
ISO/TR 12489 Executive summary
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Production assurance and safety represent the two faces of risk in petroleum, petrochemical and natural gas industries.

The ISO/TC67/WG4 - "*Reliability engineering and technology*"- is responsible for various reliability related standards like:

1. ISO 14224 ("*Collection and exchange of reliability and maintenance data for equipment*") issued in 1999 for the first edition, revised in 2006 and under revision at the present time.
2. ISO 20815 ("*Production assurance and reliability management*") issued in 2008.
3. The new technical report ISO/TR 12489 ("*Reliability modelling and calculation of safety systems*") which is the subject of this executive summary. It was scheduled for end of June but has been officially issued by ISO on the 1st of November 2013.

The convenor is Runar Østebø (Statoil, Norway) and the secretary was Øivind Bråthen (Standard Norway). Separate project groups are responsible for each standard.

Eleven countries have been involved and Jean-Pierre Signoret (TOTAL, France) has been the project leader of the ISO/TC67/WG4 Project group 3 which has developed the ISO/TR 12489 shortly described hereafter.

The ISO/TR 12489 provides guidelines to reliability engineers who deal with probabilistic approaches which, in association with qualitative considerations, are increasingly used to design reliable safety systems. This is encouraged by regulations (e.g. SEVESO directive) or widely recognized standards (e.g. the SIL approach recommended for safety instrumented systems by the IEC 61508 mother standard and the sectoral derived standards like IEC 61511 which is focused on process systems). This implies to meet various probability related requirements but these probabilistic matters are rather briefly documented in standards and not really satisfactorily addressed in reliability textbooks. Therefore, the ISO/TR 12489 aims at closing this gap by establishing a sound specific probabilistic background, helping the reliability engineers to properly deal with the probabilistic modelling and calculations of any type of safety systems (e.g. ESD, High Integrity Pressure Protection System, etc.). After gathering the relevant definitions and raising the typical challenges, the technical report explains in detail how to solve them. It analyses in detail how simplified formulae can be established for simple safety systems and how the common standardized models - reliability block diagrams (IEC 61078), fault trees (IEC 61025), Markovian approach (IEC 61165) and Petri nets (IEC 62551) - may be used to deal with more complex situations. Moreover, ISO/TR 12489 develops in detail the approaches mentioned in the IEC 61508:2010 part 6 annex B for SIL related calculations. It provides also guidelines about the multiple safety systems mentioned in the IEC 61511 ed2 which is currently under development.

When designing safety systems, a common leading idea is that the risk totally disappears when *safe states* are reached and that spurious actions don't really matter. This is particularly questionable in petroleum, petrochemical and natural gas industries where, beyond the undesirable side effects on production availability, there are also undesirable side effects on safety: pressure increasing after shutdown (e.g. oil & gas production systems), increasing number of process restarts where accidents often occur, etc. Therefore the ISO/TR 12489 provides guidelines for evaluating the spurious failure frequencies in order to find good compromises between dangerous and spurious failure probabilities or frequencies. A comprehensive chapter has been developed to present typical examples of application encountered in oil and gas industry (instrumented or not) and illustrating how the ISO/TR 12489 content can be effectively implemented by reliability engineers

The ISO/TC67 Action Plan on recent industry events (ref. Montara and Macondo accidents) have been made by ISO to identify ongoing or new key standardization efforts to strengthen the use of standards and demonstrates the need for "global standards used locally worldwide" (ISO/TC67's vision statement). The ISO/TR 12489 work activity appears as a high activity (priority 2) on this report covering the entire oil & gas arena.

The work started from scratch in November 2008, the draft TR (DTR) has been completed by the end of 2011 and circulated in January 2012 for a two months hearing. Then, the works have been delayed due to the embargo situation. The ballot has been circulated in December 2012 and the document approved in March 2013. Finally the TR has been issued by ISO and is publically available since November 2013. Furthermore it has been approved by CEN (i.e. by the European National Committees) 28th March 2015 and issued 27th January 2016 as CEN ISO/TR 12489. Since 2013 many dissemination actions and courses have been achieved or are currently in progress. Stephane Collas (TOTAL, France) is now the interim project leader for ISO/TR 12489 in ISO/TC67/WG4.
