Be smart, be happy
EFFICIENT NETWORKS

Guest contribution by Univ.-Prof. Dr.-Ing. Armin Schnettler

ENERGY INFRASTRUCTURES OF THE FUTURE – TOMORROW’S NETWORKS WILL BE SMART

INTERVIEW WITH FRIEDHELM LOH

Andreas Huhmann, John Witt
HARTING smart Power Networks

Gero Degner
RWE AND HARTING: PARTNERING IN ELECTROMOBILITY

Michael Seele, Andreas Springer
har-flex – BEAUTIFULLY SMALL
HARTING in figures

- **€ 413 million**
  revenue in financial year 2009/2010

- **1945**
  Founded

- **100%**
  family owned

- **2x**
  around the world
  If HARTING placed all the contacts manufactured in one year in the stamping department end to end they would go round the world twice

- **1.9**
  FOREIGN SUBSIDIARIES
  have been established each year since 1978

- **80,000,000**
  connectors are produced annually at HARTING

- **39**
  NATIONALITIES
  make up our global workforce
We are currently experiencing a surge in innovation associated with the concept of “smart grids”. As there is nothing new about a grid, it would appear that the innovations are inherent to the attribute “smart”. We, as connectivity and network specialists, have been asking ourselves what really makes networks smart.

Philip Harting, Senior Vice President Connectivity & Networks

As we understand things, the term “smart grid” refers to intelligent power supply networks that are essential in establishing environmentally friendly and efficient power generation, storage and consumption. Many of the devices used in today’s power supply networks can already be described as highly intelligent, equipped as they are with control systems. Therefore, it is not merely the intelligence of the individual devices that makes the grid “smart”. I am convinced that the explanation lies in the right form of communication. The aim is not to make intelligent decisions on an independent, individual basis but to build a network of devices and nodes that draw on communication capabilities to function intelligently as an entire system. This logic for energy supply networks can be merged seamlessly with the power distribution to systems and machines, which consequently makes communication the key to smart networks.

We have initially concentrated on 400 V networks in industrial applications and developed network components which communicate with each other. As the important issue for industry is to control all the subscribers in one integrated system, the communication concept chosen must not present any barriers. And what would be more suitable than Ethernet communication networking?

But we are thinking even further ahead: in order to make the communication paths clear and unambiguous, we are using the 400 V power cables for communication in the network. In this way it is possible to obtain feedback throughout the administrated or managed network in such a simple manner. Accordingly, the information concerning the communication lines is also the information about the power lines at the same time.

This approach has taught us that the right communication paths are decisive for meaningful communication.

That’s what makes communication smart. You will find more on these topics in the latest issue of our tec.News.

I hope you enjoy reading your copy,

Philip Harting
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Energy infrastructures of the future – tomorrow’s networks will be smart

Today’s mighty powerhouses are now gaining intelligence, as yesterday’s centralistic energy supply networks have evolved into the interaction of many power input facilities. And the next step is now at hand: power distribution and communication are merging. The aim: so-called smart grids, intelligent networks that manage and control the production and consumption of energy in an efficient and environmentally friendly manner.

The energy supply sector and its infrastructure are facing their greatest challenges and changes since 100 years. Given the overriding aim of ensuring a reliable, cost efficient and ecological power supply infrastructure, the existing mix of large scale power stations, huge wind parks and thousands of wind energy facilities and solar collectors have to be aligned and attuned to actual, ongoing consumption. To date, reliable power supply at all times was guaranteed by large scale power stations that covered the consumption of households and industry 7/24, year in, year out. In the future, the consumption and power production by large scale power stations will be subordinate to the provision of energy by renewable energy sources – and this will result in completely new challenges in order to maintain the stability and security of the network.

In addition, the supply of electricity, thermal energy and individual mobility will have to be optimized within the overall system in an integrated, interconnected manner. Generally speaking, it is assumed that the network of the future will perform these tasks...
“Energy infrastructures are facing their most far reaching change in 100 years.”

without incurring any loss of convenience for consumers – and at overall reasonable costs as well.

SMART GRIDS – THE INTELLIGENT NETWORKS

The term “smart grid” refers to distribution networks – in other words the part of the power supply network that serves end consumers (medium and low voltage). Today’s distribution networks that are still designed along very simple lines are connected to the transmission network by way of high voltage switchgear. On the one hand, this current infrastructure is equipped with minimal communication technology or sensors and is therefore highly efficient along with offering a long service life. On the other hand, the disadvantage is that the capacity utilization of the distribution network is not known, while the behavior of consumers is also not factored in by more individual considerations and is only described by way of average values when designed and put in place. The increasing share of decentral power generation facilities and their interaction with new consumers, such as electro vehicles, for example, call for considerably enhanced information on the individual status of the networks.

The “smart grid” that will coexist with “conventional networks” over many years or even span the course of decades will arise out of the technical convergence of information and communication systems with the energy supply infrastructure. Information on the current network status, consumption or also the forecasted demand will be collected and analyzed in superordinate network nodes (distribution substations – of which there are more than
550,000 in Germany alone). Based on this information, measures can be taken to safeguard the network, for example, as well as network sharing or shifts in the charging cycles of power storage facilities, etc. The “smart home” will also form a key element of intelligent networks and will not only feature as a consumer in future, but may also act as a power generating instance or even as an energy trader.

INFRASTRUCTURE FOR SMART GRIDS

The equipping of networks with information and communication technologies (ICT) that are currently undergoing standardization will result in considerable additional demand for reliable and cost efficient ICT retrofitting kits for the distribution networks.

At present there are numerous research and development activities ongoing which, among others, are concerned with defining the demands made on the ICT infrastructure, and enabling standardized communication between the network participants. The question remains open to date as to whether the communication will be grid-bound or wireless (based on GSM technology, for example) and which communication protocols will be opted for (IEC 61850). It is important to ensure a high degree of standardization in order to enable the smooth integration of new technologies and consumers (so-called “prosumers”, households that may act as consumers, as well as generating and storing energy. Under normal conditions the operation of a smart grid is easy to control. Safety and reliability, however, only become evident when errors occur, for example when the power supply fails on a local level for a short time.

Consequently, the next years will see the need for a considerable amount of cooperation between manufacturers, network operators, as well as research and science in order to describe the demands made on technologies in greater detail, develop prototypes and pilot series and verify them in demonstration facilities. Especially in this respect companies such as HARTING are at an advantage, as they are fielding high technical competence in connection with the required flexibility and endurance to address smart grid issues – also over the long term.

Today’s networks stand at the threshold to the future. Over the next years the planning of “smart” networks will continue, the demands and requirements will be defined and followed up by testing and verification. While we do not know precisely what technical solutions will become essential elements of tomorrow’s smart grids from where we stand today, efficient and pragmatic solutions can rapidly develop into international standards. One thing is certain: consumers will not have to have to compromise in terms of convenience – with the exception of cost issues.
Facility Management is developing a comprehensive concept for commercial buildings and plant in order to cut operating and servicing costs permanently and to ensure the technical availability of their systems. The objective is to achieve “green production” and to improve productivity, and therefore profitability, throughout the company by lowering energy supply costs, efficient power distribution, balancing out peak loads, computer-based optimization of power consumption and putting an advanced energy distribution concept in place as part of a company-wide energy management system compliant with DIN EN 16001. In order to achieve this, the power and data networks need a standardized and convergent communication system. An energy monitoring system will be set up for the most important power consumers. This will include, for example, controlling the technical energy processes, managing power consumption and raising awareness among users.

communication as a prerequisite of efficiency

The ability of industrial equipment to communicate is still considered an auxiliary function today. However, operation in isolation is counterproductive to improving the efficiency of industrial processes. A lack of diagnosis is detrimental to system availability, while the energy-efficient operation of a system is only possible if the power consumers are identified. And both of these aspects are only achieved through communication. Consequently, the objective must be to make every functioning device in a network visible and controllable.

the ranking of communication and energy supply in industry

In industry, equipment and systems are fed by three lifelines: power, data and signals. Devices with high power consumption always have a 400 Volt power connection but have a communication ability of less than 50%. These devices must be integrated as subscribers in a power network in order to allow seamless and complete administration. As a result, clear requirements of the power network emerge. When the device is connected to the power network, it should immediately be detected; it should be possible to determine its power consumption and to switch off the load in a targeted manner. These power network management functions require only a small amount of network bandwidth.

