

# Automation today

Spring 11

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**Update**  
Magazine

Product news from  
Rockwell Automation



## The ever changing world of machine **Safety**

...and how to use it to  
your advantage

**PLUS...**

- 04** Setting new standards in safety
- 06** New standards promote effectiveness of integrated safety solutions
- 10** Improving manufacturing performance through intelligent safety system design
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# Welcome to this Edition of Automation Today

This year is an important milestone in the world of machinery safety, as the safety old standards are phased out and the newer ones are introduced. For many, this change of standards is seen as a major issue; but here at Rockwell Automation we want to show you how it should, instead, be viewed as a massive opportunity.

The new standards now cater much more readily for contemporary technology and, as such, they will give many machine builders and end users the excuse and impetus they need to invest in newer, more powerful, flexible and scalable automation solutions; especially those that offer integrated safety functionality such as our GuardLogix range.

New standards also mean new safety appraisals and ratings. But, once again, we will show you that safety accreditation can be far easier thanks to safety appraisal solutions such as SISTEMA and the fact that the majority of our safety hardware comes with SISTEMA data.

I hope you enjoy this issue and appreciate the opportunities that the new safety standards can offer. Some of our customers are already reaping the benefits, isn't it about time you did as well?

If you have any comments or questions, please do not hesitate to contact us.

Hedwig Maes  
President – EMEA Region  
Rockwell Automation

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# Setting new standards in safety

**With recent and upcoming changes in safety standards, the machinery directive has evolved into one that more readily embraces contemporary technology. Many see this as a challenge; but, as we discuss here, the opportunities these changes will enable are wide-reaching and in all instances a positive step forward for machine builders and end user alike.**

The end of 2011 is a major turning point for machine builders as it represents the end of the two-year extension period companies were given to take on board new and updated machinery safety control system standards.

Derek Jones, Business Development Manager at Rockwell Automation elaborates: "It was realised some time ago that the standards that deal with the safety of machinery had not kept pace with developments in the automation of machinery. In order to help towards both the safety and productivity of contemporary machinery, safety-related control systems themselves often need to use complex and

generation standards for machine-safety-related control systems, IEC/EN 62061 and EN ISO 13849-1:2008, can both be used to show conformity with the European Machinery Directive.

They both have different system classifications: IEC/EN 62061 uses Safety Integrity Level (SIL) and EN ISO 13849-1 uses Performance Level (PL). SIL and PL can be said to be variations on the same theme and the decision on which standard to use is governed by what is best for your application.

If you are familiar with the use of the EN 954-1 categories and use relatively straightforward conventional safety

can be more complex to use and is more suited to complex applications, whereas 13489-1 has greater simplification but at the expense of some design constraints. After the withdrawal of EN 954-1 I expect the early deployment of the two new standards to be roughly 10 and 90% respectively."

So what does this mean for industry? EN 954-1 was a simple standard to use but a lot of the features in the new standards were simply not part of EN 954-1 and this lack of features was one of the primary drivers for the introduction of the new contemporary standards. Jones continues: "In the last 10 years the trend has been threefold; smaller, more complex and programmable. We have moved a long way forward from strong and simple, which is still good, don't get me wrong, but modern machines are adaptable and programmable and machinery safety has to adapt with them."

The industrial manufacturing environment is constantly evolving; driven by the need to achieve a competitive edge. One of the most decisive factors for success is the automation of machinery and processes to facilitate powerful and flexible operation. This requires the intensive use of complex, programmable technologies linked through communication networks to fast, accurate and powerful actuators.

So, what should you do? Jones explains: "The ideal first step is to read both standards in order to understand their requirements and implications. Perhaps the most daunting aspect is the fact that both require some calculations based on reliability data that the safety component manufacturers should supply. However, this has been considered and help is at hand thanks to the IFA in Germany, which provides a comprehensive calculation tool for EN ISO 13849-1 called SISTEMA."

Available for free, a link to the SISTEMA tool is available through the Rockwell Automation website where you can also register and download (for free) the Rockwell Automation product 'data library' for use in the SISTEMA tool. Using this product data, users can



programmable technologies. Machinery safety related control system standards, such as EN 954-1 (ISO 13849-1: 1999), have served us well for many years, but are now too simplistic to cope with the technology."

In its place two new standards have been introduced, which take into account advances in technology, removing the deployment shackles put in place by the incumbent standards. The two new-

functions, then EN ISO 13849-1 (PL) is probably appropriate. If you are specifically required to use SIL, or if your application uses complex multi-conditional safety functionality, then EN/IEC 62061 may be the most suitable. It is important to note that EN ISO 13849-1 covers all technologies, whereas EN/IEC 62061 only covers electrical-based systems.

"In general terms," Jones explains, "62061

*With years of experience and involvement around standards, regional legislation and the practical implementation of safety and automation solutions, Rockwell Automation can offer you the support you need, such as risk assessments services, design assistance and much more. Many years as a leading automation supplier allow Rockwell Automation's customers to reap the advantage of partnering with a supplier that not only knows safety but is also an expert in automation control.*

simply click information into the schema and the software will output information towards safety accreditation according to EN ISO 13849-1.

