TECH ARTICLE

Simple and safe: Focus on control technology

Simpler, more flexible, more productive, more efficient – as the demands on plant and machinery rise, so too does the level of automation and control technology has a key role. It is the playmaker; it processes the digital and analogue signals from the sensors and input devices, sends them to actuators, drives and control devices and keeps the plant running. The processes required to do this are becoming increasingly complex; the number of relationships within a machine is rising and the level of networking is also growing. This creates additional challenges in terms of handling. At the same time, in many sectors people are moving

Machine builders need appropriate, customised control concepts in order to meet rising demands on productivity and plant and machine availability. Interaction between the control functions for automation and safety are the key to success.

ever closer to the process, to fit and set up machinery for example. Where man-machine interaction is as close as possible, it can help to improve plant availability and therefore increase productivity. Accordingly, safe automation is becoming increasingly important within the whole automation concept. With intelligent, safe control architectures, users have the freedom they need for customised implementation of the safety requirements for design, operating and service concepts, as well as operator regulations.

The result is a specific requirement profile based on the machine type, application area and necessary safety concept – depending on the prescribed risk assessment. It may make sense, therefore, to operate existing machine control systems and safety control systems separately or even to merge them within one joint automation system. Not every concept is equally suitable for all machines.

Standardising safety

The determining factor when selecting the appropriate safety system is the plant's function range. For example, by their very nature, standalone machines have fewer safety functions than interlinked machines and do not need an overriding safety function, such as a safety area shutdown. Configurable control systems are particularly suitable for this type of application. One classic application area is series machine building. In this case, manufacturers are often forced to use prescribed or country-specific machine control systems. Slight changes are continually needed to the automation concept. Openness is therefore essential. As the Pilz configurable control systems PNOZmulti support all common fieldbus and Ethernet-based communication systems, for example, machine operators can choose the operational control system that best suits their individual needs and don't need to worry about how safety is connected. Both manufacturers and users benefit from this standardisation of safety, in terms of troubleshooting, machine design and training.

Ease of use is one of the strengths of the configurable control systems PNOZmulti. Instead of carrying out the wiring manually, the user creates a safety program quickly and simply using the software tool PNOZmulti Configurator and the certified function blocks for safety-related functions that are stored within it. Compared with conventionally wired solutions, users save time and money on design, configuration, commissioning, diagnostics and maintenance. The configurable control systems PNOZmulti are also powerful enough to assume complete machine control on smaller machines. As a result, the machine builder has no need for an additional control system and so can make savings in a range of areas, from hardware costs and space in the control cabinet to procurement and stock holding costs.

Safety and automation in one system

Increasingly, safety is no longer just dominated by static events, such as the actuation of an emergency stop mechanism or the opening of a guard door, but must be capable of reacting to sometimes multifaceted situations or to the results of complex calculations. Dynamic safety concepts, such as different operating modes or torque monitoring based on the position of one or more axes, will continue to find their way into the control architecture in future. Increasingly that requires more complex relationships with the individual elements in the overall process chain. Machine data – whether for automation or safety – must be capable of being processed together.

The trend is for automation and safety functions to use a common control architecture – or even to functionally merge the two areas that have previously always been separate. Hybrid designs are catching on, especially in distributed systems, in order to minimise cabling complexity and interface problems, for example.

Machine tools are one example: Safe CNC or motion controllers, for example, record safety-related information such as linear speed, rotational speed or standstill at the various axes directly via their integrated encoder systems, passing the information on to safety control systems for safe

evaluation. In this case they not only process local safety functions, but also record and forward signals, for monitoring end positions for example. Just one common periphery system is needed for the important control-related process signals as automation I/Os and the I/Os for the safety functions. Thanks to the openness of the safety control system, additional encoder systems, interface problems or adapter solutions are consigned to the past. Here Pilz can offer the control systems PSSuniversal multi. These continue the philosophy of the configurable control systems and can implement local safety functions as well as recording and forwarding periphery signals.

The control systems PSSuniversal PLC illustrate how great the synergies can be for visualisation, diagnostics, servicing, maintenance work and engineering when functional and safety-related parts of a machine control system can be considered together. As they are fully-fledged programmable logic controllers (PLCs), users can choose whether to program using the standardised editors in accordance with EN/IEC 61131-3 for automation and safety tasks or configure using the Program Editor PASmulti, which continues the configuration philosophy of the PNOZmulti Configurator. In all the Editors named here, Pilz offers a wide range of safe, certified function blocks.

Distributing intelligence

Both PSSuniversal multi and PSSuniversal PLC are control systems in the automation system PSS 4000 from Pilz. The central idea of PSS 4000 is to merge automation and safety. Process or control data, failsafe data and diagnostic information are exchanged and synchronised via the Ethernet-based SafetyNET p. For the control function, therefore, it makes no difference where the respective program section is processed. Instead of a centralised control system, a user program distributed in runtime is made available to the user within a centralised project. All network subscribers are configured, programmed and diagnosed this way. So for all control tasks, the user maintains a centralised view of distributed systems. If the intelligence is distributed in the machine components, the benefits can be seen in greater availability due to local error reactions and higher productivity as a result of shorter reaction times across the whole system. Dividing the intelligence into smaller machine components also leads to improved scalability.

Such multi-master automation structures result in largely standalone cell control systems, which can interact within the network. So PSS 4000 enables the mechatronic approach to be transferred to the control level, which is a key step towards Industry 4.0. Plants can be broken down into manageable, independently functioning units. As a result, the cost of engineering, commissioning and maintenance is significantly reduced. If plants are thought out and designed mechatronically, the system and hardware can be developed in parallel, for example. To date, software development is only started once the machine specification has been established.

Subsequent changes or expansions to functions are very difficult retrospectively because the program as it stands accesses the hardware directly. The degree of standardisation of elements

of plant and machinery also rises, allowing them to be adapted rapidly and flexibly to changing customer requirements.

Further information aboutthe PNOZmulti Configurator:

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