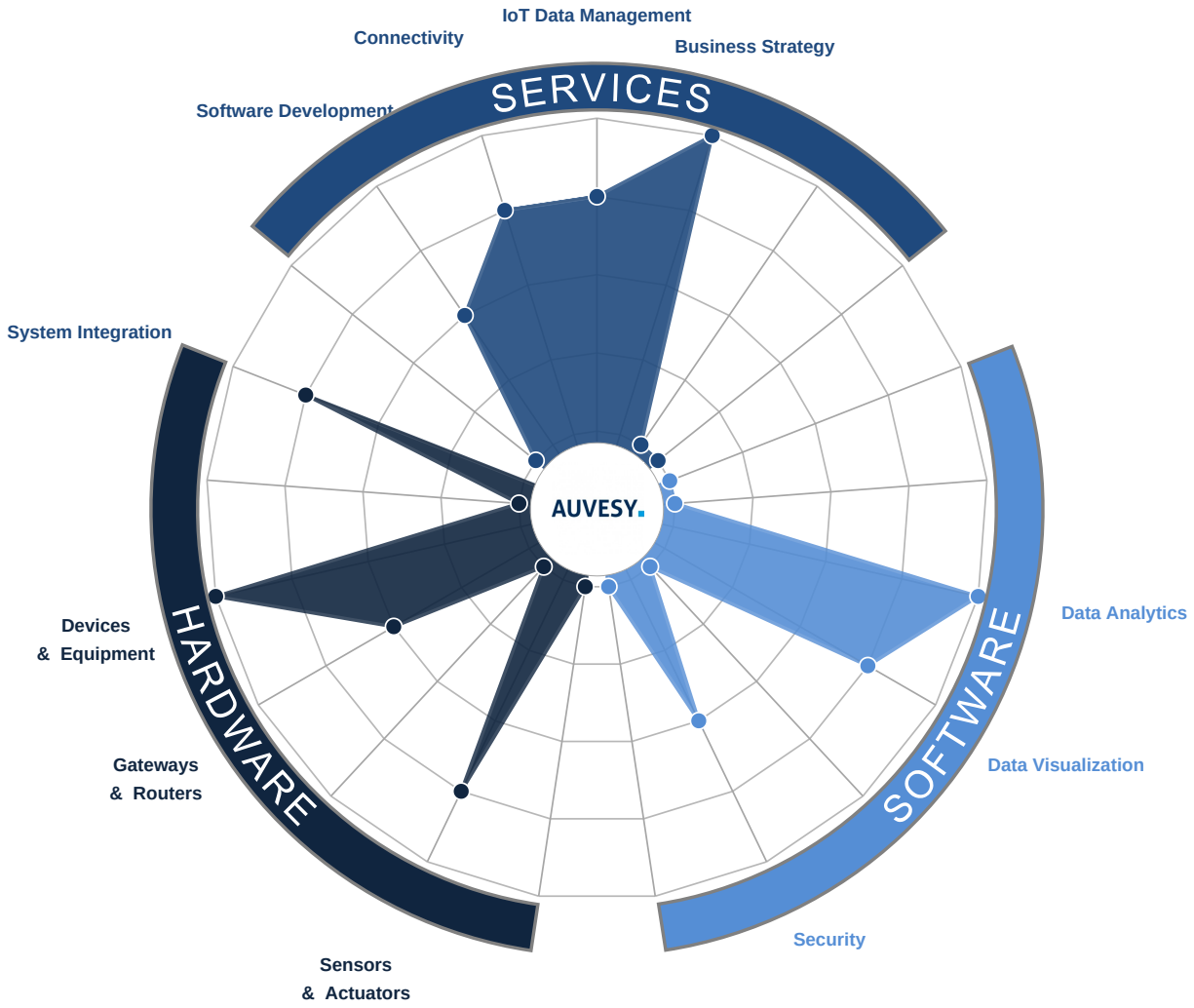
AUVESY. + IoT ONE

06. – 07. APRIL 2017
BEST PRACTICES FOR SMART MAINTENANCE
INFO INSTANDHALTUNGS FORUM 2017

New Business Models in Maintenance



Overview

Applicable Industries

Automotive

Construction

Applicable Functions

Facility Maintenance

Information Technology

Maintenance

Challenge

Everything that can be automated will be automated, and it is up to us, as people, to learn how to adjust to this development