Functions such as automation, on the other hand, demand fast communications for real-time data transmission. For example,

HARTING smart Power Networks

Smart Power Networks are the intelligent industrial energy networks of tomorrow and represent the “smart grid” for industry. The energy supply to all industrial equipment and machinery will be intelligent and have the ability to communicate, which will result in completely new ways to administrate the power network. HARTING’s idea is that every device will become a network component, irrespective of whether it is connected via a data cable or only via a power cable.

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automatic optical inspection systems need a broadband communications system.

SETTING UP A COMMUNICATIONS SYSTEM OVER THE POWER NETWORK
In order to reduce additional installation costs, HARTING has chosen communication via power supply cables for managing the basic power network functions. However, as networks converge, this must not differ from communication via separate communications cables. Therefore, Ethernet has been chosen as the basis for power network communications so that the basic functions can be enhanced as required.

The intelligent functions will transform traditional unmanaged power networks into a smart Power Network system. The network components will assume a key role because it is only through these components that it will be possible to realize the topologies that industry needs. Therefore, these HARTING smart Power Network units form the backbone of the network. HARTING has drawn conclusions from this situation and is the first company to configure energy network components that can are capable of communication.

UTILIZATION OF STANDARD ETHERNET
An Ethernet network is handled by way of managed network components. The function of these managed switches can be transferred logically to the smart Power Network units.

One primary management function in any network is the visualization of the topology and the connected subscribers. If Ethernet is selected for communication on the supply networks, the topology of the communications network is the same as that of the power networks, as the communications system and the power supply use one cable. Standard Ethernet functions, of which there is a wide range, can therefore be employed for the administration of the power network.

In this way, proprietary solutions are avoided. The system is open and scalable as the addition of separate communications lines ensures higher benefits.

**BENEFITS**
- Automatic recognition of the system structure by means of intelligent energy distributors
- Increase in system availability thanks to condition monitoring functionality
- Registration and analysis of energy consumption data in the energy network

"The energy supply for industrial devices and systems develops intelligence and communication skills."
bandwidth without any compatibility limitations.

**POWER MANAGEMENT FUNCTIONS**
Complete solutions are called for to map the different topologies of energy and data networks, and which can transmit consumption data without additional data cable to control rooms, for example, and which enable condition monitoring – without any additional installation or programming.

The integrated automatic topology detector is particularly expedient when a network is first put into operation and for the operation and visualization of the installed energy distribution system. As soon as the system is switched on, the power distributors and their consumers are detected and displayed with the present consumption figures on an industrial PC or a master display.

It is also possible to integrate a load management system. The objective is to avoid pre-defined peak values being exceeded. It therefore makes sense to define those consumers which permit automatic load-dependent switching in advance.

**CONDITION MONITORING**
Condition monitoring of loads in the energy distribution system and machines and equipment is based on regular recording and analysis of meaningful data and serves to make operations safe and efficient. As well as measuring output in the T-distributors, the whole power distribution network and its HARTING smart Power Network units are monitored permanently. Every change in the properties of the installation network and the network quality is registered and analyzed. This means that low voltage, potential cable breaks or incorrect cable connections, for example, can be detected immediately – before the system fails.

**ENERGY CONSUMPTION**
An overview of the consumers is required to reduce energy costs effectively. To this end, HARTING smart Power Network units in each of the subdistributors or control cabinets draw on an integrated measurement IC to capture and store the figures for calculating the electricity consumption.

The simplest way to reduce power consumption is to switch consumers off. Standardized I/O in the administrable power distributors permit the consumers or systems that are not needed to be switched off by a PLC without additional protocols.

**VISUALIZATION**
All the measurement data for the installation is processed on industrial PCs. Data is read in from the HARTING smart Power Network units via a standardized communications interface, processed further and archived.

Significant changes in the measurement values are registered, analyzed, stored and displayed on industrial PCs or on the control room, depending on their relevance. The output of the entire installation or of each outgoing circuit, for example, is calculated. The utilization relative to the nominal output is also shown, as is a warning if there is an overload. It is also possible to generate a graphic analysis of the energy consumption and to create long-term diagrams.
"The intelligent functions transform the conventional unmanaged power networks into the smart Power Network."
THE ZVEI IS ONE OF GERMANY’S MOST IMPORTANT INDUSTRY ASSOCIATIONS. WHAT ARE THE MAIN TASKS OF SUCH AN INTEREST REPRESENTATION?

Some 1,600 electrical engineering companies in Germany have opted for ZVEI membership. The association represents more than 90% of Germany’s second largest industry, which positions it as one of the most important industrial associations. The ZVEI represents the interests of its members in all topics and issues relevant for our sector – this comprises legislation and standardization, but also questions of Corporate Social Responsibility as well as shaping the image of the industry. Our experts are active wherever forward-looking decisions are being made: in Berlin, in Brussels and also in Peking.

WHERE ARE THE GREATEST CHALLENGES AT PRESENT?

Many highly topical challenges cannot be mastered without our industry, whether in the area of energy efficiency, electromobility in connection with intelligent power networks, or in healthcare and security. Totaling some 2.5 billion euros, today’s market for electrotechnical products ranks as the largest industrial market worldwide, and is characterized by above average growth rates.

THE ZVEI HAS MADE A NAME FOR ITSELF WITH SO-CALLED ROADMAPS. WHAT ARE THE KEY ISSUES HERE?

Our sector generates some 40% of its sales with products that were not even on the markets three years ago, while innovation cycles continue to contract. None the less, we have to decide today what we will be earning our money with in future. Roadmaps provide the necessary orientation.

In connection with these roadmaps the developments of society and technologies are systematically investigated, correlated to each other and the upcoming changes of markets are estimated and assessed on this basis – for example with regard to electrical automation. Companies and research institutes cooperate in a pre-competitive stage, in order to conduct their own development projects on the basis on these findings.

WHAT ARE THE GREATEST CHALLENGES FOR THE ASSOCIATION IN THE AREA OF TENSION BETWEEN COMPANIES AND SOCIETY?

In our interaction with policy makers we advocate open markets, general conditions that promote competition, while we are also involved with the assessment of the subsequent effects of political decisions. We use our influence to ensure that decisions are rapidly and efficiently implemented.

Electromobility is a salient example. We want Germany to become the leading provider of electromobility, which is why we are involved in the National Electromobility Platform. At the same time, ZVEI is also advocating and backing the concept of intelligent power supply systems, so-called “smart grids”. Without smart grids we will not be able to realize our electromobility objectives, nor will we achieve a higher share of renewable energy.
At the same time, we want to promote awareness among the general public that our affluence is based on industrial value creation with high-tech products. This requires an increasing share of engineers and well-trained, highly skilled personnel. Therefore, it is important to spark young people's enthusiasm for technology, in order to counter the risk of a shortage of skilled workers and specialists.

WHAT SIGNIFICANCE DOES THE ASSOCIATION HAVE FOR YOU PERSONALLY?

The electrical industry provides technological answers to the urgent questions of our day and age, which includes vital issues such as reducing CO₂ emissions, the efficient use of raw materials, mobility or demographic change. I regard our involvement in these matters as part and parcel of our societal responsibility. As ZVEI President, I have scope to shape and design these matters, and this is something that I am glad to engage in. Dietmar Harting certainly perceived his ZVEI presidency in a similar manner.

THE COMPANY

Rittal GmbH & Co. KG is headquartered in Herborn, Hesse, and ranks as a worldwide system provider of switch cabinets, power distribution and air conditioning solutions, IT infrastructure as well as fielding a software & services portfolio. System solutions by Rittal are at work in all industrial sectors, in the machine building and plant engineering area, as well as in the IT and telecommunications sector. Founded in 1961, Rittal is active across the globe in the meantime, comprising 10 manufacturing sites, 63 subsidiaries and 40 branch offices. Employing a workforce of some 10,000 members of staff, Rittal is largest company of the owner managed Friedhelm Loh Group, based in Haiger, Hesse. The entire Group employs more than 11,000 members of staff. Further information is available at www.rittal.de and www.friedhelm-loh-group.com.
RWE and HARTING: Partnering in electromobility

With immediate effect, RWE is equipping charging stations with HARTING’s standard electromobility connectors

» Gero Degner, Product Manager, Germany, HARTING Technology Group, Gero.Degner@HARTING.com

The shift in individual transport from fossil fuel based drive systems to alternative concepts is in full swing. In recent years, the development activities revolving around e-cars have been stepped up considerably. In the meantime, major carmakers have introduced concepts and have rolled out the first series production vehicles. Apart from meeting criteria such as low weight, good acceleration and a wide range, electric vehicles must also be able to draw on the most extensive network of charging stations possible. Essen-based energy supply company RWE is leading the way with its involvement in two large national mobility projects. RWE has been strongly committed to electromobility for two years. The company is leading the way in Germany in setting up the public charging infrastructure, and has already installed more than 500 charging points. By taking this approach, the RWE intends to solve the so-called chicken-egg problem. The idea is to have a viable infrastructure ready for new vehicle generations entering the market. Market observers expect that the availability of a charging infrastructure on hand will significantly accelerate electromobility’s expansion. The RWE credo: Anyone who wants to use an electric vehicle in Germany will find the right charging infrastructure already in place.

