

Updated and latest news from international standardization

*4th ISO seminar on international
standardization*

in the reliability technology and cost area

Statoil, Houston, USA, 4 May 2018

*Runar Østebø, Advisor, Statoil
ISO/TC 67/WG4 Convenor*

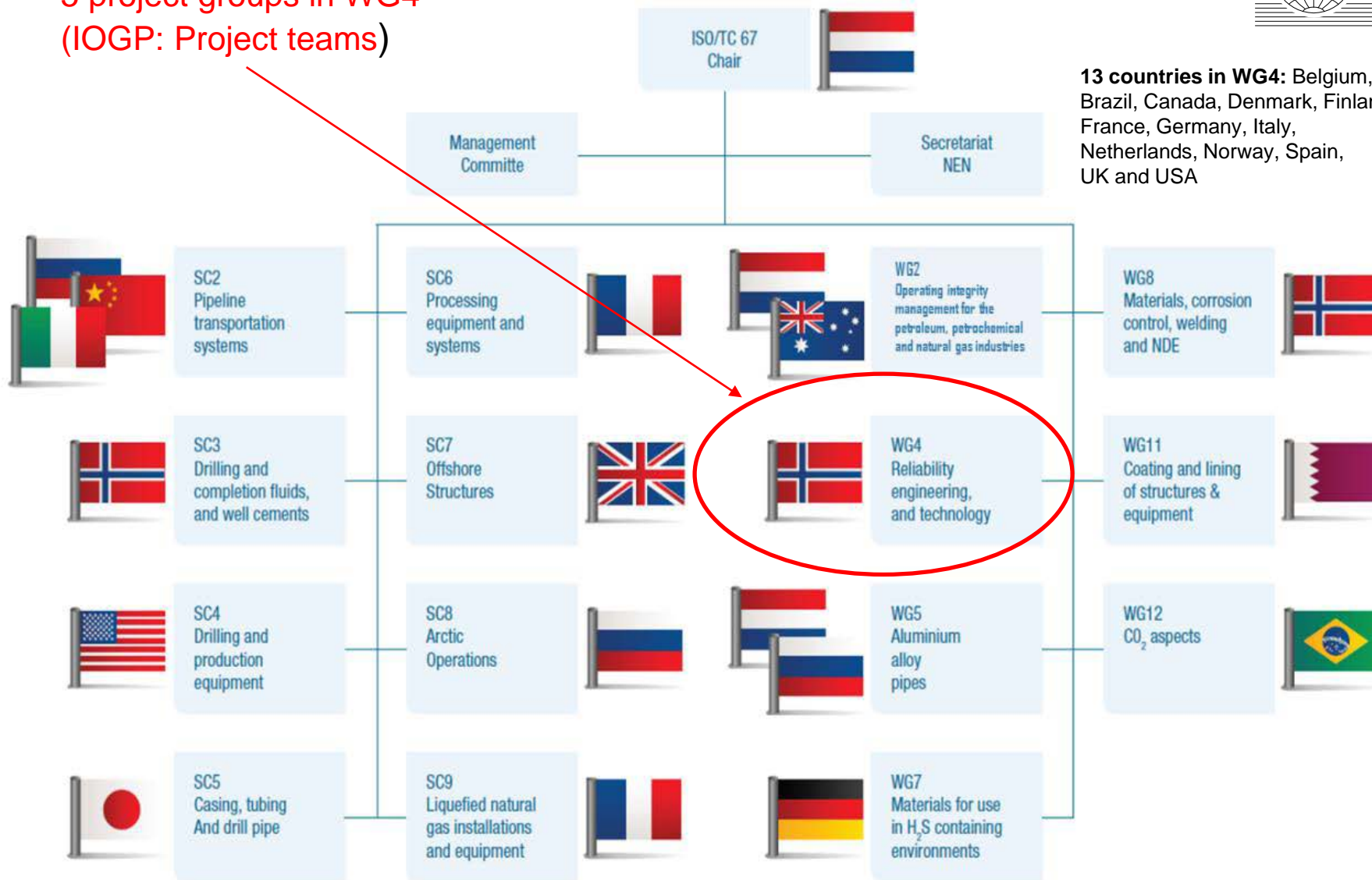
Content



- ISO/TC67 framework and WG4 portfolio
- Current main activities
- Concluding remarks