With the advent of the networking of processes and the Industrial Internet of Things, IT has further cemented its place in the production facilities of modern enterprises and is now set to revolutionise the way in which maintenance is approached. The Chamber of Industry and Commerce has its hands full when it comes to making sure that vocational and training concepts both accompany and keep up with these developments. Many employees are anxious, believing that the ongoing digitalisation of the world of work will result in greater job insecurity; a general misconception which regrettably continues to abound. The fact that digitalisation is set to provide both new opportunities and challenges, and that not every workplace is in danger, is often conveniently overlooked in the surrounding hype.

It’s as if history is due to repeat itself every time any major industrial revolution occurs. Production workers begin to fear for their jobs and fear of change in the workplace remains high. Nevertheless, production is subject to constant change and we must all learn to adapt. Today, it is IT, in the wake of the IIoT, which stands to replace traditional rosters and blackboards. What’s more, the advent of employees directly communicating with machines via speech in order to reset them is also fast approaching. Voice-control has already gained general acceptance, but an even greater degree of trust in technology is required.

If no changes are made to the way you work, the sudden advent of digitalisation may make it appear as though things are out of place or even missing. That isn't to suggest that there was a time in which IT didn't exist in the realm of production; such a statement wouldn't be true, as evidenced by the fact that, in times past, maintenance staff spent an inordinate amount of time making their rounds accompanied by a programmer's notebook, which had different editors to program components and helped to facilitate communication between human and machine. Nevertheless, the fact remains that the networking of processes continues to generate considerable uncertainty.

Customised production

The introduction of online marketing has resulted in a large percentage of industrial production being tailored to fit the customer. Affiliate marketing allows you to find out much more about your customers, their behaviour as consumers, and the underlying motives that drive their decision making. Thus, in certain sectors, it no longer makes sense to produce products, place them in storage units, and then wait until they are sold off. Instead, it is becoming the norm to make predictions according to customer decisions or trends. By using information gathered from CRM systems, customer feedback and digital sales statistics, it is possible to determine the colours, form, and features that a customer would desire a future product to have. It is also possible to produce products in such a way that the targeted customer immediately purchases them, thus resolving the need to store the products away until such a time as they are sold.

Customised production places high demands on maintenance. Common topics that are frequently brought up in addition to classical and continual improvement processes include:

- Preventive Maintenance
- Corrective Maintenance
- Condition-related maintenance

The umbrella term 'predictive maintenance' is often used to encompass the topics listed above. Predictive maintenance is a strategy that is based on real-time data taken from production. It permits you to quickly recognise and respond to problems or results which were not visible in the past, but which are now, thanks to new advances in technology (e.g. condition monitoring), immediately detectable.

What does the process of networking involve?

When surveying a newly digitalised production hall for the first time, the first difference that one notices is that a specific IP address has been assigned to all automated devices connected to the network, which allows for data to be received and sent. These automated devices can be completely different from each other. It does not matter. What does matter (where plant or machine controllers are involved) is the PLC (programmable logic controller). A digital network topology looks as such: sensors, drives, and actuators move things around; robots weld, solder, press and pack; and HMI/SCADA systems supervise the processes. Then there are presses, drills, machine tools, milling processes, and much more. Generally, there is a different editor used to program each type of automated device type. There are very few uniform standards when it comes to software editors and thus automation engineers cannot use the same software to program a wide range of devices. Visual programming languages in DIN EN 61131-3 are regulated, however, each editor has its own special features and they are seldom compatible.

