HIMA specialist essay

Integrated safety controllers with safe**ethernet.**

Distributed automation systems are considered as being the way of reducing engineering costs. This statement is correct and, in principle, can also be applied to safe automation. However, the desired savings are soon lost because of the more elaborate planning and installation of separate add-on distributed safety technology. This disadvantage of current safety systems can be eliminated by using manufacturer-neutral bus systems and integratable safety technology.

Today separation of safe/non-safe automation

In many cases, the “concept of separation” is used for safe automation. This means that safety technology is always implemented completely separately in addition to the standard automation devices. This separation is a simple means of ensuring that the standard part will not have any influence on the safety technology. However, this concept results in more effort and expenditure when planning, setting up and maintaining your system. Distributed automation in particular requires the use of separate bus systems. This results in a variety of buses, elaborate interfaces and more effort and expenditure for the wiring of manufacturer-specific bus systems. This decreases the level of flexibility in terms of planning, adjustments and extensions. The potential for increasing cost-effectiveness cannot be used.

Ethernet as a neutral communication solution

This disadvantage of current safety systems can be eliminated by using manufacturer-neutral bus systems and integratable safety technology. In this case, the technical solution ensures separation between standard and safety parts and no disadvantages arise for safety through the integration.

Ethernet, as a manufacturer-neutral bus system, is suitable as the basis for communication. Ethernet is already standard in many communication tasks and it is clear that this technology is here to stay in the field of automation.

HIMA
Paul Hildebrandt GmbH + Co KG
Postfach 1261
68777 Brühl
Telefon: (+49 6202) 7 09-0
Telefax: (+49 6202) 7 09-1 07
E-Mail: info@hima.com
Internet: www.hima.de

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The use of Ethernet also means that other problems relating to fieldbus technology can be solved at the same time. Due to the previously heavily restricted performance of existing safe fieldbuses, the number of bus devices and the scope of data to be transmitted is seriously reduced. Planning the safety systems becomes an unmanageable task which only system and safety specialists are capable of managing.

Conventional automation concept

The disadvantages of current fieldbus solutions are illustrated using the typical system structure of a distributed automation. To meet the required response time, the application
is divided into sub-areas. Time-critical signals, e.g. from the press valves, must be wired conventionally with the local controllers. Non-time-critical signals, e.g. from the safety doors and higher-level signals, are wired on remote I/O modules and forwarded to the central safety controller via a separate safety bus. The control PCs, visualisation and HMI devices are connected via an additional add-on Ethernet network. Non-safe signals are transmitted between standard controllers using an additional fieldbus.

safeethernet brakes thr**ough existing system limits**

Already since 1999, HIMA has been networking redundant and fault tolerant safety controllers in process applications using Ethernet. With the HIMatrix family, the experience and proven technologies from the process world have been combined with the requirements in Factory Automation for the first time.

HIMatrix compact and modular safety-related controllers have been designed based on proven HIMA safety technology specifically for time-critical requirements in Factory Automation. The safety-related networking of the HIMatrix systems takes place via safe**ethernet** - which is based on standard Ethernet technology and has TÜV certification. safe**ethernet**

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accelerates the transmission of safety-related data to 100 Mbps and now even supports the use of the entire range of Ethernet functions for setting up safety-related networks.

Advantages of HIMatrix

The use of fast, distributed safety controllers in connection with a safe form of communication based on Ethernet improves the performance of the entire system considerably. Thus, previous system limits disappear, paving the way for application-based safety solutions.

Flexible system structures

Ensuring the required response time means that flexible system structures are possible for distributed automation. Depending on individual requirements, the intelligence can either be distributed centrally or decentralised over the devices within the network. There is no restriction placed on the number of safe devices in the network and the scope of safe data to be transmitted in order to meet the required response time. A central controller and the implementation of parallel structures is thus no longer necessary.

The removal of the system limits means that the planning can concentrate on the process to be controlled. This creates optimum automation solutions. The faster entire system increases productivity with less space requirement through reduced safe areas. The costs for wiring and the size of the control cabinet are also reduced at the same time.

Advantages of Ethernet technology

For safe communication, standard Ethernet or FastEthernet network technology is used in accordance with IEEE802.3. Transmission safety is ensured by the certified safe**ethernet** protocol. This means that network components from any manufacturer can also be used, thereby making it

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possible to fully use all the advantages offered by Ethernet. It is thus possible to use, e.g. conventional fibre optic converters, wireless LAN, router technology, etc. without limiting safety.

Since all automation components are integrated into a network, a system-wide data transparency exists from the control level through to the field level. This allows for central programming, diagnostics or visualisation via a network, thereby reducing the elaborate interfaces and minimising downtimes.

Integration with safe**ethernet**

safe**ethernet** can be tailored to every existing Ethernet network due to adjustable network profiles. In this way, safe and non-safe data is transmitted in parallel on a standard Ethernet network without restricting safety. Therefore, for communication, Ethernet becomes the overall solution for all applications. Only one network is needed for transmitting safe and non-safe data.

By doing away with the need for a separate safety bus, the related costs for planning, installation and maintenance are also eliminated.

The user can benefit from these system advantages during the planning, project planning, installation, commissioning, maintenance and extension of the system.

