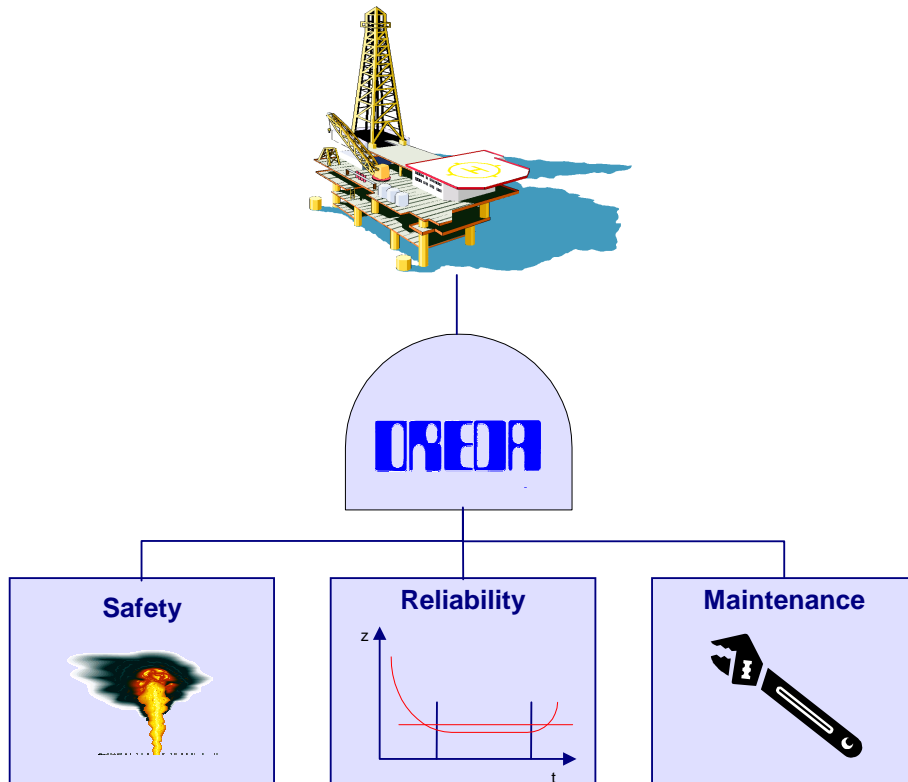












OREDA



OREDA is a project organisation sponsored by eight oil and gas companies with world-wide operations. OREDA's main purpose is to collect and exchange reliability data among the participating companies and act as The Forum for co-ordination and management of reliability data collection within the oil and gas industry. OREDA has established a comprehensive databank with reliability and maintenance data for exploration and production equipment from a wide variety of geographic areas, installations, equipment types and operating conditions. Offshore subsea and topside equipment are primarily covered, but onshore equipment is also included. The OREDA[®] data are stored in a database, and specialised OREDA[®] software and guidelines have been developed to collect, retrieve and analyse the information.

OREDA Application

The Need for Reliability Data in Oil and Gas Exploration & Production (E&P)

The reliability of E&P equipment has a major impact on safety, production availability and maintenance costs. Ensuring high technical integrity is paramount to safe and reliable operations in E&P, particularly offshore. OREDA has collected data to determine the consequences, the causes and the likelihood of such failures. A query among the OREDA companies shows that the need for such data is high.

Oil companies are operating today in a very competitive environment. Here, OREDA can help to optimise life cycle cost and reduce maintenance cost through the application of reliability know-how and data. Traditionally the main use of reliability data has been in engineering design studies. Such data have been given increased attention for use also in the operating phase in recent years.

Use of OREDA Reliability Data

Main uses of OREDA reliability data are in the following areas:

<i>Discipline</i>	<i>Typical Applications</i>
Design / Engineering	<p>Production availability and reliability management:</p> <ul style="list-style-type: none"> • Production availability estimates (e.g. system performance simulation) • Design optimisation (e.g. evaluate justification for redundancy) • Reliability engineering (e.g. FMECA, equipment selection) <p>Safety and risk:</p> <ul style="list-style-type: none"> • Estimate probabilities of critical events • Estimate survival time and system unavailability for safety-critical items • Analysis (SIL) of instrumented safety systems (ref.: IEC 61508/61511)
Operation/ Maintenance	<p>Asset management:</p> <ul style="list-style-type: none"> • Benchmarking/KPI parameters • Production assurance and decision-support <p>Reliability monitoring and maintenance optimisation:</p> <ul style="list-style-type: none"> • Optimise maintenance intervals and spare part storage • Integrated operations • Analyse reliability characteristics (e.g. lifetime distribution, failure mechanisms) • Reveal weak designs that need modification or redesign (feedback to manufacturer)
Typical analyses where data are used	Quantitative risk assessment, reliability centred maintenance, reliability based inspection, life cycle cost, production availability, safety integrity level (SIL), spare parts storage, manning resources, FMEA-analysis, benchmarking/KPI assessment, root cause analysis, (ref.: ISO 20 815)

In addition to the build-up of a large reliability databank, and the use of data by the participating companies, achievements in OREDA include:

- Standards for reliability data collection. An ISO Standard based on OREDA was issued in 1999 and revised in 2006 (ISO 14 224: "Petroleum, petrochemical and natural gas industries – Collection and exchange of reliability and maintenance data for equipment").
- Guidelines and software for data collection and data analysis
- Publication of reliability data. Five public editions of a *Reliability Data Handbook* have been issued (1984, -92, -97, -02, -09).
- Exchange of reliability knowledge between the participating companies, and co-operation with miscellaneous parties such as system suppliers, manufacturers, research institutes etc.
- Formalised co-operation with the subsea system suppliers Cameron, FMC, AkerSolutions and VetcoGray
- Promotion of the OREDA concept and OREDA data application by > 40 papers at various international conferences
- Training courses and material for OREDA data users
- Data used in various research projects and student theses

OREDA subsea co-operation agreement with:

			
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OREDA Databases

Data

Collected data are stored in a *database* containing data from 265 installations, 16 000 equipment units with 38 000 failure and 68 000 maintenance records. The databank also includes subsea fields with about 2000 well-years operating experience.

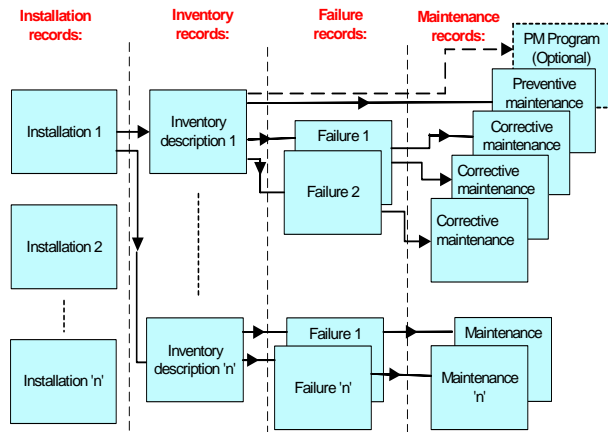
Only the OREDA member companies have access to the computerised database with its comprehensive search and analysis software. Temporary access may be given to contractors working for the OREDA companies.

The following types of equipment are covered in the OREDA database:

Rotating machinery	Mechanical equipment	Control & Safety	Subsea equipment
Combustion engines	Cranes	Control Logic Units	Control systems
Compressors	Heat exchangers	Fire & Gas detectors	Dry tree riser
Electric generators	Heaters and Boilers	HVAC	El. power distribution
Electric motors	Loading arms	Input devices	Flowlines
Gas turbines	Swivels	Nozzles	Manifolds
Pumps	Turrets	Power transformers	Pipelines
Steam turbines	Vessels	UPS	Production risers
Turboexpanders	Winches	Valves	Running tools
		Frequency converters	Subsea pumps
		Switchgear	Subsea vessels
			Templates
			Wellhead & X-mas trees

Database Structure

The data are recorded per owner and installation. Each individual item (e.g. a gas turbine) occupies a single *inventory record* in the database. This record contains a technical description (e.g. manufacturer information) plus operating and environmental conditions. For each inventory, all *failure events* are stored. Each failure event is identified by item name, date of failure, failure impact, failure mode, failure cause etc. The *maintenance* records contain data on corrective maintenance linked to the corresponding failure record, and data on preventive maintenance linked to the corresponding inventory record.



