What Matters

In This Issue of What Matters

When buying a new machine or upgrading an existing one, end users need absolute certainty that the safety system achieves necessary safety requirements. As a result, there is good reason for OEMs to make safety an integral part of the machinery design process and focus extra attention on validating that a safety system will work as intended.

Designing safety into machinery – rather than as a wrapper around it – can be challenging, especially when you're implementing new safety technology that helps improve productivity but also is more complex. Many OEMs conduct a risk assessment, select safety products and add them onto a machine without considering functional safety requirements. It is important to follow a rigorous, systematic design process that includes defining fun tional safety requirements early on, and verifying and validating the safety system when it is complete.
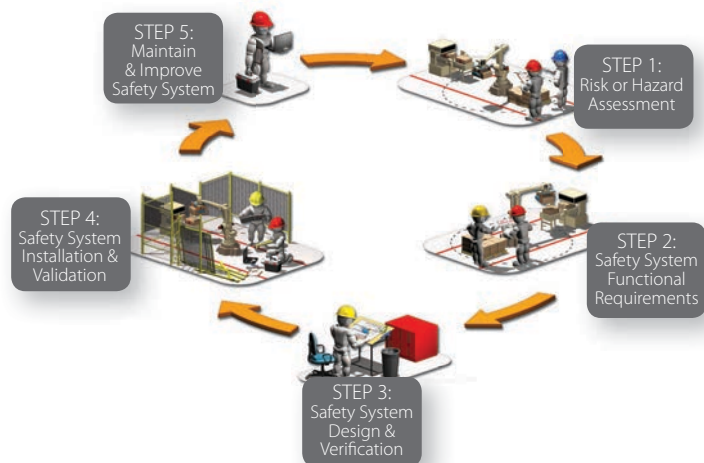
This issue of What Matters outlines best practices for designing machinery safety systems and provides tools that can help you save time in the process.

Tools to Ease Machinery Safety Design

The functional safety life cycle (pictured below), as defined in standards IEC 61508 and IEC 62061, provides a practical, systematic approach to designing safety into machinery. The cycle should start from the beginning anytime you are designing new machinery or making changes to existing equipment.

Conducting a risk assessment is the first step, followed by determining functional-safety system requirements. Too often, OEMs skip the second step and move right onto design from risk assessment, or worse, they develop the functional requirements before considering safety. One pulp and paper machine builder, Automatic Handling International, recognizes that steps one and two go hand-in-hand. "We see what we need for what function; then we decide how we want to react when an operator goes in," said Dan Pienta, president of Automatic Handling International.

STEP 5:
Maintain & Improve Safety System

STEP 1:
Risk or Hazard Assessment

STEP 4:
Safety System Installation & Validation

STEP 2:
Safety System Functional Requirements

STEP 3:
Safety System Design & Verification

LISTEN. THINK. SOLVE.

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The key is to define the functional safety requirements that will help mitigate each hazard. Tools, like the Safety Functions pre-engineered documents from Rockwell Automation, can help you determine functional safety requirements during step two. The documents include details for each safeguarding method, such as specific functionality, performance level (PL), required input, logic and output components, and verification and validation plans.

Step three is design and verification, and step four is installation and validation. Verification is the analytical, mathematical approach to confirming that the achieved PL matches the risk assessment and required PL. Attaining the required PL calculation, however, does not mean a system is safe. Validation gives real force to a safety solution by challenging the design with actual operating conditions – both normal and abnormal. As standard EN ISO 13849-2 states:

> "Validation is a process that uses both static and dynamic testing, and other methodologies, to show that all parts interact correctly to perform the intended safety function, and that unintended functions do not occur."

In other words, verification proves that a safety circuit or design works. Validation provides evidence and documentation that all safety functions work correctly and as intended. It shows you have done your due diligence, and helps reduce liability and risk. "Validation is the most important thing from a liability standpoint," said Pienta. "Just because it is a red device does not mean it is safe."

Depending on which safeguarding and automation technology your system uses, the amount of time it takes to verify and validate the safety system can vary. For example, validating programmable safety controllers can be significantly more time- and labor-intensive than validating hardware relays.

Safety Automation Builder software can help guide you through the necessary steps, bringing safety knowledge together to ease design and reduce engineering time. This software tool, available in 16 languages, helps verify that a safety system meets all requirements and generates a bill of materials.

To start, users import a machinery image or drawing, and the software asks questions about risk assessment, functions, desired performance levels and more. Users can create safety zones, pictorially showing pinch points, hazards, fixed and movable guards on the drawing. After selecting input, output and logic devices, they can drag the respective product images right onto the drawing.

The Safety Automation Builder tool exports the file to SISTEMA (Safety Integrity Software Tool for Evaluation of Machine Applications) to show progress on how required safety levels compare with achieved safety levels. The software then generates a bill of materials, so OEMs can move forward with purchasing exactly what they need.

Since its launch in February 2013, the software has been downloaded more than 19,000 times. Many OEMs are already using it to simplify selection of safety devices and speed engineering time. "It's very time-consuming to do all the research," said Pienta. According to Pienta, machine engineering can be like a funnel, where OEMs can speed production but have very few ways to speed engineering. "Anything we can do to open up that funnel is good."

Another OEM spent seven days pulling together the safety components for a machine – printing out a drawing of the machine, marking hazards and guards on the drawing, designing the necessary safety system, and getting quotes for components. Using the Safety Automation Builder tool, the job was complete in less than three hours.

Understanding End-User Expectations

Today, best-in-class manufacturers realize that strong safety performance results from a combination of employee behavior, compliance processes and the use of automation technologies that improve worker safety and productivity.

