Cover Story

Smart Factory in four steps
Industry 4.0 – disarmed

Stage 4: Functional linked Factory

Stage 3: Autonomous Factory

Stage 2: Reactive Factory
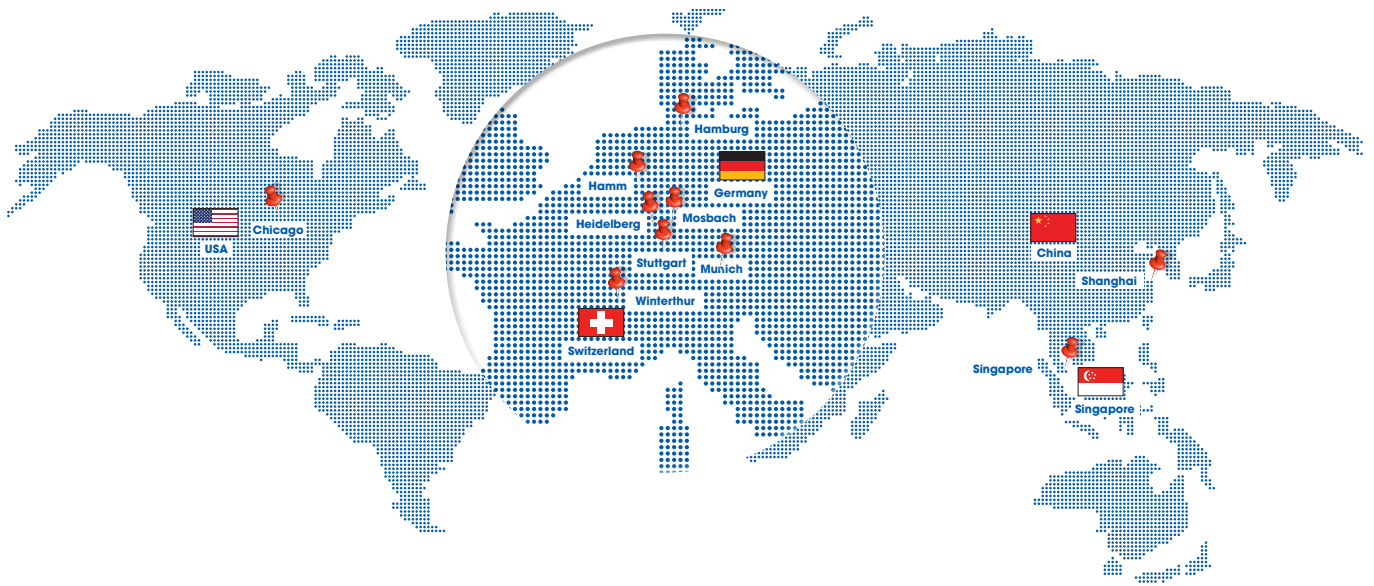
Stage 1: Transparent Factory

Highlights

The MES Experts near you.

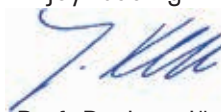# Step-by-step with MES to Industry 4.0

Industry 4.0 is still extremely popular – and rightly so in my mind! Industry 4.0 is shaking things up and bringing new ideas into factory halls. Many are coming to realize that the change to new technologies and to new organizational structures does not happen overnight. What is needed is a methodical and step-by-step approach.

With our latest campaign "Industry 4.0 disarmed" and the associated four-step model to a Smart Factory, at this year's Hannover Messe we have again demonstrated how MES is a critical component for the future of the manufacturing industry. Obviously it is not the only one. In many discussions, companies of all sizes confirmed that the practical relevance plays a major role in Industry 4.0. Here, the four-step model serves as a plausible guideline, ensuring the necessary relevance to the real world in a market that is virtually being flooded with technical innovations by so many suppliers. And yet the innovations in MES HYDRA that were presented have a very specific benefit: to simplify the path to a Smart Factory. To this end, the new Shop Floor Connectivity Suite is a very powerful tool. Industry 4.0 or rather IoT has become a topic of discussion internationally as well. This presents a good opportunity for growth for MPDV.

We interpret the success of HYDRA users as confirmation of the path we have taken. Together with the HYDRA Users Group, we will continue to ensure that our products provide practical solutions for real-world challenges. MPDV has positioned itself in line with the market with the three business units MES Products, MES Services and MES Solutions and is optimally prepared for the future.

Enjoy reading!

Prof. Dr.-Ing. Jürgen Kletti
Founder and CEO of MPDV

Content

Industry 4.0 needs Horizontal Integration
MES – but do it the right way!

An increasing demand for a state-of-the-art Manufacturing Execution System (MES) for Industry 4.0 clearly manifests itself. The functions and properties an MES system must have are detailed in the VDI guideline 5600, which is based on international norms like ANSI/ISA S95 and IEC 62264 and extends them with topics like "Horizontal Integration". But is that relevant for Industry 4.0? The Future Concept MES 4.0 casts a light on the issue.

Recommended action in order to prepare for Industry 4.0 could be: "Introduce an MES!" But which one? Which properties and functions must an MES have in order to be a central information and data platform?

VDI guideline 5600:
relevant for Industry 4.0

According to VDI guideline 5600 Horizontal Integration is of great importance for MES systems and the same is true for Industry 4.0. Thus it can be concluded that MES systems are already playing an important role during the implementation of Industry 4.0.

Status Quo

Current MES market reviews show that the market is quite diversified but only a few systems fulfil the requirements of the VDI guideline 5600. Many systems have already implemented online capability but make sacrifices in their functional range and their Horizontal Integra-

tion. Many suppliers only partly cover the tasks and must supplement other functions with external products from partners. More and more suppliers extend their own portfolio of functions which verifies the relevance of VDI 5600.

Avoiding interfaces, which is an essential requirement for Horizontal Integration, is normally not covered by increasing the number of functions. MES HYDRA by MDPV shows that it is possible to have Horizontal Integration with a full range of functions.

"Everything under one roof":
Horizontal Integration

For the Future Concept MES 4.0 "Horizontal Integration" is connecting all functions and data across the value chain and covering all tasks of an MES. Essential characteristics of the Horizontal Integration are avoiding interfaces and the modular structure of an overall system.

It goes to show that in the workplace, order postings (BDE) as well as quality inspections (CAQ)
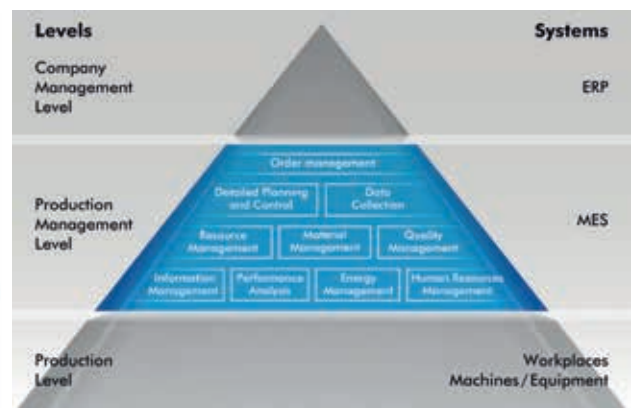
Horizontal Integration plays a central role in the "VDI House"
Picture: VDI – Verein Deutscher Ingenieure (Association of German Engineers)

are carried out at the same shop floor collection terminal. Ideally both functions are represented in comparable dialogs. This makes it easier for the operator as the modules function on the same basis. The operator saves time as there is no need to go to a specific inspection station.

Horizontal Integration is a requirement for the modular structure of an MES solution. That eases the successive introduction of the system which is significant for medium sized companies. Also users can decide for themselves which functions are sufficient for their application case and can align their selection to their requirements. The software can be extended at any time. No matter which manufacturing processes are presented by the MES in any culture or country, a modular, horizontally integrated MES solution fulfils all the requirements.

Despite that fact that only very few MES systems show the required functional width and allow for Horizontal Integration, several suppliers campaign with "Industry 4.0 compliant" products. If it is envisaged to use the system in the long term, Horizontal Integration is essential.

Further exploit data: Correlating evaluations

Especially relevant for Industry 4.0 is that systems incorporating integrative management can process and evaluate data across all areas. The more complex manufacturing environments are the more significant correlating evaluations are in order to observe and operate processes efficiently. Only context-relating correlation of data can supply valuable information and therefore knowledge. Only by collecting com-

MES systems are plentiful but a broad range of functions and a complete Horizontal Integration is only supplied with a few systems - HYDRA by MPDV is one of them

prehensive knowledge, processes can be optimized. This in turn is an important requirement to stay competitive – especially considering Industry 4.0. Here are some examples from real life:

Keeping on top of energy costs

In times of ever increasing energy costs and complex cost relief models, manufacturing companies need tools to collect and evaluate energy consumption. An integrated MES can correlate energy data with other information from production, e.g. processed orders or machine status. Instantly energy intensive production steps or energy guzzling machine are detected. Optimized planning like avoiding peak times is one of the principal activities and can only be achieved using an integrated solution as data from all areas must be linked. Ultimately, all these measures will achieve a reduction in energy costs.
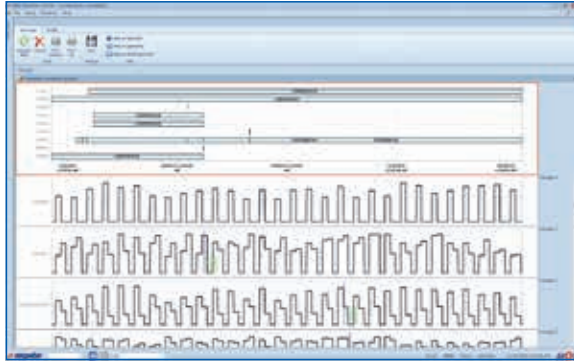
Consumption Correlation by HYDRA - to know exactly how much energy is consumed with every order

Focus on the human

Qualified personnel is an important resource for Industry 4.0. Due to an integrated database the collected attendance and absentee times are compared against postings in production using working hours when clocking in and out or shift plans. That means that apart from different evaluations, a bonus and incentive wage system can be designed. Available staff can be deployed efficiently depending on their qualification using order related personnel scheduling. That is immensely important working with smaller batches. Overall these measures improve motivation of staff.

Shop floor data collection and quality management in one system – operator in-production inspection directly at the machine with HYDRA

Quality made by MES

The product quality is also significant in the era of Industry 4.0. Using an integrated MES inspection plans can be created simultaneously to production orders. When logging an order at the shop floor terminal the equivalent inspection order is instantly available. After a defined interval (based on time or cycle) due inspections are automatically identified and displayed on the shop floor terminal. Automatically collected quantities and the machine status can be evaluated. To further increase automation of quality inspection, collected process data can be used (e.g. temperature, pressure, flow velocity) which are available if machines are connected. Therefore quality levels improve.

Preventive maintenance

An MES solution manages all production resources in one system containing apart from machinery also tools and other production aids. A common database can plan and evaluate all resources across all sectors. Planning an order in the shop floor scheduling, it is straight away apparent which tools are available or if the tool needs maintenance during utilization period. The central collection of cycles and utilization times enables preventative and needs-oriented maintenance. Therefore utilization of tools increases and idle times are reduced.