Editors continue to be further developed if only for the purpose of continuously updating them to support current operating systems. Software developers are eager to offer their customers ongoing updates, the reason for which lies in the fact that customers do not have any reason to pay for software editors that have reached the end of their development. They will only pay for new developments. For maintenance staff, this trend necessitates them to undergo constant further training in order to understand and implement the latest functions and features brought out by the software developer.

In that regard, it is interesting to note that, even as the number of people present in the production hall continues to decline, the number of maintenance staff continues to grow. This stands in stark contrast to the hype about the human factor becoming an obsolete element when it comes to production; on the contrary, the human factor will continue to grow in importance, especially when it comes to fixing unplanned malfunctions and errors that may occur to the complex machines and systems during production.

All visions involving the future state of digital production thus have one thing in common and that is the fact that people will continue to play a vital role: the ability to understand the complex connections between numerous machines, controllers and programs, will continue to be a sure-fire guarantee of success.

Customer

The challenges that digitalisation presents for maintenance

In terms of cost-benefit, digitalisation is worth investing in. There are, however, challenges. For today's smart maintenance, the challenges lie in remote maintenance and in data analysis, both of which necessitate that hardware and network infrastructure be subject to ongoing updates in order to efficiently manage the ever-increasing volume of data. Furthermore:

- Managing data is an increasingly complex process
- It requires a strategy for each step in production and for each automated device, depending on the way in which the maintenance staff view their tasks
- Modern maintenance needs to be coordinated and supervised. It requires the ability to anticipate planned and unplanned results (predictive maintenance) while taking into account time constraints and pressure on the company to generate a profit

Settling on a strategy for data management, as part of a new business model in maintenance, is a solid basis for ensuring and safeguarding investments and sustainability in production. The aim here is to sustainably strengthen and increase the significance of maintenance through proactive, value-adding measures.

The fact that IT and automation continue to grow together, has a positive effect on production efficiency and is the basis for increased plant dependability. At the same time, the means to make the most of this are often lacking because maintenance departments do not always have the appropriate IT tools.

But these tools alone are not enough. Maintenance also needs to be accompanied by new vocational and training opportunities. For example:

- Data manager
Tasks: quality control, change documentation, cybersecurity
- Data analyser
Tasks: Compare CRM to PPS, task management, internal and external communication/reports
- Network specialist
Tasks: networking processes, cybersecurity, data communication, production control

The examples listed above represent just some of the potential vocational opportunities from the point of view of data management. However, any review of

maintenance as a profession should be carried out separately and adapted to suit the industry in question. A company involved in the pharmaceutical industry is subject to different digital production strategies than a manufacturer from the automobile industry, or a power supply company.

By adapting vocational and training concepts with regard to maintenance, classical maintenance, as it now stands, needs to be re-evaluated. It is simply a question of making this new business model as acceptable and attractive as possible, and also of involving the employees who are set to be affected by this development.

Advancing the process of standardisation in relation to digitalisation

Numerous studies have prognosticated that the introduction of IIoT and other related technologies are set to create added value in the billions by 2025. Those who remain pessimistic about this change and the tasks involved will have a hard time realising this business model. As it stands, there already exists several success stories which serve as paragons in this new age. The story of Lufthansa CARGO serves as an example of a company that began, in the mid-90s, to align their approach to maintenance with their successes elsewhere.

Moreover, the tools have already been developed. The data management specialists at AUVESY have worked tirelessly for the last 10 years in order to make data management in production socially acceptable and to give maintenance staff the adequate tools needed in order to analyse data. The daily challenge will continue to be how to handle the terabytes of production data produced until such a time as a process of standardisation for IIoT is complete.

In conclusion, all analysists are in agreement: the one who masters data, is the one who, in the near future, will be at the forefront when the latest developments from the digitalisation have reached market maturity. And it is down to maintenance to make this implementation sustainable. After all, who else would be capable of contextualising the complex and intricate connections that link production quality, efficiency and profitability?

