International Association of Oil & Gas Producers

REPORT 434-00 | SEPTEMBER 2019

Risk Assessment Data Directory - Overview

Acknowledgements

Safety Committee

Photography used with permission courtesy of
©Opla/iStockphoto and ©Rapeepan Chamnong/Shutterstock (Front cover)
©Photo_Concepts/iStockphoto (Back cover)

Feedback

IOGP welcomes feedback on our reports: publications@iogp.org

Disclaimer

Copyright notice

REPORT
434-00

SEPTEMBER
2019

Risk Assessment Data Directory - Overview

Revision history

VERSION	DATE	AMENDMENTS
1.0	September 2019	First release

Contents

Contents 4

Background 5

The Risk Assessment Data Directory 6

Directory scope and content 7

Updating plans 8

Background

In 1996, the International Association of Oil and Gas Producers (then the E&P Forum) completed and issued the Risk Assessment Data Directory (RADD). Its aim was to provide a catalogue of information that could be used to improve the quality and consistency of risk assessments with readily available benchmark data and references for common types of incident analysed in upstream production operations. Incidents typically analysed in oil and gas risk assessments were identified and divided into four major categories, within which twenty-six individual datasheets were developed. Each datasheet contained information describing the event: incident frequency, population and causal data and a discussion of the data sources, range, availability and application.

In 2006, IOGP's Safety Committee formed a task force to consider the future of the data directory. As a first step, the task force undertook a survey of staff in member companies to establish the level of interest in the existing data directory and in an updated directory. The survey showed strong interest in an update. The task force acted accordingly. This process was repeated in 2016, resulting in the current update (RADD Version 3).

The use of formal risk assessment has become widely accepted in the oil and gas industry since the RADD was originally published. It is now an essential framework in legislation. Experience shows that the application of risk assessment is important both to improved plant and system integrity and to cost effectiveness. It provides valuable information for risk-based decision-making.

Formal risk assessment is a structured, systematic process. It supplements traditional design and risk management processes. It can be based on qualitative or quantitative methods or a combination thereof. The objective of formal risk assessment is to analyse and evaluate risk. Risk assessment is made up of the following fundamental steps: hazard identification to identify what could go wrong, consequence assessment to address the potential effects, frequency assessment to determine the underlying causes and likelihood or probability of occurrence of a hazardous event, assessing the risks and evaluating potential risk reduction measures.

In risk assessment, frequency is estimated based on knowledge and expert judgment, historical experience, and analytical methods. These combine to support judgments made by risk assessment teams. Historical experience is expressed in terms of statistical data gathered from existing operations, generally in the form of incidents, base failure rates and failure probabilities. A key issue when using risk assessment is the uncertainties associated with the results. This has a bearing on the confidence with which the information can be used to influence decisions. Therein lies the need for reliable data to support oil and gas risk assessment work.

The Risk Assessment Data Directory

The objective of the Risk Assessment Data Directory is to provide data and information that can be used to improve the quality and consistency of risk assessments with readily available benchmark data. The directory includes references for common incidents analysed in upstream production operations. The original 1996 data directory included 26 individual datasheets. Version 2 (2009) included 20 datasheets, although the scope of the material presented was similar to the original with some reorganisation. In 2019 IOGP published Version 3 starting with an update to 5 datasheets (published as reports 434-01, 434-02, 434-04, 434-06 and 434-20). Version 3 of the remaining datasheets is forthcoming. The structure of four major categories from the 1996 directory has been retained through all versions. Each datasheet contains:

- information describing the event
- incident frequency
- population and causal data
- a discussion of the data sources, range, availability and application.

The intention is that the Risk assessment data directory may facilitate the systematic assessment of risks within individual IOGP member companies and across the oil and gas industry. It is hoped that the updated directory will continue to be a valuable reference document.

