

PRODUCTION manager

Magazine for logistics & production



How Tenaris builds its world's most advanced plant with the help of a competence center

The Quest for Excellence

User Report

Maximum Flexibility for the
Nosta Group
WMS for Cross-Site Process
Control

Product Review

PSIPENTA/MES Supports
Companies Moving Toward
the Smart Factory
MES Reinvented

Interview

Dr. Rudolf Felix Talks
About AI in Industrial
Business Processes
Qualitative Labeling with
Deep Qualicision AI

EDITORIAL

Dear readers,

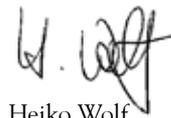
We help our production and logistics customers, as well as energy suppliers and infrastructure operators, to optimize processes, increase their competitive edge and achieve continuous innovation through digitization. There has been much talk of digitization in the context of Industry 4.0. For a number of years now, it has been fundamentally changing all areas of daily life and industry. Even today, complex production processes can only be controlled with the help of integrated IT systems, and it will only be possible to achieve the desired efficiency improvements and implement innovation processes in the future through further digitization.



Digital transformation is not an isolated step. It is not about introducing a single system, or a one-off change of working methods. It is a process of continuous analysis and improvement—a fact that we will be emphasizing in the slogan of our METEC appearance this year: the journey.

Each journey begins with a single step. Ours began with software for controlling operations in a hot strip mill 50 years ago. Since then, we have been supporting our customers on all continents in their digitization processes. We look forward to working with our customers for many more years and facing new challenges in the digital transformation.

Warm regards



Heiko Wolf
Director PSImetals FutureLab

CONTENTS

COVER STORY

The Quest for Excellence 3

USER REPORT

WMS for Cross-Site Process Control
at the Nosta Group 6

NEWS

Steel Manufacturer Gerdau S.A. Increases
Output with PSImetals 7
Smooth Migration: PSIpenta Version 9.2
at Hargassner Heiztechnik 19

PRODUCT REPORTS

PSI Java-Based Framework: Complete Overview
with one Click 8

Expansion of the Plant Monitor in
PSImetals Release 5.18 12
MES Reinvented 13
Predictive Maintenance:
Qualitative Labeling of Machine Data 16

INTERVIEWS

"Everything is a Workflow" 10
Qualitative Labeling with Deep Qualicision AI 14

EVENTS

Trends in the Digital Transformation 18
Events 19



How Tenaris builds its world's most advanced plant with the help of a competence center

The Quest for Excellence

Competition is more and more a question of good time management. It's not the big companies swallowing smaller ones, it's the fast overtaking the slow in a race for the dream customer. The so-called "Center of Excellence" or competence center contributes significantly to winning this race. It helps companies with client acquisition and provides a deep understanding of their industry. Many companies in the steel industry are also interested in establishing competence centers, for example for the implementation of a production management solution. This approach was met with great success at Tenaris, one of the world's leading suppliers of tube products, together with PSI.

On December 11, 2017, Tenaris unveiled its \$1.8 billion state-of-the-art seamless pipe mill in Bay City, Matagorda County, Texas. "TenarisBayCity shows our commitment to domestic manufacturing, competitively supplying the US oil and gas industry," said Tenaris Chairman and CEO Paolo Rocca in

his inauguration speech. "This mill, which incorporates the most advanced technologies available worldwide, will lead our domestic industrial and service network dedicated to the US market," he added.

The 1.2 million square foot mill combines a high level of automation and cutting edge technologies. Seeking

the most widely used green building rating system in the world, LEED (Leadership in Energy and Environmental Design) certification, TenarisBayCity is the company's most environmentally efficient mill. Its strategic location near key shale enhances its ability to quickly supply high quality products to customer operations. With the plant's annual capacity to produce 600,000 tons of OCTG (Oil Country Tubular Goods) Tenaris has strengthened its position as a leading producer of seamless pipes for the oil and gas industry, worldwide.

One year before the announcement of the TenarisBayCity project in 2013, Tenaris decided to implement PSImetals as a MES platform at its welded tube production facility in

Conroe, Texas. For this purpose, the company established a competence center consisting of its own employees in Veracruz, Mexico and Buenos Aires, Argentina. This was the first step in defining Tenaris' vision and strategy for a rollout within a multi-site environment.

The First Steps

After an extended proof of concept in 2012, Tenaris decided to implement PSImetals as its future MES platform in the company's welded pipe plant in Conroe, Texas. The main goals of the project were to improve business processes and staff effectiveness, dig-

was responsible for one big module: data base administration, GUI development, order dressing, quality, and production and material management.

The CoE team worked closely with PSI experts, especially in the areas of specification, configuration, customi-

zation, and implementation, as well as in go-live and maintenance spheres. Daily meetings in order to plan, evaluate and/or distribute the tasks, as well as comprehensive trainings and mentoring support from the PSImetals Academy, were an integral part of the competence team's everyday life.

The Conroe plant went live in 2014. With an established competence center and the know-how gained from it, the experts have then em-

barked on the second project—the TenarisBayCity plant.

More Independence

The comprehensive training, mentoring and coaching PSI experts provided on the Conroe project, ultimately gave the TenarisBayCity greater independence. Thanks to this support from PSImetals, the Tenaris CoE team was able to execute 80 percent of the project work themselves, while PSI took on a consulting role and provided a few additional training sessions. The main goals of the project were flexible order dressing, a high degree of automation as well as high visibility and transparency test results.



Construction of the rotary furnace in TenarisBayCity.

Internal Bundling of Competencies

A CoE is a cross-functional team that focuses on a specific area within an organization. Its aim is to achieve business objectives efficiently by continuously transferring knowledge and promoting the pooling of resources and competencies. This improves the processes within a company sustainably, leading to consistent and efficient results.

By reducing IT and process costs through defined procedures and templates and by eliminating inefficient practices, a competence center also reduces the time required to implement new technologies and acquire new competencies.

italize data, reduce costs, standardize procedures and centralize order dressing to effectively target customers and markets. After several technical and organizational difficulties during the complex implementation process in 2014, Tenaris decided to establish an internal CoE in order to increase flexibility and reduce costs for future rollouts.