The complexity issue is one envisaged by many OEMs alongside the cost of change, but according to Jones: "The perception of cost and complexity tends to be greater than reality." Instead of these exaggerated issues, users should instead look at the benefits the new standards bring. In the first instance technology can now be used that meaningfully could not be used before. Jones elaborates: "With many seeing safety as a bit of a black art, the uptake of modern technology may well have been discouraged. However, these new standards positively embrace new technology and will allow machine builders to integrate their safety and control networks into one infrastructure; greatly simplifying their machines and given them a significant competitive edge." Other positive aspects of the ability to adopt newer technology are reliability, flexibility, productivity and controllability – especially when one considers the replacement of a mechanical cam with a motion solution for example.

Jones concludes: "The most important aspect of functional safety is the recognition that machines are used to make things. If a machine is not working, it is dangerous;

people tend to climb in and do things they wouldn't normally do. If functional safety is integrated with the automation controller then the machine can be brought to a safe state and the operators are protected. Functional safety equals functional control plus safety...and in my book that equates, very simply, to good engineering design."

*For more information, e-mail us at: [info\\_at@ra.rockwell.com](mailto:info_at@ra.rockwell.com) with ref: Safety Stds*



# New standards promote effectiveness of integrated safety solutions

**Safety has and always will be one of the most essential facets in any machine or plant design. Thanks to the introduction of new machinery safety standards – which now address contemporary advances in technology – safety has reverted from a necessary but often onerous afterthought into an essential, complementary and even value-add element of the overall plant or machine.**



The ability to use contemporary technology to conform to the new standards offers the designer two extremely powerful opportunities. Not only do they get to fully utilise the enhanced capabilities and flexibility offered by modern technological advances, but they can also greatly simplify their automation and safety investment by adopting an integrated approach.

The real value of integrated safety is the ability to change the way in which safety can be deployed. Not only can programmable controllers, such as our GuardLogix and Compact GuardLogix PACs, now form an intrinsic part of the safety infrastructure, but it is now also possible to utilise the automation network for the transmission of the safety data and signals.

“In general terms,” explains Derek Jones, Business Development Manager at Rockwell Automation, “one of the most effective ways of making a machine safe is to make it ‘behave safely’; And an efficient way of doing this can be to utilise some of the same equipment that the machine is using for its production operations as part of its safety systems. You must follow the rules to provide that safety functions cannot be degraded by normal production functionality but if you build in safety-capable intelligence correctly you can use the same sensors (for example) as part of both roles.”

This integration over a common network also delivers significant data-capture capabilities. With a single network, single controller and single HMI, operators are able to get a complete picture of the whole installation rather than relying on supplementary displays and intermediary data translation steps and hardware. This

enhanced access to critical data will help operators adjust process variables, knowing that all subsystems are providing the necessary feedback. It will also allow them to undertake more effective proactive maintenance – another critical element of any safety system.

“With respect to addressing the new generation of safety related control standards,” Jones explains. “The simple stuff is still there, but as you go up in scale you may seem to have more complexity to cater for but, in fact, if you design it carefully in the first place, using the same architecture, then it can actually be simpler to install and assess.

“An integrated-safety approach offers a huge variety of benefits in terms of cost, lower complexity, easier troubleshooting, enhanced interoperability and greater flexibility,” Jones continues, “but it is also important to consider the design timescales and major stage gates relating to the machine or line. Safety should always be considered as you design your machine or plant, so the whole concept of integrating safety with the automation infrastructure as the design evolves makes complete sense.”

The problem with many bolt-on safety solutions is that they are applied too far down the design process. In most cases, safety systems are added after a machine, cell or line has been designed and their detrimental effect on production can be significant. Problems can arise with regards to throughput and efficient operator interaction and it is here that financial implications can arise. It is very easy to justify the impact of a safety system on safety grounds, but

justifying the adverse financial implications, in relation to lower machine performance, becomes a little harder to accept.

By taking this more systematic or holistic approach, performance vs. safety issues can be defined and resolved much earlier in the machine design process – minimising the financial impact on the overall system. This resolution of any conflicts at such an early stage in a project also delivers multiple business benefits. As well as introducing the ‘goodwill’ that goes with any safety installation, users can also be confident that any impact on the volume-related profitability of a line or cell has also to be considered and ‘designed out’ far earlier in the process. It is far easier and more cost-effective to resolve conflicts earlier in a process than when it is nearing completion.

*“An integrated-safety approach offers a huge variety of benefits in terms of cost, lower complexity, easier troubleshooting, enhanced interoperability and greater flexibility”*



Our concept of integrated safety is also eminently scalable, it is not restricted to large installations – in much the same way as it is not restricted to new builds. The scale of an operation does not define its ability to adopt an integrated safety infrastructure. Not every installation needs PACs or higher-level devices, so safety integration across a wider range of components means users are not restricted by the size of their application.

Rockwell Automation adopts its approach to integration by assessing the size, complexity and automation requirements of a machine, advising the correct level of safety integration and then offering an appropriate solution. Its comprehensive portfolio of safety solutions for any level of integration; from a safety-relay-based solution to a fully integrated PAC with motion, standard and safety control means it can offer its customers the right level of safety they need...not just the products it has.

We have also made significant strides in making safety assessments far easier thanks to virtually all of our hardware offering data e.g. for SISTEMA. This makes calculations simpler and, according to Jones, is steadily making helping turn SISTEMA into a communication language. He explains: "Engineers in different locations can swap SISTEMA files and they will both understand them thanks to their form, content and presentation. This is one of the reasons why SISTEMA is becoming a universal tool and language, supplanting company- and system-specific approaches."