5 project groups in WG4
(IOGP: Project teams)

13 countries in WG4: Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, UK and USA





ISO Standards for use in the oil & gas industry

ISO 10418 Process safety systems (Rev)
ISO 10419 Replaced by API Spec 6AV2
ISO 10423 Wellhead & christmas tree equipment
ISO 12429 Reliability modelling/safety systems
ISO 13354 Shallow gas diverter equipment
ISO 13533 Drill-through equipment (BDPs)
ISO 13534 Hoisting equipment - care/maintenance
ISO 13535 Hoisting equipment - specification
ISO 13626 Drilling and well-servicing structures
ISO 13702 Control and mitigation of fires and explosions
ISO 14009 Offshore piping systems
ISO 14224 Reliability and maintenance data (Rev)
ISO 14429 Subsea pigging Part 1 (Rev)
ISO 14693 Drilling equipment
ISO 15138 Heating, ventilation and air-conditioning (Rev)
ISO 15154 Cracking-resistant materials for use in H₂S environments, Parts 1-3
ISO 15544 Emergency response
ISO 15443 Life cycle costing, Parts 1,3
ISO 14901 Risk assessment in the design of offshore LNG installations
ISO 16903 Characteristics of LNG influencing design and material selection
ISO 16904 LNG Marine Transfer Arms (New)
ISO 17177 Unconventional LNG transfer systems
ISO 17292 Metal ball valves
ISO 17776 Major Accident hazard management during design (Rev)
ISO 17781 Duplex stainless steel materials testing requirements (New)
ISO 17782 Qualification of manufacturers of special materials (New)
ISO 17945 Materials resistant to sulfide stress cracking
ISO 17949 Guidelines on competency for personnel (Rev)
ISO 18688 Systems and installations for supply of LNG as fuel to ships
ISO 19038 Standard Cost Coding System (New)
ISO 20815 Production assurance and reliability management
ISO 21483 Materials selection
ISO 23936-1 Thermoplastics
ISO 23936-2 Elastomers
ISO 27449 Method of test for offshore fire dampers
ISO 29001 Sector-specific quality management systems
ISO 13624 Marine drilling riser systems, Parts 1-2
ISO 13625 Marine drilling riser couplings
ISO 19901-7 Stationkeeping systems
ISO 13629-1 Subsea production systems
ISO 13629-2 Subsea flexible pipe systems
ISO 13629-3 Subsea TFL pumpdown systems
ISO 13629-4 Subsea wellhead and tree equipment
ISO 13629-5 Subsea control umbilicals
ISO 13629-6 Subsea production controls
ISO 13629-7 Completion/workover riser system
ISO 13629-8 ROT and interlocks
ISO 13629-9 ROT intervention systems
ISO 13629-10 Bonded flexible pipe
ISO 13629-11 Flexible pipe systems for subsea and marine applications
ISO 13629-15 Subsea structures and manifolds
ISO 10400 Calculations for OCTG performance properties
ISO 10405 Care/use of casing/tubing
ISO 10407-1 Drill stem design
ISO 10407-2 Inspection and classification of drill stem elements
ISO 10414-1 Field testing of oil-water-based fluids
ISO 10414-2 Field testing of oil-based drilling fluids
ISO 10416 Drilling fluids - lab testing
ISO 10417 Subsurface safety valve systems
ISO 10427 Replaced by API Spec 5B
ISO 10424-1 Rotary drill stem elements
ISO 10424-2 Threading and gauging of connections
ISO 10426-1 Well cementing
ISO 10426-2 Testing of well cements
ISO 10426-3 Testing of deepwater well cement
ISO 10426-4 Atmospheric foamed cement slurries
ISO 10426-5 Shrinkage and expansion of well cement
ISO 10426-6 Static gel strength of cement formulations
ISO 10427-1 Blow spring casing contrainers
ISO 10427-2 Centralizer placement and stop-collar testing
ISO 10427-3 Performance testing of cement float equipment
ISO 10432 Subsurface safety valves
ISO 10433 Replaced by API Spec 6AV1
ISO 10855 Offshore containers, Part 1-3 (New)
ISO 10847 Modular drilling rigs for offshore fixed platforms (New)
ISO 10797-1 Elastomeric coating of risers - polychloroprene or EPDM (New)
ISO 19900 General requirements for offshore structures
ISO 19901-1 Metocean design and operating considerations
ISO 19901-2 Seismic design procedures and criteria (Rev)
ISO 19901-3 Topsides structure
ISO 19901-4 Geotechnical and foundation design (Rev)
ISO 19901-5 Weight control (Rev)
ISO 19901-6 Marine operations
ISO 19901-8 Marine soil investigations
ISO 19902 Fixed steel offshore structures
ISO 19903 Fixed concrete offshore structures (Rev)
ISO 19904-1 Monohulls, semi-submersibles and spars (Rev)
ISO 19905-1 Site-specific assessment of pick-ups (Rev)
ISO 19905-2 Jack-ups commentary
ISO 19905-3 Site-specific assessment of floating units (New)
ISO 19906 Arctic offshore structures
ISO 35101 Arctic Operations - Working environment (Rev)
ISO 35103 Arctic Operations - Environmental monitoring (New)
ISO 35104 Arctic operations - Ice management (New)
ISO 35106 Arctic metocean, ice and seabed data (New)
ISO 3977-5 Gas turbines - procurement
ISO 10428 Sucker rods
ISO 10431 Pumping units
ISO 10434 Bolted bonnet steel gatevalves
ISO 10436 Replaced by API Std 611
ISO 10437 Special-purpose steam turbines
ISO 10438 Lubrication, shaft-sealing and control-oil systems, Parts 1-4
ISO 10439 Centrifugal compressors
ISO 10440-1 Rotary-type positive-displacement process compressors (oil-free)
ISO 10440-2 Rotary PD packaged air compressors
ISO 10441 Flexible couplings - special
ISO 10442 Integrally geared air compressors
ISO 12211 Spiral plate heat exchangers
ISO 12212 Hairpin heat exchangers
ISO 13631 Reciprocating gas compressors
ISO 13691 High speed ancised gear units
ISO 13704 Calculation of heater tube thickness
ISO 13705 Fired heaters for general service
ISO 13706 Air-cooled heat exchangers
ISO 13707 Reciprocating compressors
ISO 13709 Centrifugal pumps
ISO 13710 Reciprocating positive displacement pumps
ISO 14691 Flexible couplings - general
ISO 15547 Heat exchangers, Parts 1-2
ISO 15649 Piping
ISO 15761 Steel valves DN 100 and smaller
ISO 16812 Shell & tube heat exchangers
ISO 16901 Risk assessment of offshore LNG installations
ISO 16961 Internal coating and lining of steel storage tanks
ISO 17177 Unconventional LNG transfer systems
ISO 17292 Metal ball valves
ISO 17348 Materials Selection in CO₂ Environment for casing, tubing and downhole equipments (New)
ISO 17349 Streams containing high levels of CO₂ (New)
ISO 18796-1 Internal coating and lining of process vessels (New)
ISO 18624-1 Design and testing of LNG storage tanks
ISO 20088-1 Resistance to cryogenic spillage of insulation materials - Liquid phase (New)
ISO 21049 Centrifugal and rotary pumps shaft sealing
ISO 23251 Replaced by API Std 521
ISO 24817 Composite repairs for pipework (Rev)
ISO 25457 Flares details
ISO 27509 Compact flanged connections
ISO 28200 Venting of storage tanks
ISO 28440 LNG - Ship to shore interface
ISO 21183 Steel pipe for pipeline transportation systems
ISO 12490 Actuation, mechanical integrity and sizing for pipeline valves
ISO 12736 Wet thermal insulation coatings
ISO 12747 Pipeline life extension
ISO 13623 Pipeline transportation systems (Rev)
ISO 13847 Welding of pipelines
ISO 14313 Pipeline valves
ISO 14722 Subsea pipeline valves
ISO 15089-1 Cathodic protection for on-land pipelines
ISO 15089-2 Cathodic protection for offshore pipelines
ISO 15590-1 Pipeline insulation bands
ISO 15590-2 Pipeline fittings
ISO 15590-3 Pipeline flanges
ISO 14440 Steel cased pipelines (New)
ISO 16708 Pipeline reliability-based limit state design
ISO 19345-1 Life cycle integrity management for offshore pipeline
ISO 21209 Test procedures for pipeline mechanical connectors
ISO 21809-1 Polyolefin coatings (3-layer PE and 3-layer PP)
ISO 21809-2 Fusion-bonded epoxy coatings
ISO 21809-3 Field joint coatings (Rev)
ISO 21809-4 Polyethylene coatings (2-layer PE)
ISO 21809-5 External concrete coatings (Rev)
ISO 11940 Casing and tubing for wells
ISO 11941 Drill pipe
ISO 12825 Qualification of casing connections for thermal wells
ISO 13085 Tubing aluminium alloy pipes
ISO 13500 Drilling fluids
ISO 13501 Drilling fluids - processing systems evaluation
ISO 13502-1 Measurement of viscous properties of completion fluids
ISO 13502-2 Measurement of properties of proppants
ISO 13502-3 Testing of heavy brines
ISO 13502-4 Measurement of stimulation & gravelpack fluid leakoff
ISO 13502-5 Measurement of long term conductivity of proppants
ISO 13502-6 Measuring leak-off of completion fluids under dynamic conditions
ISO 13678 Thread compounds
ISO 13679 Casing and tubing connections testing
ISO 13680 CSA seamless tubes for casing & tubing
ISO 14310 Packers and bridge plugs
ISO 14998 Accessory completion equipment
ISO 15136 Progressing cavity pump systems, Parts 1-2
ISO 15463 Field inspection of new casing, tubing and plain and drill pipe
ISO 15464 Gauging and inspection of threads
ISO 15551-1 Electric submersible pump systems for artificial lift
ISO 15546 Aluminium alloy drill pipe
ISO 16070 Lock mandrels and landing nipples
ISO 16530-1 Well integrity life cycle governance manual (New)
ISO 16530-2 Well integrity operational phase
ISO 17078-1 Side-pocket mandrels
ISO 17078-2 Flow control devices for side-pocket mandrels & flow control devices
ISO 17078-3 Latches & seals for side-pocket mandrels & flow control devices
ISO 17078-4 Side-pocket mandrels and related equipment
ISO 17824 Sand control screens
ISO 20012 Design of aluminium drill string
ISO 27827 Aluminium alloy drill pipe thread gauging
ISO 28781 Subsurface tubing mounted production barriers



