

Industry 4.0 requires functional bus systems

Even if there are still critical discussions surrounding Industry 4.0 and the Internet of Things, it is becoming apparent that networking and digitisation between companies is continuously increasing. Problems don't then just affect individual systems, but the entire process from production and logistics to sales.

By Gerhard Bäurle



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What better reason to take a look at the maintenance of industrial bus systems and networks? After all: if the bus is OK, production is OK. Bus system maintenance highlights two unfortunate truths. Firstly, it is found again that maintenance is simply viewed as a cost centre and its strategic importance is frequently underestimated. Secondly, bus system wear cannot be measured or quantified. To a certain extent, special mechanisms such as the automatic telegram repeat compensate for problems in communication. But the user is unaware of this happening. For as long as the number of telegram repeats remains in a defined



When combined with moisture, flux residues not removed in full become conductive. Image: IVG Göhringer.



Errors in the CAN communication will be signalled via the integrated status LEDs and an alarm contact. Image: IVG Göhringer.

range, all LEDs light up green and no errors are reported. "So it is often wrongly assumed that everything is OK, for as long as communication continues and all LEDs are green," reports Hans-Ludwig Göhringer from IVG Göhringer. Over the years, this company has accumulated extensive knowledge of field bus maintenance. The company is often called in to troubleshoot equipment stoppages and shares the experiences it has gained in various training courses. Things are much easier with mechanical assemblies like gearboxes or pumps. They wear in a linear fashion or depending on load. If the lifetime is not predictable, at least experience will tell you how to plan your maintenance schedule. "Another uncertainty factor is the complex measuring equipment and enormous specialist knowledge needed to perform an extensive bus and telegram analysis," Mr. Göhringer adds.

App-based visual inspection for troubleshooting

Faults and failures associated with field bus systems often result in the entire



Troubleshooting on the basis of a tablet-supported visual inspection. Image: ©ClarkandCompany/istockphoto.com and IVG Göhringer.

system coming to a standstill. In terms of potential causes for bus communication failure, two main types of error exist: the effects of ageing and mistakes made during installation. Ageing is the gradual deterioration of transmission quality over the entire life cycle of the bus installation – for

example due to moisture, temperature fluctuations, coolant, solvent vapours, vibrations and alternating flexural loads. The effects of wear can be easily detected by permanent bus monitoring and remedied accordingly. Before permanent monitoring is worthwhile, the mistakes made during installation

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must be remedied. Mistakes made during installation are faults that are made when the bus system was installed or extended, for example because shielding was not connected or terminating resistors were incorrectly wired. Many of these obvious mistakes can be found during the course of a visual inspection. Or as Mr. Göhringer tells on the basis of vast experience: "When troubleshooting bus systems, 70% of mistakes can be found by a visual inspection." IVG Göhringer has developed a software-based process for the visual inspection: the IVGNetApp guides the user through a structured, carefully designed process to help them proceed systematically. It took over a year to develop and test the IVGNetApp. It is available for Profinet, Profibus, Interbus and AS-Interface and is designed to accommodate the differences between individual bus systems. It is available for free from the Google Play Store as of the 2nd quarter of 2016. With the aid of a tablet and the app, operators can carry out a guided visual inspection and fix errors independently. The company also offers an optional, chargeable evaluation based on the recorded data. This includes a detailed evaluation with in-depth advice and expert troubleshooting tips.

Permanent bus monitoring

Once all the mistakes from installation have been remedied, the 'error meter' is at zero. As described above, the effects of wear due to a bus system or network ageing cannot be calculated or determined on the basis of experience. One suitable method is 'permanent condition monitoring' based on the observation of telegram traffic. IVG Göhringer has de-



In training courses and workshops, Hans-Ludwig Göhringer explains all about the various aspects of maintaining bus systems and networks. Image: IVG Göhringer.

veloped individual quick tester for various bus systems. The diagnosis modules are attached at any point on the field bus, where they work without any repercussions whatsoever. They do not measure physical parameters such as voltage level or signal times; instead they record errors at protocol level.

More specifically, the modules detect a deterioration in bus communication by detecting typical bus errors such as faulty telegrams, repeat telegrams and diagnostic messages. These errors are indicated by LED and use a potential-free alarm contact. The potential-free

alarm contact of the diagnosis modules can trigger a warning light or siren to indicate an error. The alarm contact can also be analysed by the superordinate controller.

Alongside the P-QT 10 quick tester for Profibus, which is successful on the market since five years, two new diagnosis modules C-QT 15 for CAN and A-QT 15 for the AS-Interface have been available since the end of 2015. This allows maintenance to respond to the first missing telegram – long before the system's condition deteriorates to the point where all bus communication fails.

At the 'Automatisierungstreff 2016' – which is held near Frankfurt, Germany, on 5–7 April, IVG Göhringer is offering three user workshops on maintenance for industrial networks: 'Structured PROFINET acceptance', 'Integral troubleshooting on bus systems', and 'EMC-compliant bus design'. More information can be found via: www.automatisierungstreff.com (German).

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Are you ready for the future?

Industry 4.0 – or the fourth industrial revolution – is a term that keeps popping up all around us, and a development that will have major consequences for the ways in which problems in industrial facilities worldwide will be solved in the (near) future.



It is just a matter of time before Industry 4.0, will fully kick in and facilitate a world where systems and machines are able to communicate, not only with users but especially with each other. This idea is also referred to as the IoT, the Internet of Things, or in the case of industrial systems the IIoT.

The Industrial Internet of Things promises industrial systems that can schedule their own maintenance for example, and in addition process information on performance or worn parts to other machines, thus making it possible to prevent and solve problems in completely novel ways.

Although this all sounds like a system that should have been introduced yesterday already, there are of course some challenges associated with incorporating an advanced automated system in your existing plant. Security systems management for example, as well as the maintenance of software.

In 'Harmonization of the industrial lifecycle and software-support' (page 14) lawyers Klaus M. Brisch and Marco Müller-ter Jung already dissertate on the requirements that a functioning software-based lifecycle management system should meet from a legal perspective. And in the June edition of Managing Aging Plants magazine the focus of their legal article will be on questions of IT- and cyber-security, which is of vital importance for maintaining a future-oriented strategy.

In this magazine Gerhard Bäurle from IVG Göhringer discusses the matter of Industry 4.0 in his article 'Industry 4.0 requires functional bus systems' (page 28). His focus is on the increase of networking and digitisation between companies, since problems not only affect an individual system, but the entire cycle from production to sales.

And Schmidt + Clemens invest in the future by continuous research and development that allows the company to constantly fine-tune their products and adapt them to changing demands. In addition, the company started offering the execution of upstream and downstream activities (page 10).

And you, are you ready for the future? What measures are you taking, in what ways are you researching your options? Have you invested in automated systems recently? Or are you planning on doing so in the near future? Feel free to drop me an email to discuss, or start a discussion in our Managing Aging Plants Group on LinkedIn.

Best regards
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