From planning to controlling

Systems organized in a decentralized manner like required for Industry 4.0 require standards and to a certain extent planning or controlling. Direct connection to the shop floor enables to switch from true planning to a precisely accurate production control. Unforeseen events are detected instantly and the responsible members of staff can react in real time. If a machine breaks down, the graphical planning module in the MES system checks if there are alternatives available and how it affects the orders
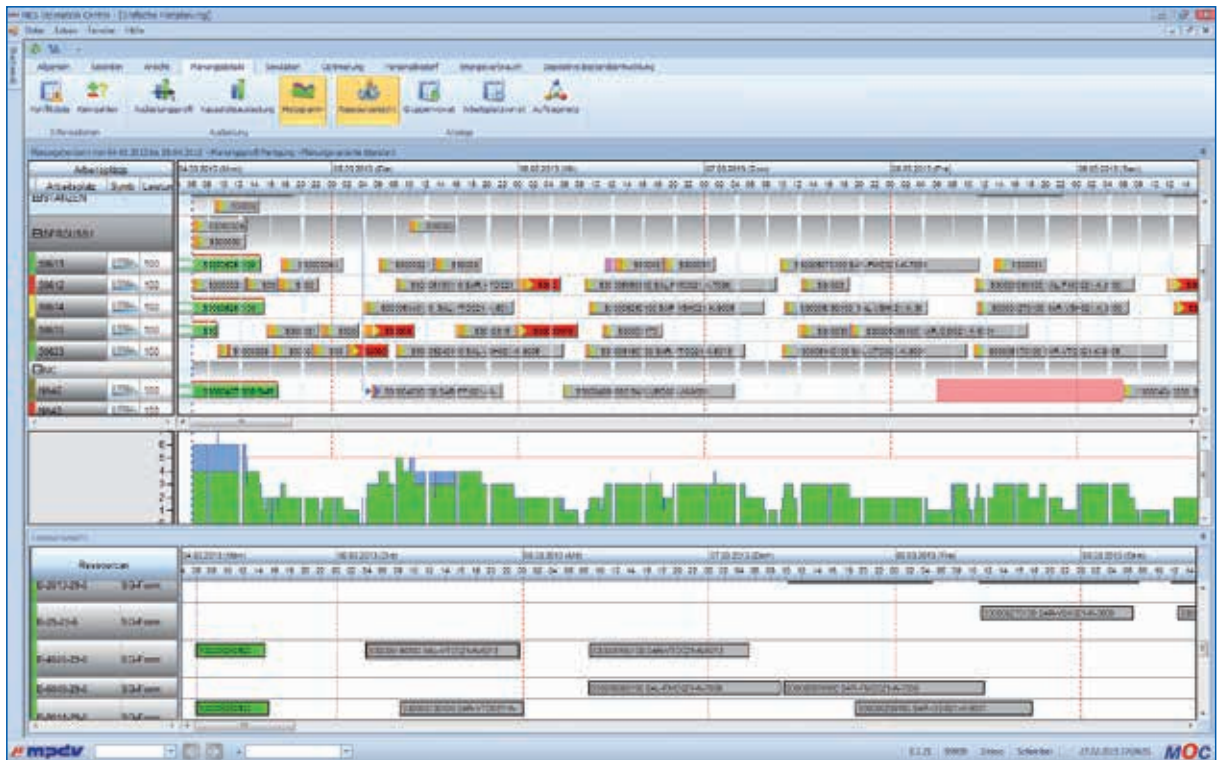
HYDRA Shop Floor Scheduling provides you with a multi-dimensional production planning and control

overall. The fully integrated MES solution can, apart from planning availability of tools and machines, also make allowances for resources like personnel, material stocks and energy consumption. Transparency achieved with the system safeguards the ability to react in production.

Outlook: The future is here

The future vision illustrated by Industry 4.0 seems to be more tangible with the realization of the Future Concept MES 4.0. Growing networks, which are presented by the Horizontal Integration of the MES environment, central data retention and the currentness of data are increasingly in the focus of production IT. Technical innovations ensure that obstacles are not insurmountable and successively disappear. Technical progress is unstoppable and therefore the number of self-regulating systems at work is rising. An unrestricted access to relevant data is more important than ever. This goes to show that an MES is not only suitable to support

Industry 4.0 but a necessary requirement. At the same time, an MES has to comply with the VDI guideline 5600 completely. Remember: not all that is labeled MES deserves being called an MES.

White Paper

It is now clear: Industry 4.0 needs Manufacturing Execution Systems (MES). But what is important in the selection of an MES system and what benefits result from a complete Horizontal Integration? This will be answered in the white paper "Industry 4.0 needs Horizontal Integration".

Request online: mpdv.info/wpnewsint

Smart Factory in four steps
Industry 4.0 – disarmed

The industry experts continue to have complex discussions about how to implement Industry 4.0. One result of this discussion was RAMI 4.0, a reference architecture model. In the current version of Industry 4.0 what can production companies take advantage of? Do businesses know how to achieve Industry 4.0? The new White Paper by MPDV tries to explain these questions and how a Manufacturing Execution System (MES) can facilitate the way to implement Industry 4.0.

Today, businesses face many challenges including increased global competition as well as customers and legislators imposing higher demands. Examples of this are as follows: Traceability/quality requirements, on-time delivery or elaborate logistics solutions like Just-in-Time and Just-in-Sequence (JIT/JIS). Adding to the above are increasing complexities arising from a wide variety or individualization of products and decreasing life cycles. In terms of economics, companies have to master the balancing act of choosing the right method and technology for Industry 4.0 to achieve their targets. The VDMA (German Engineering Federation) suggests in their guideline for Industry 4.0 to develop two separate ways to achieve the target and, therefore, defined two "tool kits": product and production. This article focuses on production and proposes a simple four-stage-model to reach the Smart Factory (picture 1).

The different stages need to be completed in chronological order due to the inner dependency on the last stage to complete the next stage's functions. For example: You can only reach stage 2 if step 1 has been completed successfully. In plain language, if the factory is not transparent, it cannot react.

Almost all essential functions deal with IT systems close to production as the stages above show. Thus it is not surprising, that an integrated Manufacturing Execution System (MES) such as

Picture 1: The four stages to the Smart Factory. Company (the factory) requirements are separated into four stages and supported by defined functions (on the right).

HYDRA is the ideal tool to cover all stages of the model. In some cases an MES is a critical tool in order to complete each stage towards the "Smart Factory". Required MES functions to cover individual stages are shown in picture 2.

Stage 1: Create transparency
In line with a reliable database, transparency is the foundation for all additional functions in the Smart Factory. Transparency allows a company to be sufficiently informed about their operational processes through all their various technologies and software to have one cohesive image. Many companies have operational processes implemented and even have software in use, but due to the lack of transparency and the lack of all systems talking they cannot have a full image of their facility.

Missing uniformity of machinery is one reason preventing companies from collecting all sorts of data. The newer the machines and facilities are the easier it is to read out large amounts of data in real time. It works sometimes for middle-aged machines by recording simple operating and cycle signals. Older machines are a real challenge. To reduce the effort of connecting machines and equipment, MPDV introduced a Shop Floor Connectivity Suite which can be operated intuitively (see page 16/17).

Utilize collected data

In the end data is not collected for the sake of it but to safeguard transparency. Initially the entirety of all collected data and their relations create a digital image of reality. We have to keep in mind though who or what is using that image – an IT system or a human being. Both target groups require an image with a different level of granularity.

IT systems profit from large and detailed amounts of data. People on the other side prefer less data but reliable key indicators and evaluations. Both requirements must be considered during data collection and processing.

Supporting MES functions

The most important functions to increase transparency in production are the HYDRA applications Shop Floor Collection and Machine Data Collection. Two factors are in focus: first, an efficient utilization of machinery and, secondly, to align automatically transferred machine data with manually recorded order postings. However, do not neglect tool and material data! If everything is considered you can detect relations and transfer these into optimization processes. Thus, recalculation of production orders can also be supported with reliable data. Due to the large amounts of recorded data, the MES also compresses and aggregates data as most ERP systems cannot process delicate raw data from the shop floor. An MES functioning as a central platform for information and data connects management, in this case the ERP system, with production. This again provides more transparency.

Stage 2: Safeguard reactivity

On the basis of data gained during stage 1, you can identify interruptions and also introduce realistic detailed planning. The more precise and comprehensive this planning is executed,
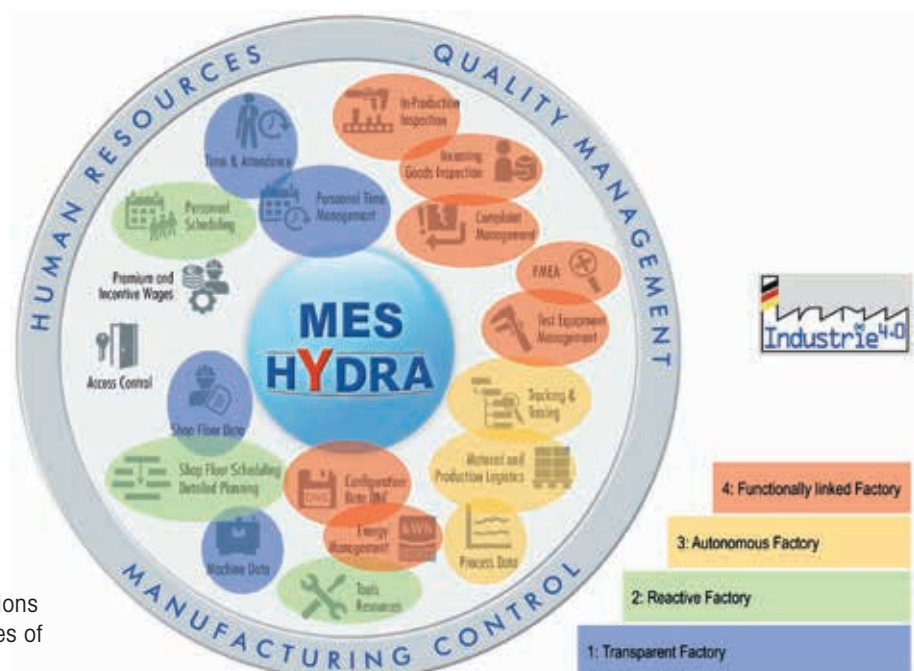
Picture 2:
Suitable MES applications
to cover different stages of
the Smart Factory

the easier it is to transfer the plan into a real-time and reactive production control. Apart from machines, other resources need to be considered, including the end users as the most vital part. HYDRA is a suitable and powerful tool for planning and controlling activities.

Stage 3: Distributing and delegating tasks

Processes stabilized during stage 2 can now be made autonomous by defining a closed cycle. Also, decentralization of tasks including relevant responsibilities is viable but only if synchronized. The ultimate aim is an autonomously working factory.

Stage 4: Functional networks

A functional network for all areas becomes even more relevant considering ever decreasing product life cycles and increasing product individualization. There is an increasing emphasis on the exchange of data between product development and production as digitalization is on the rise and the design engineer is forwarding information directly to the machine. The interface between product development and production is normally a Product Lifecycle Management system (PLM), which in the future must communicate directly with the MES. Further fields of interests for functional networks include an integrated quality management, an energy management close to production and a comprehensive look into supplier and customer – the complete supply chain.

What to do? Wait and see? Or take action?

You may ask yourself what to do? Does it make sense to act if Industry 4.0 leaves many questions unanswered? Companies may shed a light using the four-stage-model. In order to conquer individual stages the MES experts from MPDV recommend the following:

- Invest in an integrated Manufacturing Execution System (MES) and eliminate all isolated IT solutions.
- Use Lean Management and Lean Production principles to streamline processes.
- Incorporate all employees in the transition to make them feel part of the transition and cohesive in the overall goal.
- First, define the task or application and then the IT infrastructure.
- Look into communication capabilities when purchasing new machinery, facilities and sensors.
- Keep an eye on research activities, professional associations and organizations like the platform Industry 4.0 in Germany or the Industrial Internet Consortium (IIC) in the USA to identify the challenges you face and to find out about new trends and technologies on the market.
- Finally, think globally but start with a manageable number of tasks!

White Paper

Learn how to step-wise prepare your production for Industry 4.0 and why you need a Manufacturing Execution System (MES) for this by reading the white paper "Industry 4.0 disarmed".

Request online: mpdv.info/wpnewsint

Comment
Smart Factory in four steps using an MES

Prof. Dr.-Ing. Kletti, CEO MPDV Mikrolab GmbH, explains how companies move their production into the new era of Industry 4.0 supported by state-of-the-art production IT like an MES.

Many companies are heading towards Industry 4.0 but the management's immediate euphoria is dampened by the complexities and uncertainties of the issue. An additional obstacle is the multitude of terms like CPS, Internet of Things or "Smart Factory" which leaves people guessing how to pursue Industry 4.0. It becomes clearer if you proceed systematically and step by step.