An Expert for Each Module

The competence center focused on establishing the technical aspects of the project. To this end, the head of the CoE recruited five talented professionals who met the tailored requirement profiles. Every professional

Since the launch of the TenarisBayCity plant in 2017, it has been following the latest requirements on digitalization process transparency across each stage of production. For example, the mill has an extensive US OCTG product portfolio, a high integration degree with L2 and ERP as well as a highly automated lean production process that ensures no more downtimes due to logistics reasons. An optimization of all transports and a full error and defect analysis complete the profile of the world's most advanced pipe manufacturing facility.

Lessons Learned

Whether or not a company should establish its own CoE greatly depends on the scope or level of services it wants to address, the structure of the company, its objectives and its strategy. Based on Tenaris' experience, there are some aspects that should be taken into consideration when establishing a CoE.

Firstly, the company should define and discuss the purpose of the competence center and how it will operate. This will clarify the governance of the center, its most optimal strategy as well as its most efficient functionality. Secondly, the company should define main goals for its CoE. With clearly



The Tenaris competence center team.

defined goals it is easier to measure effectiveness and success of the competence center. In this regard, it is important that the head of the CoE

Interview

Marcelo Llambias, IT Senior Project Manager Tenaris

PSI: What role did the CoE play within the greater organization of Tenaris?

Marcelo Llambias: The relationship was very open. Employees from all areas had the opportunity to exchange visions, interactions and design processes. Regular user meetings were arranged to review requirements, analyze solutions, define priorities, etc.

PSI: What were the main challenges in working with a CoE?

Marcelo Llambias: The greatest challenge was to define and develop the resources in our CoE. Conroe's project experience and the trainings provided by the PSImetals Academy were very important. Another challenge was the coordination of resources: our

team consisted of experts from Argentina, Mexico and Berlin. Consequently, maintaining the source code that defines the deliveries was very important.

PSI: What made PSI the right partner for this project?

Marcelo Llambias: The product and the people! PSI has extensive knowledge in the metal industry and the experience gained in many implementations for various customers has been translated into product improvements. PSI has supported us openly and enthusiastically in establishing our competence center. The experts trained our team, shared their know-how, supported us in the technical implementation and defined the scope of work based on our capabilities.

takes part in the team recruitment process after defining tailored profiles of professionals required. Only in this case, he or she can select the right experts to do the work and ensure the quality of the competency center. Building a small core team at the beginning of a project and gaining experience step by step is key.

Thirdly, there is no perfect size of a CoE. It is more important to assign every big module to one well-skilled visionary who focuses his or her work on this special field. This ensures the depth of knowledge in every single module, which is crucial regarding the complexity of the particular system.

Fourthly, the company should outline the role of the CoE within the

greater organization and understand the needs of the CoE team so that employees can work more efficiently and achieve better results. One of these measures could be flexible working hours that allow employees to make the most of their performance curve. Finally, the most essential part of creating success is to define a clear vision of the CoE. With a clear vision, a clear set of goals and an early start of trainings, the CoE is most likely to improve the business. 🌀

PSI Metals

Swetlana Maschinez
Marketing Manager
smaschinez@psi.de
www.psimetals.de

User Report: Maximum Flexibility, Transparency and Cost Benefits for the Nosta Group

WMS for Cross-Site Process Control

By coordinating its processes across multiple sites and warehouses with the PSIWms warehouse management system, full-service logistics provider the Nosta Group is enjoying maximum flexibility, transparency and cost benefits in contract logistics. The option to configure the solution independently also represents a central component in the design of custom logistics concepts and customer-focused solutions.

Founded in 1978, the Osnabrück-based Nosta Group is a successful logistics provider that offers a complete range of services through its five business units: Road, Sea & Air, Rail, Warehousing and Logistics. The Group operates twelve of its own warehousing sites, which form a central part of its contract logistics business. At these sites, Nosta takes over all logistical tasks for its customers, from storage to IT-supported order processing, order picking and value-added services (VAS), right through to preparation for dispatch. The PSIWms warehouse management system is the IT solution at the heart of logistical processes for the eight warehousing sites with the most complex material flows. The logistics service provider has been relying on this IT system from the PSI Logistics Suite since 2007. "We had previously had bad experiences with small software vendors and isolated solutions," explains Rainer Mönning, IT Process Manager at the Nosta Group. "They had unnecessary interfaces and offered no transparency over stock levels and processes. Thus, investment security, future security



Processes coordinated across sites with PSIWms at Nosta.

and the range of functions offered by the product standard were key decision-making criteria for a new warehouse management system."

Direct Import of CSV Files

In addition to its comprehensive functionality and performance, the multi-award-winning PSIWms is designed for a custom configuration. This gives users the flexibility to adapt much of the IT system to their own individual requirements, independently of the manufacturer. The ability to update the system and install new releases also underlines its investment and future security. And this is certainly the case at Nosta. "With the option of self-configuration, we have been able to adapt PSIWms exactly to our needs over the years," says the IT Process Manager. Mönning also thinks that the ability to import CSV files (comma-sepa-

rated values) directly into PSIWms and use them in the system is an extremely useful and time-saving option. The service provider has come to appreciate the advantages of customization in everyday business processes, especially

in its forklift-operated block storage areas and high-bay racking. "It may be the case that we need to relocate clients from one site to another," says Mönning. "PSIWms makes this easy. We can keep track at all times of which employee is working on which client and at which location, and maintain a complete

overview of each client's order data and stock levels across all sites."

“ With the option of self-configuration, we have been able to adapt PSIWms exactly to our needs over the years.

Rainer Mönning
IT Process Manager
Nosta Group

Future-Oriented Investment

The multi-user and multi-site compatible PSIWms is installed only once, at the Nosta Group's Osnabrück headquarters. The individual warehouses are managed from here with virtually and logically sepa-

rated systems. This makes it impossible for any accidental changes to be made to other locations. The complete overview is only accessible to defined superusers. In addition, each site can be individually shut down and serviced, or its configurations can be modified. The



Nosta warehouse.

Nosta Group has been able to expand on these benefits with the option to upgrade PSIWms and install new releases. As a special feature

of the solution, PSI Logistics separated product standards and individual configurations during product development.

PSI Logistics GmbH

Phillip Korzinetzki
Marketing Manager
p.korzinetzki@psilogistics.com
www.psilogistics.com

When switching to a current release of PSIWms, the new functions of the product standard can be used while customer-specific adaptations are retained. "Our choice of PSIWms as a future-oriented investment has been more than justified," says IT Process Manager Mönnig. 