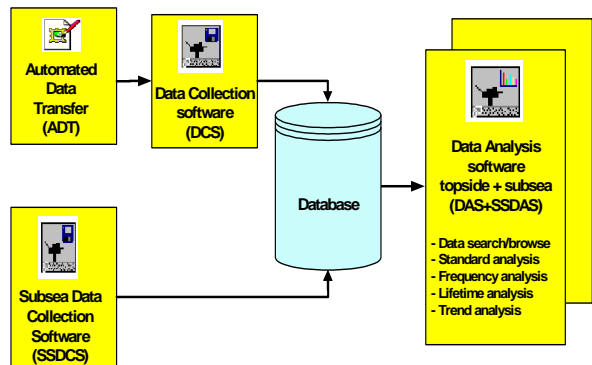
Databank structure

Software

Purpose made OREDA[®] software (SW) has been made to handle data collection, acquisition and analysis. Additionally, special utility SW is developed for SW configuration, automated data transfer, quality check etc.

The SW concept is flexible and can be configured to user defined applications. The SW includes features for advanced data search and selection, and commonly used reliability analyses. The software is also used to collect internal company data.

A tailor made SW has been developed for subsea data. This SW module has a feature used as a tool for logging of events.



Main software modules

OREDA History and Organisation

History

The Norwegian Petroleum Directorate (now: Petroleum Safety Authority) initiated the OREDA Project in 1981. The primary objective was to collect reliability data for safety equipment. It was agreed that OREDA was to be run by a group of oil companies in 1983. The objective of OREDA was subsequently expanded to collect experience data from the operation of offshore oil & gas production facilities to improve the basic data in safety & reliability studies. The OREDA project has since its start been run in phases normally lasting for 2 - 3 years. The OREDA phases with subsequent major activities and milestones are summarised below:

OREDA history

Phase	Time period	No. of participating companies	Achievements and milestones
I	1981-84	8	<ul style="list-style-type: none"> OREDA Reliability Data Handbook ('84 edition)
II	1985-88	7	<ul style="list-style-type: none"> Issued phase II reliability database Guideline for Data Collection Software for data storage and analysis (DOS).
III	1990-92	10	<ul style="list-style-type: none"> Issued phase III reliability database 2nd Handbook issued ('92 edition) Initiated vendor cooperation
III-IV	1993	10	<ul style="list-style-type: none"> Data analysis methods developed and tested Cost-benefit study Promoted the OREDA concept as ISO Standard
IV	1994-96	10	<ul style="list-style-type: none"> New software for data collection and analysis (Windows) Collected data on preventive maintenance New Guideline, also included in new software
V	1997-99	10 - 11	<ul style="list-style-type: none"> 3rd Handbook issued ('97 edition) ISO 14 224 issued (first edition) New subsea software Software tool for automated data transfer (ADT)
VI	2000-01	10	<ul style="list-style-type: none"> Strengthen focus on subsea equipment Co-operation with subsea manufacturers established
VII	2002-03	8	<ul style="list-style-type: none"> 4th Handbook issued (2002 edition) Focus on safety & subsea equipment
VIII	2004-05	9	<ul style="list-style-type: none"> Continuation of phase VII New associated member (Gassco) Involved in revised ISO 14 224 Standard (second edition)
IX	2006-08	9	<ul style="list-style-type: none"> OREDA seminar as part of 25 years anniversary (2006) Adoption of OREDA taxonomy and software to ISO 14 224 Continued focus on worldwide span of data coverage
X	2009-11	8-10	<ul style="list-style-type: none"> 5th Handbook issued (2009 edition) QA of existing database SIL data based on OREDA New associated members (GdF SUEZ and Petrobras)

Organisation

A Steering Committee (SC) comprising one member and one deputy member from each participating company manages OREDA. The SC elects one of its members as Chairman and appoints a Project Manager (PM). PM co-ordinates the activities approved by the SC including quality control of data. DNV served as PM during phases I and II; SINTEF took over this role and served as PM during phases III-IX, before handing this role over to DNV again from 2009 when phase X was commenced.

OREDA contact persons/organisations:

Steering Committee Chairman	Project Management	Software	Reliability Data Handbooks
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OREDA Website: <http://www.oreda.com>

Internal company reference:

Company:	Name, Contact address, Telephone, E-mail: