Multi-disciplinary ISO standards

Management system days,
Equinor, Fornebu, 30 October 2019

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ISO/TC67/WG4 Convenor
1. Executive overview of ISO/TC67/WG4 portfolio
   • Work Group 4 “Reliability engineering and technology”
     • ISO/TC67/WG responsible for reliability and cost related ISO/TC 67 standardization activities within petroleum, petrochemical and natural gas industries.

2. Application arena
   • Multi-disciplinary - across value chain
   • Business objectives: HSE, Profitability/Cost, Quality
   • Life cycle stages
     a) Technology development
     b) Project execution
     c) Operation

3. Equinor examples related to management of business objectives
ISO/TC 67 members involvement in TC67/WG4

P (Participating) members – 35 (WG4 involvement – currently 14 countries).
Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Canada, China, Cyprus, Denmark, Finland, France, Germany, Indonesia, Iran, Ireland, Italy, Japan, Kazakhstan, Republic of Korea, Kuwait, Mexico, Netherlands, Nigeria, Norway, Portugal, Qatar, Russian Federation, Saudi Arabia, Spain, Sweden, Thailand, Ukraine, United Kingdom and United States.
6 project groups in WG4 (IOGP: Project teams)

14 countries in WG4: Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, UK and USA - 50 experts
Projects (active projects currently organized via IOGP Standards Solution)

- **ISO 14224** “Collection and exchange of reliability and maintenance data for equipment”

- **ISO 20815** “Production assurance and reliability management”

- **ISO/TR 12489** “Reliability modelling and calculation of safety systems”

- **ISO 15663-1/2/3** “Life cycle costing”

- **ISO 19008** “Standard Cost Coding System for oil and gas production and processing facilities”

- **ISO/TR xyz** “Calculation and reporting production efficiency in the operating phase”
  - New activity from February 2019.
ISO 20815:2018
“Production assurance and reliability management”

Scope

- Production assurance and reliability management
  - Production Assurance Programme (PAP) (operating companies)
  - Reliability Management Programme (RMP) (equipment suppliers)
- Definitions including
  - Technology Readiness Level (TRL)
  - Production and Time loss categorization - interacting with ISO 14224
- Contractual reliability framing (targeting)
- Analysis techniques adapted to project risk
- Supports quality management (ISO 20815 refers to ISO 9000, ISO 9001 and ISO/TS 29001)

Regulatory example: NS-EN ISO 20815 quoted also in PSA (see e.g. Maintenance programme in Activity Regulations - § 47).
ISO 14224:2016
"Collection and exchange of reliability and maintenance data for equipment"

Scope

- Standardized data format to facilitate RM data exchange
- Provide key definitions + Data analytics methods
- 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)
- All type of facilities and operations for all life cycle phases

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
System/equipment quality performance

Multi-disciplinary:
- Rotating, Mechanical, Electrical, Safety, Subsea, Drilling, Well, etc.

Location & Consequence(s)

Focus area at equipment level:
- Inventory
- Failure
- Maintenance

Source: ISO 14224 (Dec 2006) – Figure 4

Production availability*
System availability
Reliability data

*In operation often called Production efficiency (PE)
ISO 19008
«Standard Cost Coding System for oil and gas production and processing facilities»

Scope
– Provide standard cost coding for classification and coding of:
  – Cost (e.g. equipment purchase cost)
  – Activities (e.g. duration of construction)
  – Physical quantities (e.g. equipment weight and pipeline length)
### Examples of use of ISO wrt. Equinor governance

Across Value Chain – Corporate Framework - Various governing documents
Technology development/Project development/Operation and maintenance

<table>
<thead>
<tr>
<th>ISO-standard</th>
<th>Technology development</th>
<th>Project execution</th>
<th>Operations</th>
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| ISO 14224    | -Technology qualification (e.g. failure mode and failure mechanisms)  
-Reliability management for new technology | -Reliability data for analyses  
- Performance requirements (equipment reliability targets) | -Failure reporting  
(ISO failure codes in SAP)  
-Maintenance planning  
-Accident investigation |
| ISO 20815    | -Technology qualification (TRL:Technology Readiness Level)  
-Reliability management/RMP in technology projects | -Production Assurance Programme (PAP)  
-Reliability Management Programme (RMP) towards suppliers. | -Production efficiency reporting  
-Reliability management |
| ISO 15663    | -Life cycle costing | -Life cycle costing of project alternatives | -Life cycle costing for e.g modifications |
| ISO 19008    | -Cost and quantity estimation, benchmarking and analysis | -Cost and quantity reporting, forecasting, data collection and analysis | -Cost and quantity data collection |
| **General**  | Terms & definitions in ISO standards are used in various governance documents  
Standards limit needs for subject company specifications towards external suppliers etc.  
Multi-disciplinary applications and deployment via courses.  
ISO/TR 12489 also applied in functional safety and in reliability management. |
ISO/DIS 15663 (ed. 2) – Life Cycle Costing

Stakeholders

Involvement by levels of detail

- Operators
  - Appraise
  - Select
  - Define
  - Execute
  - Operate
- Contractors
  - Field
  - Facility
  - Systems
  - Equipment
- Vendors

Involvement by life cycle phase

- Field
- Facility
- Systems
- Equipment

Figure 2 — The role of participants with respect to level of detail and life cycle phase
Concluding remarks

ISO/TC67 Mission:
• To create value-added standards for the oil and gas industry

ISO/TC67 Vision

Oil and gas industry: Standards actively used and integrated in governance systems to:
• Reduce risk (safety and environment) and optimize production assurance
• Ensure cost-efficiency and operational excellence
• Minimize company own specifications
• Risk-based prioritization of production assurance activities + Focus on safety critical & production critical equipment.