Jones concludes elegantly: "To make a machine productive, you must control it properly. To make a machine safe, you must also control it properly. These are the one and the same goal...it therefore makes perfect sense that you should use the same infrastructure."

For more information, e-mail us at: [info\\_at@ra.rockwell.com](mailto:info_at@ra.rockwell.com) with ref: Int Safety

*"By taking this more systematic or holistic approach, performance vs. safety issues can be defined and resolved much earlier in the machine design process – minimising the financial impact on the overall system"*

# Integrated safety helps streamline control system design

**Spurred by advancing technology and changes in industry standards, single-system platforms for safety and standard control have become easier and more cost-effective than ever to design, implement and maintain. This means that designers now have greater flexibility in how they can implement safety systems, helping streamline costs and improve productivity.**

**E**conomic factors – namely the aim to increase the bottom line without losing sight of safety – are driving the evolution of safety systems, from older ‘hard-wired’ to networked integrated configurations. The more designers can integrate the safety functions of a control system with non-safety functions, the better the opportunity to minimise equipment redundancies, improve productivity and minimise costs.

Along with eliminating the need for a separate safety controller, integrated safety systems also use a single programming software. This means no need to write and coordinate multiple programs on different controllers, thus simplifying application programming, and helping to reduce training and support costs.

## CIP Safety Allows Integration

Another important step in the evolution of integrated safety occurred with the introduction of CIP Safety. Seamless communication in the past was nearly impossible because no single network was

able to integrate safety and standard control systems while enabling the seamless transport of data across multiple plant-floor physical networks. That changed with the Common Industrial Protocol (CIP), an application protocol for industrial networking that is independent of the physical network. The CIP protocol provides a set of common services for control, configuration, collection and sharing across all of the CIP networks, DeviceNet, ControlNet and EtherNet/IP.

In the past, a safety event in one section of a machine could result in the entire machine shutting down because the standard system had limited knowledge of the safety event. CIP Safety allows the control and safety systems to coexist on the same network and to share data between the safety and standard applications. This enables engineers, for example, to perform ‘zone control’ where one zone of the machine is brought to a safe state while other zones continue to operate.

CIP Safety also helps eliminate the need to install expensive and often difficult-to-maintain gateways between each network.

Before the development of safety networks, engineers often had to use smaller systems or minimise their performance requirements since it was difficult to hard-wire interlocks and relay-based safety logic into a complete automation system. Now, engineers can integrate their devices on common physical network segments and allow safety and standard information to flow between devices and controllers.

## Next Generation Safety Control

Recent developments in integrated safety involve leveraging the benefits of a common control platform and extending them into a more compact, scalable form factor. This gives users more design flexibility, allowing them to apply integrated safety functionality across a broader range of applications, including many midrange applications where a larger controller previously would have been excessive or cost-prohibitive.

Our Allen-Bradley Compact GuardLogix Programmable Automation Controller (PAC) offers the ultimate in integration by performing all machine control functions – including drive, motion and high-speed sequential control – while simultaneously executing SIL 2 and SIL 3 safety functions. Compact GuardLogix is ideal for midrange applications where it offers safety functionality previously found only in larger integrated systems.

Integrated safety also offers the advantages of a common programming environment, which helps reduce design, configuration, startup and maintenance time and costs. With a single software program managing both safety and standard functionality, engineers no longer need to manually manage the separation of standard and safety memory or worry about partitioning logic to isolate safety.



## More Streamlined Designs

These design productivity benefits led Amcor, a global packaging manufacturer, to implement a new integrated safety solution at its Revesby, Australia aluminium can production plant. Previously, standard controllers on the plant's 11 bodymaker and trimming machines were interlocked with a separate, hard-wired safety control system. Now 11 individual integrated safety controllers manage them.

An EtherNet/IP connection provides interlocking between machines and links the integrated safety controllers to the factory's supervisory control and data acquisition (SCADA) system. The combination of distributed I/O and a CIP Safety network helped reduce site installation and wiring time.

The integrated development environment allowed engineers to develop the standard and safety control system code concurrently, which saved significant time. In addition, with the integrated control architecture already set-up, developing and expanding the system is much easier.

## Improved Control, Consistency

New software tools, such as high-integrity add-on instructions (AOIs), are contributing to even more accurate and efficient safety system designs. AOIs encapsulate code that is capable of being pre-validated and easily reused. This promotes consistency between projects, helps simplify debugging and troubleshooting, and minimises the risk of coding errors.

These high-integrity AOIs employ a signature feature to help designers protect their data from being accidentally or intentionally altered. The signature feature lets them know whether an AOI definition has been modified. This revision control capability is critical in highly regulated industries where manufacturers need to maintain consistency to meet regulatory requirements and protect intellectual property.

The future of integrated safety points to more options and more flexibility to apply safety technology to meet specific needs. As safety and standard components continue to become more seamlessly integrated into control system designs, implementing safety will no longer be a separate discipline, but rather a concurrent and more natural part of the design process. In turn, these innovations will help keep personnel and machines safer while boosting the bottom line.

