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PSI

EDITORIAL

Dear readers,

Qualicision optimizations are used in many industries in connection with a range of PSI software products. If you assess the impact—or potential impact—of improving the sustainability of optimized business processes, the effects can be interesting. In this regard, Qualicision is a real contribution to the Green Software aspect of the PSI Group.

Please read the leading article in this issue to see how such effects can be identified. In the future, by combining with Deep Qualicision, learning systems will be created that make the sustainability of business processes visible. We will publish additional articles on this in future editions.

We are also currently reporting on interesting developments in our production segment. Learn how Deep Qualicision contributes to data con-

sistency, how PSI software products enrich quality, and how adaptive production control can be implemented. Further reports from logistics and the metal industry show new trends and respond to user reports.

And of course, our usual sections are worth a look. I hope you enjoy reading them.

Sincerely,

Dr. Rudolf Felix
Managing Director
PSI FLS
Fuzzy Logik & Neuro Systeme GmbH

Read PRODUCTION manager online as well:
https://www.psi.de/en/psi-pressevents/customer-magazines/

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Sustainability in Business Processes by Qualicision and Deep Qualicision

Green KPIs and Intelligent Optimization

Conserving resources in business processes has a huge impact on improving their sustainability. With Qualicision-based optimizations, traditional process goals can be mapped onto or traced back to sustainability goals by using KPIs. In this way, Green KPIs can be integrated into Qualicision optimizations. Green Qualicision emerges.

To begin with, all process improvements that contribute to the reduction or the consistent and even use of resources without unnecessary stress peaks are green. Suitable use cases can always be defined if the underlying business processes require multiple resources whose modes of action must be coordinated. For example, when organizing and carrying out maintenance processes for electrical transmission networks, appropriate optimization potential can be achieved by suitable optimization of deployment.

The advantage of Qualicision as an optimization logic for software-driven business processes lies in the possibilities of linking technical and operational KPIs (key performance indicators). With Qualicision, technical restrictions can be efficiently linked to any number of other KPIs. These include those that represent the sustainability of the processes. These can be both indirect green KPIs aimed at conserving resources, and KPIs that are directly mapped to the relation between original KPIs such as utilization, throughput or adherence to delivery dates, as well as sustainability KPIs such as energy efficiency. The following use cases, which have already been implemented or are in preparation, show which sustainability effects can be achieved by a suitable Qualicision-based optimization.

Sustainability effects in the maintenance of electrical networks

The maintenance of a power grid in the network area of a federal state is usually in the hands of several hundred maintenance teams which have to carry out more than one hundred thousand maintenance operations per year. Optimally coordinated, the operations carried out every day allow substantial CO_2 savings. Assuming that in such a business process about 500 maintenance vehicles are on the road, covering every day a distance of about 50 km, each year a total distance of 50*500*220 km, that is 5.5 million km is travelled. This corresponds to a total distance of more than 137 times around the earth. At a defensive estimate of approx. 100 grams per kilo-

meter (following the ADAC[1]), the resulting CO_2 emissions correspond to approx. 550 tons per year.

By means of a suitable Qualicision-based optimization as part of the software tool PSIcommand, the business process described above could be improved in such a way that the same workload could be managed with a 15 percent reduction in the use of resources. If this is translated into kilometers traveled and the resulting CO_2 emissions, a saving of about 80 tons of CO_2 emissions per year is achieved, which corresponds to about 655 flights on the Munich-Berlin route (approx. 122 kg of CO_2 per passenger and flight[2]) or approximately four flights of an Airbus A320[3]. If this is then extrapolated to all German federal states, intelligent optimization of maintenance processes in this present business process alone results in potential savings in CO_2 emissions comparable to around 64 medium-haul flights.

Sustainability effects by Qualicision-based sequencing

Comparable or even stronger effects can be derived from optimizing production processes. For example, estimates suggest that the production of a mid-range vehicle is connected with between 3 and 5.3 tons[4] of CO_2 emissions. If, making a cautious assumption, we take half that number and assume that a factory produces about 500 000 vehicles per year, we can expect a total of around one million tons of CO_2 in one year. In terms of calculating assembly sequences, Qualicision-based optimizations have been able to achieve poten-

tials which, depending on the initial situation, have led to an improvement of 10 to 20 percent. After introducing this optimization, it was therefore possible to work more sustainably with an average of 15 percent resource conservation.