A study[1] by the Aberdeen Group showed a clear correlation between reduced injury rates and improved operational efficiency. The study indicated that best-in-class manufacturers achieve 5 to 7 percent higher overall equipment effectiveness, 2 to 4 percent less unscheduled downtime, and less than half the injury rate of average performers.

To remain competitive, your customers are measuring their safety programs and developing their paths to best-in-class safety. Rockwell Automation developed the Safety Maturity Index™ tool to help them evaluate company performance in three core criteria – culture (behavioral), compliance (procedural) and capital (technical). The tool indicates areas of success and opportunities for improvement.

As manufacturers continue to see significant productivity improvements using safety solutions, they turn to OEMs that deliver machinery with the right safety system and help them move forward in their safety journey.

1. "A Risk Management Approach for Improving Safety and Productivity" study by the Aberdeen Group, October 2010.
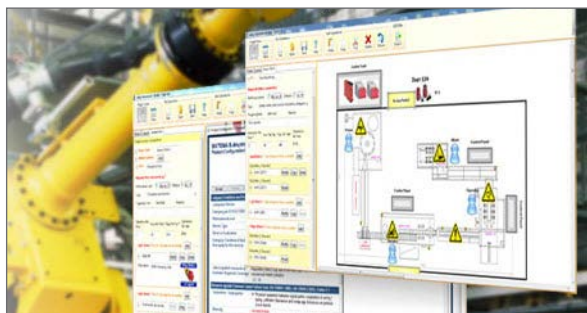
Safety Automation Builder

You can save design time by using the Safety Automation Builder tool to guide you through the safety system design process. The tool allows you to import a machine image and answer questions using a drop-down menu and help screens to select necessary safeguards. It provides options for layout, safety performance level (PL) analysis based on ISO 13849-1 using IFA's SISTEMA, and product selection using Allen-Bradley® products. It then compiles all selections and generates a bill of materials.
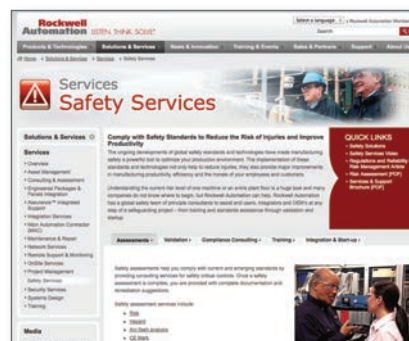
Download now

Guidebooks for Machinery and Process Safety

Need help understanding which regional and international safety standards apply to your projects? Want guidance for how to conduct a risk assessment? Rockwell Automation develops Safebooks to help you understand how to apply the latest standards and implement safety in machinery or process applications. Each Safebook is available as a free download.

Download the latest Machinery Safebook

Download the latest Process Safebook

Safety Functions

After going through the Safety Automation Builder process, you can use Safety Functions pre-engineered documents, with details for each safeguarding method, to complete a safety system design. Each document includes specific functionality, PL, required input, logic and output components, parts lists, electrical drawings, a SISTEMA project file, and verification and validation plans.

See the options

Machinery Safety Services

Need help on a safeguarding project? Rockwell Automation machinery safety consultants can assist you at any stage. Services include training, standards assistance, risk and hazard assessments, circuit evaluations, system architecture development, hard-guarding design, validation and startup.

Read more

Join the Online Safety Community

Join the conversation about manufacturing safety, get the latest information, and network with peers and industry leaders.

Save the Date: SPS IPC Drives 2014

Join more than 1,600 exhibitors and thousands of attendees from around the world at this year's SPS IPC Drives trade fair, Nov. 25 to 27 in Nuremberg, Germany. Visit Rockwell Automation in Hall 9 at Booth 205 to learn about the latest technology and tools for OEMs.

Read more

Save the Date: PACK EXPO International 2014

Join an expected 50,000 attendees from 130 countries at PACK EXPO® International (co-located with Pharma EXPO™), Nov. 2 to 5 in Chicago. This year, Rockwell Automation and its PartnerNetwork program members will sponsor the Center for Trends and Technology (CTT). Located in the South Hall (Booth 3097), the CTT is a one-stop spot to hear concise educational sessions, ask questions, and learn from and network with peers and industry leaders. Topics will include machinery safety, line and skid integration, network security and remote support, the Internet of Things and more.

Get the details

Events Around the World

Rockwell Automation hosts events around the globe to help you learn more about how to use technology as a competitive advantage. The events help you get your products and services to market faster, reduce costs, better utilize power and plant-floor assets, and minimize risk in your manufacturing environment.

Learn about upcoming events

For more information on OEM Solutions from Rockwell Automation visit: www.rockwellautomation.com/oem

Save the Date: 2014 Automation Fair® Event

Join us at this year's Automation Fair® event, Nov. 19 and 20 in Anaheim, California, to learn how you can take advantage of information-sharing technologies to anticipate and respond to customer goals for a truly connected enterprise. As more end users realize the connected enterprise opportunity, they'll turn to OEMs that provide machinery-to-enterprise information flow. Rockwell Automation and its PartnerNetwork™ program members will share how you can build machinery that easily integrates into a facility and turns mined data into working information capital. In addition, forums designed for OEMs – including one on safety – provide an opportunity for you to hear from peers.

Read more

Rockwell Automation OEM Program

As an OEM, you are challenged to differentiate yourself amid global competition and rapidly evolving technology. To effectively compete, you need to define value beyond the cost of your equipment and maximize company performance. Rockwell Automation can help improve your performance with solutions and services to lower the Total Cost to Design, Develop and Deliver® equipment and meet your customers' requirements. As part of the OEM Program, you can expect increased comarketing opportunities, better market planning with our sales force, and improved customer engagement with comanaged objectives.

Learn more

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