For more information, e-mail us at: [info\\_at@ra.rockwell.com](mailto:info_at@ra.rockwell.com) with ref: Integrated Safety

*“Recent developments in integrated safety involve leveraging the benefits of a common control platform and extending them into a more compact, scalable form factor”*



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# Improving manufacturing performance through intelligent safety system design

**Ask any production line manager about the importance of safety and they will most likely tell you about the critical role it plays in helping to protect personnel, reduce injuries and meet compliance demands. These are all valid objectives, but manufacturers and machine builders are missing opportunities if they only focus on avoiding negative consequences rather than striving for greater performance.**

Historically, industry has viewed safety practices as punitive actions or compliance activities. These days, however, manufacturers understand that a well-designed safety system can help improve efficiency and productivity, and machine builders increasingly recognise how safety systems can improve both business and machine performance.

The combination of functional safety standards, new safety technologies and innovative design approaches are positioning safety as a core system function that can deliver significant business and economic value.

To achieve a higher level of functional safety and experience the resulting benefits, system designers must have in-depth understanding of the manufacturing process, the machinery limits and functions and a thorough knowledge of the ways that people interact with the machinery. They also need to be willing to consider and apply new safety technologies and techniques.

The functional safety lifecycle – as defined by IEC 61508 and IEC 62061 – provides the foundation for this detailed, more systematic design process for machinery applications. A key objective of the safety lifecycle is addressing the cause of accidents. To do this, designers aim to create a system that helps reduce and minimise risks, meets appropriate technical requirements and helps assure personnel competency. Previous standards have relied on prescriptive measures defining specific safeguarding. The new functional standards are performance-based, which makes it easier for designers to quantify and justify the value of safety, giving users the ability to tailor the specific safety functions to the application. It helps reduce cost

and complexity, improves machine sustainability and helps achieve a more optimum level of safety for each defined safety circuit or function.

## Safety Lifecycle Phases

A risk assessment is the first phase of the safety lifecycle as it provides the basis for the overall risk-reduction process, which involves the following steps:

- Help eliminate hazards by design using inherently safe design concepts
- Employ safeguarding and protective measures with hard guarding and safety devices
- Implement complementary safety measures including Personal Protective Equipment (PPE)
- Help achieve safer working practice with procedures, training and supervision

When designing a safety system, a risk assessment helps determine what potential hazards exist, and which safety mechanisms should be implemented to help ensure adequate protection against them.

The functional lifecycle provides the framework for several highly effective 'design-in' safety concepts. These include passive, configurable and lockable system designs.

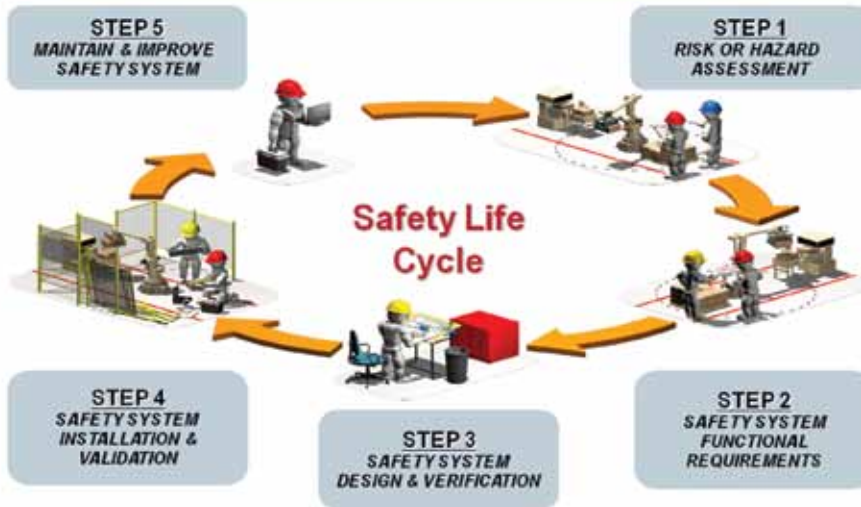
## Easier and More Intuitive

A passive approach aligns with the design philosophy that safety systems should be easy to use and not hinder production. An effective passive system design performs its function automatically helping boost productivity.

For example, in many production operations, manufacturers often use light curtains to help prevent machine motion when an operator enters a hazardous area. Other



## Functional Safety Life Cycle



*“The combination of functional safety standards, new safety technologies and innovative design approaches are positioning safety as a core system function that can deliver significant business and economic value”*

approaches, such as a safety interlock gate, require operators to perform a task to initiate the safety function. Even if it only takes 10 seconds to open and close the gate for each cycle, that time accumulates over the course of a 200-cycle day. With a light curtain, the operator simply breaks the infrared barrier when entering hazardous areas and the operation comes to a safe stop.

Over time, this passive design helps increase productivity and creates a positive return.

Another approach that helps limit exposure to hazards and reduces the incentive to bypass the safety system is a configurable design, which allows operators to alter the behaviour of the safety system based on the task they need to perform.

For example, an operator may need to access a machine and still need some form of power. The initial risk assessment identifies and defines all the tasks, including these, that must be performed on the machine with or without power. The assessment offers insight to create a configurable design that meets global safety requirements, helps increase productivity and helps reduce the incentive to bypass the system. In most cases, inexpensive components, like push buttons, selector switches and lights, are all that is needed to achieve an acceptable level of safety.

### Turning Safety into Productivity

Using a lockable system design to systematically reduce mean time to repair (MTTR) can help boost productivity. It allows operators to select a safety configuration then lock it in place at the point of entry. A lockable design also helps achieve higher productivity by using the safety system in lieu of lock-out/tag-out (LO/TO) for many routine maintenance and set-up procedures.