News: Steelmaker Gerdau S.A. achieves strong benefits with new functions in PSImetals

Successful Partnership

Brazilian steelmaker Gerdau S.A. has achieved significant performance improvements with the implementation of new functions in the Plate Combiner as part of the production management software PSImetals/Planning, which were designed together with PSI Metals.

Gerdau has started the plate mill operation in September 2016 and successfully entered the flat steel market together with the hot strip mill.

Their first version of the Plate Combiner already provided an excellent standard: the designed mechanical yield had an average of 88 percent and the percentage of unallocated plates was around 1.4 percent.

An improved algorithm enabled a consistent reduction from 2.0 percent to 0.4 percent of the production of unallocated child slabs, which corresponds to 80 percent reduction.

Higher Quality

An example: assuming a theoretical slab consumption of 50 000 tons in the plate mill, the amount of slabs to be cast in order to satisfy the same demand could be reduced from 51 000 tons to 50 200 tons. This represents 800 tons of avoided stock slabs per month and 9 600 tons per year. The significant reduction of stock slabs was achieved with no negative impact on any other performance indicator. The amount of unallocated plates and mechanical yield remained stable. Furthermore, additional features like new reports support Gerdau to continuously keeping the product engineering systems up to date. Plus, a new

constraint was created for the maximum spreading index. When converting slabs into plates, the width spread index must be limited in order to avoid a quality defect known as 'barrel defect'. The new system was tested in parallel with the existing one for many weeks with daily updates on the input data based on updates of the real demand.

Gerdau S.A., headquartered in Porto Alegre in Brasil is one of the main steel suppliers of long steel in the Americas and special long steel worldwide. The company has an installed production capacity of over 21 million tons of steel per year, and is also the largest steel recycler in Latin America. 

PSI Metals

Swetlana Maschinez
Marketing Manager
smaschinez@psi.de
www.psimetals.de

Product Report: Java-Based Framework for Modifiability and Integrated Networking of Systems

Complete Overview with one Click

The Group-wide, standardized programming basis PSI Java Framework (PJF) enables cross-system integration of functionalities that differentiate a company from the competition. It also meets the requirements of modifiability and integrated networking of IT systems. Automation and digitization, and therefore the increasing implementation of Industry/Logistics 4.0, are making rapid headway within companies. Particularly in employee-intensive sectors such as logistics, the automation of processes opens up potential for optimization and increases efficiency.

Plant manufacturers cover this with layouts that can be consistently tailored to individual requirements with modular system components. If a design is to be future-proof, it requires systems that are stable yet flexibly modifiable. This applies to both the hardware of the operational intralogistics and to the enabler of the processes, the controlling IT infrastructure in each case. Their flexibility and modifiability are based on future-proof architecture, as well as the option to upgrade the software systems and install new releases.

More Competitive Advantages

These attributes make it possible to continuously integrate current tech-

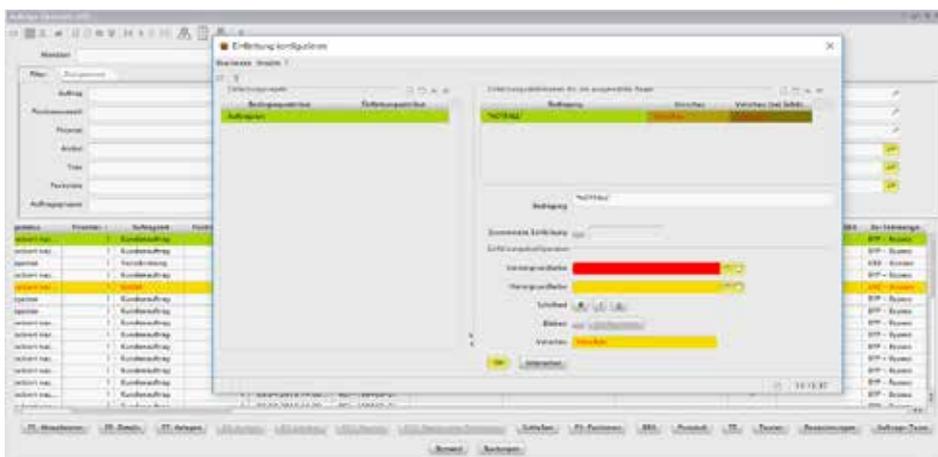
nological developments and solution options into market-oriented software products and to generate further optimizations on this basis. The use of new technologies and the data-based integration of all value-creation processes offer competitive advantages.

Against this background, PSI has created a unique development environment with a standardized programming basis in the form of the Java-based framework, and established it throughout the Group. It enables new and innovative program functions, applications and technologies developed in the individual business units of the PSI Group to be easily integrated into all other products.

PSI Logistics, for example, together with PSI FLS Fuzzy Logik & Neuro Systeme used functions of the optimization software Qualicision to issue a proof of concept for a baggage handling system at Hamburg Airport that is based on artificial intelligence (AI) methods. This involved the development of a neural network for AutoID, documentation and tracking with surveillance camera systems, CCTV (closed-circuit television), and integration into the process-controlling airport system from the PSI Logistics Suite.

Integration of Future Technologies PJF therefore supports the requirements for modifiability and integrated networking of systems. This is because it lays the foundation for the integration of future functional requirements and technologies that are still hard to predict, such as artificial intelligence (AI) methods, and offers users not only long-term stability and an individual system design, but also maximum investment security.

The result of this mutual integration capability of modules and functionalities of the software products developed within the Group is individual systems based on configurable standard modules with the most extensive range of functions. "Users can access a complete IT infrastructure with conflict-free networking from a single source, from supply chain planning to production planning, enterprise resource planning and TMS systems, right through to warehouse management," says Dr. Giovanni



Customized adaptation of the dialog screen according to functions with PSI-Click-Design.



Linking multiple dialogs in PSIWms with PSI-Click-Design.

