> Modularisation > Digitalisation > Miniaturisation > Customisation > Integration > Identification

Integrated Industry
becomes tangible

The advent of IT has given the automation of manufacturing an enormous performance boost. Without this "ITisation", efficient production of quality complex products would be very difficult to achieve. HARTING is now analysing trends and identifying their relevance to current projects and applications.

» Uwe Gräff, Managing Director HARTING Electric and HARTING Electronis, HARTING Technology Group, Uwe.Graeff@HARTING.com

In addition to this, software has become an essential component of the functionality of machines and systems - both in the engineering process and as embedded software in machines, systems and facilities themselves. IT, in the form of industrial PCs, has a long history of controlling facilities - Ethernet-based services transmit data within the application inside the shop floor and to the top floor. As a result, this leads to more cost-effective products, increased productivity and enhanced production flexibility.

Still, despite wide-ranging synergies in the area of hardware and communications, industry still relies on its own automation standards. For example, the industrial production process places tough demands on the deterministic real-time behavior of systems, something which cannot be met by traditional IT. At the same time, different safety requirements are implemented in order to protect man and machine as well as the actual production know-how.

Consequently, a synergy between automation and information technology can only offer potential opportunities if it also encompasses the entire value chain. Integrated Industry, Industrie 4.0 and the Internet of Things demonstrate the potential of the convergence of automation and information technology. This is based on continuous value-creation networks over the entire life cycle of applications. – permitting new services to establish themselves which are supported in particular via integrated software functions of the automation systems. They make interacting with complex systems simpler and more transparent for the operator while adapting production more easily to changing prevailing supply chain conditions and market conditions.

Yet - how does the path lead from established automation technology to Integrated Industry? "Industrie 4.0 is a conceptual revolution as a disruption of production logistics, since the resulting product controls its own production," explained Prof. Dr. Wolfgang Wahlster, technical-scientific director of the German Research Center for Artificial Intelligence, speaking at Verpackungstage 2014, the packaging trade fair held in Aschaffenburg. This central paradigm shift gradually changes the foundations of production, and the classical production hierarchy gradually dissolves. "However, the implementation of this is carried out incrementally via migration solutions, meaning that the revolution takes place as an evolution," adds Wahlster. Technological drivers are the Internet of Things, intelligent sensor networks and cyber-physical systems. Figure 1 presents possible scenarios.

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scenarios point in one direction. Since all solutions involve changes, technological changes should be coupled with solutions regardless of their disruptive or evolutionary character. **For HARTING, in analysing these trends it was crucial to see that their relevance is confirmed in current projects. Here, it has come to light that individual scenarios can be viewed as migration levels of Integrated Industry, depending on the extent to which these trends are implemented.**
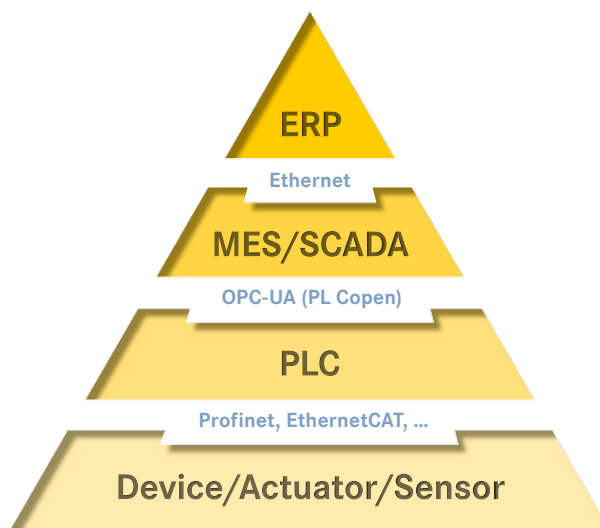
CURRENT AUTOMATION PYRAMID

ERP

Ethernet

MES/SCADA

OPC-UA (PL Copen)

PLC

Profinet, EthernetCAT, ...

Device/Actuator/Sensor

Figure 1: An exemplary automation pyramid

## TREND TOPICS AND ISSUES IN INTEGRATED INDUSTRY

Trend 1 concerns the modularisation of machines and systems. It provides a high degree of flexibility for seamless plug & produce. Important factors here are flexible, durable IT interfaces and module-neutral infrastructure solutions for supplying energy, as well as system-neutral networking. Systems engineering can connect smart objects on the machine side via hardware and software. HARTING developed its infrastructure box on this basis, with the box combining electrical and digital interfaces via individually assembled cables and modular connectors.

