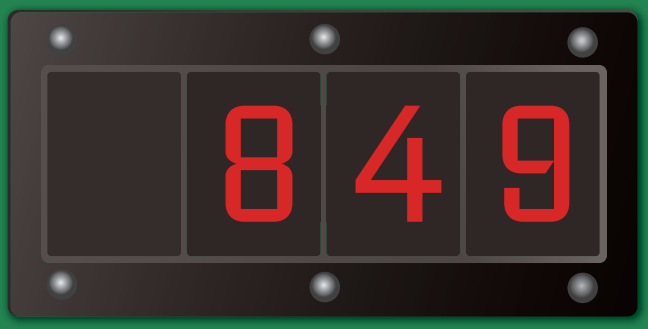
This plant has wor



days with
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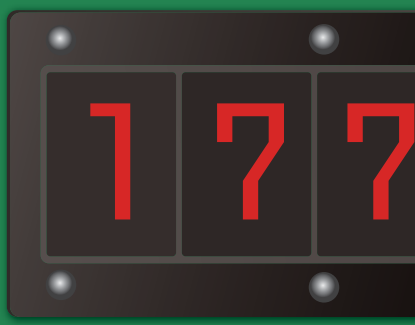
Profits have
increased



Safety is Good Business

New machine safety standards usher in an era of better design flexibility and safety performance.

By Mike Miller, Safety Market Development and Wayne Solberg, Global Technical Consultant, Rockwell Automation

Keeping up with changing safety standards is nothing new for machine builders. But recent changes to the European Commission's new Machinery Directive, which took effect December 29, 2009, will reshape how designers approach machine safety system design.

As it relates to functional safety, EN 954-1, the standard that categorizes safety levels, is being superseded by two standards that will coexist. Machine builders and system integrators can choose to conform to requirements of either EN ISO 13849-1 or EN/IEC 62061 to demonstrate compliance with the machinery directive.

EN ISO 13849-1, "Safety of machinery, Safety-related parts of control systems," specifies system reliability in one of five performance levels. These levels primarily are used for low complexity devices and circuits.

EN/IEC 62061, "Safety of Machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems," defines the integrity of the safety function in safety integrity levels (SIL). These primarily are used on more complex devices and circuits.

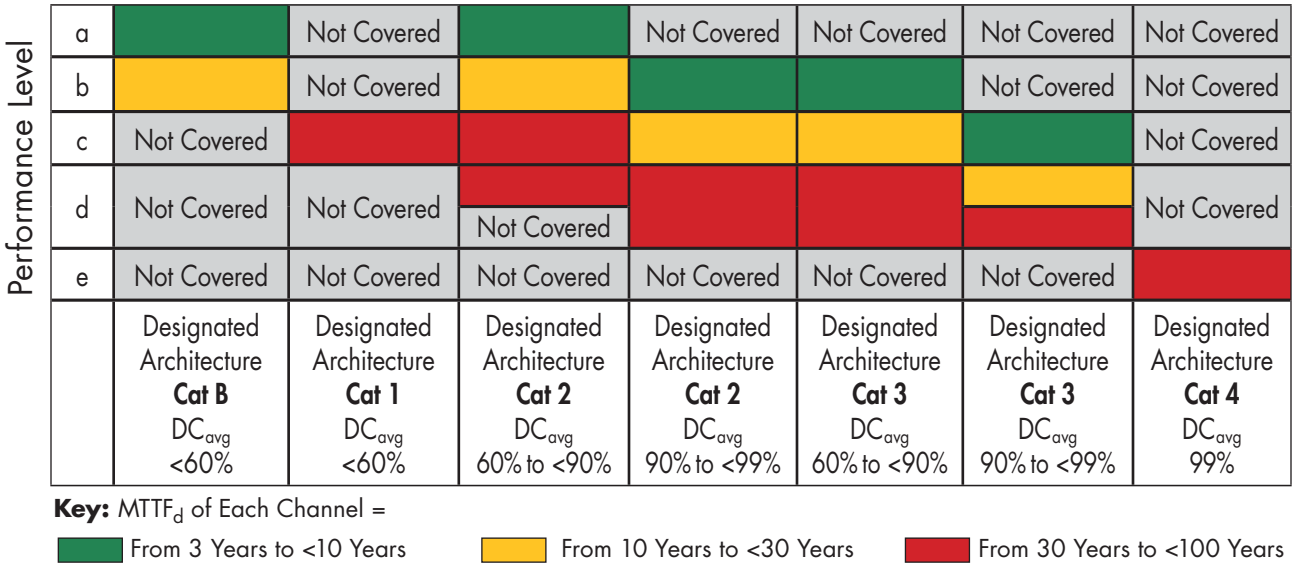


Figure 1. The ability to define performance requirements provides machine designers more flexibility to tailor their circuits to meet the specific needs of the application, rather than generalizing the overall design based on the simpler, more prescriptive requirements of the past.

The European Commission recently extended the deadline for transition from EN 954-1 to EN/ISO 13849-1 until December 31, 2011. This additional time should be viewed as an additional transition period — not as an extension to EN 954-1.