For example, in a LO/TO situation, operators may need to use six locks to safely shut down a line. If the safety system meets the target safety level – and complies with standard

ANSI Z244-1 – the safety system can be used to disable the hazards. In this case, LO/TO is not required. Instead of locking the disconnect switch, operators only lock the safety system. The potential cost savings associated with reducing the LO/TO downtime by even a few minutes often proves to be substantial.

The far-reaching economic benefits of a well-designed safety system are too significant to overlook. Using safety technology with excellent reliability and the rigorous approach defined in the Safety Lifecycle, manufacturers and machine builders can harness the inherent value of intelligent safety system designs to help drive productivity, reduce labour costs and ultimately increase the bottom line.

*For more information, e-mail us at: [info\\_at@ra.rockwell.com](mailto:info_at@ra.rockwell.com) with ref: Intelligent Safety*

# Hampshire Tobacco Machinery Services benefits from class-leading approach to machine safety

**Tobacco industry machine supplier and refurbisher conquers modern safety legislation more easily thanks to Rockwell Automation.**

## Solutions

A Rockwell Automation solution was installed, which included:

- Allen-Bradley® MicroLogix™ 1200
- RSNetWorx™ Software
- Allen-Bradley SmartGuard™ 600
- Allen-Bradley SensaGuard™ RFID coded safety interlock switches
- Allen-Bradley 100S Safety Contactors
- Allen-Bradley E3 Softstarts
- Connectors
- SISTEMA software

## Results

- Integration of advanced automation and safety solution on older machines
- Much easier safety appraisal to EN ISO 13849-1
- End result easier for customer to employ

**H**ampshire Tobacco Machinery Services (HTMS) was established in 1986, initially for the supply and manufacture of machine spare parts and re-engineered secondary machinery – as both individual machines or as complete maker/packer combinations – together with after-sales service. Today, the company's principal interest is the supply of new packing equipment, centred on hard box, hinge lid packing machinery.

Although there are many companies engaged in this field worldwide – many who are larger than HTMS – the company's managing director can uniquely claim to have been at the vanguard of those introducing the concept of re-engineering to the industry. The company assists a number of UK and European production manufacturers to develop existing machinery, raising its efficiency and converting size in accordance with market trends.

## Challenge

One of the primary challenges that HTMS faces is bringing older machines up to modern standards, especially with regards to international machinery safety directives.

The machines it re-engineers – some of which were built in the 1940s – often do not have any form of contemporary safety functions. So HTMS really has a challenge when it comes to bringing older machines up to required specification.

As well as incorporating an approved safety infrastructure into these older machines, HTMS faces another major issue, in common with the vast majority of machine builders, and that is certifying the machines to the standards laid down by EN ISO 13849-1. It's for this reason that HTMS called upon the services of Rockwell Automation; not only for its comprehensive range of safety solutions, but also for its knowledge, help and tools that would help HTMS address the demands of these standards.

## Solution

The integration of safety and machine control is now a common request to Rockwell Automation. Having safety and automation closely interlinked generates a huge range of benefits including: reduced wiring; common, single-platform training and programming; fewer 'between-systems' data bottlenecks; and reduced overall cost.



It was for these reasons, among others – on a machine it was refurbishing that was built in the 1980s – that HTMS opted for a control and safety solution based on an Allen-Bradley MicroLogix 1200 PLC connected with an Allen-Bradley SmartGuard 600 programmable safety controller. The idea was to automate the machine while certifying the safety system using the new EN ISO 13849-1 Functional Safety Standards. HTMS and Rockwell Automation jointly assessed the machine, developed the solution and designed and engineered a state-of-the-art safety solution.

Bringing the machine up to modern standards, other components from the extensive safety range from Rockwell Automation included software, connectors, RSNetWorx, SensaGuard RFID coded safety interlock switches, 100S Safety Contactors and Softstarts. Finally – and one of the most beneficial facets of this project – was HTMS's

*“Everything is so much simpler and the process is made much easier by the fact that all of the Rockwell Automation equipment is in the SISTEMA library”*



looked at the machine as a whole. Everything is so much simpler and the process is made much easier by the fact that all of the Rockwell Automation equipment is in the SISTEMA library; so it is just a case of dragging and dropping the components into the application. You can almost immediately see if there are any safety issues. Not only is this far easier for us, it is also a whole lot easier for the user.

"The engineers at Rockwell Automation have been invaluable with their advice and support, offering us help from day one with specialist support, equipment and programming. It has been a very smooth ride and has made our job significantly easier," Woodthorpe concludes.

Thanks to the flexibility of the components supplied by Rockwell Automation, coupled with their interoperability and their presence within the SISTEMA library, the addition of contemporary safety solutions, even onto machines that are 70 years old, is now much easier and far less onerous than it used to be.


For more information, e-mail us at: [info\\_at@ra.rockwell.com](mailto:info_at@ra.rockwell.com) with ref: HTMS

use of SISTEMA software, from the IFA in Germany, to evaluate the machine's safety in relation to EN ISO 13849-1.


The SISTEMA tool allows users to model the structure of the safety-related control components based upon the designated architectures, permitting the automated calculation of reliability values with various levels of detail, including that of the attained Performance Level (PL).