Examples of specific applications of the directory include:

- Estimating screening level and order of magnitude incident frequencies
- Reviewing external risk assessment (i.e. those performed by consultants, design contractors, etc.)
- Evaluating risk in QRAs and qualitative assessments
- Comparing industry and corporate performance
- Identifying important risk contributors

The directory also provides reference lists of data sources that can be consulted for more detailed information. The directory is not intended to be a comprehensive source of incident data. Applications requiring more comprehensive data should consult the original references as well as other publicly available information and company data sources. Sources for the data include information available to the public and industry such as may be obtained from industry projects and the literature. That is, the directory contains organised publicly available information and data contributed by individual companies, which has been previously submitted by others.

While every reasonable effort has been made to ensure the quality and accuracy of the information and data provided, it is the responsibility of each company or organisation using the data to review the information and determine that the material is suitable for their specific application.

Directory scope and content

The directory covers both onshore and offshore oil and gas activities. The data have been collated under four major categories:

- **Accident data**: Collated statistical data of accidents (i.e., events that have led to detrimental effects in terms of loss of life, environmental damage or property damage)
- **Event data**: Collated statistical data of hazardous events (i.e., events that led to or had the potential to lead to an accident)
- **Safety systems**: Collated statistical data on the reliability of various safety systems employed to prevent and/or mitigate hazardous events.
- **Vulnerabilities**: Criteria for assessing the vulnerability of plant and humans to hazardous events.

There are a total of twenty datasheets as listed below:

- Accident data:
  - Major accidents
  - Occupational risk
  - Land transport accident statistics
  - Aviation transport accident statistics
  - Water transport accident statistics
  - Construction risk for offshore units
- Event data:
  - Process release frequencies
  - Risers & pipeline release frequencies
  - Storage incident frequencies
  - Blowout frequencies
  - Mechanical lifting failures
  - Ship/installation collisions
  - Ignition probabilities
  - Structural risk for offshore installations
- Safety systems:
  - Guide to finding and using reliability data for QRA
- Vulnerabilities:
  - Vulnerability of humans
  - Vulnerability of plant/structure
  - Escape, evacuation and rescue
  - Human factors in QRA
  - Consequence modelling

The basic content of each datasheet is as follows:

1) **Scope and application**: Brief outline of data presented in datasheet and details of the situation for which the datasheet would be applicable. This includes statements regarding where care should be exercised in its use.
2) **Summary of recommended data**: Data presented in a tabular and/or graphical format.
3) **Guidance on data use**: Guidance on general validity and precautions to be applied in using the data. Consideration of uncertainties.
4) **Review of data sources**: The data sources used to obtain the data presented in section 2.
5) **Recommended data sources for further information**: Listing of sources of more detailed and specific data.
6) **References**: Detailed list of references.

Note that the format presented above is general. Individual datasheets vary to some extent, depending on relevance and availability of information.

The objective has been to identify so far as practical data available in the public domain and to discuss their applicability. However, in a few isolated cases, reference is made to data not publicly available yet held by an IOGP. Where this is the case, the judgment of the RADD Task Force is that these data are sufficiently robust to include even though the user is not able to source the data directly.

It is not the intention of the Directory to address or comment in any way on the best approach or methods for risk assessment studies. In some of the datasheets, particularly for Safety Systems, the key data presented are in terms of how 'reliable' these systems are. "Reliability Analysis" is a distinct specialist area. Any detailed assessment would require expert assistance. Another area that is recognised as directly influencing the frequency of accidents and events is Human Factors. Again, this is a distinct specialist area, which would require expert assistance if any detailed assessment work was to be undertaken. It should also be noted that there are many other areas where expert assistance would be needed to undertake an in-depth study, e.g. assessing structural vulnerabilities or marine hazards.

Updating plans

It is recognised and accepted that the data presented in IOGP's Risk assessment data directory will become out-of-date. Nevertheless, many of the databases identified are actively maintained and by directly accessing these source databases, up-to-date information can be obtained.