In addition to the charging station with two tanking points developed for the public sector, RWE has also developed a charging box, called the “Ladebox home” that can be used in the private sector. This charging box can easily be installed in the home garage or carport, and guarantees that car batteries can be also be swiftly and conveniently charged with green electricity when at home.

RWE has also kept a strict eye on ecological impact: 100 % of the RWE electricity for cars is generated from renewable sources, guaranteeing that the electric vehicles drive CO₂-free, also beyond their local areas. Moreover, the electricity production releases only low levels of CO₂ and consequently contributes significantly to reducing emissions. In this way, RWE is bringing green electricity, which is principally generated in large offshore windparks in the North Sea, onto the streets.

During the RWE electromobility road show held at Berlin’s Sony Center, RWE and HARTING jointly presented the electromobility connector developed by the HARTING Technology Group. This connector...
satisfies the requirements for Type 2 as defined by the IEC 62196-2 standard and will be used in all RWE charging stations and boxes with immediate effect. HARTING’s solution features particularly simple handling, a progressive industrial design as well as product properties such as longevity and reliability, which play a role in the overall concept’s acceptance. The first discussions on the development of the new connector generation for the RWE charging infrastructure were held during the winter of 2009/2010. After a development time of just under six months, HARTING has now rolled out a marketable product. According to company planning, series manufacturing will kick off as from second quarter 2011.

Carolin Reichert, Head of E-Mobility at RWE Effizienz GmbH, commented on cooperation with HARTING as follows: “We expect that the Type 2 electromobility connector will be accepted as the international standard around mid-2011. This will significantly speed up the expansion of the charging infrastructure. With an eye to avoiding supply bottlenecks, we developed this new connection with the HARTING Group on the basis of the de facto standard. We will also be equipping our charging infrastructure systems with HARTING products with immediate effect. HARTING delivers outstanding quality, and we are very satisfied with this collaboration.”

Carolin Reichert, Head of Electromobility at RWE Effizienz GmbH, and Philip Harting, Senior Vice-President Connectivity & Networks, HARTING Technology Group
Wind power moves out to sea

The output from wind farms has risen steadily over recent years. Current plans envisage wind farms providing output up to 15 MW. If these facilities are to be utilized to the fullest extent, they will have to be built in efficient locations. Constant wind at a higher than average speed is persuading operators to build their wind farms offshore, at increasing distances from the coast.

The demands made on wind farm components, whether onshore or offshore, are very high: In addition to resisting strong vibrations and coping with a wide range of temperatures, they also need to ensure a long service life. The trend towards offshore projects places additional strain on wind farm components.

They require protection designed for maritime conditions, must be resistant to the high salt content of the sea air and they must also satisfy higher reliability requirements. Breakdowns at sea can result in long periods of downtime as the farms cannot always be reached immediately.

The HARTING Technology Group has developed a new range of connectors, the Han-Eco® series, which meets all these demands with a higher protection class (IP 65) and a wider range of operating temperatures from -40 °C to 125 °C.

Furthermore, the Han-Eco® series is manufactured from a high-performance plastic which is very resistant to environmental factors such as salt spray and is also extremely robust with regard to its mechanical properties. As it weighs much less than standard solutions, the high-quality Han-Eco® series is in line with the trend to reduce the weight of the turbines at work in both onshore and offshore wind farms.

The Han-Eco® series is designed for tool-free assembly and the connectors are specially configured for the use of modules. This enables the flexible design of interfaces and results in many combination options. In addition to savings in assembly time, it is also possible to reduce costs overall by optimizing the use of the components. Consequently, these connectors ideally cater to the ongoing modularization trends in wind power systems.
Small Powerhouses

Small wind turbines are also playing an important role in the new energy economy and energy management systems. They can be integrated into a grid or used as isolated systems, particularly for small consumers who need electric power under difficult conditions.

Branislav Thurský, Application Engineer, MWE s.r.o., Slovakia
Tomas Ledvina, Product Manager, Czech Republic, HARTING Technology Group, Tomas.Ledvina@HARTING.com

In the European Union, the greatest potential for small wind turbines is close to the Atlantic coast, in Slovakia, in local mountainous areas and also in the Danube lowlands. There is a market for small wind turbines wherever the installation of large systems is impossible due to specific conditions or the lack of a suitable infrastructure.

MWE s.r.o. in the Danube lowlands has developed the MWE 451M, a small wind turbine with a nominal power of 45 kW. The turbine’s rotor has a diameter of 13 m and the blades can be adjusted synchronously around their longitudinal axis, which allows optimal adjustment to whatever wind strengths may be available. The turbine is operated in two states – via moment control, which ensures the turbine’s constant output at variable rotor speeds, or via rotation control, which keeps the rotor’s speed constant while the output power is changed depending on the current wind strength.

The prototype of the MWE 451M has been successfully put into operation, and an additional 40 turbines are to be delivered in 2011. The already foreseeable success will be followed by exports of turbines by MWE. A system upgrade is also on agenda, perhaps as soon as in the more powerful 100 kW version.

The electronic power and control area is based on the SINAMICS S120 industrial system, for which HARTING has contributed the connector technology. Type Han® K 6/6, Han D® AV40 and Han® 16 E connectors are used to ensure a reliable connection between the controller and the gondola and to ensure additional modularity. With their robust construction, they guarantee the long service life expected in wind energy systems, and also allow flexible system assembly. For instance, the gondola can be variably connected to the main container that holds the wind turbine’s power and control sections. System assembly and dismantlement have been simplified as well as commissioning. Moreover, the system’s modular design and resulting high variability translate as lower maintenance and repair costs.
Ha-VIS Fast Track Switch in field testing

The utilization of Ethernet throughout every company area, from offices on to the control level and all the way down to field level continues apace. Ethernet, however, is unable to rise to the challenges presented by automation applications, particularly in terms of real-time capabilities, with conventional switches.

Heiko Henschel, Market and Application Manager ICPN, Germany, HARTING Technology Group, Heiko.Henschel@HARTING.com

Automation IT is HARTING’s communication platform serving the entire range of applications within a corporate network. Fielding the Ha-VIS Fast Track Switch product series, HARTING is providing a solution for the deterministic response time that Ethernet currently lacks.

Fast Track Switching operates by using the Ethernet headers to detect those automation frames that are important for the application in order to forward them with top priority by way of the cut-through process. By proceeding on a fast track, so to speak, the high-priority automation frames can thereby overtake the other data traffic.

KUKA ROBOTER GmbH based in Augsburg, Germany, has subjected Fast Track Switching technology to extremely rigorous testing. The aim was to validate this technology and make the most of these features in
communication systems deployed in manufacturing systems, especially in the automotive industry. For this purpose, an Ethernet network was set up with various subscribers (see illustration) consisting of automation and office equipment as well as a camera. Two Ha-VIS Fast Track switches, type FTS 3100s-A, were opted for as infrastructure components. The switches were configured so that the PROFINET data (shown in green) was accelerated to overtake all the other network traffic (shown in black) in Fast Track Switching mode.

The test results documented that with Fast Track Switching all of the PROFINET frames reached their destination devices within the required cycle time – irrespective of the load on the network generated by camera data or data transfer from the corporate network through the bottleneck of the switch cascade. The test not only proved the deterministic behavior in the control system in actual practice, but also demonstrated outstanding performance.

Ha-VIS Fast Track Switches enable real-time solutions and thereby the use of standard Ethernet, such as PROFINET RT, Ethernet/IP and Modbus TCP for the most demanding applications, right down to field level.