Automation concept with HIMatrix

The representation of the system structure with HIMatrix illustrates the advantages of this flexibility. To achieve maximum safety and minimum response times, HIMA resolves the distributed application decentrally and without a separate safety bus. The exchange of the safe signals is integrated into the existing Ethernet network. All safe signals – both time-

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critical and non-time-critical – are read via remote I/O modules and forwarded to the HIMatrix controllers via the same Ethernet/ safe**ethernet** network. The central safety controller is no longer required and the conventional wiring is reduced to a minimum. Local safety controllers, which are not absolutely necessary, can be replaced in the control cabinets by remote I/O modules. The signals are then processed using any HIMatrix controller available on the network.

HIMatrix in practice

The advantages of the HIMatrix systems are already being used in practice, e.g. for the manufacture of cast parts for chassis parts for the GOLF V Platform at ThyssenKrupp Rautenbach Castings GmbH. Here, the HIMatrix system is being used for higher-level safety functions in the gradual processing of aluminium cast parts. For the application a separate safety bus was provided for the safety system. Yet, thanks to the advantages of the HIMatrix system, it was possible to simplify the set up considerably.

Integration of any automation solutions

A distributed network with central processing of the safe function was selected as the system structure due to its high performance. The safe communication was integrated into the existing Ethernet network of the Siemens S7 controllers. In this way, the necessary bus systems were reduced to a common Ethernet network. In addition, it was also possible to save on the planned network switches by using the integrated switches of the HIMatrix controllers. Safe and non-safe data is transmitted at the same time on the common network. This allows for the visualisation, safe communication and programming of the connected HIMatrix controllers via a common network. In addition, a DSL connection is used for the remote maintenance for the HIMatrix systems.

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Summary

By combining the world's fastest safety controllers “HIMatrix” with the world's fastest safety bus “safe**ethernet**”, HIMA is creating a hitherto unknown level of flexibility for safety-related automation. This flexibility is the basis for the development of new potential. The current system limits of safety-related automation concepts are disappearing, paving the way for truly application-based safety solutions. This creates new potential for increasing productivity and reducing the total costs for safety technology.

restart: Come with HIMA into a new era of safety-related automation and make the most of our truly intelligent solutions.

The author:

Thomas Janzer

Graduate Engineer

Product Manager for

Engineering Software at HIMA

Paul Hildebrandt GmbH + Co KG, Brühl

HIMA
Paul Hildebrandt GmbH + Co KG
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Appendix

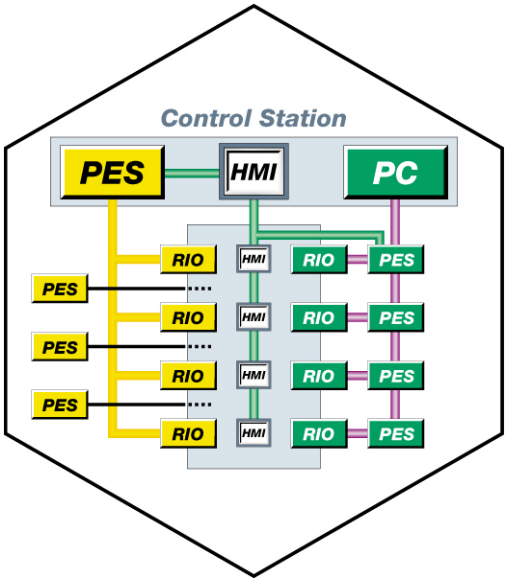

Figure 1
Conventional automation concept: Concept with a separate add-on safety bus and local controllers for time-critical applications.

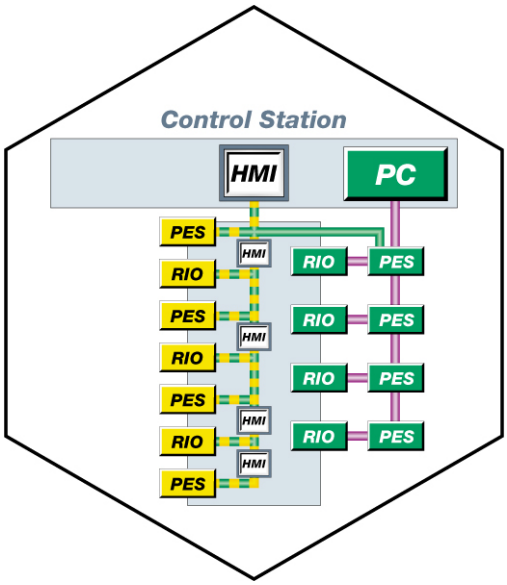

Figure 2
Automation concept with HIMatrix: safe**ethernet** leads to a reduction in fieldbuses

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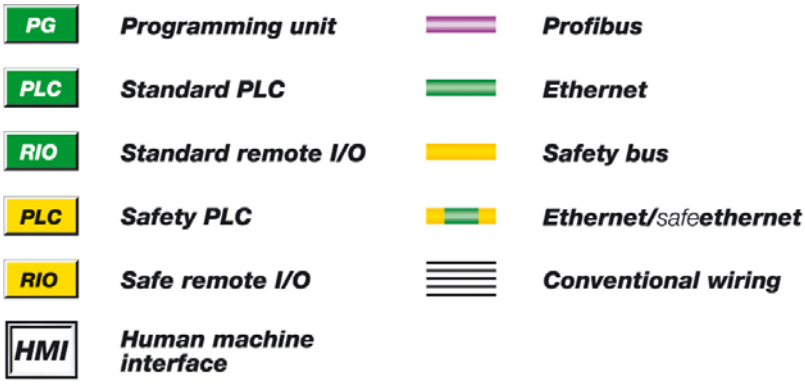

Figure 3

Legend

Figure 4

HIMatrix system family: High-speed compact and modular safety controllers.

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