Version 3 of the RADD is published starting with an update to five datasheets in 2019, work on the remaining 15 datasheets is underway, with 3-5 datasheets planned to be updated per year. Table 1 records the revision status of all datasheets.

Users are welcome to provide feedback on errors and omissions, suggestions for potential revision, any new or better information, or data from other geographic areas through publications@iogp.org.

Table 1: RADD Datasheets and their revision status

Datasheet	Report #	Version	Published date
Risk assessment data directory – Overview Overview of the Risk Assessment Data Directory	434	3	2019 Sept
Risk assessment data directory - Process release frequencies This datasheet presents frequencies of releases from process equipment. They are intended to be applied to process equipment on the topsides of offshore installations and on onshore facilities handling hydrocarbons but are not restricted to releases of hydrocarbons.	434-01	3	2019 Sept
Risk assessment data directory - Blowout frequencies This datasheet presents frequencies of blowouts and well control incidents. They are intended to be applied to well operations worldwide, both offshore and onshore.	434-02	3	2019 Sept
Risk assessment data directory - Storage incident frequencies This datasheet presents frequencies of releases from the following types of storage: 1. Atmospheric storage 2. Refrigerated storage 3. Pressurised storage 4. Oil storage on FPSOs 5. Non-process Hydrocarbon Storage Offshore 6. Underground storage	434-03	2	2010 Mar
Risk assessment data directory - Riser & pipeline release frequencies This datasheet presents frequencies of riser and pipeline releases. Frequencies for offshore and onshore pipelines are included. The frequencies given are based on analysis for pipelines conveying hydrocarbons.	434-04	3	2019 Sept
Risk assessment data directory - Human factors in QRA This report contains guidance material for Human Factors (HF) studies within the various forms of risk and error assessment and analysis.	434-05	2	2010 Mar
Risk assessment data directory - Ignition probabilities The data provides estimates of the probabilities of hydrocarbon releases igniting to result in an explosion and/or a sustained fire. These data may be applied to any on the leak types described in the Process Release Frequencies datasheet (434-01).	434-06	3	2019 Sept
Risk assessment data directory - Consequence modelling This datasheet presents recommended approaches to consequence modelling for accidental releases of hazardous materials, with the potential to cause harm to people, damage to assets and impairment of safety functions, from offshore and onshore installations.	434-07	2	2010 Mar
Risk assessment data directory - Mechanical lifting failures This datasheet presents information on the frequency of dropped objects resulting from the failure of lifting devices on offshore installations. Specifically it includes dropped load frequencies for the following types of lifting equipment: 1. Main cranes 2. Drilling derrick 3. Other devices	434-08	2	2010 Mar
Risk assessment data directory - Land transport accident statistics This datasheet provides information on land transport accident statistics for use in Quantitative Risk Assessment (QRA). Most of the data concern motor vehicles and rail transport, although some data for cyclists are also presented. Data excludes pedestrians.	434-09	2	2010 Mar
Risk assessment data directory - Water transport accident statistics This datasheet provides information on water transport accident statistics for use in Quantitative Risk Assessment (QRA).. The data in this sheet are intended for three main uses: • Assessing the risk of personnel on board vessels; • Assessing the frequencies of vessel/ship accidents; • Assessing the frequencies of oil spills.	434-10	2	2010 Mar
Risk assessment data directory - Aviation transport accident statistics This datasheet provides information on aviation transport accident statistics for use in Quantitative Risk Assessment (QRA). The data in this sheet are intended for two main uses: Assessing the risk of helicopter transport; Assessing the risk of fixed wing transport	434-11	2	2010 Mar