Standards in purple issued in 2016
 Standards in blue are a priority for 2017 issue

These ISO standards, TR and TS (abbreviated titles) are only a core collection of several hundreds of standards available for the oil & gas industry from ABNT, ANSI, API, AS, BSI, CSA, NORSOK, NF, GOST, SAC etc. Some ISO/TC67 standards have been withdrawn and the relevant API standard is referenced above

ISO/TC67/WG4 - Reliability Engineering & Technology

Portfolio Status and Highlights



- **ISO 14224:2016** *“Collection and exchange of reliability and maintenance data for equipment”*
 - French version NF EN ISO 14224 has been officially issued 10 October 2017
Portuguese translation of 3rd edition is delayed and expected in 2019
 - Interim phase focusing on deployment and marketing
- **ISO 20815** *“Production assurance and reliability management”*
 - **DIS version for 2nd ed. was approved** in Oct 2017 based P-members voting (100% voting positively).
 - **FDIS version expected to come in June/July 2018**
 - Active phase focusing on new version to come
- **ISO/TR 12489:2013** *“Reliability modelling and calculation of safety systems”*
 - Interim phase focusing on deployment and marketing.
- **ISO 15663-1/2/3:2001**: *“Life cycle costing”*
 - New active phase with revision in progress, via IOGP Standards Solution. 10 countries
- **ISO 19008:2016** *“Standard Cost Coding System for oil and gas production and processing facilities”*
 - **EN ISO 19008 approved by CEN** in 26 Dec 2017, and issued 28 March 2018 by CEN
 - Interim phase focus with particular focus on applications to ensure cost control



ISO 14224:2016

“Collection and exchange of reliability and maintenance data for equipment”

- *Scope*

- Standardized data format to facilitate exchange reliability and maintenance (RM) data between operator and owner, etc.
- Provide key definitions
- Basis for communicating equipment experience
«reliability esperanto»
- Normative terminology e.g.
 - **Failure modes (per equipment class)**
 - **Failure mechanism and failure cause (generic across all equipment classes)**
- **Key Performance Indicators (KPI)**
- Applicable for all type of oil & gas facilities and operation, and all phases.
- Guidance for analysis of reliability and maintenance data

INTERNATIONAL
STANDARD

ISO
14224

Third edition
2016-09-15

Corrected version
2016-10-01

Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment

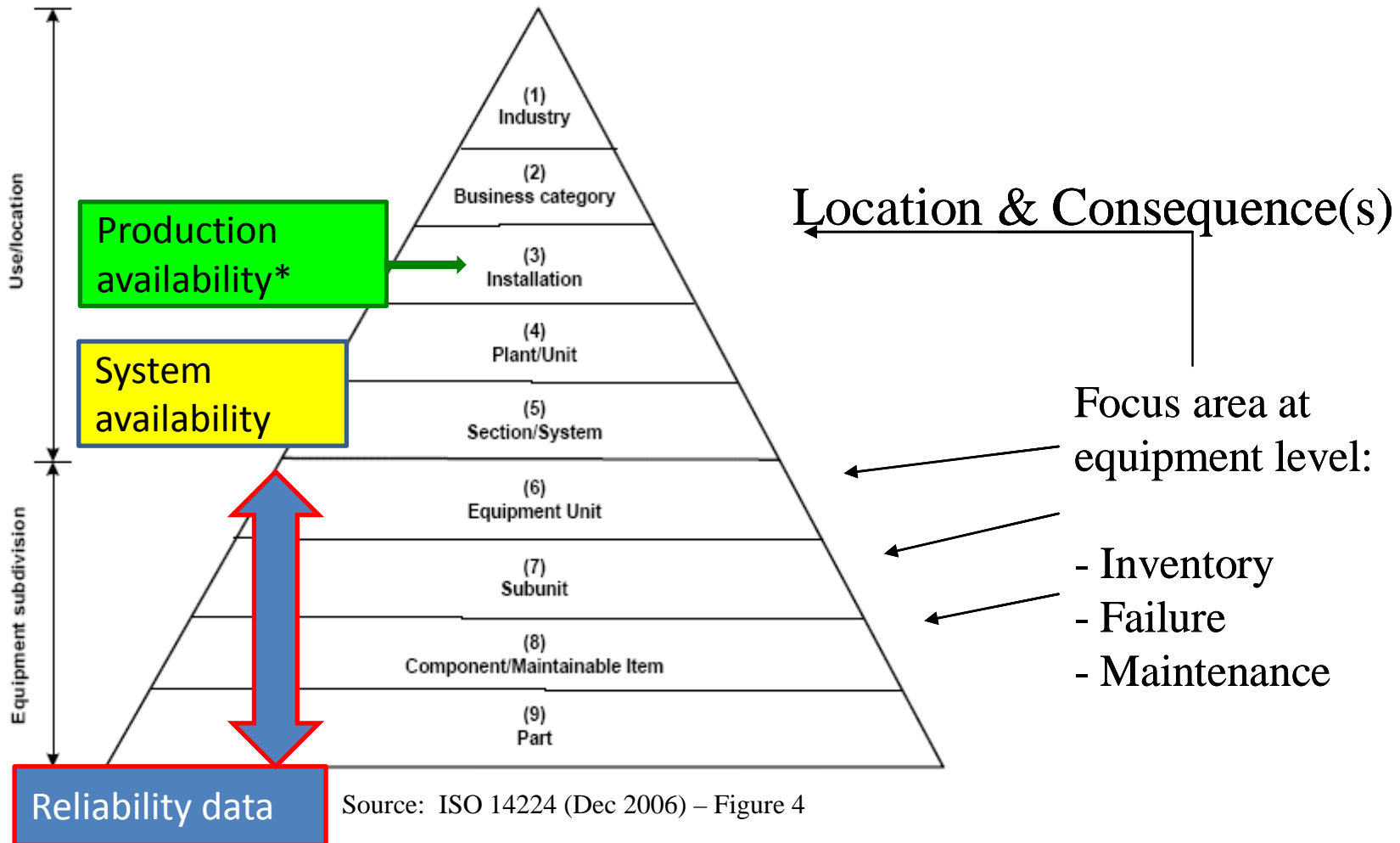
Important standard also with respect to digitalization and LCI.