Therefore, I would like to suggest a simple plan containing four steps:

Make your factory transparent by comprehensively collecting and evaluating data with a Manufacturing Execution System (MES).
Transform your production planning and control into a reactive tool by integrating collected data into the MES planning process and subsequently reducing waste.
Incorporate your findings to create control cycles in production, which leads to an autonomous factory.
Functionally link all departments, resources and systems involved in the production process. This includes a direct connection from product development to production.

This means specifically that production companies can still use existing facilities, on the one hand, which also reduces investments and, on the other, employees benefit from a systematic approach. As you know, qualified personnel are an asset to any company. It is crucial to retain employees in the business, to integrate them into changes and to take them along to the era of Industry 4.0.
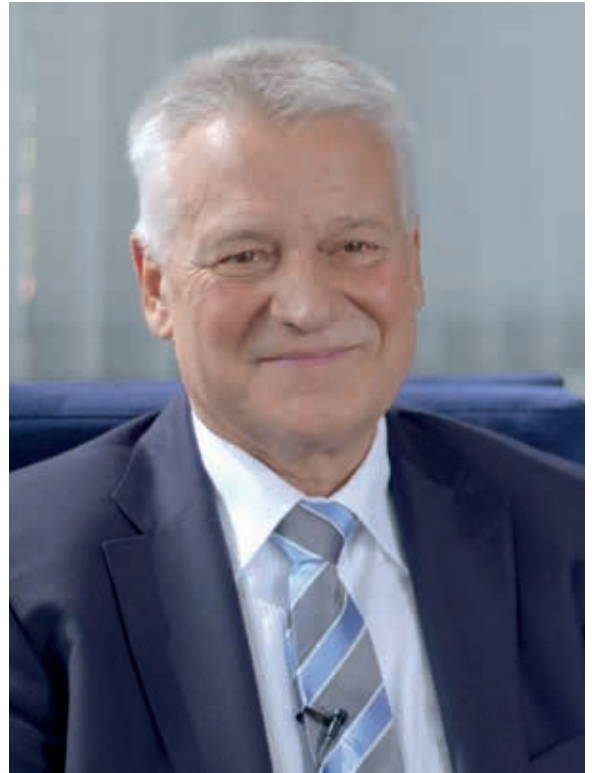
We need support from IT systems to transform production into a "Smart Factory". Integrated MES systems have proven to be the most suitable tool according to the IEC 62264 because they provide, collect and process all relevant data. An MES serves as a central data platform for production and other departments and as an interface between the human being and the factory.

This leaves us with the question: When should we begin to implement the four-stage-model? The earlier the better! I am sure that you can only transform your production into a Smart Factory and thus managing Industry 4.0 with an integrated MES. Therefore, companies should start with the introduction or extension of their MES system as quickly as possible.

HYDRA in Sequence Production
Just-in-Time/Just-in-Sequence

These days, many industries would not be able to do without flexible logistics concepts such as Just-in-Time (JIT) and Just-in-Sequence (JIS) – one example being automotive production. But what are these concepts exactly and what requirements arise from them for a Manufacturing Execution System (MES) such as HYDRA?

In principle, JIT means that just the right amount of material in just the right quality is supplied directly to the production line at just the right time for it to be assembled immediately. This drastically reduces warehouse stock and buffer inventories. With the even more precise process of JIS, the parts also have to be supplied in a specified order.

Sequence production needs flexible IT support

At assembly lines especially, this leads to huge challenges, because the pre-assembled components are combined to produce a great variety of items. The MES HYDRA provides the necessary support with its upstream detailed planning of the pending orders and operations. The ability to document manufacturing processes, such as in terms of traceability, is also included in the scope of HYDRA functions. Moreover, the horizontal integration of the MES ensures that the quality assurance processes that accompany production are represented in the same system. This significantly reduces time and effort in both the planning phase as well as in the production process.

Another particular challenge in sequence production is posed by the extremely fast work cycles. In this situation, employees expect the most up-to-date and relevant information

(e. g. drawings, assembly instructions and parts lists) available at exactly the right time. In order to meet these requirements, the MES experts at MPDV are currently developing a "High-Performance Data Provider" (work title) that is meant to extend the proven HYDRA architecture. With this innovation, the MES will be able to represent process steps which in the past could only be operated using classic automation technology. In addition to the horizontal integration of all other processes, the significantly increased flexibility when introducing new variants and when changing process sequences is one of the huge advantages of the MES as compared to automation.

HYDRA is already being used in JIT/JIS environments today, yet with its new functions it will be able to assume even more tasks in the future.

Industry solution for electronics production extended
HYDRA for Electronics

In addition to the MES industry solutions for metal and plastics processing, HYDRA for Electronics is now addressing another important production industry with very specific demands of a Manufacturing Execution System (MES). As usual, the industry solution for the production of electronics is based on HYDRA as a fully integrated MES and includes industry-specific adaptations or add-ons.

The most important feature that an MES must have to incorporate it into electronics production is the ability to connect automatic placement machines (such as Siplace or Fuji machines). HYDRA for Electronics has successfully proven in various projects that it is well equipped to overcome this challenge. MPDV has now further extended the industry solution HYDRA for Electronics.

First Pass Yield
The most important key figure in electronics production is without doubt the First Pass Yield (FPY). This value provides information on the percentage of modules that is defect-free after the first production run – meaning they require no additional repair or rework. HYDRA for Electronics calculates this key figure and provides the corresponding evaluations.

Setup list for variable setup
The availability of material – meaning a large variety of small components – plays a crucial role in electronics production. This is why so-called commissioning trolleys are used in order to bring flexible groups of components to an assembly unit at once. This is called "variable setup" – as opposed to a "fixed setup" which remains at the machine permanently. HYDRA for Electronics also offers so-called "setup lists" for variable setup, which makes work scheduling even more efficient.

Moisture Sensitivity Level (MSL)
The time restriction for the use of electronic parts is closely linked to humidity levels, for example. HYDRA for Electronics can account for and manage this indicator when planning and utilizing material.

Unique identifications with UID
To ensure that the correct parts are being used, a unique ID (UID) is typically issued upon goods receipt for each roll or package. HYDRA for Electronics can either generate and manage the UIDs itself or adopt them from a connected third-party system (e. g. ERP or warehouse management).

Conclusion
HYDRA for Electronics takes all important challenges of electronics production into account, from material handling to production methods through to quality inspection (see image).

Applications for the MES solution HYDRA for Electronics

mpdv.info/electronicsen

New product releases CAQ 8.2

More functionality, more integration

There can be no doubt that integrating quality assurance functions into a Manufacturing Execution System (MES) is beneficial. With the latest 8.2 release of the HYDRA modules In-production Inspection (FEP), Incoming Goods Inspection (WEP), Complaint Management (REK) and Test Equipment Management (PMV), MPDV is further expanding both the functional scope and the degree of integration.

In addition to the many new improvements, which make operation of HYDRA more intuitive than ever, the new releases of the CAQ modules also offer larger new functional blocks.

Visual failure recording

To simplify the recording of failure locations, the HYDRA Shop Floor Client now allows to highlight the exact position by simply touching an image on the screen. This also significantly reduces mistakes caused by entering "mixed up" numbers.

Quality-based material flow control

With the new CAQ 8.2, quality data is linked automatically via batches, lots and serial numbers. This optimizes the material flow control, which can now also be based on test results (OK/NOK). Depending on the application, this ensures both a reduction in time and effort as well as overall lower costs.

Document management in Quality Assurance

In order to improve the documentation of the test process, documents (e. g. images, texts) can now be attached to both the inspection
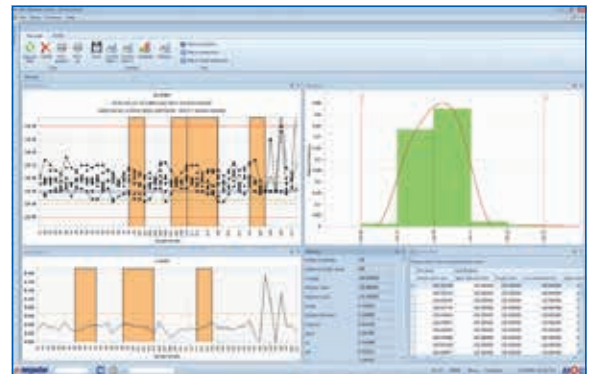
Expansion of the control chart – statistical analyses of measured values with HYDRA CAQ 8.2

characteristics as well as to the specific inspection point and measured values. This way, any deviation can be analyzed better later on, meaning that failures are remedied more efficiently.

Upstream list of inspection points

Especially at inspection stations detached from the production line (e. g. in the QA lab) various inspections are performed. In a clearly arranged list of inspection points, the user can now filter, sort and search based on individual criteria and then select the precise inspection point to be processed next. A possible search criteria are batch numbers that are attached as a label on the next test sample.

Comprehensive reports

In addition to the report of quality data relating to an order, HYDRA FEP 8.2 now also enables the calculation of key figures by cavity, which is particularly beneficial when assessing an injection mold in the plastics industry. A condition-based maintenance strategy could be derived from the results. Key figures such as Cp and Cpk can also be calculated beyond the scope of the order – even by cavity if desired.

Intuitive operation – visual failure inspection with HYDRA CAQ 8.2

FMEA – Failure Mode and Effects Analysis
Even more Quality Assurance with HYDRA

Failure Mode and Effects Analysis (FMEA) has become indispensable in the automotive environment and more and more industries are now also seeing the necessity of FMEA. For this reason MPDV is introducing an integrated HYDRA module to the market.

As a methodical instrument for improving reliability, an FMEA takes effect even before the start of production by providing a risk analysis which supports the early detection of failures and the avoidance of failures during the production process.

The new HYDRA module FMEA covers the complete process flow of an FMEA:

1. Preparing a team
   Team members and their responsibilities are assigned to the FMEA.
2. Mapping the technical structure
   Where the FMEA relates to a specific item, it is "broken down" into separate technical parts and the relevant functions of the components are described.
3. Defining potential failures
   Potential failures which may occur during the production process are defined for each of the components and their functions.

4. Defining measures to avoid failures
   The team defines measures that need to be performed as soon as a failure occurs.
5. Function net and failure net
   A function net illustrates the relevant processes in the production of an item. The failure net shows which failure is dependent on which prerequisite or consequence.
6. Continuous improvement with revision states
   An FMEA is not carved in stone: If a complaint is uploaded, an FMEA can be supplemented and thus be continuously optimized.

User benefit
Documentation of the FMEA ensures the user has a recorded knowledge base that can be used to efficiently support ongoing and future development projects. In addition, unnecessary failures can be avoided as early as in the design or development phase, which will help prevent additional costs.
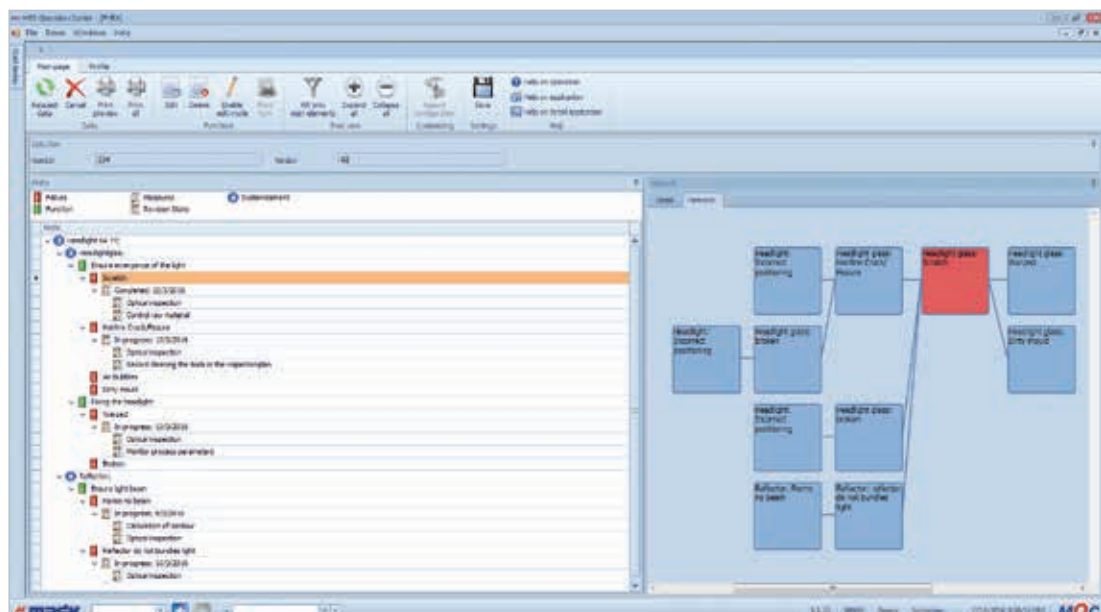
Shopfloor Connectivity Suite
Machine connection in no time

More often than not, the machinery in production companies of any size is heterogeneous. This is why attempting to connect machines and equipment to an MES system often requires a huge amount of effort. The new Shopfloor Connectivity Suite puts an end to this once and for all.