Datasheet	Report #	Version	Published date
Risk assessment data directory - Occupation risk This datasheet presents occupational risks in the global E&P (Exploration & Production) industry, for both onshore and offshore facilities. The occupational risks include transport risks, which are often analysed separately in QRAs. Some indication is given as to how the occupational risks presented can be adjusted to remove transport risks.	434-12	2	2010 Mar
Risk assessment data directory - Structural risk for offshore installations This datasheet presents information on structural events statistics for use in Quantitative Risk Assessment (QRA). The data are applicable to offshore installations only.	434-13	2	2010 Mar
Risk assessment data directory - Vulnerability of humans This datasheet provides information on the vulnerability of humans to the consequences of major hazard events at onshore and offshore installations, primarily those producing and/or processing hydrocarbon fluids. The focus is on fatality criteria as QRAs generally address fatality risks, however injury thresholds are also identified where appropriate.	434-14	2	2010 Mar
Risk assessment data directory - Vulnerability of plant/structure This datasheet provides information on vulnerability of plant/structure to the consequences of major hazard events on onshore and offshore installations. The focus is on primary structures (e.g. primary beams/columns, firewalls, control rooms etc.) and major items of equipment such as pressure vessels where failure can lead to escalation effects. Information is presented relating to the structural response failure criteria. The following consequences are considered: • Fire • Explosion • Missile	434-15	2	2010 Mar
Risk assessment data directory - Ship/installation collisions This datasheet provides data on ship/installation collision risks in relation to activities within the offshore oil & gas Exploration and Production industry, for use in Quantitative Risk Assessment (QRA). The risks related to icebergs are not considered.	434-16	2	2010 Mar
Risk assessment data directory - Major accidents This datasheet provides background historical information on major accidents in the onshore and offshore oil and gas production and process industries, to serve as background for QRA studies. The focus of this datasheet is on presenting an overview the range of accident types and their relative frequency of occurrence, rather than on absolute frequencies.	434-17	2	2010 Mar
Risk assessment data directory - Construction risk for offshore units This datasheet presents estimates of fabrication, construction and installation risks in respect of asset damage/loss and personnel safety. The data are mainly applicable to offshore installations although reference is made to onshore construction fatal accident rates. The datasheet has not been designed to assist with the quantification of general project management uncertainties for the purpose of estimating the likelihood of project schedule and cost overruns.	434-18	2	2010 Mar
Risk assessment data directory - Evacuation, escape & rescue This data sheet provides Quantitative Risk Assessment (QRA) data and guidance for Evacuation, Escape and Rescue (EER) from offshore installations as this has the potential to be more significant in personnel risk terms compared to onshore installations. Total evacuations of installations are rare events and each has very different circumstances. Thus, data relating to real EER events are sparse and QRA tends to rely on detailed analysis of escalation scenarios and EER activities within each scenario. This datasheet contains a number of example data rule sets and general guidance for EER analysis.	434-19	2	2010 Mar
Risk assessment data directory - Guide to finding and using reliability data for QRA The reliabilities of fire and gas detection, ESD and blowdown, blowout prevention and fire protection systems are key inputs to Quantitative Risk Assessment (QRA) of exploration and production facilities. This datasheet provides guidance on obtaining, selecting and using reliability data for these systems and for their component parts, for use in QRA.	434-20	3	2019 Sept
Risk assessment data directory - Appendix 1 This Appendix was added in Version 1 to present data published in Version 1 excluded from Version 2. It has been withdrawn with the publication of Version 3.	434-A1	withdrawn	2010 Mar

Registered Office
City Tower
Level 14
40 Basinghall Street
London EC2V 5DE
United Kingdom