The Ha-VIS Fast Track Switch product family has been extended with several managed variants. These devices offer a host of management functions in addition to the Fast Track Switching technology and implementation of the PROFINET IO stack, providing options for the configuration and diagnosis of the automation environment.

**BENEFITS**

- Prioritization
- Determinism
- Performance
- Topological freedom
The solar market is growing worldwide

The global photovoltaic market has been flourishing for many years and the growth forecast for the future is looking extremely good. HARTING has developed some new and effective networking ideas for large solar projects.

» Carsten Wendt, Product Manager ICPN, Germany, HARTING Technology Group, Carsten.Wendt@HARTING.com

The photovoltaic industry is anticipating that 2011 will prove another record year for installations. Estimates indicate that solar power systems generating around 15.8 gigawatts (GW) were installed around the world in 2010. This represented an increase of approximately 118.7 % over 2009. These figures demonstrate the importance of renewable energies for the supply of electricity of the future. But there is more: With the costs of fossil fuels rising and the pressure to achieve further reductions of CO₂ emissions from energy generation, strong growth is also predicted for the next few years.

Energy demand and environmental protection are developing hand in hand, in a parallel process. Countries with rapidly expanding economic outputs and rising standards of living have a huge demand for energy, which must be met by adopting environmentally friendly approaches. Take, for example, the Turkish electricity market, which is currently growing by around 7 % every year. The Turkish government announced in 2009 that it would be supporting renewable energies more strongly in order to become independent of raw material imports. India is planning to install around 20 gigawatts of solar power by 2022. In southern Europe, systems with a total output of 38 gigawatts will be installed by 2020.

In Germany alone, the cost of PV systems has fallen by 45 % since the year 2006. This is not only due to the expansion in production capacity, but is also because the automation components used in the systems are becoming ever more affordable.

PUSHING COSTS DOWN

Over the last few years, the HARTING Technology Group has cooperated with some well-known photovoltaic manufacturers in Germany and abroad to develop and implement new solutions for networking and cabling large solar power systems. The projects carried out for SOLON SE in Europe and North America in recent years are salient examples. SOLON SE is a leading solar system house and one of Europe’s largest solar module producers. Moreover, the Berlin based company plans, designs and installs large roof systems and turnkey solar power stations throughout the world.

A high-availability Ethernet network and simple low-cost Ethernet components were deciding factors in SOLON SE’s choice of partners to provide the cabling in their major power station projects.

Multi-megawatt solar parks have considerable space requirements (from 10,000 m² to 100,000 m²). Consequently,
The cabling regularly needs to be run over distances exceeding the maximum permitted distance of 100 meters for patch cables. For this reason, there are significant advantages in networking the switching stations via optical Ethernet ports rather than RJ45 patch cables. For example, HARTING’s Ha-VIS sCon 3000 product was chosen for the 18 MW power plant with single axis tracking in the solar park in Gila Bent, in the US state of Arizona. SOLON is constructing this facility for Arizona Public Services, the local electric power provider.

SOLON SE has opted for HARTING Ha-VIS sCon 3082-AD Ethernet switches in a 100 Mbit/s multimode fiber optic ring (62.5/125 μm) to network the power station.

**The Cabling Concept**

Only intelligent and well-thought-out concepts to control and monitor the systems can guarantee sustained high output from a solar power plant. A simple ring cabling topology is ideal to provide the safe and redundant error messaging needed for a rapid response to faults or malfunctions and was installed at the Gila Bent power plant. Furthermore, if the complex and extensive system is broken down into small segments (clusters), errors or faults will be local or confined to small areas.

“Ring redundancies” are a problem that occurs frequently in cabling for large-scale systems. Fully managed switches with functions such as RSTP, IGMP or prioritization have often been used in these cases in the past. For this project, HARTING relied on sCon 3000 Ethernet switches, unmanaged Ethernet switches with a ring redundancy which can be configured in just a few steps. It is not necessary to have in-depth knowledge of managed Ethernet switches to use them. Among other things, the utilization of Ha-VIS sCon Ethernet switches results in a significant, up to 30 %, reduction in application costs. The costs of service training and initial operation are also much lower, as the Ethernet functions of the Ha-VIS sCon Ethernet switches are reduced to a minimum and users can see all the functions at a glance, thanks to a clearly laid out selection menu.

The ideas put into practice in the Gila Bent project can be adapted to almost any other project in just a few minutes with some minor modifications. The use of HARTING’s Ha-VIS sCon 3000 has not only ensured a highly available Ethernet network, but also made the solution far less complicated.

“Energy needs and environmental protection develop in parallel.”
The use of connectors is reducing costs for wind power plant assembly, installation and maintenance. The HARTING Technology Group has developed tailored concepts and products for the wind industry.

Bob Laskowski, Wind Energy Market Development and Application Manager, North America, HARTING Technology Group, Bob.Laskowski@HARTING.com

A multitude of different components and sub-systems are integrated into wind power plants. Power supply, data communication and control signal transmission are designed for the specific application. Before being shipped from the manufacturing plant to the wind park site, most wind turbine components have been monitored and tested by the manufacturer. Then, at the site, the nacelle, tower and switching station are connected to one another and the electrical connections are made. After the complete wind power plant has been tested, it is ready for operation.

**HARD-WIRING**

In the past, hard-wiring was commonly used to connect the most important sub-systems and components, although this approach has numerous disadvantages. This wiring usually runs through conduits with the on-site electrical installation being inefficient and expensive. This method considerably obstructs testing and error correction. Further, the system’s final assembly in the field, where it is not always possible to avoid mistakes in the hard-wiring, is just as difficult. These problems actually multiply during the installation in the tower, which includes
the turbine controller, data communication system, internal lighting and external navigation warning lights, as well as any power and control lines for an elevator.

The costs can be substantial. The direct labor costs for the hard-wiring are approximately matched when the system is dismantled for shipping. Often mistakes can only be corrected by separating individual cables from the termination points in order to allow the problem to be localized.

The situation at the site when the system is set up is similar. In the worst case, wiring mistakes can cause components to be damaged when the system starts operation. Particularly complex problems additionally require the consultation of engineers and technicians, which entails additional costs and delays.

CURRENT DEVELOPMENTS IN CABELING
"Design for Manufacturing" provides an expedient solution by considering the installation as a part of the manufacturing process.

In this case, the developers favor cables assembled with connectors in order to simplify the assembly and dismantling. Modular connector systems that allow hybrid (multi-functional) connections to be made. This makes it possible to manufacture made-to-function connectors that can hold glass fiber, Ethernet, coaxial, power and even compressed air lines, as well as many other special connection forms.

Such cables can be equipped very quickly, and automatic testing reliably prevents wiring errors. If errors are detected, the cable wires can simply be stripped and reconnected. The result is a pre-wired, tested and assembled cable that connects the important parts of a wind power plant to one another.

The figures show the differences between hard-wiring and a cable equipped with connectors. This example includes a wire fan-out at the cable’s connector end, which is typical for terminals on a control board. The utilization of individual connectors at the fan-out with corresponding counterparts at the subassemblies or components would also be possible.

COST-BENEFIT RATIO IN DESIGN FOR MANUFACTURING
The use of connector-cable systems offers a number of advantages:

• More efficient (thanks to standardization) planning, design and assembly processes
• Reduced downtime for maintenance and repairs
• Faster dismantlement for shipping
• Reduced wiring costs and shorter commissioning times in the field
• Fewer personnel needed during the on-site installation
• Standardized cables and connectors reduce the spare parts supply required
• Cost reduction of approximately 45 % in the overall wiring concept
• Lower warranty costs
• Simpler changes for upgrades, expansions, etc. at the site.
• Greater customer satisfaction
• No rigid conduits are needed
• Less cable braid at the control board ("clean" design)
Sugar, Ethanol and Ethernet

The Brazilian sugar and ethanol industry has been charting a growth course in recent years and has positioned itself as a significant factor on the international markets. And this is exactly why strong performance capabilities are now called for in order to further expand this position. HARTING Ethernet switches are helping to modernize the systems at one of the largest Brazilian manufacturers.

Gustavo Yokoyama, Field Sales Engineer, Brazil, HARTING Technology Group, Gustavo.Yokoyama@HARTING.com

The Brazilian sugar and ethanol industry’s success is no coincidence: competitive advantages such as the electricity generated by the combustion of sugar cane biomass (bagasse), modern and efficient power-heat coupling stations and new application areas, such as ethanol’s use as an alternative fuel and as a raw material for new “ecological plastics” have contributed to this success. Now the industry must prepare for the imminent market developments, as renewable raw materials hold a key position for our future energy supply. This also explains the interest of large international corporations in the Brazilian companies that are becoming increasingly involved in this sector.