## Results


Commenting on the equipment and, in particular, the use of the SISTEMA software, Pete Woodthorpe, Technical Director at HTMS, explains: "The approach to evaluating the safety of the system is very similar to the way we used to do it. By using SISTEMA we are able to assess the machine by areas or modules, unlike the old way where you




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# Safety is top of the curriculum at the University of Wels

**Productivity and safety used to be seen as two contradictory goals, but this ceased to be the case some time ago. This is because intelligent safety controls help to avoid downtime and can allow maintenance work to be undertaken in hazardous areas – under strict supervision – without stopping the whole plant.**

## Challenge

In order to increase safety for students in the university's CIM lab, a flexible solution was needed which not only secures the whole plant, but also can exclude certain machines for practice purposes.

## Solutions

- Compact Allen-Bradley SmartGuard 600 safety controller
- Decentralised safety I/Os which are integrated via DeviceNet
- Allen-Bradley Guardmaster SafeZone™ safety laser scanner, MatGuard™ system, Lifeline rope operated interlock system, Guard Shield PAC 3 light curtains

## Results

In laboratories equipped with the latest technologies, students can be trained for their profession in field projects using real plant machinery. Students and visitors are safeguarded from the installed robots.

With safety having such central importance, it makes sense to start including it in the engineering degree curriculum – and this is something the University of Wels in Austria has done. In its Computer Integrated Manufacturing (CIM) laboratory, Rockwell Automation's light curtains, safety mats and emergency stop switches help make sure that students and visitors are safeguarded from the installed robots. This is particularly important considering that, with one exception, none of the robots moving around the area is enclosed in any physical guarding. A compact Allen-Bradley SmartGuard 600 safety controller intelligently controls the various components.

Until recently, safety was not a main focus in the university's CIM laboratory. "We did have a list of do's and don'ts for the students – a sort of code of conduct in the lab," admits Professor Reinhardt Busch, Wels University's Production Engineering Department Head, "but we didn't have any safety technology as such."

The professor of production engineering was delighted when one of his mechatronics

students decided to create a detailed analysis of dangers and risks together with concrete proposals for solutions – and make this the subject of a degree thesis. The student provided the impetus for the introduction of more stringent safety precautions, which were then implemented with the help of Rockwell Automation.

"We wanted a flexible solution that allowed us to switch between several different modes of operation," explains Hans-Jürgen Becherstorfer, Chief CIM Engineer. "It was important to not only secure the whole plant, but also to exclude certain machines for practice purposes."

The system is made up of several practice stations including robots and image recognition, a control and visual display system, central and remote Programmable Logic Controllers (PLCs), a safety PLC, an offline robot programming module, and a station for programming the Profibus-based RFID system. Every automation and mechatronics student at Wels University must master each of these stations in the course of a semester.

Under the guidance of the Chief CIM Engineer and a tutor, the students also have to achieve specific goals at each stage. From October 2009, an additional task will be added: "Integrate laser scanners, light curtains, safety mats and emergency stop devices with the safety PLC and create a functioning safety application."

Programming the Rockwell Automation safety solution is facilitated by the predefined modules and is more a case of setting parameters than actual coding. Describing the programming principle, Martin Berger, commercial engineer motion & safety at Rockwell Automation says: "The user simply selects the desired inputs and predefined function blocks from the library, then connects them to the output by simple drag and drop. SmartGuard 600 makes it





*“With safety having such central importance, it makes sense to start including it in the engineering degree curriculum”*

simpler and quicker to program even complex and sophisticated safety applications. If there are not enough on-board I/Os for large applications, users can just increase the number of inputs and outputs using decentralised I/Os on DeviceNet.”

In the CIM lab, two SmartGuard 600 safety controllers are at the heart of the recently-installed safety solution. Nine decentralised I/O stations have been integrated via DeviceNet, providing a total of 192 inputs and outputs for this application. Extensions can be added whenever required. SmartGuard 600 can also communicate with an overarching machine control system via DeviceNet. It mainly shares status and diagnostic data so that the standard PLC can supply information about the point at which the safety circuit was interrupted.

## Different ways to provide safety

Until recently, Wels University had chosen a simple method to prevent unauthorised entry to the CIM lab’s robot and production machine area during its open day. “We just blocked off the area with an array of tables, plant stands and potted shrubs,” admits Prof. Busch with a smile. Things have come a long way since then. With one exception, the robots moving around the area are not enclosed in any physical guarding, so safeguarding is now provided by safety light curtains, laser scanners, safety mats and safety interlock switches. “Rockwell Automation offers a broad range of safety products, making it easier to find the right solution for any application,” comments Martin Berger from Rockwell Automation.

Rockwell Automation has installed several different safety solutions in the CIM laboratory. There is an Allen-Bradley Guardmaster SafeZone safety laser scanner beside the SCARA station that is used for configuring and programming the warning and alarm fields according to the safety levels required. The pendulum arm robot has a MatGuard system at its feet. “The advantage of the safety mats is that they last for a very long time and can withstand harsh conditions,” says Berger. “They can handle three tonnes with no problem.”

In an emergency, safety can be provided rapidly by a rope (cable-operated) pull switch, similar to a skydiver’s ripcord. Berger describes it: “Our Lifeline rope-operated interlock system is ideal for conveyor belt

applications. It helps safeguard a worker in the event of the worker being caught up in something on the conveyor and be dragged along it or pulled onto the belt.” The students working in Wels University’s CIM lab are protected from the dangers of the conveyor belt with a pull switch on one side and a safety light curtain on the other.