CEN version approved July 2016: EN ISO 14224
(Per April 2018: Adopted by 37 CEN-member countries)
 e.g. adopted in Norway as Norwegian standard 1 Jan 2017: NS-EN ISO 14224:2016
Edition 2 was adopted in USA as ANSI/API Std 689 in July 2007. Ed. 3 pending?

Regulatory example: NS-EN ISO 14224:2016 quoted also in PSA (see e.g. failure and maintenance data in [Activity Regulations](#) - § 49).

ISO 14224 - Taxonomy classification

Taxonomic level for performance measurement



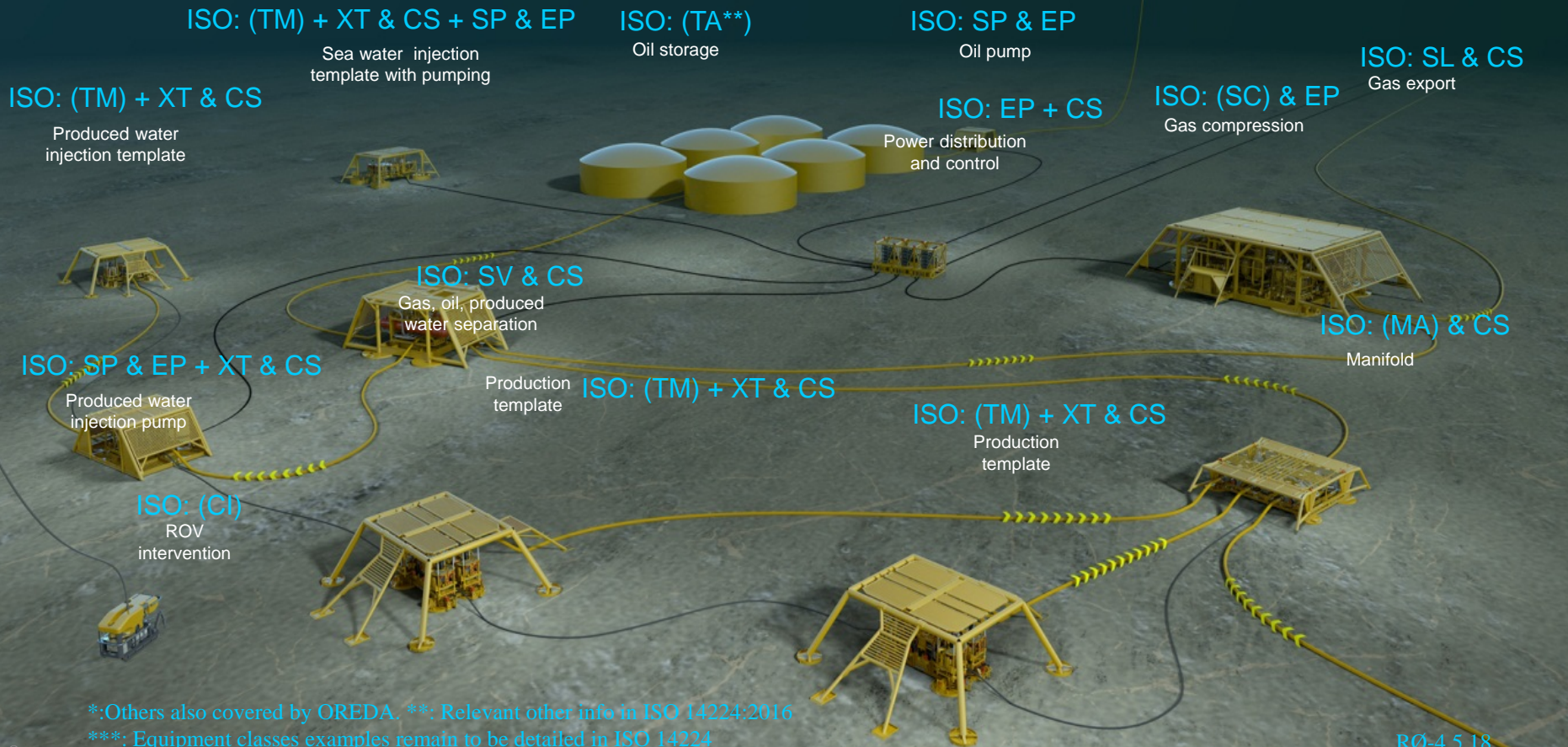
*In operation often called Production efficiency (PE)