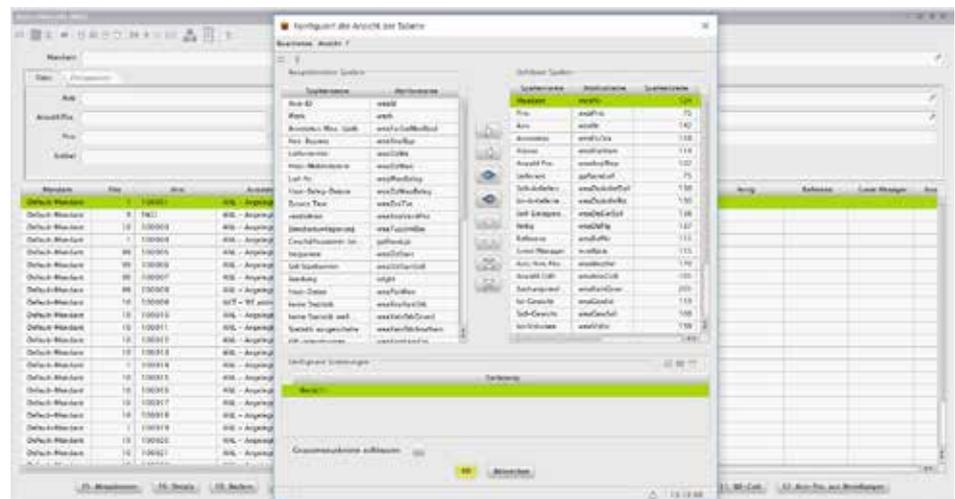
Prestifilippo, Managing Director of PSI Logistics.

Industrial Intelligence

The Swiss Post is one example of an organization that has optimized and future-proofed its transport logistics on the basis of an appropriately combined IT system that draws on modules of the strategic planning and optimization system for supply chain network design PSIGlobal and PSITms from the PSI Logistics Suite. PSI consolidates this model of IT infrastructure under the term "Industrial Intelligence". The conventional interpretation often reduces "Industrial Intelligence" to the integration of AI methods, such as machine learning or production automation, by means of robotics, but this is clearly inadequate. AI, robotics and automation are merely instruments. They are integrated and, like AI, can contribute to further optimization of system performance by automating the computing processes of the software itself.

However, in addition to coordinated process control, Industrial Intelligence also includes in particular

the networking, filtering and intelligent processing of the data collected through consistent acquisition. Special algorithms are used to generate added value, for example through



Individual customizations of the dialog screen can be implemented quickly and easily.

forward-looking analysis and the resulting, reliable recommendations for action.

PSI-Click-Design in Use

PSI-Click-Design is another example of cross-system integration of functionalities that differentiate a company from the competition in the daily operational use of software systems.

This function gives customers that use the warehouse management software PSIWms, such as Fiege Logistik Stiftung & Co. KG, e.GO Mobile AG and Mahr GmbH, the option of using click, drag and drop to customize the user interface for the systems (GUI—graphical user interface) to suit individual requirements in a completely flexible and independent way that goes beyond programming specifications.

Supported by an intuitive visual editor, users can combine menus, list and table dialogs, detail views and their own filter definitions in a process-oriented way on a single screen and save them in profiles. For example, overviews can be individually

configured in column selection, sorting order, grouping and coloring definition, and new full overviews can be created from existing dialogs. In short, it gives users a complete overview at the click of a mouse. 🔄

PSI Logistics GmbH
Phillip Korzinetzki
Marketing Manager
p.korzinetzki@psilogistics.com
www.psilogistics.com

Interview: Flemming Hirschfeld Talks About Workflow Functionalities in ERP and MES

"Everything Is a Workflow"

In the field of ERP systems and MES, workflow functionalities are currently experiencing a renaissance. They give companies the opportunity to become more agile while simplifying work for employees. Flemming Hirschfeld, Product Manager ERP at PSI Automotive and Industry, talks about the opportunities presented by these developments in an interview with Production manager.

the same time, monolithic "all-in-one" software is broken down into a dynamic system.

How might a workflow be used in practice?

What are the major challenges that ERP systems currently face?

Flemming Hirschfeld: Smart interfaces, usability and agile working are definitely important developments. We have invested a lot of money in new technology platforms for our products in recent years. On this basis, we want to provide customers with cross-system screens and dialogs. We connect different systems via workflow functions so that we can provide the individual employee with the necessary data directly. Employees—like those in purchasing, production, or sales—don't need to gather their information from different systems, as was previously the case. Users are given a dialog in which they can find all the data that is important to them, regardless of which application this data comes from. So we make the work easier and more efficient for users.

Why are workflow functions the future of enterprise software?

A workflow changes the way companies work. In the past, employees had to go into different applications and see what needed to be done. In the future, they will be able to receive their tasks conveniently via push functionality. So we are making the work far



Flemming Hirschfeld is Product Manager ERP at PSI Automotive & Industry GmbH.

easier for users and enabling agile working.

What do workflows mean for the system architecture of ERP systems?

The complexity of enterprise IT is becoming more and more pronounced, with more and more products in use. For users, this quickly leads to confusion. We want to find a solution with the help of the workflow.

In our next release, we will open up our workflow functionality even further and connect a large number of systems. It will be possible to work across systems from one interface. At

The workflow is the king of the process. Processes no longer have to be adapted for each individual customer by programming them. Customers can configure their processes and assign tasks to individual users via workflow functions—and they can do this together with our consultants, if necessary.

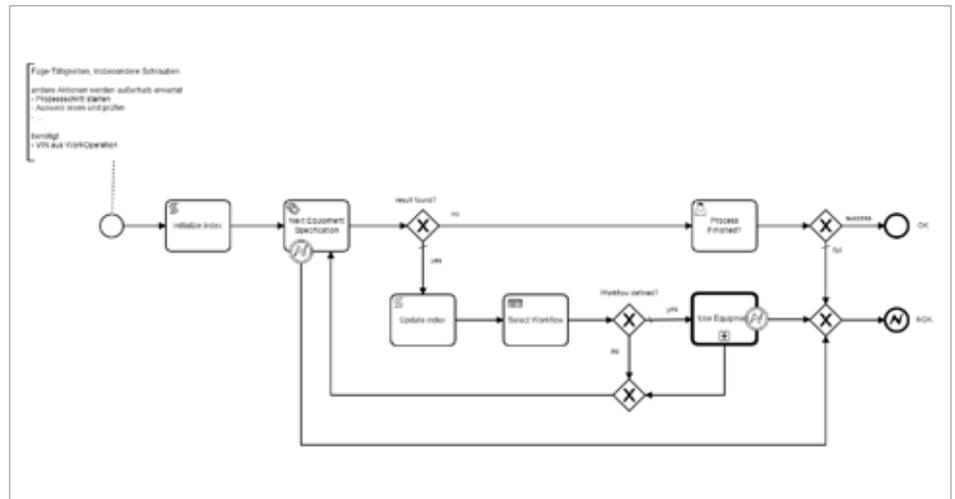
Our customer e.Go Mobile is an excellent example. We use workflow functions in production to assign tasks and report them back via an operator cockpit. But the principle works in every other area too. That's why we say, "Everything is a workflow!"