“We provided the university’s CIM lab with various safety components and the corresponding engineering services,” notes Ludwig Haslauer, Sales Director of Rockwell Automation in Austria. “Our goal was to give the students an introduction to the wide range of safety systems and applications available. Once they start work, they’ll hopefully think about implementing safety measures right from the outset!”

*For more information, e-mail us at: info\_at@ra.rockwell.com with ref: FH Wels*



# Contemporary technology helps Diosna address customer's local demands alongside safety and automation needs

**Leading food and pharmaceutical machinery manufacturer opts for Allen-Bradley GuardLogix PACs, for batch, automation and safety infrastructure.**

## Challenge

In the design for a machine for the Americas, Diosna was asked to use a control and safety infrastructure comprising equipment from Allen-Bradley. This was the company's first project using Rockwell Automation so, as well as hardware requirements, Diosna was also looking for an above-average level of help and support.

## Solutions

- Allen-Bradley GuardLogix PAC
- Allen-Bradley PowerFlex® 70 drives
- Allen-Bradley Distributed Safety I/O
- Ethernet fieldbus
- Extensive CSM support, including:
  - Commercial Engineering
  - Embedded Engineer
  - Tailored training
  - On-site support

## Results

- Quality standards and regulatory compliance
- Easier coding and calculations
- Confidence to specify Rockwell Automation again for other export opportunities

With a 120-year pedigree Diosna has a history of supplying machine-based solutions to the food, bakery, pharmaceutical and chemical industries across the globe – providing them with state-of-the-art production and laboratory plant and equipment.

For the bakery trade the company supplies kneading plants, lifting and discharging stations as well as kneaders and mixers for canteen kitchens, butchers and food production companies.

For the chemical, pharmaceutical and plastics industries it produces standard and specially designed mixers, granulators, dryers (VAC) and vacuum dryers for single-pot processing, fluid-bed batch processing plants, coating plants, mixing and processing plants.

Today it describes itself as a system provider capable of offering its customers complete process solutions, from individual plant planning through to state-of-the-art qualification, with a history of innovations, which have changed the market in the same way that its first kneading machine did many years ago.

## Challenge

Diosna was recently approached by a customer who wanted a Compact Granulator Solution (CGS) for a tablet manufacturing plant in Puerto Rico. Comprising a granulator, a mixer granulator and a fluid-bed drier, the system needed to offer a compact installation, good accessibility and exhibit good containment as well as incorporating a robust safety infrastructure. In this particular instance, the customer specified Allen-Bradley equipment, not only because Rockwell Automation's technology was more than capable of handling the task, but also because of its global presence, comprehensive product and service offering and the availability of knowledgeable local support.

Rockwell Automation not only provided hardware in the form of Allen-Bradley GuardLogix PACs, Distributed Safety I/O and PowerFlex 70 drives, but it also delivered significant help from its Customer Support and Maintenance (CSM) division. This included a commercial engineering team, the

services of an embedded engineer to oversee the design and tailored training to help the company make the most of its investment.

## Solution

In the pharmaceutical industry, granulator suites are used to both mix and prepare raw material ingredients prior to final tablet pressing. The multistage process used in this Diosna installation uses the Allen-Bradley GuardLogix PAC to handle the batch control, the process parameter control, all of the automation needed to keep the machine and materials moving and, last but not least, the machines safety infrastructure. It also encompasses the integration of several PowerFlex drives and other and external devices; connected via ethernet.

This is a graphic example of a GuardLogix unit being used as a multidiscipline PAC for discrete, process, drive and safety control. This means that there is only a single software environment needed to realise what is a complex application; helping achieve a reduction in engineering time and effort. Henning Falk, Product Manager, Fluid Bed and Coating Technologies at Diosna explains: "In operation, the granulator suite accepts all of the carefully measured raw materials, comprising the bulk materials and the active ingredients and mixes them thoroughly before transferring them, in a granular form, to a fluid bed drier. The drier is then used to remove the moisture content until the required level is obtained before transferring the material to an Intermediate Bulk Container (IBC). Once in the IBC further additives are introduced and a further mixing operation takes place. Once this final mix is completed, the raw material is then passed to the tablet press which creates the



final product.

“Throughout the entire process, strict controls have to be maintained at every stage,” he continues, “to help maintain quality, throughput and machine utilisation levels. The GuardLogix PAC controls all elements of the operation: fans, vacuum conveyors and the IBC blender by monitoring multiple parameters including temperature, moisture and throughput”.

“All of our machines are bespoke; created

to match the customer’s application requirements, however, we can still re-use blocks of code for standard operations and we have found that programme editing on the Allen-Bradley equipment has been nice and simple; some of the calculations are easier to perform than they are on equipment from some of our other suppliers”.

“Throughout the whole project, we have had a great deal of very useful support from

Rockwell Automation – at multiple levels – from design through to help with communications,” Falk concludes. “This was our first project with this particular hardware and software combination and the immediate support we were given has made it much easier to deal with...so much so that I would have no hesitation in specifying Rockwell Automation again.”

Rockwell Automation’s global presence and its extensive experience in the food and pharmaceutical world in general, are becoming more apparent to machine builders in the EMEA region. As export potential grows, so does the machine builder’s need to satisfy the automation requirements of the markets they are exporting to. In many cases, thanks to its comprehensive product range, device interoperability, simplicity of installation and programming and international support capability, Rockwell Automation is the first name on many people’s lists.