If you want to produce efficiently, transparency is key. However, transparency requires that data is consistently collected in the shop floor and therefore a connection between machines and MES. The process of connecting machines has become significantly quicker with the new Shopfloor Connectivity Suite. In future, this process will be broken down into four steps:

1. Defining input channels

The first step is defining in HYDRA which workplaces are to be supplied with real-time data. To this end, so-called HYDRA channels are configured. For example, an injection molding machine, a yield counter, a scrap counter and a machine status signal are assigned to workplace SGM34. This clarifies which data HYDRA will receive for those machines.

2. Selecting and setting up the driver module

Now the technical machine connection is selected. For this purpose, an intuitive wizard inquires about the type of data to be collected. In our example, this would be machine data. Then the collection architecture is selected. The MES HYDRA basically distinguishes between collecting data separately and collecting data via a shop floor terminal. Then, one must select the driver module that ultimately contacts the machine or the control unit from a library. OPC UA is an example. Finally, the user declares the HYDRA system that will receive the data.

3. Configuring the data source

Using the Interface Explorer, the data offered by the machine is assigned to so-called output

channels. Depending on the driver module and the machine type, the range of data offered may be quite extensive and unclear. It is therefore recommended to use a meaningful designation for the output channels in order to provide a better overview.
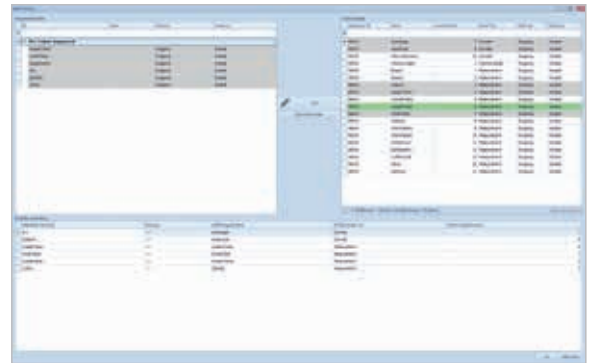
4. Connecting channels

Finally, the mapping tool links the output channels of the connected machines to the input channels of the HYDRA workplaces. This way, every workplace receives the real time data that it expects and needs for processing.

Distributing the configuration as a template
Especially for larger companies, it makes sense to save a machine connection once it has been configured and to re-use it at other locations. The Shopfloor Connectivity Suite includes a template manager especially for this purpose.

Broad basis –
Process Communication Controller

Even the best Connectivity Suite requires a broad technological basis – in this case the Process Communication Controller (PCC) with its extensive library of driver and interface modules. The PCC offers:

- Serial data interfaces for the communication with controls via proprietary protocols
- Interfaces based on the OPC standard

Functional scope of the new Shopfloor Connectivity Suite

Simple channel allocation to connect data sources and to process data

- Communication via specific protocols, e.g. Euromap 63 or the Weihenstephan Standard
- Server interfaces, e.g. to the Arburg host computer system (ALS)
- Interfaces used to transfer weighing results from scales
- Communication via bus systems such as Arcnet or Profibus
- UMCM – Universal Machine Connectivity for MES: a universal interface defined by MPDV to easily collect machine status, quantities and process data

Driver Development Kit

Ultimately, there will always be machines/controls for which PCC will be unable to offer a preconfigured driver module. In these cases, the Driver Development Kit allows either an MPDV expert or the user himself to develop any kind of communication block or adapt the existing modules.

User benefit: more transparency

The new Shopfloor Connectivity Suite not only makes it easier to connect machines and equipment to the MES HYDRA. It indirectly also ensures a greater degree of transparency, because of the ease in which more data can be added to the system. This goes along with the current trend of Industry 4.0: Transparency is the basis for decisions, optimizations and also for self-governance. And even today, transparency is resulting in much better efficiency.

PEP 8.2 with new functions
Personnel Scheduling in Practice

In the past, a simple shift volume scheduling was all that was needed, but these days flexible working times and employee qualifications must all be taken into account in scheduling. In its latest version 8.2, HYDRA Personnel Scheduling (PEP) offers even more practical functions.

Personnel Scheduling made easy

PEP supports production companies in utilizing valuable human resources more efficiently. For this purpose, employees can be assigned to workplaces manually or automatically in the graphic planning board. However, planning is not the only thing that is important. It must also be ensured that employees are informed on how they will be assigned. Here, HYDRA not only offers the ability to print out a personnel schedule, but also sends personalized information to a PZE terminal or to a mobile app on a smartphone.

New PEP 8.2 functions

The new 8.2 release of personnel scheduling offers on the one hand additional analysis options (such as available capacities). On the other hand, the HYDRA module now offers further practical functions that make planning more efficient – for example the copy functions that can be used to assign recurring time intervals. This saves effort and improves the planning quality.
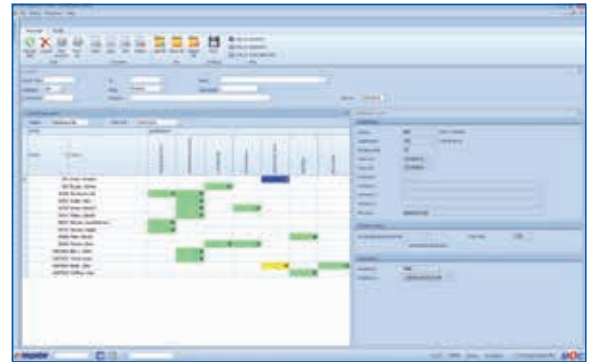
Special case composition – optimized material composition for the secondary metallurgy

The definition of the personnel requirement has also become much more flexible with PEP 8.2. In addition to staffing needs during actual production, the personnel required specifically for setup can now also be scheduled.

The new central workplace assignment schedule makes it easier to inform employees. Combined with the HYDRA eReportManager, it can even be created automatically, for example by being printed out on a central printer at a predefined time on a regular basis.

Another highlight is the new qualifications matrix. Employees and their existing qualifications can be assigned here quickly and clearly. On the one hand, the matrix offers convenient input functions and on the other hand a clearly arranged presentation. The supervisor or the HR department is now automatically notified about qualifications with a time limit (such as fork lift driver license or handling hazardous materials) in due time prior to their expiration. This way, any further training measures that are required can be organized in good time.

Personnel scheduling via drag & drop

HYDRA Shop Floor Scheduling extended to include HR functions
Staffing requirements included in graphic planning

In addition to traditional resources such as machines, tools and material the ability to plan human resources is becoming increasingly important for detailed order planning. It is not only the availability of employees that has to be considered here, but also their qualifications. For this purpose, HYDRA Shop Floor Scheduling (HLS) now has new functions to visualize and run plausibility checks of the planned staff.

Display of planned staff

The planner has a better overview with the display of the planned staff. He can now see which employees are assigned to the individual workplaces and is therefore in a better position to check whether his planned orders can be performed.

Workplaces with mandatory staff assignment

If there are machines that are only used when needed, the system can be set up so that they are only available if at least one employee is planned for the machine. This capability simplifies planning enormously, while also helping to ensure that the planned orders can indeed be produced.

Quality inspection in detailed order planning

In many companies, staffing needs and the required qualifications depend on the items to be produced. This is why when planning a specific order, HYDRA Shop Floor Scheduling checks whether the planned staff are in fact available and whether each of the employees has the required qualifications. This also results in a significant improvement in the planning quality.

Conclusion

The new HYDRA HLS functions to take staff capacities into account improve planning and make it more realistic. Both graphic planning as well as personnel scheduling benefit from the complete horizontal integration of the MES HYDRA.

Display of personnel in the graphic planning board

The new generation of MES Shop Floor Terminal
More ergonomics and flexibility in production

User acceptance is particularly important for IT systems close to production. With its intuitive operating concept and flexible display options, the new Shop Floor Terminal ensures that every worker is able to operate the HYDRA Manufacturing Execution System (MES) from MPDV efficiently.

Data collection redefined in the shop floor

In order to make manual data collection in the shop floor even more intuitive and comfortable, the new shop floor terminal AIP 8.2 from MPDV displays all information in a context-sensitive manner. This way, the worker can always see exactly what is needed for the current task. For example, all about the machine that the operator is currently using. Gestures such as "swiping" or "touching information" known from conventional smartphones and tablets allow the worker to easily navigate to the desired input dialog.

Flexible presentation

The optimized presentation of information in the modern tile look also supports the intuitive operating concept. Here, both the dialogs and the manner in which the information is visualized can be adjusted to individual processes and challenges. The operator is able to make these adjustments himself – entirely independent of the system supplier.

Machine overview with language conversion

International requirements

Making IT systems available in multiple languages is becoming increasingly important not only in large corporations but also in medium-sized production companies, either because of employees that speak a foreign language or due to branch locations in different countries. Depending on the language, exotic character sets may also be needed. Due to its Unicode capability the new AIP 8.2 can easily display all kinds of characters – no matter whether they are Cyrillic, Arabic or Chinese. The new shop floor terminal offers every user the option to choose his national language, thus ensuring a high degree of user comfort. This results in a greater degree of acceptance among workers and in many cases saves on additional time for on-the-job training.

Improved database for increased efficiency in production

Ultimately, the goal of ergonomic and flexible data collection is to supply a Manufacturing Execution System (MES) with continuous data from production in real time. These days, in order for a company to increase productivity and be able to compete in the market, an integrated MES such as HYDRA from MPDV is indispensable.

New workspace view in tile manner

Touch2Plan & Smart MES Applications
Mobile solution for HYDRA

Complex manufacturing processes need flexible MES solutions. Touch2Plan and all the other Smart MES Applications help employees of manufacturing companies to stay in touch with HYDRA.

Mobile devices provide up-to-date information from any location in manufacturing sites. This means to be always informed regarding events in production. It also reduces reaction time. The supervisor gets notified about a malfunction on the tablet PC or the smartphone and therefore can directly go to the relevant machine. The production site is "on hand".

Using mobile devices intelligently business processes can be displayed "smart". Here smartphones and tablet PCs need to be handled intuitively at the right time in a few easy steps. If supervisors are at a machine they require relevant information regarding running orders of the produced articles and the reason why it is malfunctioning. A large selection screen and a call-off system for all machines on site are laborious and time consuming on mobile devices. Therefore the applications must lead to the required data in quick succession.

For example a maintenance engineer calls-off a list of malfunctions, selects the longest duration of a malfunction, registers at the machine, changes the machine status and carries out repair work. Then he adds comments to the mal-

function and logs off. Currently a list of malfunctions of the complete site can be called-off on the HYDRA Office Client (MOC). Then it must be registered on shop floor terminal (AIP) in order to clear the problem. Now the whole process runs on a mobile app on a smartphone or tablet PC. The user achieves a certain independence of the hardware using any device available. MOC and the AIP form a symbiosis. In future linking to other apps is feasible. If an OEE downward trend is located, the responsible contact partner is found via a "Contact-app". With the functionality of a smartphone the stored number can be dialed instantly.

Smart MES Application is not replacing MOC and AIP, they add to the portfolio of the MES HYDRA by being useful to call-off data. The user benefits from being more flexible regardless of location. In doing so the office PC and the mobile device are using the same procedures. Smart MES Applications are significant components for the future concept MES 4.0 and sets us up for the challenges of tomorrow.