MODERNIZATION MISSION

To begin with, the new owners mainly initiated investments geared to enabling the convergence of process data online and the direct control of the production process. The technical expansion was further advanced with the implementation of Industrial Ethernet.

To date, insular systems were the rule. Decentralized control systems were already established in sugar and ethanol factories with coupled power generation. Each production area was equipped with its own SCADA (Supervisory Control and Data Acquisition) system that included a computer-controlled monitoring system, industrial PLC controllers, field units and corresponding infrastructure.

This existing architecture did not allow online data to be acquired from the production process, however. Process decisions could not be made on a solid basis, and they were also difficult to implement. Consequently, investments were committed to new process automation systems, and the control architecture was centralized. The SCADA systems were integrated into so-called IOCs (Integrated Operational Centers).
HARTING’S SOLUTION

HARTING Brazil supplies individual switch solutions to one of the largest Brazilian producers, dealers and exporters of sugar and ethanol. The customer also ranks as the world’s largest producer of electricity from sugarcane biogas.

HARTING delivered Ha-VIS mCon 3000 Ethernet switches for one project. After the first project’s success, the group’s remaining 25 plants are to undergo the same conversion in the coming years.

The project was carried out in two stages: In the first stage, HARTING Brazil supplied six Ha-VIS mCon 3063-ADV switches. In the second stage, two additional Ethernet switches of the same type were installed in the IOC. Each Ethernet switch provides the connection to a redundant data server that compiles and evaluates the data and controls the system. Integration into existing control cabinets was convenient thanks to the HARTING switches’ compact, space saving design.

“The ability to handle heavy loads was one of the core requirements for the HARTING solution, as sugar and ethanol production takes place under demanding environmental conditions. Electromagnetic interference from frequency converters, high temperatures generated by boilers, and dust coming from nearby sugarcane plantations all impact on the switches. Products with IP 30 protection guarantee reliable functional capability here, while (remote) management functions ensure that the system can be controlled openly and reliably. In view of the size of the plant and the large number of control units VLANs (Virtual Local Area Networks) are used to split up the network traffic. ”

The Ethernet network achieves high availability levels and features RSTP functionality (Rapid Spanning Tree Protocol) for swift network recovery in the event of a disturbance or malfunction of the fiber optics. Each switch has three full-duplex glass fiber terminals that allow communication between two optical slots and the Ethernet switch from the next area, thereby forming a ring topology. A third optical port is available for communication with remote areas.

In the future, a number of IP cameras monitoring the production areas will be connected to the switches. The QoS function (Quality of Service) will allow control and video data to be prioritized.

PARTNERS: HARTING BRAZIL AND HEXANS DATACOM

HARTING’s partner for the production system modernization is the Brazilian company Hexans Datacom, which specializes in the planning, installation and maintenance of Ethernet networks in sugar and ethanol plants. HARTING Brazil and Hexans Datacom have been working together successfully for two years.

Hexans Datacom not only supplies customers with HARTING components, such as Ethernet switches, optical and metal cables, and connectors, but also delivers complete solutions in which HARTING plays a key role in development.
The safety standards in underground mining are continuously elevated to increasingly stringent levels, and with good reason. Apart from protecting tangible assets, they safeguard the miners first and foremost. In order to guarantee the safety of raw material mining and those working in this field, mining companies are intensively expanding the data networks that guarantee failure-free and resilient communication between the control center and the complex tunnel network underground.

As the tunnels advance, networks that are connected to a number of clients are also extended. Mobile mining and transport equipment are connected to the network along with cameras, radio telephones, mobile data processing equipment and data collectors. The goal is to allow the control center to view the situation underground at all times in order to detect danger at an early stage so that countermeasures can be taken. In an emergency, it must be possible to initiate and carry out safety and rescue measures swiftly and effectively.

Consequently, the communication paths must connect the periphery to the control center under extreme conditions, for example, in order to locate injured miners in the tunnels. The network features a redundant design and the periphery is set up in a linear topology. Peripheral devices are connected by means of wireless network switches.

A mining equipment supplier is offering these switches, and HARTING Technology Group’s Han® 3 A hybrid LC duplex connector has been selected to connect the individual switches in the cable network.

This connector, which was originally developed for the communications industry, is designed as a hybrid that can be simultaneously used for transferring energy and signals via glass fiber.

Reliability, robustness and safety come first in underground mining. The utilization of the Han® 3 A hybrid LC here has delivered significant cost reductions by comparison with previously used solutions, because now only four connectors per switch handle the work of the eight that formerly were required. The combination of energy and signal transmission in one connector exceeds the current the state of the art in the mining industry by a wide measure.

Benefits

- Hybrid interfaces
- Harsh environmental conditions
- Failure-free data transmission over fiber optic cable
- Space-saving installation for data and power transmission

Mining accidents like the recent one in Chile strongly draw our attention to the need for strict safety requirements underground. Communication and data transmission take the highest priority here – and HARTING connectors are playing a key role.

Rainer Bussmann, Senior Product Manager, Germany, HARTING Technology Group, Rainer.Bussmann@HARTING.com

Safety net
The miniaturization trend in industrial production shows no signs of ending. Controllers and other components are being delivered in increasingly compact sizes, regardless of the size of the end devices. This extends all the way down to the printed circuit board as the basis for the electronic structure of industrial systems. Here cost reduction pressures, together with the demand for improved performance, constantly drive new and innovative designs.

The pressure to achieve increasingly compact dimensions is also leading to new requirements in the orientation of PCB connections. To date, the conventional approach has been to connect PCBs to one another by means of a backplane. However, this rigid construction can constrain the designer who wants to adapt to other, unconventional designs for devices that utilize PCBs. This is why there has recently been a move towards designs that plug a device’s individual modules directly to one another. As previously, this can be accomplished by means of a right-angle arrangement. But the trend is also moving

Flexible PCB connectors have become indispensable in addressing the trend towards miniaturization in industrial applications. HARTING is expanding the current application range with the addition of insulation displacement connectors (IDC) to the har-flex family.

Michael Seele, Global Product Manager, Germany, HARTING Technology Group, Michael.Seele@HARTING.com

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towards parallel arrangements of the PCBs, the so-called mezzanine approach, as well as positioning the modules next to one another on one level. If the distances between the individual modules are too great for conventional connectors, a ribbon cable is used for the connection.

This development is the most interesting with regard to the connectors, where the trend towards different architectures is opening up new possibilities and leading to new designs.

This evolution goes beyond just the elimination of the backplane, as entire systems requires greater flexibility. HARTING has rigorously implemented the principle of flexibility in the har-flex range, which has been developed as a universally compatible board-to-board connector family. This family offers straight and angled versions in addition to cable mounted connectors with ribbon cable termination, in insulation displacement connector (IDC) technology. This combination of configurations meets all of the necessary new board to board arrangements. For example, two straight connectors are used for the mezzanine application, two angled connectors for PCBs on one level, and a combination allows the classic pairing of mother and daughter cards. PCBs can consequently be built up into complex systems perfectly adapted to their surroundings.

Users benefit from even more application advantages if connectors with ribbon cable termination are used. The har-flex IDC model is easy to assemble on-site, because the proven and reliable insulation displacement connection (IDC) is utilized. There is no need to strip the individual strands and the design ensures a gas-tight connection that additionally guarantees secure strain relief. har-flex IDC is equipped with an integrated locking/unlocking function and clicks into place on the PCB connector. Preassembled cables are also available upon request.

The flexible spacing of vertically and horizontally arranged PCBs represent a further advantage. A number of PCBs can be connected to a BUS (daisy chain) or a multiple board connection. Point-to-point connections are possible without complex routes through the PCB.

Moreover, the entire har-flex PCB connector family can be integrated into the standard manufacturing process without additional process steps. This eliminates special processes in production that could involve additional connector fitting and soldering that could lead to the potential of damage. The connectors are soldered in a reflow process and are suitable for automatic pick-and-place operations.

har-flex is equipped with 1.27 mm contact spacing, which has already proven its mechanical suitability in industry while satisfying the prerequisites for high data rates. HARTING offers a multitude of sizes and numbers of poles to address the diverse requirements that industrial clients place on the connector’s design (6 to 100 poles in increments of 2). The modular tool concept turns an individual design into a standard component. No special tooling changes are needed for customer-specific solutions.