T +44 (0)20 3763 9700
reception@iogp.org

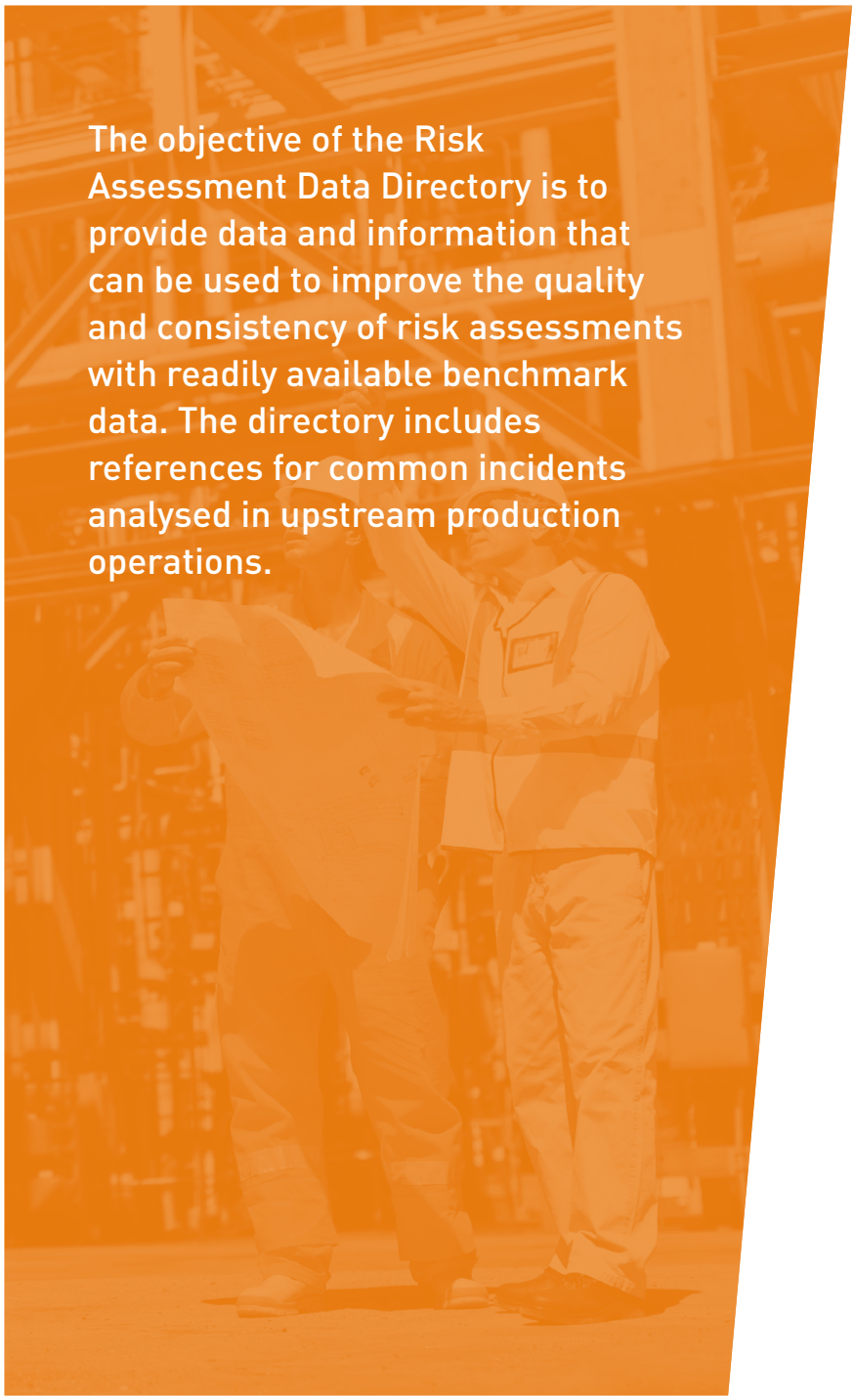
Brussels Office
Avenue de Tervuren 188A
B-1150 Brussels
Belgium

T +32 (0)2 790 7762
eu-reception@iogp.org

Houston Office
19219 Katy Freeway
Suite 175
Houston, TX 77094
USA

T +1 (713) 261 0411
reception@iogp.org

www.iogp.org



The objective of the Risk Assessment Data Directory is to provide data and information that can be used to improve the quality and consistency of risk assessments with readily available benchmark data. The directory includes references for common incidents analysed in upstream production operations.