The Statoil Subsea Factory™

ISO 14224:2016 subsea related equipment classes

Old ISO 14224:2006: Subsea production control (CS), Subsea wellhead and Xmas trees (XT), Subsea pumps (SP), Subsea template* (TM), Subsea manifolds* (MA), Subsea flowlines* (FL), Risers (PR) and Subsea BOPs (BO).

Additions in new ISO 14224:2016: Subsea electrical power distribution (EP), Subsea pressure vessels (SV), Subsea pipelines (SL), Subsea well intervention (OI) and Surface well control equipment (WC). Future: Subsea compressors*** (SC), Subsea intervention*** (CI)



*:Others also covered by OREDA. **: Relevant other info in ISO 14224:2016

***: Equipment classes examples remain to be detailed in ISO 14224

ISO 20815

“Production assurance and reliability management”

- **Scope**
 - Production assurance and reliability management - **Production Assurance Programme (PAP)**
 - Definitions including
 - Technology Readiness Level (TRL)
 - Production and Time loss categorization - interacting with ISO 14224
 - Contractual reliability framing (targeting)
 - Analysis techniques

Status ed.1: CEN version approved February 2010: EN ISO 20815
(Per April 2018: Adopted by 39 CEN-countries)
e.g. adopted as Norwegian standard June 2010: NS-EN ISO 20815:2010

DRAFT INTERNATIONAL STANDARD
ISO/DIS 20815

ISO/TC 67 Secretariat: NEN

Voting begins on: Voting terminates on:
2017-07-26 2017-10-17

**Petroleum, petrochemical and natural gas industries –
Production assurance and reliability management**

Industries du pétrole, de la pétrochimie et du gaz naturel – Assurance de la production et management de la fiabilité

**NEW Ed.2 to come in 2018
(FDIS planned June 2018)**

Regulatory example: NS-EN ISO 20815:2010 quoted also in PSA (see e.g. Maintenance programme in [Activity Regulations](#) - § 47).