The high degree of flexibility that har-flex offers is opening up new perspectives for device manufacturers. Even with the sector’s extremely short innovation cycles, this connector family retains continuity in termination technology without restricting the development options.

"har-flex has been developed as a universally compatible board-to-board connector family.”

**BENEFITS**

- Flexible, cost efficient and space-saving solution
- Proven and reliable insulation displacement termination
Chinese investments in the railway sector continue as scheduled

As in so many other market segments, China is also rapidly setting new world records in the railway industry. Ongoing developments here are fully in line with the five-year plan, positioning China as one of the few countries to fully adhere to its investment intentions. As the eleventh five-year plan is being implemented, the next one is already emerging on the horizon. In addition to a clear-cut strategy for developing its population, one of the goals China is pursuing in this plan is to attain a leading position in the railway technology sector.

» Sam Chen, Market Manager Transportation, China, HARTING Technology Group, Sam.Chen@HARTING.com

INVESTMENTS IN ROLLING STOCK

As part of the eleventh five-year plan (2006-2010) China has invested ¥ 2.2 trillion (€ 246.7 billion). The total investment volume as part of the upcoming twelfth five-year plan (2011-2015) is expected to amount to ¥ 3.5 trillion (€ 392.5 billion). Compared to the boom year 2010, annual growth in expenditure in 2011 will remain at a cautiously stable level.

The twelfth five-year-plan envisages 30,000 km of track (of which 6,000 km are high-speed) compared to 19,800 km (4,200 km) in the previous plan.

As far as rolling stock is concerned, the 300-380 km/h CRH380 EMU plays a key role in the new five year plan. It will replace the CRH model which is designed for 200-250 km/h. Annual production of the CRH380 standard trains (eight carriages) is predicted at some 160 EMUs, which is equivalent to 250 % of the production capacity of the last five-year plan. The CHR380 trains are based on technology from manufacturers Siemens Velaro, Kawasaki Shinkansen and Bombardier Zefiro. Investments in signaling technology are on a similar scale.

A RAIL NETWORK FOR A BETTER QUALITY OF LIFE IN CHINA

The planned route network demonstrates that the investment is intended to achieve more than just linking the large conurbations on China’s east coast. It is also intended to give the population living along the north-south axis in the Chinese interior access to the coast. This will drive the development of the country forward significantly in order to help the people achieve higher living standards.

Furthermore, new high speed routes are rendering some shorter flights (normally up to 500 km) superfluous, thereby reducing CO₂ emissions and making an important contribution to protecting the global environment.

Irrespective of the construction method or speed of the new trains, high quality and comfort standards are essential. Each train offers a first and a second class. As a rule, passenger information such as the current speed and the destination is displayed on up to four state-of-the-art LED video screens in each carriage. At the stations, the trains stop precisely in the designated positions, so that passengers can form orderly queues in front of the carriage doors. The authorities responsible for the railways are decidedly proud of the frequency and punctuality of the trains, which approach Japanese standards. This
is enabled by the independent nature of the railway network that does not need to be coordinated with other train networks or transport modes. Another reason is the decision to install the extremely powerful CTCS train control system, which operates under the name of ETCS in Europe. Unlike the railway engineers in the West, who normally try to find a compromise between speed and maintenance costs and the train’s lifecycle, the Chinese authorities are also backing maximum speed all the way.

Products made by HARTING are fully supporting the Chinese railway authorities’ high aspirations in terms of quality and operability. The robust, heavy-duty HARTING connectors are finding use in interior as well as exterior applications of the new train generations. The standard connectors in DIN, D-Sub and M12 formats guarantee high levels of availability for the communications and control systems in the trains as well as the train control systems along the tracks.

“HARTING products support the high quality and operating requirements.”
On the Fast Track

HOHENLOHER Spezialmöbelwerk Schaffitzel GmbH & Co. KG in Öhringen supplies innovative, high quality solutions to the school and laboratory segment. The Ha-VIS preLink® cabling concept satisfies the requirements for fast installation and a high level of operational reliability.

» Rainer Schmidt, Product Manager ICPN, Germany, HARTING Technology Group, Rainer.Schmidt@HARTING.com

The media lift system features as one of HOHENLOHER’s most important products. It is installed in schools, universities and laboratories in order to supply work and training stations with various media. A movable terminal is equipped with outlets and supply lines for the 230 V power supply, various types of gas or even data lines.

This terminal, along with its pivot arm and ceiling channel, is pre-assembled in special manufacturing facilities. In the past, the data line lengths had to be planned exactly to suit each particular case. Cable paths with an RJ45 jack on one side and an RJ45 connector on the other were provided in order to make this process more efficient.

The intricate and cost-intensive installation processes involved are the drawbacks of this solution. Threading the cable paths into the pivot arm represents painstaking and time-consuming work. Excess lengths that protrude from the media lift for connection in the distributor obstruct the transport to the installation site and can also be easily damaged in the process.

This is where HARTING’s Ha-VIS preLink® concept enters the picture. By breaking the system down into the preassembled cable path (the link before the link, or preLink) and the connectors, it was possible to rearrange the work sequence. Threading the cable paths through the protective tube in the pivot arm is much simpler now and the required time has been greatly reduced. In addition, dividing the cable path into two parts means that excess lengths are now a thing of the past. The decision on the length of the patch cords to be connected is made according to the media lift’s position at the installation site.

In consultation with HOHENLOHER Spezialmöbelwerk, HARTING built in a reference path for checking the function. HARTING tested and certified this path in its own internal accredited laboratory. The test verified perfect function. The test results also showed that there was still considerable reserve capacity in the transmission channel, which provides additional data security during operation and increases the overall system’s error resistance.

A BYWORD FOR QUALITY FOR MORE THAN 130 YEARS

School and laboratory equipment from HOHENLOHER have been synonymous with high quality for more than 130 years. Serving education and research, HOHENLOHER consistently stands for innovative products. Quality, ergonomics and superior practical utility make the HOHENLOHER product system unique.
The Han-Yellock® connector from HARTING is a genuine innovation: A connector concept with a completely new approach and design, has caused a sensation on the market. Han-Yellock® is successful on a number of fronts. The first pilot projects show that the new product from the HARTING Technology Group fully lives up to the expectations.

**FUNCTIONALITY AND FLEXIBILITY**

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Frank Quast, Product Manager,
Germany, HARTING Technology Group,
Frank.Quast@HARTING.com

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**Perfectly formed and sporting a new feature**

One year after its market launch, the Han-Yellock® connector and its convincing design and functionality are scoring points with a new feature: Thanks to Han-Quick Lock® termination technology, the connector is faster and simpler to use.

Frank Quast, Product Manager,
Germany, HARTING Technology Group,
Frank.Quast@HARTING.com

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**FUNCTIONALITY AND FLEXIBILITY**

The Han-Yellock® impresses with many functions and high performance levels. The contact bridging function makes it possible to move switch cabinet functions into the connector and consequently simplifies the entire configuration and reduces the system’s complexity, particularly in terms of control technology, while also securing advantages during installation. In addition, there is an easy to operate lock. Simpler, faster and error-proof – these are strong arguments in favor of the Han-Yellock®. Han-Yellock® also shows what development can achieve in terms of flexibility: The
housing is divided on the cable side, which means that terminals can be inspected and rewiring can be performed in a manner that is simple and easy on the wires. The inner connector parts can be snapped into place from the mating side and/or the termination side which facilitates installation work and retooling.

GREATER CONVENIENCE THANKS TO QUICK LOCK TERMINATION TECHNOLOGY
HARTING has added another convincing feature to this product series: Contacts inside the Han-Yellock® were previously connected by crimping. Although this termination technology has proven itself, broad international use is difficult due to the need for special tools and individual contacts for different cable cross-sections. Consequently, HARTING has additionally equipped Han-Yellock® with the Han-Quick Lock® termination technology.

USE IN THE FIELD
Han-Quick Lock® has been developed for tool-free processing in the field. It is based on a radial spring clamp terminal and combines the advantages of a tension spring with those of crimping. Han-Quick Lock® is suitable for flexible stranded conductors. The individual wires are separated by a central cone and then pressed against the cone with a radially arranged spring. The spring is positioned in a plastic element, the so-called actuator. This is pressed down with a simple screwdriver. The spring then moves over the individual wires and the cone. The result is simple and vibration-proof termination technology with crimp technology contact spacing.