Is this agility reflected in your in-house software development process?

PSI uses agile software development in various areas and projects. Specifically, the development of the software solution for e.GO Mobile was a scrum project in which we worked with sprints and the overview was visualized on a Kanban board. Incidentally, workflows are particularly well suited to agile management methods.

What is important to you personally when developing ERP systems?

We see that different requirements are placed on the systems depending on the industry in question. We are the industry expert for production, or in other words for mechanical and plant engineering and the automotive industry. We have built up a strong competence in these fields over the decades, as well as in consulting. This focus allows us to un-



The process modeled in BPMN 2.0 is expanded to include the arrival time of the materials in front of the workstation.

derstand our customers and their processes and to optimize them in a targeted manner.

For expansion abroad, the easy configuration of the workflow makes it possible to respond to different, country-specific rules. This has been a major challenge for medium-sized companies, especially if they have been active in a number of countries. Workflow functions help our customers

meet all requirements because the different rules are mapped as a process and controlled by workflow. Deliveries are then only released automatically, for example, if all requirements have actually been met. 

PSI Automotive & Industry GmbH

Felix Saran

Content Marketing Manager

fsaran@psi.de

www.psi-automotive-industry.de

**The IPA annual conference 2019 will be held on November 7-8, 2019 in Erfurt.
More information on the event will be provided in the coming weeks.**



Product Report: Expansion of the Plant Monitor in PSImetals Release 5.18

Graphical Visualization of Dynamic Data

PSImetals software is synonymous with high usability standards and process-controlled user guidance. With its modern user interface that is easy to configure via the PSI-Click-Design, as well as its user-oriented operation, it is possible to visualize the production status according to your own requirements. One of the highlights of its user-friendly operation is the PSImetals Plant Monitor.

What's Next?

In the current PSImetals Release 5.18, the Plant Monitor has been further enhanced with PSI-Click-Design and equipped with extensive functions, such as an extended function library

The PSImetals Plant Monitor enables customers to create and edit their own graphical representations, which are linked to dynamic data. These show the aggregated production data for a configurable time horizon, allowing easy and direct access to the detailed data behind the aggregation. The system is mainly used for production monitoring, bottleneck forecasting and as input information for scheduling by specialists and control departments.



Configurable overview of plant information.

Continuous Monitoring of the Plant

The PSImetals Plant Monitor provides a graphical data display of the plant areas connected to the PSImetals Factory Model. Through continuous monitoring, the solution increases the plant's operational efficiency and supports rapid operator decision-making.

The visualization of the current process status in production offers different perspectives on the activities in the plant, such as the current inventory situation, the KPIs for the current shift for OEE or the quality rate. The feature is intuitive and highly configurable by a trained customer.

in the logic editor, a widget selection and support for right-click actions. All new features will be available to all PSImetals customers from May 2019. 🔄

PSI Metals
 Svetlana Maschinez
 Marketing Manager
 smaschinez@psi.de
 www.psimetals.de

PSI celebrates 50th anniversary

As a pioneer in process control, PSI started with first orders from the steel and logistic industries. Today, PSI is one of the leading global software suppliers for optimizing the flow of energy and materials.



Product Report: The new PSIpenta/MES Supports Companies Moving Toward the Smart Factory

MES Reinvented

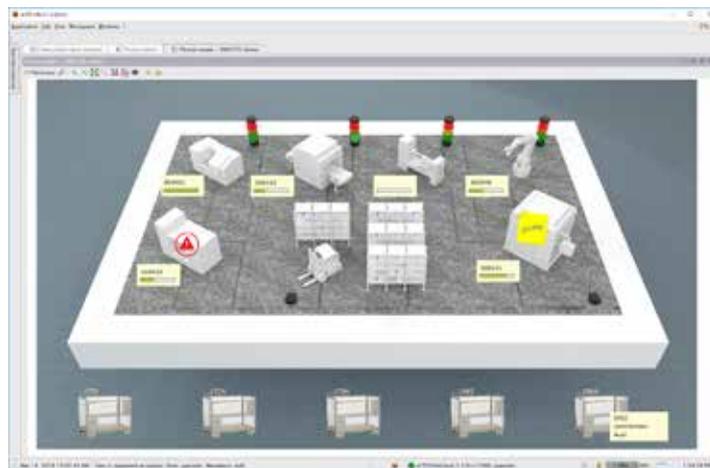
Agile working, adaptability in production and smart factories—many of the current buzzwords indicate that a fundamental change is taking place in production. Customers' needs are changing at a faster and faster pace. Manufacturing companies have to adapt value-added chains and the associated processes in an ever shorter time frame. At the same time, consistently high-quality production has to be ensured and costs have to be kept in check.

The new Manufacturing Execution System (MES) from PSI is the ideal solution to meet these growing demands.

Adaptable, Reliable and Efficient

In companies, PSIpenta/MES serves as the foundation for agile working and a new form of cooperation between Production and IT.

Seamless processes tailored to your needs no longer require laborious programming. Instead, companies simply model and change their processes themselves, as well as control the process logic in a traceable and efficient



Maximum transparency in production—the factory monitor helps to detect errors early.

way, and benefit from improved transparency and responsiveness. Processes are not only clearly and thoroughly documented, but executed exactly as required as an integral part of the solution.

Proven in Practice

Three examples illustrate the advantages of the new MES:

1. Quality improvement through worker assistance

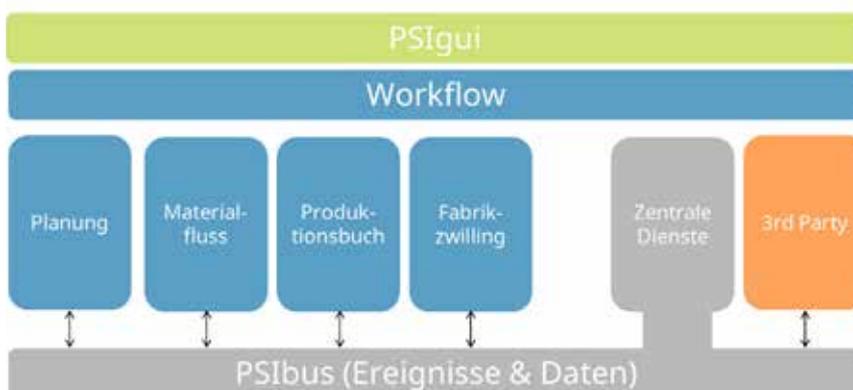
The operator cockpit supports employees at their production (or mobile) workstations in the workflow, including graphics and process-dependent procedure instructions. Errors are avoided and training times are minimized.