Control App Touch2Plan

Using Touch2Plan, a mobile App to locally control production, production managers can move planned operations, cancel operations or plan new ones from the pool of orders simply with a tablet or a smart phone. Just a few clicks and the new detailed planning is arranged and after the release is synchronized with the central data. Touch2Plan is part of the Smart MES Applications (SMA) and complements the large product portfolio for the future project Industry 4.0.

MPDV in line with the market

Our Business Units

There are many ways to implement a Manufacturing Execution System (MES). Our customers decide if they want to purchase single products, customized services or a complete solution. MPDV's MES experts provide adequate support during this process. If required, we enable our customers and partners to carry out defined services on their own as part of an MES project.

In order to be in line with the market, MPDV provides three business units:

- **MES Products**
- **MES Services**
- **MES Solutions**

Statement from Prof. Jürgen Kletti:

"Our HYDRA users will initially not notice very much as far as the transition to the three business unit is concerned. The same sales staff and contacts will still be available to both our customers as well as our prospects. Ongoing projects will be assumed one-to-one in the MES Solutions business unit. The only change here will be the name. However, now our users as well as prospects have the opportunity to make use of the range of products and services from the two new business units MES Products and MES Services – even without an ongoing project. This means everyone benefits from our extensive market experience, because the same

employees are still involved in developing the products and/or rendering our services.

In fact, everything is simply becoming much easier and more flexible – both for our employees as well as for our existing and future MES users. Or in other words: by consistently reducing friction losses, we are able to improve our ability to respond to our customers and will be perceived as being more in line with the market. Of course, it will take a while for us to be noticed in the market with our new business units. Yet I still believe that we are now better positioned and that our more differentiated range of products will enable us to address manufacturing companies in a more targeted manner. With the three new business units, I see us in a positive and future-oriented position."

MES
Products

State-of-the-art MES components used by MPDV's customers and integration partners to design their individual MES solution

MES
Services

Services supporting manufacturing businesses on their way to achieving their perfect MES solution, well-founded user training and worldwide support for existing systems

MES
Solutions

Products and services combined with customized MES solutions, professional project management and implementation services according to individual requirements

The MES Experts continue to expand
Success Story MPDV

Employee growth, revenue growth and broad presence in trade press are just a few examples of the continuing success of MPDV. But what's the secret behind this success story?

A lack of orders is definitely nothing the MES experts can complain about. Just the opposite: current trends such as Industry 4.0 or Digital Transformation continue to bring in a variety of requests and orders. As a result, MPDV employs more than 325 qualified people worldwide to satisfy all requirements of the market. Luckily, the decision to build a new office building at the headquarters in Mosbach, Germany was made strategically early so that further staff additions are also possible in 2016 and 2017. At the moment, MPDV's growth mainly comes from Consulting, Software Development and Product Management. Still, the support teams are also looking for new members that actively support HYDRA users. However, the search for qualified staff is not restricted to Germany but also to the sites in Singapore, Shanghai and Chicago as more and more new projects are started.

MPDV Highlights for Hannover Messe
Safeguarding the future with MES and Industry 4.0

At the 2016 Hannover Messe, MPDV showed, in addition to many product innovations, just how important Industry 4.0 and future-oriented Manufacturing Execution Systems (MES) are for high-wage locations. Both are crucial in order to be able to create and safeguard jobs in the long term.

Hannover Messe is the leading industrial fair worldwide. This year the fair's theme was "Integrated Industry – Discover Solutions!". As such, the world's most important industrial trade fair took up the central topic of the future – "Industry 4.0". For MPDV, this was a good opportunity to present its future-oriented MES solutions to a wide audience of manufacturing companies. For MPDV, the continued "hype" relating to Industry 4.0 is a welcome catalyst for successful business transactions involving close-to-production IT systems. This ultimately contributes to the MPDV's consistent growth offering solutions, products and services in the MES environment.

MPDV booth at Hannover Messe in Hall 7

In four steps to Smart Factory

Again this year, one of the central topics of Hannover Messe was the Smart Factory. With its four-stage-model, MPDV provides specific ideas on how manufacturing companies can, step by step, achieve an efficient factory of the future. Well related to the first stage ("transparent factory"), the MES experts presented the new Shop Floor Connectivity Suite that allows machines and systems to be connected to MES HYDRA in

an instant. In support of stage 2 ("responsive factory"), MPDV presented a variety of innovations in HYDRA Shop Floor Scheduling and Personnel Scheduling.

Forward-looking discussions

On day two, Professor Jürgen Kletti, CEO, and Markus Diesner, Product Marketing Manager, took part in the "Dell IIoT Think Tank" – IIoT stands for Industrial Internet of Things and refers to the area of the Internet of Things used for industrial purposes. Here, top-level representatives of a variety of companies discussed topics

Karl Schneebauer, global alliance manager of MPDV group assists a Chinese delegation at the MPDV booth

relating to the merging of IT (Information Technology) and OT (Operational Technology or automation technology). In retrospect of the event, MPDV assumed the role of the forward-looking intermediary between IT and OT.

Cooperation with WAGO

Also on the border between IT and OT as well as compatible with the four-stage-model, MPDV started a cooperation with WAGO, the specialist

Jürgen Schäfer, WAGO (right) and Professor Jürgen Kletti, MPDV (left) start the joint "transparency offensive" at the WAGO booth at the 2016 Hannover Messe

for electrical connector technology and automation. The objective here is to be able to combine WAGO components with MES HYDRA to make it easier to record machine and energy consumption data. As a result, the increased transparency in the shop floor can provide a greater degree of efficiency.

Successful Hannover Messe

Fully reflecting the trend toward internationalization, the MPDV booth featured sales colleagues not only flown in from China, but also from the United States. Rainer Deisenroth, Vice President Sales/Marketing is satisfied: "Despite the difficult basic conditions caused by a visit from US President Obama, we noted an encouragingly high number of visitors in Hall 7, the Digital Factory, and at the MPDV booth in particular. We held promising talks with customers and sales leads from every industry and from around the world throughout the entire week." Hannover Messe is and remains the most important industrial trade fair in the world and has firmly established itself as the annual event highlight for MPDV.

MPDV @ embedded world 2016
MES HYDRA captures the Internet of Things

Industry 4.0 and the Internet of Things (IoT) are often mentioned concurrently. That is why MPDV now presented an MES architecture compatible with IoT. Interested manufacturing companies could view this at the embedded world 2016, February 23-26th in Nuremburg.

Cloud computing is nothing new to the IT environment, but the idea of a central IT resource or the use of common network technology on the shop floor is. Connecting the shop floor with the IT environment leaves many manufactures nervous. During embedded world 2016, MPDV's MES experts eased the nerves by showing how real time data with integrated cloud computing can provide valuable information to improve your business.

Of clouds and fog
On the one hand, the proposed MES architecture is based on the Internet of Things, completely linking all resources and the manufacturing companies' security needs. Consequently, shop floor and IT clouds should be separated. In order for the machine level to reap benefits from cloud technologies, a specific modification known as the edge cloud or fog, was employed. The central instance, the edge gateway, connects the edge cloud (fog) with the IT cloud. Therefore, shop floor components can communicate with each other in real time and the IT cloud can retrieve and manage the data.

Showcase:
MES HYDRA and Dell IoT Gateway
MPDV showed how the suggested architecture can look like in practice at the Dell both (hall 5, booth 380). Visitors experienced how live data is collected from the shop floor and immediately made available in the IT cloud. Crucial elements were the IoT Edge Gateway 5000 by Dell and MPDV's Manufacturing Execution System (MES) HYDRA.
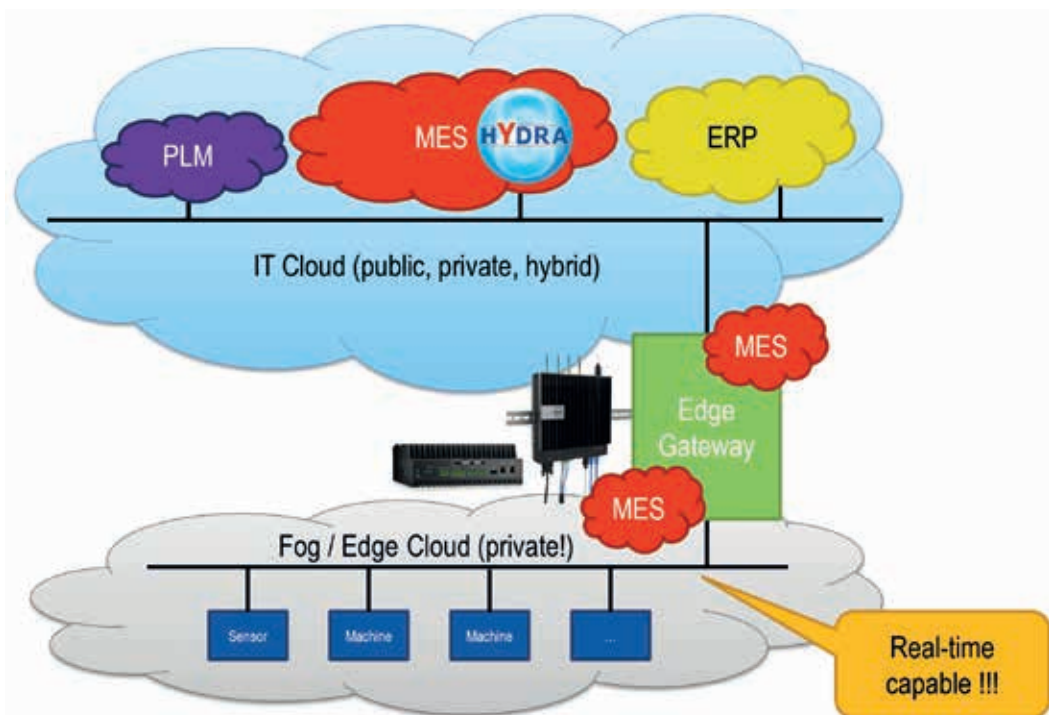
MPDV cooperates with Fujitsu

A matter of trust: MES in the cloud

There are lots of cloud providers but industry only trusts a few. MPDV, the leading provider of Manufacturing Execution Systems (MES), has found the right partner in Fujitsu, the leading Japanese provider of business solutions based on information and communication technology (ICT). In April 2015 the two companies signed an alliance contract.

"Confidence plays an essential role in Cloud Computing particularly with respect to the manufacturing industry" explains Thorsten Strebel, Vice President Product Development and Consulting. "High availability of data and reliable protection against manipulation and industrial espionage are of the utmost importance." Fujitsu is the only large IT provider offering an extensive portfolio "Made in Germany" including cloud services rendered in their own, high-security data centers in Germany.

Common future

Based on the Fujitsu Cloud Trusted Public S5, MPDV wants to provide a platform for the manufacturing industry in order to meet future, technological challenges. As already announced MES HYDRA used by more than 930 manufacturing businesses can be operated locally and in the cloud.

MES HYDRA
Solutions for all industrial sectors

Users benefit from ...

• Wide range of HYDRA basic functions for al industrial sectors
• Industry-specific customizing of HYDRA standard functions
• Specific functions for different industrial sectors

Futher information: mpdv.info/indsolutions

HYDRA for Plastics • HYDRA for Metals • HYDRA for Electronics • HYDRA for Medical • HYDRA for SME

Frost & Sullivan Commends the High Flexibility of HYDRA
MPDV's IIoT-enabled MES Platform for Discrete Industries

According to Frost & Sullivan, the HYDRA MES platform is production-ready to scale to any additional IIoT-based device and is backed by a robust server framework. During IAS 2016 in Shanghai, MPDV received the Frost & Sullivan 2016 Best Practice award for Customer Value Leadership.

Based on its recent analysis of the Industrial Internet of Things (IIoT)-based Manufacturing Execution Systems (MES) market for discrete manufacturing, Frost & Sullivan recognizes MPDV Mikrolab GmbH (MPDV) with the 2016 Global Award for Customer Value Leadership. MPDV's strategy of leveraging IIoT-based technology has resulted in a service-oriented architecture (SOA)-based HYDRA MES platform, which can house the rising number of IIoT service functionalities to support the shop floor. It is proving to be a popular choice across discrete industries across the world.