The Han-Yellock® Quick Lock module enables the assembly of a complete Han-Yellock® connector without any special tools. Cables can be connected quickly, dispensing entirely with special tools and expensive equipment. Consequently, Quick Lock becomes the preferred technique for interfaces that require fast, uncomplicated replacement.

OVERVIEW AND SPEED
Examples from a wide range of market segments are easy to find. Example 1: System cabling: a multitude of individual cable lengths are required to wire a system. This variety cannot be completely covered with pre-assembled system cables. The combined use of crimp and Quick Lock terminals allows standard lengths to be shortened and laid out in a manner that optimizes the lengths. Unnecessary cable loops are eliminated and the wiring is more clearly arranged.

Example 2: Production facilities: Consequential costs are especially critical in large, complex production facilities in view of downtimes. If maintenance personnel can deal with Han-Quick Lock® modules, repair work can be carried out much more swiftly, and without the need for special tools.

The main application areas for the Han-Yellock® with Quick Lock technology are in machine construction and automation, or all areas that call for signals and power to be transmitted in a compact configuration. Local installation components such as I/O modules and distribution boxes can be retrofitted just as quickly as energy bus structures. Maintenance work and repairs require no special tools, which is enormously significant for complex production systems such as those in automotive plant applications, which suffer high losses due to downtimes.

HARTING PLUS
HARTING covers the entire range of highly specialized interface termination technology, while ensuring compatibility at the same time. Consequently, HARTING has initiated and established its own termination technologies such as the Axial screw inserts and Han-Quick Lock® in addition to conventional crimp connections. Fast handling, flexibility and reliability are the key standards guaranteed across the entire range of solutions.

“The Han-Yellock® impresses with numerous functionalities and top performance.”

**Benefits**
- Swift and simple termination technology: Han-Quick Lock®
- Field-installable without special tools
- Plug-compatible with modules in crimp technology
- Combines the potential multiplication of the Yellock modules with the simple handling of a radial cage-clamp terminal
Accurate and Swift Diagnosis

Accurate examination and analysis technologies are extremely important in medical technology. In the event of illnesses or emergencies patients depend critically on the equipment employed. Doctors want swift, safe and reliable procedures during the examination in order to minimize stress on their patients and allow accurate diagnoses.

» Frank Quast, Product Manager, Germany, HARTING Technology Group, Frank.Quast@HARTING.com

The stringent demands placed on hospital equipment also apply to the connection technology involved. Real-time video transmission in the operating room is a salient example. Rapid connection of the interfaces is essential, although conventional connectors have proved inadequate in this respect to date. Broken housings and deformed contacts have led to unacceptable maintenance requirements.

Han-Yellock® connectors from HARTING prevent such failures. In a prototype project, HARTING installed the Han-Yellock® housing in mobile consoles in order to provide a reliable connection between the monitor and a mobile camera. Additional equipment in the operating room was also connected. This combination is used in endoscopic examinations.

Han-Yellock® is utilized as a "plug-and-play" connector in order to reduce the hospital personnel’s work load. The combination with Han-Modular® multi-contact modules and premium coax contacts results in precise and resilient connections. The trial in five operating rooms proved extremely successful, and the combination is set to move into standard use.

Further application areas for Han-Yellock® in the medical sector also include building equipment and patient information systems. For example, some hospitals visualize "patient tracking" data using information displays. Han-Yellock® has been selected for these applications with an additional model in white color tones which blends in perfectly with its new surroundings.
Reliability up, costs down

Here’s a new approach that doubles the payoff: HARTING Han-Power® T series connectors were selected for a new diesel motor production line in American industry.

And with outstanding success: The production facility’s installation costs dropped, while production reliability increased significantly.

The concept implemented by HARTING North American modernizes conveyor belt control and connection technology in a decisive manner. Conveyor belts in production facilities consist of individual segments. The systems must handle both 480 V alternating current power supplies and 24 V direct current control signals. ASI was selected as the field bus for activating the drive motor, while PROFIBUS and PROFINET were additionally selected for other control applications.

The key project demand was to simplify the course of the supply and control lines to the drive motors, as wiring and connection also impact significantly on installation costs and maintainability.

The system draws on HARTING Han-Power® T connectors, which allow the assembly line drive motors to be connected to a combined trunk cable that contains the wires for the supply and control signals. It is also possible to implement supply and control taps to each motor.

HARTING Han-Power® T is designed for power connections up to 600 V AC and signal connections up to 250 V. The supply and signal inserts for the connector are available in various configurations for different wire diameters and current-carrying capacities. As an additional safeguard, the connector features a locking lever that prevents accidental separation of the connection when the system is on. Han-Power® T is also delivered in protection class IP 67 housings, allowing it to satisfy the comprehensive safety requirements in American industry and ensuring safe deployment also in harsh environments.

More than 600 connectors were fitted in the cable sub-assemblies that are being assembled at the HARTING Elgin plant for the manufacturing line that has now been completed. System integrators not only benefit from a high level of planning flexibility, but also from the availability of standard components and the associated cost advantages. End customers, in turn, profit from a cabling and connector concept that impresses with a high level of flexibility and simple maintenance.
Brains on the Move

Communication-Based Train Control (CBTC) is revolutionizing railroad technology. Powerful systems on board trains and along the routes are increasing the traffic and passenger capacities of local public transport companies while complying with the most stringent safety standards. The HARTING Technology Group is supporting Siemens Mobility France in upgrading the Paris Métro by supplying its connectors and contributing its experience in transport route construction and backplane technology.

Romaric Thévenet, Product Manager, France, HARTING Technology Group, Romaric.Thevenet@HARTING.com

A RELIABLE SOLUTION THAT’S READY TO GO

The Trainguard MT CBTC system developed by Siemens Mobility in France makes it possible to drive trains with different equipment on a line at the same time. The system is based on continuous, bi-directional communication between the route and train systems.

Siemens has developed this solution for local transport companies that face the job of building new lines and modernizing existing ones – or even using fully automatic, driverless train systems on existing lines without interfering with the ongoing passenger operation.

The on-board train control system calculates the train’s optimal speed profile on the particular line and allows various operating modes, from "semi-automatic" operation with an operator to completely
automated operation which requires no driver at all.

**DIRECT ADVANTAGES FOR PASSENGERS**
The CBTC solution from Siemens allows much more flexible operation by optimally adapting the train speed and distances between trains. Routes equipped with this system offer passengers faster and more efficient transport:

- 30% more trains thanks to shorter cycle times
- Shorter waiting times at the stations and shorter ride times due to faster driving speeds
- Highest punctuality level
- Reliable and precise passenger information

**HARTING WITH SIEMENS FOR MÉTRO LINE 1**
The Parisian local public transport administration RATP commissioned Siemens with converting Line 1 of the Paris Métro network (Château de Vincennes – La Défense) into fully automatic operation.

Line 1 (16.6 km, 25 stations) is the oldest and most-frequented of the Métro’s 14 lines: each year this connection transports more than 200 million people, which means more than 700,000 passengers a day. Line 1 serves Paris’ La Défense financial district and important long-distance train stations, as well as the "Hôtel de Ville" city hall, the Louvre and the Champs Élysées. One of the requirements was a switch to a driverless version during operation.

The automation of this special line was a difficult, but also prestigious challenge for Siemens. Siemens needed a special and particularly compact solution of its standard Trainguard MT CBTC for the Line 1 and Octys project, which uses a 6U-high rack for the on-board computer unit (OBCU).

Siemens secured support from HARTING France during the development of this new OBCU frame model. HARTING not only supplied Siemens with its proven DIN 41 612 connectors but also contributed know-how in the field of route cable components and HARTING Integrated Solutions (HIS) experience in backplane technology. The OBCU forms the heart of the CBTC system. It is a fully wired frame that ensures the communication among the computer expansion cards (the so-called daughter cards) and with the train, and consequently functions as the CBTC backbone.