2. Process improvement made easy

The dwell time of the material in front of the workstation needs to be optimized, and the IT systems must be adapted accordingly. With PSIpenta/MES, the modification can be quickly modeled and tested so that it is ready to implement. The change is also immediately visible in the operator cockpit.

3. Error prevention instead of rectification

The factory monitor for your production not only visualizes statuses, but also proactively issues rule-based alerts before faults occur. The maintenance service can then respond faster to the individual fault. 



Advantages of an integrated workflow engine: processes modeled in BPMN 2.0 are executed directly, which significantly shortens development cycles.

PSI Automotive & Industry GmbH

Felix Saran

Content Marketing Manager

fsaran@psi.de

www.psi-automotive-industry.de

Interview: Dr. Rudolf Felix Talks About AI in Industrial Business Processes

Qualitative Labeling with Deep Qualicision AI

For PSI, Industrial Intelligence means using AI in industrial business processes. What distinguishes the use of AI methods in business processes?

The advantage of using AI methods is that you can enhance systems and solutions with capabilities that are usually attributed to people. In this way, you can solve problems in business processes that you would not always have entrusted to software systems. For example, suitable AI algorithms can detect patterns in large amounts of data very effectively if labeled data is available for these patterns. This can be a major advantage if large amounts of data need to be analyzed in business processes in a very short time.

In many cases, balancing target conflicts, such as utilization against throughput, is not an easy task when optimizing production. Systems based on extended fuzzy logic or neural networks that use qualitative labels can do this very effectively. They are also better able to explain the calculated decisions. Hybrid AI systems can complement each other and lead to even better solutions. Depending on the issue in question, there are many other AI methods that can offer advantages.

Can you give examples of some important AI methods?

Beside the extended fuzzy logic and neural networks and their variants, which I already mentioned, there are other important methods like support-

vector machines and random forest approaches. Beyond this, methods of conventional operation research and many statistical methods should also be included. Depending on the issue in question, hybrid systems combine different AI methods to form suitable overall systems that also combine conventional analytical methods from advanced engineering with AI methods.

What is particularly important when using AI in industrial applications?

In addition to in-depth knowledge of all AI methods, the problem-solving expertise of the developers of AI-based solutions is important. That's why PSI talks about Industrial Intelligence, which combines AI method knowledge with industrial process knowledge. If you have both, the advantages of AI solutions are far-reaching. But another important aspect is the availability of labeled data. This is a prerequisite that has remained largely ignored in the public perception of AI. Nevertheless, it is of crucial importance in most cases of industrial AI applications.

What is labeled data and why is it so important?

Labeled data is prepared data that has already been assigned meaning

before the AI learning process takes place. Thus it can be used by a suitable AI learning method for creating a model of that data in order to automatically detect similar data patterns



Interview with Dr. Rudolf Felix.

in future data. You might say labeled data is the bridge between data patterns and their real meaning in the real world, such as the meaning of a business process. In conventional AI applications like image classification or speech recognition, the labeling of data is usually pre-classified empirically and often even carried out manually. This is only possible because the data patterns labeled in these applications do not change substantially over time and the labeled data material has long-term applicability. For example, an AI-based speech recognition program can assume that

the meaning of speech and word patterns in a language will basically remain unchanged once they have been trained. The spoken word will endure for months or even years. But dynamic business process data is very different.

So does this mean you have to keep re-processing the data relating to business processes in order to keep the AI application "up to date"?

Exactly. With business process data, the continuous emergence of data patterns means automated labeling of data is essential once AI applications are operating in the area of optimization of business processes and real-time decision support. In production processes with a higher number of variants, customer ordering behavior and the resource situation in the production process will change on a daily basis. An AI-compatible data preparation process needs to automatically detect and visualize patterns in the process data in the form of self-calculated classes of data patterns based on historical and current data so that it can automatically label the raw data. Only in this way can raw business process data be used for self-adapting and learning AI algorithms.

And how are you meeting this challenge?

We have developed algorithms for "qualitative labeling" in conjunction with Deep Qualicision AI. Simply put, qualitative labeling makes use of the measurement data that is already collected in the business processes. I'm referring to micro and macro KPIs, which the customer classifies as key figures with regard to satisfaction from its own perspective or from the per-

spective of the process. Based on this minimum amount of quality-oriented information, we can derive data time series and calculate the qualitative labels for the relevant business process without any further input knowledge. The qualitative labels are derived automatically from the quality requirements of the business process and their inherent reality, and the business process data is processed automatically in a way that is AI-compliant. Qualitative labeling forms an essential component of the Industrial Intelligence in PSI systems.

So the use of AI at PSI should already include qualitative labeling. Is that the case?

First of all, at PSI, we claim that our systems are really industrially intelligent. Neural networks have been in use in systems at PSI customers for more than ten years. Systems based on extended fuzzy logic are used to control processes at well-known automotive manufacturers and suppliers worldwide on more than 180 production lines. PSI customers in the metal industry are also optimizing their processes worldwide with AI scheduling algorithms. PSI AI systems are ensuring that processes are harmonized in bus depots. Maintenance management systems are optimizing maintenance schedules in power grids. In total, PSI has supplied and is currently supporting over 50 different AI processes.

And what about qualitative labeling?

Qualitative labeling is already in use in a number of these applications. Some important reference applications include AI autopilots for op-

tional automatic control of production processes or for self-learning of system settings in the automotive industry and in energy management processes. We should also mention the forecasting methods that were recently presented for the first time at the Hanover Trade Fair in conjunction with the management of energy loads in "micro grids", or in the self-diagnostics of complex machinery for predictive maintenance.

What specific experiences have PSI and customers had with the use of AI?

A range of positive experiences, in particular, that PSI Industrial Intelligence really works. In some applications, qualitative labeling works quietly, efficiently and inconspicuously. Since the solution is the main focus and not the method, this topic is only now being discussed in greater depth. However, as the topic of automatic data processing of business process data is becoming increasingly important, qualitative labeling is also coming under the spotlight.

What is your vision for the future when it comes to using AI in PSI solutions?

