use them to prioritize the supervision activities |

3.4 Near-misses

| Failure Reporting Systems | Targeted Facility | Targeted equipment | Objective of database specified? | Return on Investment specified? |
|---|------------------------------------|--|--|--|
| Offshore Facilities | | | | |
| IADC Near-Miss/Hit Report System | Well-Servicing, Workover, Drilling | All the equipment included in IADC Incidents Statistics Program (ISP) database | Increase awareness of potential hazards when employees understand that near miss/hit events could potentially be catastrophic and by studying them, rig personnel can avoid or correct items that could lead to an actual event. | - |

| | | | | |
|---|-----------------------------|---|---|--|
| <p>ABS Mariner Personal Safety Project</p> | <p>Vessels and Mariners</p> | <p>To gather a large worldwide database of maritime incident, injury, and near-miss reports. The goal is to provide a searchable database of these incidents, injuries, and near-miss to identify trends and possible causes, potential lessons learned, potential corrective actions, and to develop near miss benchmarking statistics and industry relevant training.</p> | <p>Obtain and review incident and close call reports; Identify trends; Create benchmarking statistics; Identify potential corrective actions; Identify potential lessons learned; Develop and share results</p> | <p>Access to analysis of database performed by Lamar</p> |
|---|-----------------------------|---|---|--|

4. Reference websites of databases

- OREDA (Offshore Reliability Data): <http://www.oreda.com/>
- WellMAster ExproSoft: <http://www.exprosoft.com/products>
- SubseaMAster ExproSoft: <http://www.exprosoft.com/products>
- Reliability of Deepwater Subsea BOP Systems and Well Kicks: <http://www.icard.org/en/News1/US-BOEMRE-funds-study-of-Deepwater-Blowout-Preventer-BOP-Reliability--Well-Kicks-from-Outer-Continental-Shelf-OCS-Oil--Gas-Floating-EP-Facilities/>
- SINTEF Reports (PDS Data Handbook): <http://www.sintef.no/Projectweb/PDS-Main-Page/PDS-Research-Projects/PDS-Reports/>
- PDS Data Handbook: <http://www.sintef.no/Projectweb/PDS-Main-Page/PDS-Handbooks/PDS-Data-Handbook/>
- PERD (Process Equipment Reliability Database) by CCPS: <http://www.aiche.org/ccps/resources/process-equipment-reliability-database-perd>
- IRN (Instrument Reliability Network) by MKOPSC: <http://sis-tech.com/irn>
- HSE UK HID CI5: <https://www.scribd.com/doc/162120855/UK-HSE-Failure-rates>
- EXIDA (SERH): <http://www.exida.com/Software>
- SRDF (Systeme de recueil de donnees-de fiabilite): <http://www.sciencedirect.com/science/article/pii/0029549384902589>
- European Industry Reliability Data Bank EIReDA: <http://hdl.handle.net/10068/63025>
- MIL-HDBK-217F: http://www.reliabilityeducation.com/intro_mil217.html
- FARADIP (Failure RATE Data In Perspective): <http://www.m2k.com/failure-rate-data-in-perspective.htm>
- GIDEP (Government-Industry Data Exchange Program): <http://www.gidep.org/>
- SPIDR (System and Part Integrated Data Resource): <http://src.alionscience.com/spidr/>
- FIDES: <http://www.fides-reliability.org/>
- RIAC (Reliability Information Analysis Center): <http://www.theriac.org/>

- IEEE 493-1997 (Design of Reliable Industrial and Commercial Power Systems):
<http://standards.ieee.org/findstds/standard/493-1997.html>
- DNV-WOAD (Worldwide Offshore Accident Databank):
http://www.dnv.com/services/software/products/phast_safeti/safeti/woad.asp
- MAIB-Marine Accident Investigation Branch (UK):
http://www.maib.gov.uk/report_an_accident/index.cfm
- COS (Center for offshore safety)-Learning from incidents program (LFI):
<http://www.centerforoffshoresafety.org/COSforum/Proceedings/1-7-Learning%20from%20Incidents%20V5%20CARROLLV5.pdf>
- HSE (Offshore Safety Division), ORION (the former Sun Safety System, from 2000 to ORION)
- HSE (Offshore Safety Division) Hydrocarbon release Database:
<https://www.hse.gov.uk/hcr3/index.asp>
- UK-Collision Incidents Database: <http://www.hse.gov.uk/research/rrpdf/rr053.pdf>
- BSEE- TIMS: <https://timsweb.bsee.gov/login.jsp?id=6f58hbq3r2mc38r03rdb>
- SINTEF-Offshore Blowout Database: <http://www.sintef.com/home/Technology-and-Society/Projects/Projects-SINTEF-TS-2001/SINTEF-Offshore-Blowout-Database/>
- OGP - WCID (Well Control Incident Database): <http://www.ogp.org.uk/committees/wells/>
- RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations):
<http://www.hse.gov.uk/riddor/report.htm>
- IADC Incident Learning Program: <http://www.iadc.org/isp/>
- ABS - Incident Database (The Mariner Personal Safety Database):
http://www.socp.us/images.html?file_id=YztW5%2F1CKro%3D
- Center for Offshore Safety (COS) SPI (Safety Performance Indicators):
<http://www.centerforoffshoresafety.org/COSforum/Proceedings/1-4%20Safety%20Performance%20Indicators-Smolen%20Final.pdf>
- The International Association of Oil & Gas Producers (OGP):
<http://www.ogp.org.uk/publications/safety-committee/safety-performance-indicators1/safety-performance-indicators-2013-data/>
- IRF Performance Measurement Project
- Danish Energy Agency -- Work-Related Injuries and Other incidents: <http://www.ens.dk/en/oil-gas/health-safety/work-related-injuries-other-incident/reporting-work-related-diseases>
- IADC Near-Miss/Hit Report System: <http://www.iadc.org/isp/>