**THE HARTING TECHNOLOGY GROUP’S TASK SCOPE COMPRISED:**

- Planning a complete backplane based on HIS experience
- Integrating and wiring the backplane in the frame
- Reviewing compliance with the standards for track systems
- Testing the fully integrated system according to Siemens specifications

HARTING’s experts worked closely with Siemens during all project stages in order to ensure that the full range of Siemens’ technical requirements were implemented in the OBCU frame design and manufacture. HARTING also provided all authorizations that guarantee that the high expectations that Siemens’ final customers placed on the product’s quality and safety were met. Each product is tested individually, and comprehensive quality records ensure that the required testing procedures are satisfied and evaluated.

After the conclusion of the Métro Line 1 conversion project, the RATP intends to continue the Octys modernization program for its route network. As a result, the Paris Métro partnership between Siemens France and HARTING will continue for years.
Hannover Reliability Offensive

Trains attract a great deal of public attention, and delays or cancellations likewise draw considerable criticism from the affected passengers. Modernizing maintenance management systems can help in this context. The HARTING Technology Group is equipping the Hannover “üstra” suburban trains with an individually tailored RFID system that should ensure that the vehicles achieve high availability rates.

» Jörg Hehlgans, Product Manager, Germany, HARTING Technology Group, Joerg.Hehlgans@HARTING.com

The Hannover transportation companies, üstra, are planning ahead. Although their trains enjoy a sound reputation and Hannover’s public transportation system has been regarded as exemplary since Expo 2000, it is important to continue developing the vehicle management system with an eye to the future.

üstra operates almost 300 vehicles in two type classes for passenger transportation. In the meantime, there is scope for further technological development here, as can be seen by taking the maintenance management system as an example.

MAINTENANCE MANAGEMENT’S CURRENT STATUS: MANUAL DATA INPUT

Strict adherence to maintenance intervals, particularly for main components, is necessary in order to keep the passenger transport’s safety and reliability at the customary high level. This level must also be guaranteed when parts of vehicles are replaced and upgraded, which means that the vehicle and its parts have different ages or are subject to different maintenance intervals. Some examples of these core components are the bogies, railcar bodies and axles, all of which are essential elements for the operation of the trains.

Until now, üstra has determined the distance a vehicle has traveled by reading out mechanical odometers, and the computer services area has been responsible for assigning these data to the particular components. Reading out the data and inputting it is not only time-consuming, it also leaves a lot of room for mistakes. Replacing components during repair or maintenance work presents additional challenges for the data quality.

“In future, system integration in the rail sector should also continue to be handled by strong partners.”

THE AUTOMATION GOALS: OPTIMIZATION OF MAINTENANCE AND BUSINESS PROCESSES

The goal of the pilot project initiated by üstra and HARTING was to automate the data acquisition for both the individual vehicle and its main components. This step was intended to ensure swift and sure traceability of the components relevant for testing and maintenance, while keeping a record of the distance driven with each component. The manual solution is replaced by automatic data recording, with additional consideration given to the complexity of the vehicle configuration. In this way, it is possible to minimize mistakes and record the actual vehicle status at all times. The system furthermore has to be suitable for office computer systems, and it must be possible to identify each vehicle while keeping a record of its main components.

In order to optimize the business processes, the computer system will not only control the maintenance and calculate the maintenance requirements, it will also enable the substantiation of maintenance quality for presentation to public authorities. This point in particular has been significantly expanded in the guidelines from the technical regulatory authorities in recent years.
THE HARTING SOLUTION

The HARTING Technology Group not only acted as a successful system supplier in this pilot project, it was also the system integrator, which allowed the company to demonstrate the HARTING components’ performance. System integration should continue to be handled by strong partners in the rail sector in the future as well.

HARTING RFID (Radio Frequency Identification) transponders with expanded memory and sensor interfaces were opted for. In combination with a microprocessor, the transponder can be programmed with a sequence controller that converts axle rotations into kilometers.

Because the üstra trains have low-hanging aprons, it was not possible to implement the original solution which had the reader’s antenna mounted vertically in a wall. In the new solution, the antenna is countersunk in the track between the rails. This means that it must be possible for trucks and buses with a surface load of up to 60 t to drive over it. The antenna box has to be heated in order to guarantee that the system works during the winter, because snow and ice largely shield UHF signals.

When driving over an RFID reader antenna that has been placed in the ground at the üstra depot’s entry area, the RF 800 RFID reader first reliably identifies the vehicle and then automatically reads out the kilometers that the vehicle has driven. The main components, which are given UHF tags (Ultra High Frequency, passive high frequency identification transponders), are also identified. Necessary maintenance jobs can then be initiated immediately.

The HARTING RFID system has been designed to ensure reliable use also in harsh environments (cold, heat, moisture, dirt, weight) – a necessity for a system countersunk in the ground.
HARTING Inc. of North America is celebrating its 25-year anniversary. The American branch is one of the HARTING Technology Group’s 32 local subsidiaries. The company was founded in Hoffmann Estates, Illinois in 1986 and has been based in Elgin, Illinois since 1998. A separate production facility was added to the sales and marketing location in 2005. HARTING Inc. of North America is particularly active in the transportation, automation, telecom, and medical markets, with customers located throughout Canada, Mexico, and the USA.

An international jury has awarded the HARTING Han-Yellox® connector the iF product design award 2011 in the “industry + skilled trades” category. With this distinctive new product design, HARTING is playing a pioneering role throughout the sector. The accolade also documents the unique position the Han-Yellox® is claiming on international levels. A total of 1,121 participants from 43 countries competed for the awards with their products. “This prize is the reward for our courage to strike out in a bold new direction. With Han-Yellox® we have proven that innovative connection technology can be aesthetic as well as functional,” as Philip Harting, Senior Vice President Connectivity & Networks stated.

The HARTING Technology Group’s Asian subsidiary HARTING Hong Kong has won the renowned “HSBC Living Business Award – Certificate of Excellence” in the “People Caring” category. This award acknowledges companies who commit to socially and environmentally compatible business practices in the context of sustained growth and pays tribute to the company’s outstanding achievements in the area of employee development and employee care.
**Honorary Doctorate for Dietmar Harting**

The Faculty for Electrical Engineering and Computer Science of the Leibniz University of Hannover has bestowed an honorary doctorate on Dietmar Harting. The university has awarded this highest academic distinction in recognition of Dietmar Harting’s outstanding service to national and international standardization, his entrepreneurial achievements and his multifaceted commitment and contributions to both state and society.

**Optimized Online Catalog**

The HARTING Technology Group has integrated its HARKIS® online catalog information system into its eBusiness along with adding new functionalities (https://b2b.HARTING.com/ebusiness/init.do). Now users can log into the eBusiness portal from HARKIS® at any time, and the system will provide them with the use of all functions such as availability check, inquiries and orders. The new HARKIS® version also offers two crucial improvements: in the piece part and set consulting, users are now free to decide which order the features to be evaluated are selected. In addition, detailed set consulting is now available for the DIN 41 612 product series.

**HARTING ranks as one of “Germany’s Best Employers 2011“**

HARTING has now been acknowledged as one of Germany’s best employers by the »Great Place to Work®« Institute. The Technology Group won this distinction thanks to its special quality and appeal as an employer.

The confirmation as one of Germany’s best employers honors the wealth of diverse activities at HARTING geared to offer employees attractive and future-oriented jobs at an innovative high technology company.

**Category Victory in “Factory of the Year / GEO 2010“**

The HARTING Electronics business unit is one of the winners in the toughest benchmark competition for the manufacturing industry in Germany. HARTING won "Factory of the Year / GEO 2010" in the “excellent high volume series manufacturing” category. The competition, staged by corporate consultant A.T. Kearney and the magazine “Produktion”, recognizes the achievements of production companies that meet high benchmark standards in terms of economic efficiency, agility, quality, innovation, value creation and customer satisfaction in an exemplary fashion and demonstrate outstanding developments over the course of three years.
Dear Readers,

we would like to take this opportunity to thank you for contributing so enthusiastically to our tec.News survey. Your ongoing suggestions help us to continue to improve tec.News, and naturally, we are always particularly pleased to hear positive feedback. Our aim is to keep you informed about innovations and applications from HARTING – in the best possible way.

In this issue, we have focused on the area of renewable energies, along with other interesting features on the entire HARTING world. Once again, we are asking for your feedback. Please give us a few minutes of your time and do take part in our online survey.

Send us your comments until July 31, 2011. As a thank you, we will once again enter all participants in a draw to win an Apple iPad – this time with practical stand.

We have written to the lucky winner of the last survey.

With best wishes from your Editorial Team

Click here to go to the survey: www.HARTING.com/tecNews-survey
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