There is undoubtedly great future potential in the networking of existing solutions to form comprehensive solution scenarios. If the individual solutions from the automotive industry, depot management, traffic flow optimization, and maintenance and control of power grids are combined into networked scenarios, this instantly creates global solution scenarios, for example in concepts for modern mobility, e-mobility or in the networking

of production and transport logistics, with immediately tangible benefits. Here, I believe PSI strikes with its unique potential, as I stated in a similar interview in 2017. As we also inte-

grate qualitative labeling into all PSI tools as part of the PSI platform strategy, we have several USPs that put us in an excellent position for the AI future. 

PSI FLS
Fuzzy Logik & Neuro Systeme GmbH
 Dr. Rudolf Felix
 Managing Director
 felix@fuzzy.de
 www.qualicision.de

Product Report: AI-based Predictive Maintenance and Scheduled Servicing with Forecasting Software

Qualitative Labeling of Machine Data

The AI software Deep Qualicision learns patterns in process data automatically by means of qualitative labeling and has been used to optimize the product life cycle as well as service and maintenance process for machinery and plants in the age of Industry 4.0. The software is integrated into the PSI technology platform so it can be connected to other PSI software products, in this case PSIpenta. The AI software offers real added value by implementing predictive and automated service and maintenance.

There are several challenges that need to be met every day when planning maintenance and servicing. These often give rise to the following questions: How can machine availability be increased while minimizing maintenance and repair work? And are there any cost-effective ways to take account of maintenance orders and re-

Qualitative Labeling of Micro KPIs with Qualicision

During predictive maintenance with automatic classification from the intelligent software solution Deep Qualicision, the first step is to make a distinction based on the selection of relevant criteria (see Figure 1) such as temperature, pressure, working hours, date of last maintenance, power consumption

purpose, micro KPIs are defined in advance on the basis of standard machine parameters, which are agreed with the machine manufacturer, and qualified through Qualicision evaluation functions based on extended fuzzy logic. The qualified micro KPIs are used to detect correlations in the micro KPIs so the machine data can be processed with the Deep Qualicision algorithm and qualitative labeling can be applied.

Learning Macro KPIs from Data with Qualitative Labeling

Based on the labeled machine data, aggregated macro KPIs are then learned and used as criteria for detecting machine states and classifying maintenance requirements. The classification (see Figure 2) may be based, for example, on the categories "maintenance required urgently", "maintenance required in a middle-term" or "maintenance not required now". The machine manufacturer itself determines the exact classifications by adjusting the self-diagnostics of the machines using Deep Qualicision—but this is not essential.

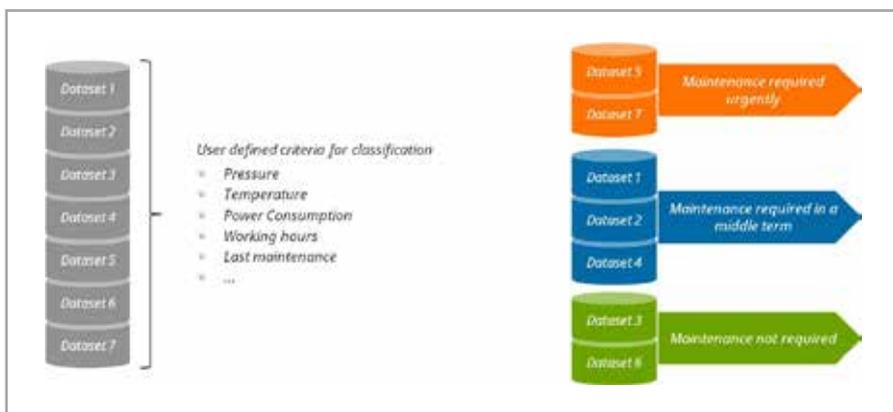


Figure 1: Relevant criteria.

sulting operational changes that may be required when planning and classifying capacity peaks?

or criticality of the machine failure and their negative, normal and positive effects on machine maintenance. For this

Automatic Detection of Maintenance Requirements through Short-Term and Long-Term Learning

This enables automatic detection of maintenance and servicing require-

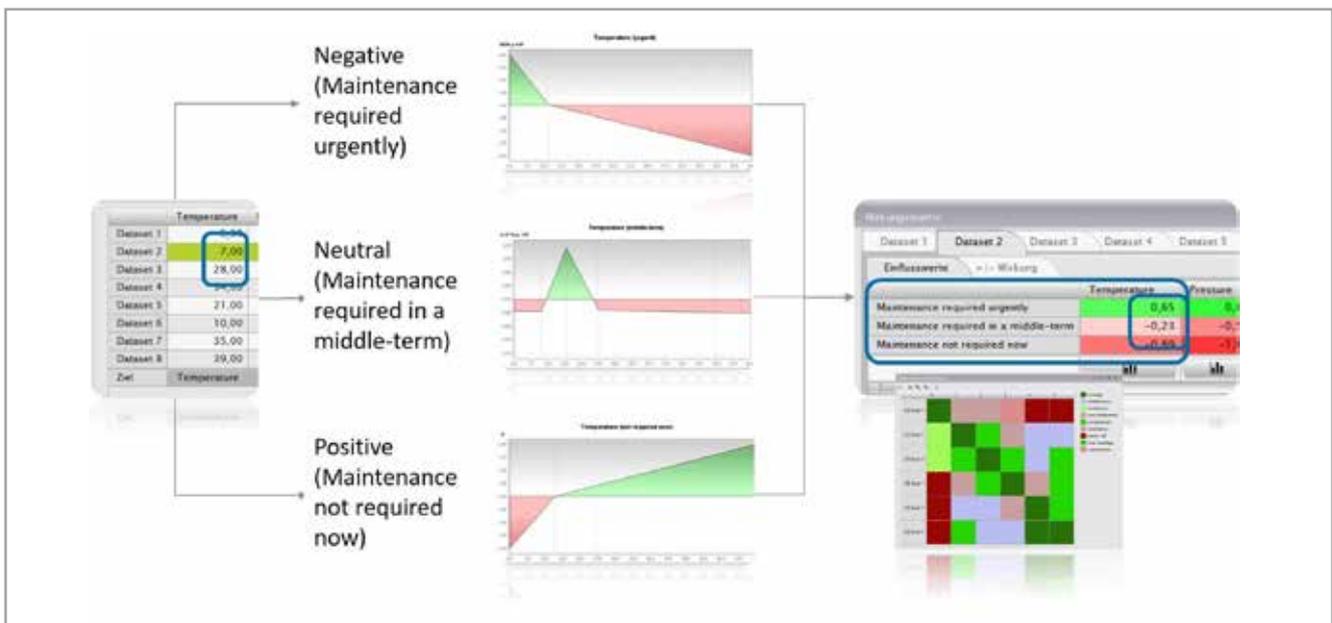


Figure 2: Classification of maintenance requirements.

ments based on sensor data. The criteria can be adjusted by applying different priorities to the relevance of the labeled data—either manually or in combination with further automatic learning of the criteria priorities. This means the appropriate weighting of the sensor signals can continuously re-learn the interactions between the qualitatively labeled criteria for maintenance-related classification of the sensor signals for both current, actual patterns and long-term patterns.