Solution

It is clear: even the most modern technology remains dependent on people

Networks and programs for automated devices in production will continue to be further developed. So long as there is someone on board who is able to document who changed what, when, where and why, everything will function as it should. It pays to be able to be able to identify and extract the right data from a multitude of

different data streams, so that one can then draw the right conclusions about the production. Thus it pays to have a well-trained maintenance staff on board, who are capable of performing tasks such as the ones included in the list below:

- Extract data from networked sensors and actuators (which provide information about the current status of machines)
- Extract data from devices programmed to monitor differences in temperature (which provides vital information about any suspicious conditions occurring during production)
- Manage data taken from devices measuring pressure and volume streams by using setpoints and parameters
- Identify, analyse and carry out preventive maintenance of data generated by changes or oscillations from brackets and motors (which helps to increase a machine's service life)
- Remotely configure and set data (such as parameters or setpoints)

The reality that fewer and fewer employees will continue to work directly on the machines (a by-product of digitalisation) is due to the fact that it is now possible to control such machines from anywhere. All that is required is an IP address, and then the operator on the other side of the network is able to the control the machine while sitting in front of a monitor in any office.

As stated before, it is important to be able to extract the right data from the controller (which in-turn allows you to draw the right conclusions about the production) without the need to be physically present. However, it is also important that one possesses the requisite expertise, creativity and abstract thought-processes. Without these human qualities, it is impossible to eliminate malfunctions and errors, or to optimise machinery.
In the end, modern technology and all of its varying components will always be dependent upon maintenance staff and their ability to detect and identify changes. The numbers reflect this: 65% of maintenance actions are purely reactive, while only 30% focus on predictive maintenance.

Using your data strategically

In order to interpret and maintain automated production in the IIoT age, a data management strategy is needed. Extracting data from the production for the purpose of analysing it remains the undisputed task of the maintenance staff member.

The only difference will be that the next generation of maintenance staff will be

employed to engage with and perform new and additional tasks from a remote distance. The future topics that are set to impact on new business models in maintenance include:

- Safety & security
- Flexible and customised production
- Efficiency (resources and energy)
- Supply chain management (spare parts) and logistics
- Production line efficiency
- Economic efficiency
- Maintenance costs

Maintenance departments that are suddenly confronted with having to deal with these areas will quickly become overwhelmed by the sheer volume of work involved in performing them. To further complicate matters, one only has to factor in the multitude of approaches that exist across the globe. Due to a lack strategy and standardisation of data management, these approaches are often notably different. For example:

- In countries where the labour costs are low, the inverse has occurred. Rather than having a networked production that performs data backups and analyses automatically, remote control has been replaced by employees, who are physically present at the controllers and who carry out data backups and analyses on-site
- In some work environments, even if data backups of automated devices have been carried out, it still remains to be determined what exactly was changed since the last backup was performed. Software versions can have different setpoints and parameters, which bears the question: how do you manually verify these software codes and according to which standards?
- Across the board, changes frequently continue to be documented by hand. This creates the perfect opportunity for errors to occur. Automated documentation goes a long way towards eliminating the likelihood of such errors occurring
- Obsolete methods concerning cyber-related safety & security measures continue to persist. However, cybersecurity cannot be achieved using a sword and a shield. It can be achieved, however, with know-how and a digital cybersecurity defence strategy

Data Collected

Data from automated production, machines, robots, frequency changers, plcs, hmis, SCADA-systems,...

Solution Type

IOT

Solution Maturity	Mature (technology has been on the market for > 5 years)

Operational Impact

Impact #1	New Business Models in Maintenance
Impact #2	Advancing the process of standardisation in relation to digitalisation

Quantitative Benefit

Benefit #1	Safety & security
Benefit #2	Flexible and customized production
Benefit #3	Economic efficiency

Technology

Software

versiondog

Auvesy

versiondog is the leading version control and data management software solution for industrial automation. versiondog brings order and clarity where project data needs to be continually changed and ma ...