With adoption of these functional safety standards, designers will need to assess reliability of safety components by adding a quantitative calculation to the control safety system design. While this means more steps and procedures, it also offers benefits. Namely, these standards create a methodical approach that can lead to machinery with more predictable machine performance, greater reliability and availability, and improved return on investment (ROI).

Both methodologies use quantitative calculations to define the performance and integrity of safety functions, based on safety data typically supplied from the component manufacturers.

In addition, both standards are based on determining risk levels involved with identified hazards of the machine and its functions. A documented risk assessment of the machine must be the basis of any safety circuit or safety functions to define clearly the level of performance or integrity of that safety function.

Less Complexity, Better Reliability

Historically, standards mostly were prescriptive in nature, simply providing guidance on the structure of control systems to help ensure safety requirements were met.

Functional safety adds a "time" element to build on the existing safety structure (category) approach. This addition instills a reinforcing level of confidence that the safety system will perform properly today and tomorrow. In other words, designers have more information — and therefore more confidence — about the **reliability** of the safety function.

The ability to define performance requirements provides designers more flexibility to tailor their circuits to meet specific needs of the application, rather than generalizing the overall design based on simpler, more prescriptive requirements of the past.

For example, in conducting a risk assessment under EN ISO 13849-1, a designer may find that Performance Level d is required. The chart in **Figure 1** reveals several alternatives. A Category 2 (zero fault tolerant) structure with a very high mean time to dangerous failure ($MTTF_d$) and low diagnostic coverage may be the least expensive solution.

At the other end of the spectrum, a Category 3 (single fault tolerant) system with medium diagnostics may be the ideal solution. Rather than taking a conservative approach and potentially overcompensating on the design, this approach gives designers more flexibility to specify an optimum level of safety to meet individual application demands.

Standard EN (IEC) 62061 offers similar flexibility. This performance-based approach makes it easier for designers to quantify and justify safety's value. With the ability to quantify circuit reliability through specific performance and system integrity calculations, the designer can show the value of actual risk reduction, and thereby more easily justify safety expenditures.

The ability to tailor specific safety functions to the application by using a more methodical, deterministic

approach helps reduce cost and complexity and improves machine sustainability. It also helps improve ROI by achieving an optimum level of safety for each safety circuit or function.

Laying the Groundwork

The challenge for machine builders is two-fold. First, they need to understand the new Machinery Directive's requirements and how those requirements affect design and component selection.

Second, machine builders need to understand documentation requirements and begin gathering functional safety data needed from component suppliers to support their safety designs with an SIL or PL for the system.

Many electronic component safety manufacturers are embracing the new standards by indicating the SIL level the system containing the safety component could achieve, and by supplying safety data for PL and SIL verification. This allows designers to take that information and perform the necessary calculations to meet application requirements according to the standards.

Automation suppliers also are continuing to get their safety products certified and are offering education and training programs and tools to help machine builders meet these new requirements. For example, Rockwell Automation released a product library file designed for use with the SISTEMA calculation tool. The SISTEMA tool, developed by Germany's IFA organization, automates calculation of the attained PL of the safety-related parts of a machine's control system in the context of EN ISO 13849-1.

The combination of the SISTEMA tool, along with new product libraries from component suppliers, will provide machinery and control system designers with comprehensive support in the evaluation of safety in context of EN ISO 13849-1. Engineers are spared time-consuming consultation of tables and calculations of formulae because the software performs these tasks. Results can be printed out in a report.

The machine safety world continues to change, and these new functional safety standards represent a giant leap forward. Though the deadline remains months away, machine builders should take steps now to evaluate the directive's impact on their equipment. □

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>> Download the Free SISTEMA Tool

The SISTEMA tool is available for download free of charge by following the link on the Rockwell Automation Safety Portal at http://bit.ly/dehltT.

>> Learn About New Safety Standards and Procedures

To help protect personnel and reduce business risk, machine builders and system designers need to stay abreast of impending changes in functional safety standards. Rockwell Automation is sharing its expertise on the subject through a series of seminars and Webinars.

Through the company's SafeDesign program, machine builders of control and safety systems can learn about the requirements and benefits of compliance demands, plus technology options and design considerations for meeting these updated standards.

Safety Assessment Machine Review involves an on-site visit by Rockwell Automation to review machine builder products and lead your team through the globally recognized risk assessment process. The review also offers guidelines on a range of risk reductions techniques that encompass process redesign, guarding, awareness, training and administrative requirements.

The Functional Safety Educational Webinar Series includes a series of Internet-based educational programs focusing on the five-phased functional safety life cycle and its role in helping eliminate hazards, reduce costs and increase productivity.

The functional safety life cycle, as defined in standard IEC 62061, provides the foundation for a detailed, more systematic design process for machinery applications. The standard is part of the impending changes to the European Commission's new Machinery Directive.

The Functional Safety Educational Seminars will be delivered live in various locations through the United States beginning later this year. They will cover many of the same topics covered in the Webinars, including emerging design philosophies — such as passive, configurable and lockable — and how those help add value and provide a financial return on safety investments.

For more information on the Rockwell Automation SafeDesign program and related events and training opportunities, please visit the "functional safety" section at http://bit.ly/9aJ5Zp.