Trend 2 is miniaturisation. Increasingly functions are bundled in smart devices, which significantly reduces installation s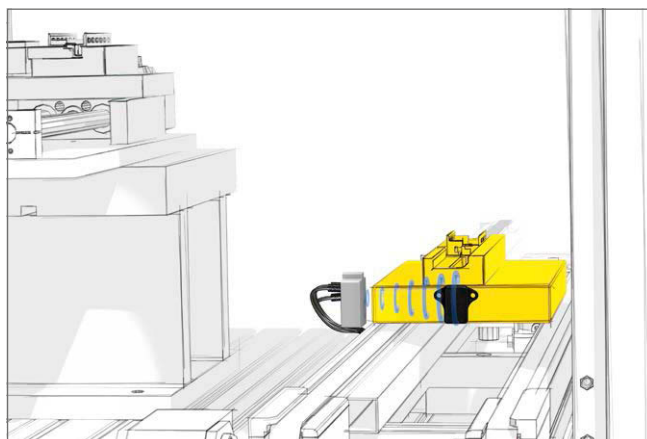pace in the switch cabinet. Smaller devices have smaller boards and smaller PCB connectors. Hybrid connectors reduce space requirements for interfaces and cut installation effort because they transmit power and data simultaneously.

Trend 3 is the ever more individualised manufacturing of customised products. This applies not only to the finished products, but also for automation equipment and its installation technology.

Trend 4 designates identification as a key to transparency in production and logistics processes. Machines and smart objects communicate directly with the product to be produced or the goods to be transported. Here, machine modules and production processes must be fully mapped in IT and uniquely identified. RFID and Auto-ID solutions that are embedded
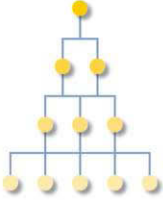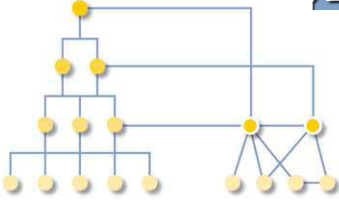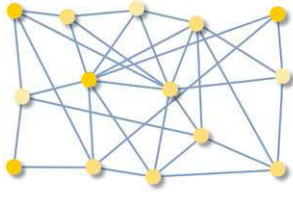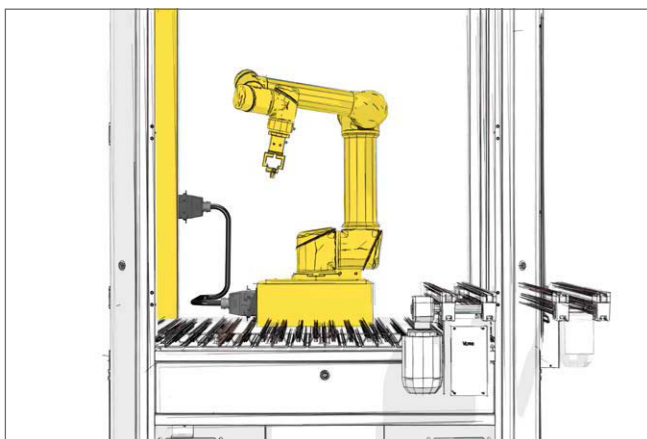

Modularisation with a Han-Modular® connection

Identification with RFID

POTENTIAL FUTURE SCENARIOS

1

- Extreme case: No evolutionary/ revolutionary change in the technical structure.
- The classical model of the automation pyramid remains in place.
- Business models of suppliers and users remain virtually unchanged.

2

- The classical structure of the automation pyramid is supplemented by distributed systems.
- Additive business models arise, leading to the emergence of a new value-creation level.

3

- Extreme case: Radical change. The classical structure is replaced by a network composed of distributed systems.
- This leads to a radical realignment of existing business models and to the formation of a value-creation network.

directly into the interfaces offer the required real-time transparency.

In **Trend 5,** digitalisation is a prerequisite for new value-added networks and a new service orientation. Integrated analysis functions such as Smart Power Network record and monitor the energy data of machines and plants, enabling new service and maintenance concepts.

Trend 6 - integration – is of particular importance in Integrated Industry at various levels. With functional integration at the level of smart devices and cyber-physical systems, so-called self-X features such as self-recognition, self-diagnosis and self-regulation are coupled with intelligent sensors. During the integration of services as in asset and energy management,

predictive maintenance, etc., each automation object makes its service objective available. This is supported by infrastructure boxes. In the area of system integration, data streams are analysed using algorithms for state detection and predictions are made regarding potential production, while automation targets are also optimised.

As a result, all of the above trends in Integrated Industry leads to more cost-effective products, increased productivity, higher quality and more production flexibility. ◼
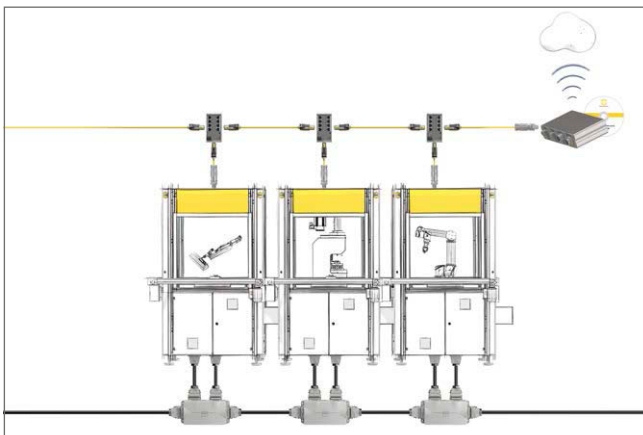
Infrastructure of the HAII4YOU Factory

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