New Business Models in Maintenance

Stefan Schnackertz, Business Development

Co-Author: Dr. Tim Weckerle, Managing Director

AUVESY GmbH & Co. KG

Everything that can be automated will be automated, and it is up to us, as people, to learn how to adjust to this development

With the advent of the networking of processes and the Industrial Internet of Things, IT has further cemented its place in the production facilities of modern enterprises and is now set to revolutionise the way in which maintenance is approached. The Chamber of Industry and Commerce has its hands full when it comes to making sure that vocational and training concepts both accompany and keep up with these developments. Many employees are anxious, believing that the ongoing digitalisation of the world of work will result in greater job insecurity; a general misconception which regrettably continues to abound. The fact that digitalisation is set to provide both new opportunities and challenges, and that not every workplace is in danger, is often conveniently overlooked in the surrounding hype.

It's as if history is due to repeat itself every time any major industrial revolution occurs. Production workers begin to fear for their jobs and fear of change in the workplace remains high. Nevertheless, production is subject to constant change and we must all learn to adapt. Today, it is IT, in the wake of the IIoT, which stands to replace traditional rosters and blackboards. What's more, the advent of employees directly communicating with machines via speech in order to reset them is also fast approaching. Voice-control has already gained general acceptance, but an even greater degree of trust in technology is required.

If no changes are made to the way you work, the sudden advent of digitalisation may make it appear as though things are out of place or even missing. That isn't to suggest that there was a time in which IT didn't exist in the realm of production; such a statement wouldn't be true, as evidenced by the fact that, in times past, maintenance staff spent an inordinate amount of time making their rounds accompanied by a programmer's notebook, which had different editors to program components and helped to facilitate communication between human and machine.

Nevertheless, the fact remains that the networking of processes continues to generate considerable uncertainty.

Customised production

The introduction of online marketing has resulted in a large percentage of industrial production being tailored to fit the customer. Affiliate marketing allows you to find out much more about your customers, their behaviour as consumers, and the underlying motives that drive their decision making. Thus, in certain sectors, it no longer makes sense to produce products, place them in storage units, and then wait until they are sold off. Instead, it is becoming the norm to make predictions according to customer decisions or trends. By using information gathered from CRM systems, customer feedback and digital sales statistics, it is possible to determine the colours, form, and features that a customer would desire a future product to have. It is also possible to produce products in such a way that the targeted customer immediately purchases them, thus resolving the need to store the products away until such a time as they are sold.

Customised production places high demands on maintenance. Common topics that are frequently brought up in addition to classical and continual improvement processes include:

- Preventive Maintenance
- Corrective Maintenance
- Condition-related maintenance

The umbrella term ‘predictive maintenance’ is often used to encompass the topics listed above. Predictive maintenance is a strategy that is based on real-time data taken from production. It permits you to quickly recognise and respond to problems or results which were not visible in the past, but which are now, thanks to new advances in technology (e.g. condition monitoring), immediately detectable.

What does the process of networking involve?

When surveying a newly digitalised production hall for the first time, the first difference that one notices is that a specific IP address has been assigned to all automated devices connected to the network, which allows for data to be received and sent. These automated devices can be completely different from each other. It does not matter. What does matter (where plant or machine controllers are involved) is the PLC (programmable logic controller). A digital network topology looks as such: sensors, drives, and actuators move things around; robots weld, solder, press and pack; and HMI/SCADA systems supervise the processes. Then there are presses, drills, machine tools, milling processes, and much more.
Generally, there is a different editor used to program each type of automated device type. There are very few uniform standards when it comes to software editors and thus automation engineers cannot use the same software to program a wide range of devices. Visual programming languages in DIN EN 61131-3 are regulated, however, each editor has its own special features and they are seldom compatible.

Editors continue to be further developed if only for the purpose of continuously updating them to support current operating systems. Software developers are eager to offer their customers ongoing updates, the reason for which lies in the fact that customers do not have any reason to pay for software editors that have reached the end of their development. They will only pay for new developments. For maintenance staff, this trend necessitates them to undergo constant further training in order to understand and implement the latest functions and features brought out by the software developer.