Presentation at Hanover Trade Fair 2019

The software was presented at the Hanover Trade Fair 2019 in conjunction with its use in predictive maintenance of high-tech winding machines (see Figure 3) at KAMPF.

For the processing of web-shaped materials with a thickness of only a few micrometers, the produced parent rolls, which can have a diameter of 1700 mm, a width of 11 m and a weight of up to 26000 kg, are finished into many individual intermediate products according to the

customer's application and requirements. Special rewinding stations are installed in the individual slitting machines, which are designed

and roll weights, as well as sensor data such as temperature, humidity or vibrations, play a decisive role in achieving high total plant efficiency.



Figure 3: High-tech winding machines at Kampf.

to meet individual end customer requirements and therefore have to be compact and efficient due to the wide range of applications.

Process data such as speed profiles or system-related dynamic factors, variable foil types, running lengths, foil width-dependent web tensions

They also act as input micro KPIs for the Deep Qualicision AI. 

PSI FLS

Fuzzy Logik & Neuro Systeme GmbH

Dr. Rudolf Felix
Managing Director
felix@fuzzy.de
www.qualicision.de

Event: PSI at AIST Digital Transformation Forum, USA

Trends in the Digital Transformation

The American steel industry has experienced an economic boom in recent years that has triggered a wave of investment in the modernization of steel plants with new technologies. American steel producers want to keep pace with digitization in other industries and are promoting the use of Artificial Intelligence (AI). There is no doubt that an already highly automated industry such as steel industry can undergo further digital transformation through Industry 4.0 technologies. But which technology is the real deal and what is just hype?

The fact that the American steel association AIST set up an event on digitization shows just how important the topic has become in the industry. For the first time, the new "Digital Transformation Forum" offered the opportunity to discuss existing and future digital technologies and their relevance to the steel industry. Around 240 representatives of steel companies, technology providers and academics met in Pittsburgh to discuss requirements at steel companies and to demonstrate the optimization potential offered by digital technologies.

Predictive Analytics

Numerous technology providers highlighted the importance of predictive analytics in a packed agenda featur-

ing 30 talks. For example, it can be used to predict when a production in-



Heiko Wolf at the AIST Digital Transformation Forum 2019.

terruption or plant breakdown is most likely to occur. In this context, Heiko Wolf, Director of PSI Metals Future-Lab, presented the idea of using Artificial Intelligence modelling for quality prediction. .

Would you like to know more about the current trends in digital transformation in the American steel market? The full article can be found on the PSI blog. Please scan the QR code!



"Digitally Confused"

On the last day of the conference, two panel discussions featuring steel representatives and technology providers gave a comprehensive overview of the state of digital transformation in the American steel industry and highlighted the expectations and challenges. A lack of willingness to change, a lack of awareness of the economic benefits of Industry 4.0, and an overload of digital services leading to "digital confusion" were noted as the main challenges. ☺

PSI Metals

Swetlana Maschinez
Marketing Manager
smaschinez@psi.de
www.psimetals.de

+ Digital Transformation

The Journey



Join us on our journey into the future of production management!
Next stop is at Metec 2019, June 25-29 in Düsseldorf.

PSI booth in hall 4/C10

www.psimetals.com/thejourney

News: Quick installation of PSIpenta 9.2 at Hargassner Heiztechnik

Smooth Migration

PSI Automotive & Industry GmbH has successfully installed the new version 9.2 of the ERP system PSIpenta at Hargassner Heiztechnik GesmbH in a short time. The fast migration was possible due to the standard solutions in sales and services which didn't require further adjustments.

Regardless of the tight schedule, the migration went smoothly within four months. The new modules Variant Configurator, PSI Industrial Apps and Cost Accounting have been installed successfully. In addition, the existing modules Order Management, Warehouse Management, Service and Contact Management as well as various interfaces to third-party systems have been completely migrated from the existing PSIpenta version 8.2 to the new version 9.2. Since the beginning of April, they are running fully in operations. Furthermore, different partner products had to be taken into account during the migration.

Benefits from Java-based PSI framework

In the future, Hargassner Heiztechnik will benefit from all functionalities of the Java-based PSI framework, e.g. PSI Click Design, which allows intuitive user interface customization. Based in Weng in Austria, Hargassner Heiztechnik was founded in 1984 and is a pioneer in environmentally friendly heating from renewable energy. The company with about 300 employees and more than 100000 customers develops, produces and sells wood chips, pellets and firewood heating systems. 

PSI Automotive & Industry GmbH
Felix Saran
Content Marketing Manager
fsaran@psi.de
www.psi-automotive-industry.de

IMPRINT

Publisher

PSI Software AG
Dircksenstr  e 42-44
10178 Berlin (Mitte)
Germany
Phone: +49 30 2801-0
Fax: +49 30 2801-1000
produktionsmanagement@psi.de
www.psi.de

Managing Editor

Bozana Matejcek

Editorial Team

Bettina H  ls
Pascal K  tzel
Phillip Korzinetzki
Swetlana Maschinez
Felix Saran

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Heike Krause

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| 24.-28.06.2019 | ESTAD European Steel Technology and Application Days 2019 D  sseldorf, Germany | PSI Metals |
| 25.-29.06.2019 | METEC 2019 D  sseldorf, Germany | PSI Metals |
| 27.06.2019 | IPA Customer Meeting Alfing Kessler Sondermaschinen Aalen, Germany | PSI Automotive & Industry |

PRODUCTION manager

PSI Software AG
Dircksenstraße 42–44
10178 Berlin (Mitte)
Germany
Phone: +49 30 2801-0
Fax: +49 30 2801-1000
info@psi.de
www.psi.de

PSI 