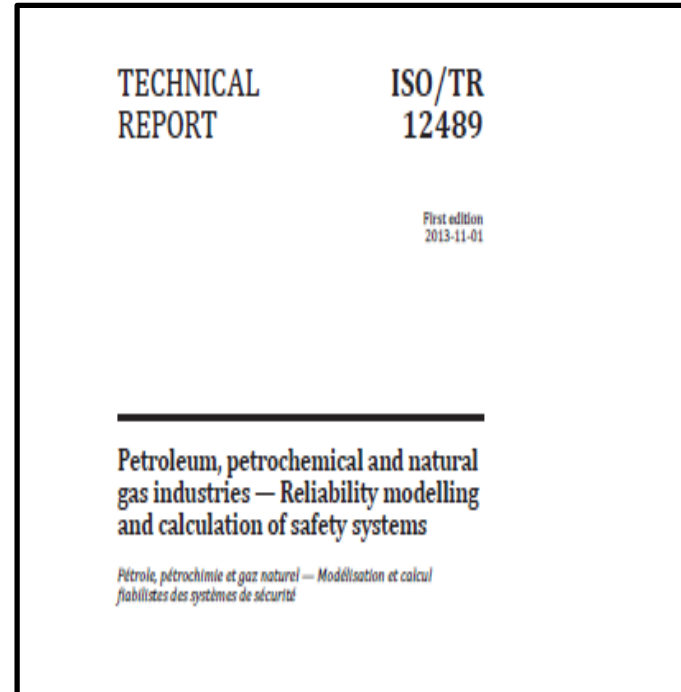
ISO Technical Report 12489

”Reliability modelling and calculation of safety systems”

Scope

- Provide guidelines with focus on modelling & calculations
- ISO/TR 12489 is an important supplement of IEC 61508-part 6 (functional safety), but for all safety systems
- Priority 2 issue on ISO/TC 67 ”Action plan industry events” (Montara/Macondo)

CEN version approved March 2015 and issued Jan 2016: CEN ISO/TR 12489
(Per April 2018: Adopted by 22 CEN-member countries)



ISO 15663 – Life Cycle Costing (Part 1,2 and 3)

- **Scope**

- Provide guidelines for Life Cycle Costing of competing options

- **Status**

- 1st edition was issued in 2000 (Part 1) and 2001 (Part 2 + 3).
- Expert members from 9 countries takes part (via IOGP) in re-established TC67/WG4/PT4
 - Brazil, Denmark, Finland, France, Germany, Italy, Norway, Spain, and UK.

- **New draft ed. 2 planned to come as DIS in 2019**

National adopted versions:

- ***CEN version of Part 1 (adopted by 38 countries)***
- ***CEN version of Part 2&3 will coe when new ISO 15663, ed.2***

ISO 19008

Standard Cost Coding System for oil and gas production and processing facilities



- **Scope** – Provide standard cost coding system
- New 1st edition was issued in August 2016.
- Main parts and 3 normative Annexes containing each of the coding structures PBS, SAB and COR with code, code name and definition
 - Excel files can be found in the <http://standards.iso.org/iso/19008>
- One informative Annex containing examples of use

INTERNATIONAL
STANDARD

ISO
19008

First edition
2016-08-15

**Standard cost coding system for oil
and gas production and processing
facilities**

*Système de codage du coût standard pour la production de gaz et
d'huile, et des installations de traitement*

CEN version approved December 2017: EN ISO 19008
(Per April 2018: Adopted by 7 CEN-countries)
e.g. adopted as British standard in 2018: BSI-EN ISO 19008:2018

Concluding remarks

- Governance: Management and selective use of the ISO standards amongst industry companies as defined in regulations and governance systems
- Use of these developed oil & gas ISO-standards is an industrial responsibility – for equipment and work processes
 - To reduce risk (safety and environment) and optimize production assurance
 - To save cost by controlling variety
 - To minimize company own specifications
 - Capture standardized learnings
- Compliant use of ISO standards – and also supporting current digitalization - can unlock business value and is a means to achieve cost-efficiency, profitability, HSE objectives, and also minimize climate impact