"MPDV, through its HYDRA platform, has been able to guide customers toward higher production efficiencies and enhanced energy management," noted Frost & Sullivan Research Manager Muthuraman 'Ram' Ramasamy. "These, along with its ability to gather different types of data, analyze it in context of the situation, and drive action continue to drive market adoption."

An outstandingly innovative feature of MPDV's solution is an edge gateway scenario, which provides an unmatched, continuous interface between the IT cloud and edge cloud. The gateway also acts as a barrier between them to protect the edge cloud from bandwidth- and hardware-related problems. It can host security features to regulate the data flow between the IT cloud and private cloud. Data acquisition functionalities of HYDRA can be installed on the edge gateway providing real-time communication.

Global Awards
Each year, Frost & Sullivan presents the Global Award for Customer Value Leadership to the company that has demonstrated excellence in implementing strategies that proactively create value for its customers with a focus on improving the return on the investment that customers make in its services or products. The award recognizes the company's inordinate focus on augmenting the value that its customers receive, beyond simply good customer service, leading to improved customer retention and ultimately customer base expansion.

This is already the third Frost & Sullivan award MPDV has received. In 2010, the MES Experts were awarded for Best Practice and Product Excellence in European Discrete Manufacturing Execution and in 2011 for Best Practice and Customer Value Enhancement in Global Manufacturing Executions Systems. "The award

Frost & Sullivan recognizes MPDV Mikrolab GmbH (MPDV) with the 2016 Global Award for Customer Value Leadership

encourages us in our quest for global leadership in the MES market. Together with our MPDV colleagues in Europe, the US, Singapore and China we will continue to provide innovative and field-proven solutions for manufacturing companies worldwide." said Prof. Dr.-Ing. Juergen Kletti upon accepting the award.

MPDV at the award ceremony in Shanghai: Prof. Dr.-Ing. Jürgen Kletti, CEO of MPDV group (center)

MPDV is once again a TOP100 Innovator
Progress through Innovation

To be an innovator and pioneer in a market segment has its benefits, but also quite a few challenges. A quick look at the innovation scorecard that flows into the award shows exactly what it is that makes MPDV one of the TOP 100 Innovators and how our MES users benefit from this.

In 2015, MPDV was again awarded the prize of TOP 100 Innovator, and therefore distinguished as one of the most innovative medium-sized businesses in Germany.

The fact that MPDV convinced each and every one of the members of the scientific TOP 100 jury is shown in particular by the jury's final remarks: "The Innovation Scorecard shows that MPDV Mikrolab GmbH is a company that takes the topic of "Innovation" seriously. The differences to "average" medium-sized companies are huge and striking." Further confirmation of this is the classification in the highest possible A+ rating category.

Dedicated Staff supports Innovation

Prof. Kletti, CEO of MPDV, is very well aware that he or the members of top management on their own do not make the company the remarkable innovator it is. Indeed, he is very proud of the dedication of MPDV's employees. "I am always truly overwhelmed by how much our staff personally dedicates itself to achieving our goals. This can be seen not only in their daily performance, but especially in the frequent inspiring ideas and improvement proposals, with which our employees have earned my highest respect. Without our employees we would be nowhere near where we are today – on a very healthy and lasting road to success."

MPDV USA with expanded resources
A solid foundation for growth

Within a short time frame the US office has grown from 5 to 12 employees which made it necessary to move to a new office building. With more space and new people MPDV USA is now perfectly equipped to further spread the MES concept into the region.

Thomas Riedinger, COO of MPDV USA: "We can now staff all necessary project functions directly from the North American MPDV team. For our clients it is important that they can rely on local support. During peak times we can even enlarge our capacity by temporary assignments from the German HQ".

The new facility offers a full blown training center for up to eight training participants. Each training place is equipped with the most modern terminal and MOC hard- and software. MPDV USA thus offers the full range of training like in the other five international MPDV training centers.

New staff members

Dr. Stefan Loelkes joint MPDV USA as new Chief Sales Officer for North America in February 2016. He is taking over responsibilities from Armin Singer who already established a reputable number of new accounts in the North American sphere in his time as interims CSO. Loelkes has a strong background in automation as well as tracking & tracing software in various industries. Together with his local team of account managers he will expand the install base of currently already over 60 customers in North America. MPDV offers not only one of the most complete packages for managing shop floors, but also can rely on full local staffing for all project functions on three continents. Loelkes concludes "This offering is attractive to smaller and midsize customers due to its modularity and

New chief sales officer for North America – Dr. Stefan Loelkes

scalability as well as to global corporate customers. Especially the latter ones reward the fact that MPDV has not only a dominating presence in Europe but also strong local representation in North America and Asia and can by that support multi-national deployments."

The sales team was also strengthened by an additional local account manager, Ms. Courtney Heim. Heim has a background in ERP software sales for several years and is an optimal fit for the growing sales team in Chicago.

New consultants

The local team in Chicago has been grown by three new consultants. Ralf Sipmeier is a veteran in lean manufacturing with over 20 years of experience in the automotive industry, now taking senior consulting responsibilities with our North American customers. Just recently Manuel Martinez, a native Spanish speaker, became part of the consulting team for North America, already now taking over first tasks in one of our Mexican projects. Daniel Wittkowsky has been working with MPDV in Germany and relocated to the US to transfer knowledge from the German HQ to the US organization.

Support Center Chicago started!

MPDV USA now also hosts one of the three global support centers of MPDV and is proudly taking one shift of the "follow the sun" support concept of MPDV, when the European or Asian support colleagues are off duty. Support analysts Keith L. Bartelmey and Torsten Mayer each have perennial experience in serving customers in IT support and are happy to receive your calls to help you with any support case!

MPDV USA Inc.
10710 W. 143rd Street, Suite 10
Orland Park, IL 60462, USA
Phone: +1 708 966.4290
E-Mail: info.usa@mpdv.com

Team MPDV USA showed strong presence at major US tradeshows
Highlights from MPDV at MESA and IMTS

With a new trade show concept and latest news on MES HYDRA the MPDV US team showed strong presence at MESA and IMTS.

In May 2016, MPDV USA inaugurated its new trade show booth at the Manufacturing & Technology Conference & Expo at Rosemont convention center, IL. Karl Schneebauer, global alliance manager of MPDV group and MESA board member: "The MESA convention brings together over 800 decision makers from manufacturing industry. As this show and conference is focused exclusively on manufacturing software all major players in the MES field exhibit here." At its brand new booth, the US team secured several very promising leads and deepened the relationship with existing customers.

The second tradeshow highlight of the year was IMTS in September. The team was there with an even bigger booth than at MESA, using 20x20 square feet to show the latest developments of HYDRA. Armin Singer, COO Sales for MPDV USA gave an invited talk on Industry 4.0/IIoT during the 2016 Integrated Industries Conference which was framed by IMTS 2016, in McCormick Convention Center, Chicago, IL. The talk raised great attention and earned very positive feedback from the more than 60 attendees. A lot of them visited the MPDV booth afterwards to further discuss open questions and learn more on MES HYDRA. Overall team MPDV USA looks back on two very successful tradeshows.

New booth concept and a lot of news on MES HYDRA at MESA 2016

Team MPDV USA and Prof. Kletti (on the right) during the opening of IMTS 2016

Industry 4.0 as a driver
MPDV continues to grow in Asia

Close to the 10th anniversary of MPDV's Asia-presence, MPDV is proud of many diverse project experiences as well as organic and controlled growth.

With additional team members Team Singapore can serve local customers even better

From the origins as a small sales office in Singapore, MPDV today maintains a presence of 30 employees in Asia. MPDV Asia Pte. Ltd. in Singapore acts as the Asia base with all operational areas, including Sales/Marketing, Project Services, Support and Solution Development, with a focus on Asian customer requirements.

In China, MPDV Software & Technology Services (Shanghai) Co., Ltd. has a similar setup. However, leveraging on the synergies from the already-existing software development in Singapore, which means same time zone and same language area. In Shanghai, an internal translation team takes care of adapting MPDV's MES Products, their standard documentations, as well as customer-specific project documentations.

Today, both subsidiaries support far more than 50 Asian MPDV MES installations. In Southeast Asia, MPDV supports a lot of so-called "MES HYDRA Template" installations in which local and international companies centrally maintain and control their respective plants, Asia- and worldwide. The close collaboration between MPDV Singapore and MPDV China provides significant advantages for the customers, financially and in terms of support.

News from Team Singapore
A newly introduced Technical Manager position was filled with MPDV'S long-years team lead Johnny Bravenboer. Johnny is now overall responsible for the areas of Solution Development, Customer Support and Implementation Services. At the same time, the vacant position of the Solution Development Team Lead has been filled with new recruit Jikesh Kannan, who brings in vast experience from similar positions.

Furthermore, new positions were created in Sales and Consulting, that have been occupied with experienced local experts.

MPDV China Deputy General Manager Ray Xi Chen

News from Team Shanghai

In early 2016, MPDV could win over Mr. Ray Xi Chen as the lead of the local MPDV Shanghai team. Ray brings in more than 10 years of MES experience in the Chinese market.

Due to the number and the size of MPDV's MES projects in China, the local Consulting Team has been significantly reinforced. Mr. Kjelle Meudt from MPDV Germany has been stationed in MPDV Shanghai as Consulting Head (China), where he contributes his strong MPDV experience, having the mission to build up a local consulting team. Further MES Consultants have been employed, through staff transfer from MPDV Singapore as well as through local recruitment. Thus, our customers will benefit from the expanded resources.

Extended seminar activities

Industry 4.0 has become an important driver in the entire Asian region, for MES-based integration and networking of production data. The already important position of MES in the production environment has been significantly elevated again through the thoughts of Industry 4.0 – particularly in view of connecting the factors machine/workplace, human, material, job order, as well as the department-to-department and plant-to-plant communication.

Southeast Asia predominantly orientates on the German Industry 4.0 standards, whereby China defines own localised programs, such as "Made in China 2025", strongly related to Industry 4.0.

MPDV Asia Pte Ltd
46 Kim Yam Road #01-11 The Herencia Singapore 239351 Singapore
Phone: +65 (6836) 7790

MPDV Software & Technology Services (Shanghai) Co., Ltd
425 Yishan Road Pole Tower, Unit 903 XuHui District, Shanghai 200235 China
Phone:+86 (21 5632) 1032

Highlights from MPDV at IAS 2016
Industry 4.0 with Manufacturing Execution Systems

The Industrial Automation Show (IAS), a themed show under the China International Industry Fair (CIIF), took place on November 1-5, 2016 in the National Exhibition and Convention Center (Shanghai). IAS has become the biggest industrial automation show in Asia in terms of scale and influence and is considered as the industry barometer of China's automation market.

At booth A051 in the "Made in Germany" pavilion of IAS, visitors met MPDV's MES experts and learnt how businesses can prepare their production for the future using a state-of-the-art Manufacturing Execution System (MES). MPDV presented current business trends and new MES solutions that help manufacturers to turn their factory into a Smart Factory. An indispensable tool along the way is an integrated MES such as HYDRA from MPDV. HYDRA manages machines, tools, material, energy and personnel. It visualizes data as flexible dashboards and production KPIs and allows for integrated quality management. This and many other features of HYDRA were showcased live at the MPDV booth.

MES Seminar with MPDV Founder Prof. Kletti
On November 2, during IAS, the 15th MES Development & Application Thematic Meeting organized by CAA, CESA and SAA provided a unique forum for the intersection of science and advocacy on MES and Industry 4.0. As a keynote speaker, Prof. Dr.-Ing. Juergen Kletti, Founder and CEO of MPDV, gave a talk. His subject was "The Way to Industry 4.0 with MES". The key message of Prof. Kletti is that for manufacturers, Industry 4.0 can only work with MES. 150 professional participants attended the seminar which was directly followed by another highlight: the Frost & Sullivan award ceremony.

Frost & Sullivan Award
Directly after his MES seminar Prof. Kletti received the Frost & Sullivan "Best Practice Award 2016" for Customer Value Leadership – IIoT-based MES Platform for Discrete Manufacturing. MPDV already received a Frost & Sullivan "Best Practice Award" in 2010 and 2011. For more information on the award, please have look at page 28.