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# Kia Motor Slovakia reduces safety downtime by up to 70% in Body Complete Line with Allen-Bradley GuardLogix Safety PLC

Rockwell Automation Allen-Bradley GuardLogix with I/O modules on EtherNet I/P helps to maximise efficiency in body shop, by decreasing downtime and bringing in visualisation.

## Background

Kia Motors Corporation (KMC) was founded in 1944 and is Korea's oldest manufacturer of motor vehicles. As part of the Hyundai-Kia Automotive Group, Kia aims to become one of the world's premier automotive brands.

To increase the market share not only in Europe but also worldwide, KMC built its first-ever European facility in Zilina located in Slovakia and started its production in December 2006 with capacity of 300,000 units a year.

Kia Motor Slovakia (KMS) produced two models, the Kia cee'd and Kia Sportage in 2009. The Kia cee'd model represented more than 80% of the total production. New SUV models, brand new Sportage and Hyundai ix35, were added to the production portfolio in 2010, so Kia Motors Slovakia currently produces 3 models. SUV models represented more than 50% of all production in 2010. Kia Motors Slovakia produced 229,505 automobiles in 2010.

## Challenge

Like other automotive companies, optimising manufacturing process became more important than ever before, to maximise efficiency and productivity. And KMS required an integrated solution where information and devices are seamlessly connected to each other.

KMS's Body Shop was operating with CompactLogix™ connected with ControlLogix® and its Body Complete (BC) Line was assembling all moving parts, with manual handling, by 20 workers. But frequent breakdowns not only decreased



productivity, but also sometimes caused the entire line at KMS to stop production.

The BC Line was configured with SICK safety relays and it was guarded with SICK safety scanners and relays. The safety relays had complicated wiring and long conductor routing from the safety device to the relay in the main cabinet, without having a by-pass function from the scanners.

The safety circuits or the safety devices caused a lot of small line stops and it was often difficult to identify the reason or the location of the failure while also taking a long time for replacement. Future line stops were always anticipated due to the long and complicated safety wiring circuit.

Relay-based safety controls have a long history of helping prevent hazardous

*“With the ability to identify the failure and solve problems quickly, we have dramatically increased productivity by reducing up to 70% of the safety breakdown time”*

encounters between worker and machine. Safety devices such as scanners and emergency stop push buttons connected by safety relays have been the method of choice to protect machine operators.

But Relays can offer limited fault diagnostics and are difficult to adapt as applications change because of the hardwiring they require. For these reasons, and considering the critical situation, an alternative integrated safety solution offering status visualisation and higher reliability and flexibility than the incumbent relay system was required at KMS.

## Solution

Seeking a solution to meet its needs for an integrated safety solution with visualisation and increased reliability, KMS turned to Rockwell Automation – a trusted supplier for many of its operations from the commencement of the plant’s production.

Rockwell Automation proposed a safety system that comprised safety-related programmable controllers and a network. Safety controller, instead of traditional safety relays, helps customers to create both lean and quick adaptable manufacturing processes that help keep operators safe.

Rockwell Automation offered its Allen-Bradley GuardLogix safety controller, which expand on standard Allen-Bradley ControlLogix processors with safety firmware and safety processor. Remote safety I/O modules were added and connected to the EtherNet I/P network and visualisation of safety conditions, alarms, emergency events and programming of control system and visualisation was developed for the existing Allen-Bradley PanelView Plus panel. All jobs, including programming and installation, were provided from Rockwell Automation Customer Support and Maintenance (CSM) team.

Allen-Bradley GuardLogix brings together the benefit of a Logix platform – common



programming environment, common networks, and common control engine – with integrated safety control in an easy-to-use environment while providing Safety Integrity Level (SIL) 3 control. By partnering with the Allen-Bradley ControlLogix processor, GuardLogix users can benefit from common programming software, controller and I/O to help reduce development time and application cost.

In traditional designs, if a person entered the cell or if one device failed during production, the entire line stopped. KMS had to check each area and its devices to discover the problem. It was difficult to identify the failure and KMS was unable to figure out which safety button was pushed. The entire line was stopped until the failure was identified and solved.

With the new design, the line was divided into five zones. Each zone had a cabinet with Safety Point I/O only with 2-3m wiring. Each Safety Point I/O was connected to Allen-Bradley GuardLogix with EtherNet I/P using RSLogix 5000. Each scanner had a by-pass function with the possibility of light

signalling and switching. Now, when the line is interrupted, only the relevant zone is stopped, signalling the location. The operator can also easily communicate with each zone with visualisation through EtherNet I/P. The failure can be easily identified and quickly recovered while other zones remain operational.

## Result

KMS considers the Rockwell Automation solution a complete success. By converting to a Safety PLC from a relay-based solution, KMS now has a flexible line with excellent reliability. The flexible platform reduces maintenance and troubleshooting, while helping to secure safety as required. KMS now plans to expand and apply the integrated safety concept to other lines in the body and press shops.

“With the ability to identify the failure and solve problems quickly, we have dramatically increased productivity by reducing up to 70% of the safety breakdown time,” said Ondrej Vasek, Maintenance Manager in Body, KMS. “And most of all, the line is easy to maintain and made my life easier.”

One of the targets in KMS is to improve efficiency of existing safety lines. As part of its next step, KMS is now considering plans to adapt a similar solution in other lines. And Rockwell Automation’s integrated safety solution with GuardLogix will more than likely be considered as the standard platform within KMS.

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