In that regard, it is interesting to note that, even as the number of people present in the production hall continues to decline, the number of maintenance staff continues to grow. This stands in stark contrast to the hype about the human factor becoming an obsolete element when it comes to production; on the contrary, the human factor will continue to grow in importance, especially when it comes to fixing unplanned malfunctions and errors that may occur to the complex machines and systems during production.

All visions involving the future state of digital production thus have one thing in common and that is the fact that people will continue to play a vital role: the ability to understand the complex connections between numerous machines, controllers and programs, will continue to be a sure-fire guarantee of success.

It is clear: even the most modern technology remains dependent on people

Networks and programs for automated devices in production will continue to be further developed. So long as there is someone on board who is able to document who changed what, when, where and why, everything will function as it should. It pays to be able to be able to identify and extract the right data from a multitude of different data streams, so that one can then draw the right conclusions about the production. Thus it pays to have a well-trained maintenance staff on board, who are capable of performing tasks such as the ones included in the list below:

- Extract data from networked sensors and actuators (which provide information about the current status of machines)
- Extract data from devices programmed to monitor differences in temperature (which provides vital information about any suspicious conditions occurring during production)
- Manage data taken from devices measuring pressure and volume streams by using setpoints and parameters
- Identify, analyse and carry out preventive maintenance of data generated by changes or oscillations from brackets and motors (which helps to increase a machine's service life)
- Remotely configure and set data (such as parameters or setpoints)

The reality that fewer and fewer employees will continue to work directly on the machines (a by-product of digitalisation) is due to the fact that it is now possible to control such machines from anywhere. All that is required is an IP address, and then the operator on the other side of the network is able to the control the machine while sitting in front of a monitor in any office.

As stated before, it is important to be able to extract the right data from the controller (which in-turn allows you to draw the right conclusions about the production) without the need to be physically present. However, it is also important that one possesses the requisite expertise, creativity and abstract thought-processes. Without these human qualities, it is impossible to eliminate malfunctions and errors, or to optimise machinery.
In the end, modern technology and all of its varying components will always be dependent upon maintenance staff and their ability to detect and identify changes. The numbers reflect this: 65% of maintenance actions are purely reactive, while only 30% focus on predictive maintenance.

Using your data strategically

In order to interpret and maintain automated production in the IIoT age, a data management strategy is needed. Extracting data from the production for the purpose of analysing it remains the undisputed task of the maintenance staff member.

The only difference will be that the next generation of maintenance staff will be employed to engage with and perform new and additional tasks from a remote distance. The future topics that are set to impact on new business models in maintenance include:

- Safety & security
- Flexible and customised production
- Efficiency (resources and energy)
- Supply chain management (spare parts) and logistics
- Production line efficiency
- Economic efficiency
- Maintenance costs

Maintenance departments that are suddenly confronted with having to deal with these areas will quickly become overwhelmed by the sheer volume of work involved in performing them. To further complicate matters, one only has to factor in the multitude of approaches that exist across the globe. Due to a lack strategy and

standardisation of data management, these approaches are often notably different. For example:

- In countries where the labour costs are low, the inverse has occurred. Rather than having a networked production that performs data backups and analyses automatically, remote control has been replaced by employees, who are physically present at the controllers and who carry out data backups and analyses on-site
- In some work environments, even if data backups of automated devices have been carried out, it still remains to be determined what exactly was changed since the last backup was performed. Software versions can have different setpoints and parameters, which bears the question: how do you manually verify these software codes and according to which standards?
- Across the board, changes frequently continue to be documented by hand. This creates the perfect opportunity for errors to occur. Automated documentation goes a long way towards eliminating the likelihood of such errors occurring
- Obsolete methods concerning cyber-related safety & security measures continue to persist. However, cybersecurity cannot be achieved using a sword and a shield. It can be achieved, however, with know-how and a digital cybersecurity defence strategy

The challenges that digitalisation presents for maintenance

In terms of cost-benefit, digitalisation is worth investing in. There are, however, challenges. For today's smart maintenance, the challenges lie in remote maintenance and in data analysis, both of which necessitate that hardware and network infrastructure be subject to ongoing updates in order to efficiently manage the ever-increasing volume of data. Furthermore:

- Managing data is an increasingly complex process
- It requires a strategy for each step in production and for each automated device, depending on the way in which the maintenance staff view their tasks

- Modern maintenance needs to be coordinated and supervised. It requires the ability to anticipate planned and unplanned results (predictive maintenance) while taking into account time constraints and pressure on the company to generate a profit

Settling on a strategy for data management, as part of a new business model in maintenance, is a solid basis for ensuring and safeguarding investments and sustainability in production. The aim here is to sustainably strengthen and increase the significance of maintenance through proactive, value-adding measures.

The fact that IT and automation continue to grow together, has a positive effect on production efficiency and is the basis for increased plant dependability. At the same time, the means to make the most of this are often lacking because maintenance departments do not always have the appropriate IT tools.

But these tools alone are not enough. Maintenance also needs to be accompanied by new vocational and training opportunities. For example:

- **Data manager**
  Tasks: quality control, change documentation, cybersecurity
- **Data analyser**
  Tasks: Compare CRM to PPS, task management, internal and external communication/reports
- **Network specialist**
  Tasks: networking processes, cybersecurity, data communication, production control

The examples listed above represent just some of the potential vocational opportunities from the point of view of data management. However, any review of maintenance as a profession should be carried out separately and adapted to suit the industry in question. A company involved in the pharmaceutical industry is subject to different digital production strategies than a manufacturer from the automobile industry, or a power supply company.

By adapting vocational and training concepts with regard to maintenance, classical maintenance, as it now stands, needs to be re-evaluated. It is simply a question of making this new business model as acceptable and attractive as possible, and also of involving the employees who are set to be affected by this development.

Advancing the process of standardisation in relation to digitalisation

Numerous studies have prognosticated that the introduction of IIoT and other related technologies are set to create added value in the billions by 2025. Those who remain pessimistic about this change and the tasks involved will have a hard time realising this business model. As it stands, there already exists several success stories which serve as paragons in this new age. The story of Lufthansa CARGO serves as an example of a company that began, in the mid-90s, to align their approach to maintenance with their successes elsewhere.

Moreover, the tools have already been developed. The data management specialists at AUVESY have worked tirelessly for the last 10 years in order to make data management in production socially acceptable and to give maintenance staff the adequate tools needed in order to analyse data. The daily challenge will continue to be how to handle the terabytes of production data produced until such a time as a process of standardisation for IIoT is complete.

In conclusion, all analysists are in agreement: the one who masters data, is the one who, in the near future, will be at the forefront when the latest developments from the digitalisation have reached market maturity. And it is down to maintenance to make this implementation sustainable. After all, who else would be capable of contextualising the complex and intricate connections that link production quality, efficiency and profitability?

Information about the author:

Stefan Schnackertz
AUVESY GmbH & Co. KG
Business Development

With more than twenty years of experience working as a consultant in the software industry, today Stefan Schnackertz is involved in developing new business models at AUVESY. Thanks to his strong customer connections, Mr. Schnackertz knows well that a good data management system is a vital element in the digital revolution now well underway in industrial manufacture.

Information about the co-author:

Dr.-Ing. Tim Weckerle
Managing Director AUVESY GmbH & Co. KG
Head of Software Production

Tim Weckerle has worked at AUVESY since 2011. During this time, his sphere of responsibility has continually expanded. A qualified engineer specialising in control engineering and machine tools, Dr. Weckerle’s detailed knowledge of the latest developments that are taking place thanks to strategic data management is invaluable.

IoT ONE Featured Case Study

Accelerating the Industrial Internet of Things

IoT ONE is widely recognized as a leading Industrial IoT research firm, opinion influencer, and go-to-market channel.

1. Create a **free account** to view and download hundreds of IoT case studies and supplier profiles.

2. Already have an account? **Feature** your case studies, and your hardware and software solutions.

3. You can connect with us via email at **team@iotone.com**.

www.iotone.com