Chinese MES Expert Book
MPDV is a pioneer in spreading the MES concept and published a large number of MES books over the years. During IAS, the Chinese version of the bestseller "HYDRA Manufacturing Execution System Guide Book – A Perfect MES Solution" was presented for the first time.

Prof. Kletti and Prof. Shen signed 100 copies of the Chinese version of MPDV's bestseller "HYDRA Manufacturing Execution System Guide Book – A Perfect MES Solution"

MPDV launched the new book during the MES Seminar, to allow visitors to get an exclusive preview of the book. Visitors met the author (Prof. Kletti) and the translator (Prof. Shen) and received a signed copy of the book. The crowd was huge and in the end 100 books were given out. The event was noted broadly and local media interviewed Prof. Kletti.

For Team Asia IAS 2016 ended as a huge success with a big leap forward towards a broad recognition as an MES supplier in the Asian market.
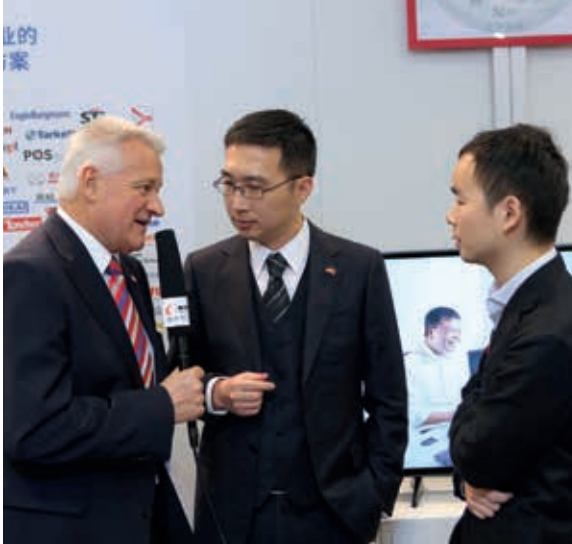
Prof. Kletti and Ray Chen during an interview with local media

The presented MES solutions raised broad interest and constant traffic at MPDV's booth

Cooperations and partner networks in Asia
Jointly spreading the MES concept

Growing local teams with strong expertise in MES and a vision of Industry 4.0 is one important factor to be successful in the MES market. Having established local partners and networks that help spreading the MES concept by organizing seminars and road shows is yet another key to success.

Additionally, MPDV Shanghai closely cooperates with the renowned Tongji University in Shanghai, and organizes joint seminars on "Industry 4.0 with MES4.0", adapted to local requirements. Within Tongji University, the established Advanced Manufacturing Technology Center (amtc) will also be equipped with a HYDRA demo system.

"Industry 4.0 with MES4.0" seminar at Tongji University

To reach all potential MES users in China, MPDV Shanghai strongly engages in respective partner networks and works closely with MPDV's Global Alliance Manager, Mr. Karl Schneebauer from the German headquarters. Established industry partners ensure the geographical reach towards users in remote cities and furthermore open the door on cultural- and relationship-basis.

To this end, MPDV Shanghai conducted a very successful Industry 4.0 seminar in June 2016, in cooperation with JNRS, a renowned manufacturer and service provider for factory automation in the area of CNC precision machining. Furthermore, MPDV Shanghai looks back on a successful participation at the CIMES exhibition in Beijing in June, 2016.

In the follow-up activities of the respective seminars and events, both MPDV Sales and Consulting teams in Southeast Asia and China have been heavily involved with customers and prospects, to further exploit the potentials of "Industry 4.0 with MES4.0" through MPDV's MES

Products portfolio. Firm service orders and contracts for MES concept establishments could be achieved. Further expansion of the seminar and event activities towards Beijing/China, Bangkok/Thailand and Jakarta/Indonesia are being scheduled. Dates and locations will be posted on www.mpdv.com.
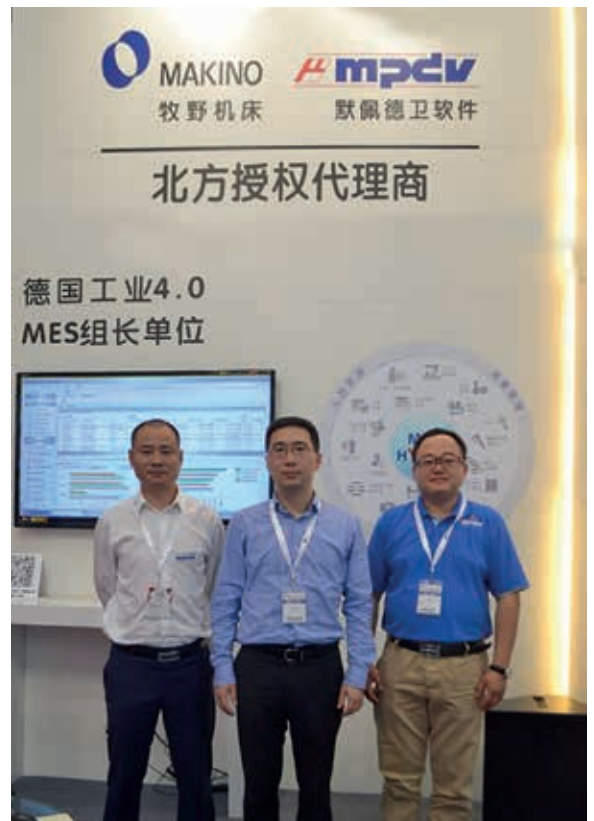
Team Shanghai at CIMES in Beijing

Joint activities with JNRS

> **Sascha Graef, Managing Director Asia/ General Manager China, concludes:**
> Our Singapore and Shanghai teams can be very proud of their achievements of recent years. We highly appreciate our customers, some of them have taken a long and loyal journey with us. The effort and patience of all team members – also during economically challenging times like during the banking and economic crisis 2009 – is paying off today. We soberly yet optimistically look forward into the future.

www.hirschvogel.com

Hirschvogel Automotive Group

The Hirschvogel Automotive Group is considered one of the most successful manufacturers of forged steel and aluminum components. With more than 4,000 employees worldwide, the company produces forged parts and components for the automotive industry and their system suppliers. In 2014, the Group had consolidated sales of 869 million euros while outputting 309,000 tons of forged parts.

In addition to the MES HYDRA that the Group has been using for many years, it also wanted to implement a comprehensive KPI system. With such a system in place, it would be easier to access evaluations from all production locations as well as to compare machines across all locations.

To achieve this, Hirschvogel introduced the MES-Cockpit Applications in the fall of 2014. In contrast to an independent Business Intelligence (BI) tool, the MES-Cockpit Applications already include prepared evaluations and process the data collected by HYDRA seamlessly. The automotive supplier relies on a combination or predefined functions and evaluations configured in-house. The focus is on various rates of capacity utilization as well as on evaluating quantities and status classes. For this purpose, individual machines or individually selected groups can be evaluated and compared flexibly.
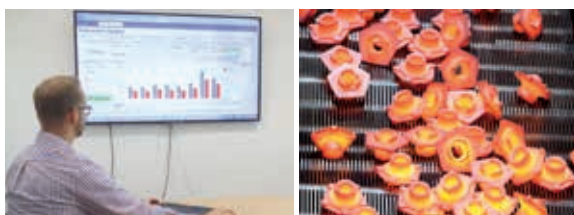
In order to be able to adapt the evaluations to the individual requirements, Hirschvogel attended not only the basic application training, but also the corresponding customizing training. Combined with the Development Suite licensed especially for this purpose, the trained employees can now modify the existing evaluations, create new dashboards and define their own KPIs.

In the long term, more and more users will be able to access production data collected by HYDRA using the MES-Cockpit Applications. To this end, Hirschvogel plans to implement additional evaluations, for example the machine time profile and a graphical visualization of the machinery.

Currently, Hirschvogel is using MES-Cockpit Applications in combination with HYDRA at six locations in Germany, Poland, China and the United States. A roll-out is planned for the plant in India in 2016.

❝ Reiner Gebhardt, Stabstelle COO Hirschvogel Holding GmbH:

One of the greatest benefits is that MES-Cockpit Applications allow us to illustrate our KPIs across different plants. In the process, we remain flexible with regard to the definitions of the set KPIs, which we can adjust according to our needs in-house any time we need. The ability to individually adjust standard views enables employees to create customized evaluations. This ensures that we can work individually, but still have access to standardized results. This also fosters acceptance to work with the system and to take advantage of its benefits. ❞

www.hansgrohe.com

hansgrohe

Hansgrohe is one of the few global players in the sanitary sector consisting of 34 companies and 21 sales offices. In 2015, the business had a turnover of 964 Mio Euro employing more than 3,800 people. Hansgrohe, headquartered in Schiltach/Germany was founded 115 years ago and gained a reputation as an innovator in technology, design and sustainability in the sanitary sector.

In 2012, Hansgrohe issued a tender for a Manufacturing Execution System (MES) to achieve four main goals:

1. Increasing transparency and reactivity in production
2. Reduction of waste and idle times
3. Implementation of an efficient shop floor management
4. Facilitating planning processes and increasing process stability

After a pilot phase, Hansgrohe gradually introduced the integrated MES HYDRA to the sites in Offenburg/Germany, Shanghai/China and the headquarters in Schiltach/Germany. The following modules were installed: machine data (MDE), shop floor data (BDE), DNC & configuration data (DNC) and shop floor scheduling (HLS).

The collected machine data are mainly used in the evolving shop floor management. Besides printed reports and graphics 14 monitors installed in the production hall provide information on current KPIs. This guarantees that each employee is updated on events in production which promotes employee motivation and sense of responsibility for their own working area.

The additional collection of order and shop floor data provides more transparency. With HYDRA, Hansgrohe now has a valuable tool to optimize its production planning. Confirming real-time data from the shop floor enables planning against real capacities and guarantees reactivity and production control. To facilitate setup processes, Hansgrohe uses HYDRA DNC for transferring configuration data.

> **❝ Thomas Schüßler,
> Vice President Production Hansgrohe SE:**
> Our plan to combine the introduction of HYDRA with our evolving shop floor management has proven successful. HYDRA is a vital tool to obtain information and to control production for all employees. We cannot imagine our daily routines without HYDRA. **❞**

www.hella.com

HELLA is a global, independent, family-owned company that employs some 32,000 members of staff at over 100 locations in more than 35 countries. With annual sales of around 5.8 billion Euros in the fiscal year 2014/2015, the HELLA Group is among the top 40 automotive suppliers in the world. The range of products offered by the Lighting Division includes headlights, multifunction lamps, interior lights and lighting electronics, which are produced at the production sites in Germany, the Czech Republic, Slovakia, Slovenia, Mexico and China.

A comprehensive Manufacturing Execution System (MES) was to be introduced as a supplement to the shop floor. The MES was supposed to cover a variety of production areas (e.g. plastic injection molding, painting and packing locations) in one system.

After extensive market research and a successful pilot project at the production location in Lippstadt, the Lighting Business Division is now introducing MPDV's integrated MES HYDRA step-by-step and around the world. In the final stage, around 700 workplaces and machines of various types and manufacturers will be connected to HYDRA. HELLA's main focus will be on collecting and processing shop floor and machine data. Process data as well as the central administration and automatic use of DNC configuration data will supplement the scope

of functions on relevant machines. Basic order data and master data for the machinery will be downloaded using the certified interface from the leading SAP ERP system.

In addition to the entry dialogs customized for HELLA to improve operating ergonomics, the large number of large screens with real time information are evidence of the intensive use of the HYDRA MES in everyday production. HYDRA depicts multi-level orders in addition to Kanban processes and automatically generates master reports as well as management status reports.

HELLA itself equips other divisions and plants with HYDRA on its own. They implement the roll-out with a central core team from Lippstadt, an international MES-IT corporate department and a group of local experts at each particular production site. In this regard, HELLA benefits from the international MPDV offices in the United States and in China, which offer HYDRA trainings in the national language.

> **❝ Dr. Jan Niestadtkötter, Project Manager Production, Lighting Business Division, HELLA KGaA Hueck & Co.:**
> With HYDRA we have found an MES whose standard version already supports a huge part of our production processes. The consistent use of the system helps us to successively achieve more stable processes and higher productivity. ❞

Integrated MES for more productivity and efficiency
Energy – expensive yet indispensable

Nowadays almost nothing runs without energy. However, that energy can not only be used to run machines, but also to optimize production has now been proved by plastics processor Ruch Novaplast – with the integrated manufacturing execution system (MES) HYDRA.

On the introduction of HYDRA, the fog started to lift for Mathias Schmälzle, Head of Controlling and responsible for the introduction of MES at Ruch Novaplast. Since then the capture of real-time data in manufacturing has made it possible to calculate KPIs such as OEE (overall equipment effectiveness) and is ensuring greater transparency and efficiency at both production sites, in Germany and in the Czech Republic. Since 1960 the medium-sized plastics company Ruch Novaplast has been producing molded parts made of EPS and EPP particle foams and, with its 180 employees, is one of Europe's market leaders in this sector.

Mathias Schmälzle explains: "For our colleagues in manufacturing the use of the MES is just as natural and indispensable as the use of the ERP system in administration. The MES HYDRA offers us all the functions we need in order to monitor and control our production. The productivity KPIs are automatically generated by the MES. Even in the first 24 months after introducing the MES we were able to significantly improve our OEE index."

Simple data capture in the field

The extension of the existing MES installation by adding the energy management module was a quantum leap. In production, Ruch Novaplast needs both compressed air and steam in production. While a compressor generates compressed air, as in most factories, steam is produced by heating water with a gas burner. In total, all energy costs account for up to 15 % of total expenditure. The HYDRA energy management system, with numerous evaluations and KPIs, creates the conditions for recording energy consumption and optimizing it as far as possible.

Ruch Novaplast uses WAGO automation technology for collecting energy data. An Ethernet-I/O module with signal inputs records the use of steam in kilograms and that of the compressed air in cubic meters. In addition, the gas consumption to generate steam and the electricity needed to generate compressed air are captured centrally. Steam and compressed air consumptions vary from article to article. However, when looking at several consecutive cycles,

MPDV's interface module makes the recording of energy consumption easy

Mold production of all kinds at Ruch Novaplast

Everything from one system:
data entry at the shopfloor terminal and information for all directly in the production hall shown on a flatscreen

they develop consistently which allows a failure to be determined in the system when there are excessive patterns of consumption. This allows to determine for example a leaky valve or a crack in one of the lines not only visually but also in the MES, so that servicing can be initiated in a timely manner.

Compare, optimize, visualize

HYDRA correlates concrete energy consumption data to the machines, the registered orders and the machine status. This allows conclusions to be drawn as to which machine manufactures an article most efficiently and when does it pay to turn one off. Especially the energy consumption in stand-by mode contains savings potentials. Evaluations of this type are, however, only possible since Ruch Novaplast records the energy consumption in the integrated MES HYDRA.

As in other disciplines, KPIs simplify the overview of complex connections. For example, the energy consumption per good part provides information on the efficiency of a production step,

provided there is a target setting. Also, the consumption per working hour or during stand-by mode allow machines to be compared. However, even meaningful KPIs will not help if no one knows them. This is why Ruch Novaplast visualizes these on to the shop floor terminal directly at the machine as well as on large flat screen monitors placed in the production hall. The added transparency increases the awareness of the employees for their own work and provides extra motivation. What matters most in the end is that there is a bit of improvement every day. Occurring failures are determined early and countermeasures are taken even faster.

Energy: more than just a consumable resource

In the end, energy is not only a necessary, but also a very expensive consumable resource for companies such as Ruch Novaplast. These are a means to an end of optimizing production processes. As Mathias Schmälzle confirms, "HYDRA Energy Management has brought new life into our production halls and helps us to continue to offer functional solutions with an added value to our clients. In addition, we not only have further energy-saving potentials, but are also expanding our environmental management." As such, energy management now has three relevant optimization aspects: economical, ecological and organizational.

Ruch Novaplast: The plant in Oberkirch (Black Forest, Germany) is one of the largest productions of molded parts in the industry

MES HYDRA

We report briefly in the Project Ticker about some of the companies having decided to use the MES solution by MPDV.

Barat Ceramics, Germany

At the Auma-Weidatal site, the manufacturer of technical ceramics uses the HYDRA modules BDE and MDE as well as HLS for the fine planning subordinate to SAP.

Bosch Petfood Concepts, Germany

Located in South Germany, acting worldwide, the producer for high-quality animal food decided for MES HYDRA. The modules BDE, MDE, HLS, PDV, WRM, MPL, TRT, DNC, PZE/PZW, PEP, ZKS and LLE will used at the company headquarters in Blaufelden.

BQHY, China

BQHY is the joint venture company of China BAIC and Korea Hanil E-HWA and produces automotive interior parts. The current project scope includes the implementation of BDE, MDE, MPL, WRM, and CAQ. The go live rollout is expected for late 2016. The goal of this project is to set up benchmarks in the business and potentially rollout to the ChongQin Plant.

Buschhoff Stanztechnik GmbH, Germany

The Cologne family business will be using HYDRA BDE and MDE for metal processing and production of stamped parts.

Diehl Metal Applications GmbH, Germany

The automotive supplier and metal processor will use the solution developed for the Röthenbach site also at the Berlin site. The Diehl Template (BDE, MDE, PZE/PZW, ZKS and PEP) will be used.

Diehl SynchroTec Manufacturing (Wuxi) Co. Ltd., China

With the Chinese plant Wuxi (Jiangsu) yet another subsidiary of the long-standing HYDRA user Diehl Metal counts on MES HYDRA. The implementation of the complex Diehl Template with the modules BDE, MDE, HLS, MPL, WRM, PZE / PZW, ZKS and PEP will make the production of synchronizer rings in the Asian region more efficient.

Eisfink Max Maier GmbH & Co. KG, Germany

The leading provider of kitchen technology for the professional catering and the private household decided for MES HYDRA and the use of HYDRA BDE and MDE at the Reutlingen site. An expansion to WRM and EMG is planned for the near future.

EMKA Beschlagteile GmbH & Co. KG, Germany

EMKA is the world leader for locking systems, hinges and sealings, which are used in cabinets and control cabinets for electronics and electrical engineering. The company is introducing the HYDRA applications BDE, MDE and EMG and also relies on MPDV's Smart MES Applications (SMA).

GPE Systeme GmbH, Germany

As a supplier of plastic and metal system components for numerous industries, among others Medical and automotive, another global player decided for MES HYDRA. GPE will be using BDE and TRT.

KangHua Plant, Metal Business Unit, China

In June 2016 YFJC went live with the HYDRA modules BDE, MDE, MPL and HLS. A complex interface with ESB / WMS / SAP was implemented. The main goal is to enhance the transparency and traceability of the KangHua Plant. A rollout to seven other metal plants and business units in China is in discussion.

LEONI AG, Poland

During the pilot phase of the planned, worldwide HYDRA rollout, the polish subsidiary of LEONI AG will implement the modules MDE, PDV and EMG for cable production.

Magna Mirror TianJin, China

Magna Mirror TianJin is one of the global accounts of the Magna group. For the existing scope, the project includes the introduction of the HYDRA modules BDE, MDE, and HLS. MPDV is currently working with the Magna Global IT team to discuss the potential roll out to other Magna sites in China.

OVD Kinegram AG, Switzerland

The world's leading manufacturer of optical security features for the protection of governmental documents and banknotes, located in Zug, Switzerland, counts on MES HYDRA. The modules BDE, MDE, WRM, HLS, PZE/PZW and PEP are being used.

Panduit, USA

Following the successful initial implementation of the HYDRA modules BDE and MDE at the Costa Rica site, the company plans the rollout to 10 additional plants. In a further step, the installation will be expanded by the WRM module. Panduit manufactures electrical and network engineering products as well as cabling worldwide.

RECARO Automotive GmbH & Co. KG, Germany

At its Kirchheim/Teck site, the world famous manufacturer of car seats is counting on MES HYDRA. In use are the modules BDE and MDE. RECARO Automotive Seating is a product group of Johnson Controls.

Rollout KIRCHHOFF/ Van Rob, Mexico / USA

The HYDRA competence team at Kirchhoff Automotive has independently rolled out the HYDRA modules BDE and MDE at the sites in Lansing (Michigan/ USA) and Querétaro (Mexico).

Safran Morpho Cards CZ, Czech Republic

The global leader in security and identity solutions is going to rollout the HYDRA applications BDE, MDE, HLS MPL and TRT to their plant in Ostrava, Czech Republic.

Sin Kwang Plastic & ATA Industrial, Malaysia

The two Malaysian suppliers and operators of assembly lines for the Dyson Group – known for vacuum cleaners and fans – are introducing HYDRA applications BDE, MDE, MPL, TRT, HLS, PMV as well as escalation management.

Storopack, France / Spain

HYDRA modules BDE and MDE are rolled out to the Storopack sites in France and Spain. The company produces transportation and protective packaging as well as technical molded parts.

Tente Rollen GmbH, Germany

At the headquarters in Wermelskirchen the company produces castors and wheels for medical beds, shopping cart, furniture and transport trolleys. With the introduction of HYDRA MDE, BDE, HLS and WRM efficiencies in production will increase. Personnel scheduling will be done using MES too.

ThyssenKrupp Bilstein of America Inc., USA

The HYDRA modules BDE, MDE, HLS, PDV, MPL and TRT will be introduced at the Hamilton, OH (USA) site. The company is already using them at the plant in Mandern (Germany).

Xingye Copper International Group Ltd., China

XingYe Copper is one of the long-time customers of MPDV China. It is listed on the HongKong stock exchange. Multi phases for long run are planned for Xingye. The purpose is to establish a "Model Smart Factory" for the metal business.

Yanfeng Johnson Controls Seating Co. Ltd., China

China's industry leader for the production of car seat systems located in Shanghai will implement HYDRA applications BDE, MDE, HLS, MPL and TRT. This will optimize assembly and welding processes for the construction of car seats.

Zhuzhou torch spark plug Co. Ltd., China

Torch Plunge is a subsidiary of WeiChai Power, one of the most important automotive part suppliers in China. The entire project was divided into 3 phases: Phase 1 BDE, MDE, MPL go live in A1 Plant in April 2016; Phase 2 CAQ of Plant A2 is currently in progress and expected to go live in August 2016. Phase 3 roll out to the A3 plant is expected complete by the end of 2016.

Legend of the abbreviations:

Access Control (ZKS), Complaint Management (REK), DNC & Configuration Data (DNC), Energy Management (EMG), FMEA (FMEA), Incoming Goods Inspections (WEP), In-Production Inspection (FEP), Machine Data (MDE), Material and Production Logistics (MPL), Personnel Scheduling (PEP), Personnel Time Management (PZW), Premium and Incentive Wages (LLE), Process Data (PDV), Shop Floor Data (BDE), Shop Floor Scheduling Detailed Planning (HLS), Test Equipment Management (PMV), Time & Attendance (PZE), Tools and Resources (WRM), Tracking & Tracing (TRT)

More about MPDV, MES and effiency in production

www.mpdv.com

MPDV Mikrolab GmbH
Headquarters
Römerring 1
74821 Mosbach
Germany
Phone +49 6261 9209-0
info@mpdv.com

MPDV Schweiz AG
Zürcherstrasse 83
8500 Frauenfeld
Switzerland
Phone +41 52 7283 900
info@mpdv.ch

MPDV USA, Inc.
Headquarters – Chicago
10730 W. 143rd St., Ste. 32
Orland Park, IL 60462
USA
Phone +1 708 966.4290
info.usa@mpdv.com

MPDV Asia Pte Ltd
46 Kim Yam Road
#01-11 The Herencia
239351 Singapore
Singapore
Phone +65 6836 7790
info@mpdv.com.sg

**MPDV Software & Technology
Services (Shanghai) Co., Ltd.**
425 Yishan Road
Pole Tower, Unit 903
XuHui District, Shanghai 200235
China
Phone +86 21 5632 1032
info@mpdv-china.cn