If we assume, for the sake of simplicity, that assembly only accounts for about 2.5 percent[5] of the CO_2 emissions, then 25 percent of one percent of 1 000 000 tons, i.e. 2500 tons, of CO_2 reduction per factory in the first year of using the optimization can likewise be assumed. Two thousand five hundred tons correspond to almost 20 500 less flights on the Munich-Berlin route, according to the figures mentioned above. This is already a surprisingly high number, given that it corresponds to approximately 122 fully
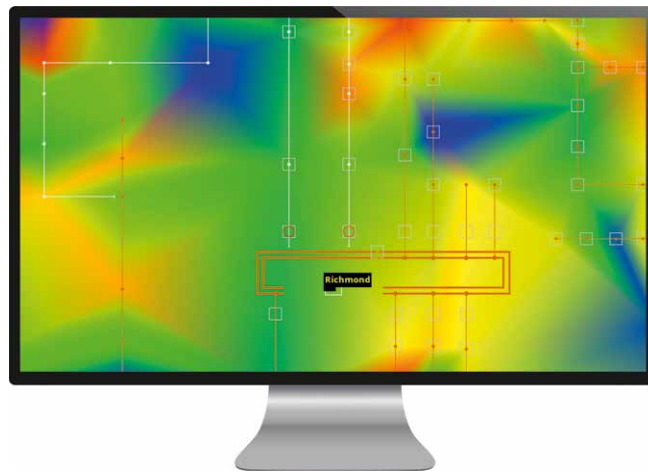
Representation of a "heat map" in the PSIsaso module of the PSI network control system.

booked flights of an Airbus A320. But, if you extrapolate this potential to all factories equipped with Qualicision optimizations, the figures are truly impressive. Accordingly, it can be estimated that Qualicision algorithms already contribute significantly to reducing CO_2 emissions, representing a considerable share of the PSI Group's Green Software.

Sustainable network management by PSIsaso with Qualicision [6]

Decision Support is particularly associated with new sustainable energies and the corresponding increase in decentralized energy production. For example, we can see the growing importance of the usually static separation points in the network. In the "Decision Support" module, a dynamic optimization of the separation points is implemented. This enables a significantly better utilization of the entire medium and low-voltage network while complying with the prescribed voltage bands. The goal of this optimization is to avoid additional grid expansion projects. Here too, the conservation of resources plays a decisive role. Sustainability for sustainability is the credo. Since the system is designed to use Qualicision to incorporate additional operational and economic KPIs into decision support, the inclusion of green KPIs that can reflect sustainability aspects is on the agenda.

Holistic depot and charge management for e-bus fleets [7]

Emission-free local passenger transport is an important sustainability goal for modern mobility concepts in municipalities and cities. Electric buses are becoming increasingly important. At the same time, the changeover to e-mobility also has a significant impact on depot processes. In addition to the new requirements for qualification of employees and on technology for service and maintenance, dispatching systems also need to be adapted. This is because, if future public transport

The PSIebus software solution integrates all e-mobility tasks into one system.

operations are to be sustainable—but still no less reliable—new factors such as limited battery range, charging infrastructure on bus routes and in the depot, numbers of passengers, outside temperature and connection capacity will be decisive.

These factors are incorporated into the PSIebus optimization goal system as Green Qualicision KPIs. This system offers transport companies a holistic software solution that combines knowledge about public transport processes with those of energy supply. The system combines the depot management module PSIeDMS, which is already equipped with Qualicision, with the charge management system PSIsmartcharging (soon also powered by Deep Qualicision AI, i.e. learning functionalities) and thus takes into account the necessary sustainability factors and original dependencies. In doing so, all vehicles, whether in the depot or on the road, are optimized for sustainability in terms of efficient control, charging and dispatching.

Green Qualicision KPIs

The use cases described above already improve the sustainability of the optimized business processes. The given figures are intended to illustrate a possible order of magnitude of the effects of optimization on the different aspects of sustainability. At this point, it is not a question of deducing precise series of numbers. But it is clear that even original economic KPIs contribute to sustainability. Because Qualicision optimizations are open to the integration of a wide range of types of KPIs, further developments should explicitly integrate sustainability KPIs. These can certainly be described as green KPIs which will be included in the KPI portfolio of existing optimizations in a leading position.

For example, the program includes "energy balancing", with a working group established specifically for this topic having been set up within the PSI Community Industrial Intelligence (CII). This group is concerned with a holistic harmonization, based on energy KPIs, of the use of existing PSI software tools for optimizing business processes, in particular by defining green sustainability KPIs. These KPIs then serve as decision support and AI tools by modeling with Qualicision and Deep Qualicision to control business processes directly from a sustainability perspective. There is a lot to do.

Sources:

[1] www.adac.de

[2] www.utopia.de

[3] www.lufthansagroup.com

[4] https://edison.media

[5] www.mhp.com

[6] www.psienergy.de

[7] www.psitrans.de ◉

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User Report: Lödige Maschinenbau Counts on the Adaptive ERP System

The Critical Path Proves a Success

Individual production and project production need one thing above all: Precise planning. That is the only way to deliver custom-made products according to schedule at globally competitive prices. Gebrüder Lödige Maschinenbau GmbH (Lödige) is overcoming these challenges thanks to the intelligent ERP system PSIpenta.

With more than 500 patents and over 35 000 delivered machines, Lödige is one of the world's leading manufacturers of process equipment and subsystems for industrial mixing as well as for processing operations such as coating, granulating, drying, reacting and related processes. The customer base of the internationally

Project production and individual production need flexibility

At the core of every individual customer solution there is always a mixer, dryer, reactor or coater. Around this core, Lödige then plans and builds an optimized system of equipment and machines. This makes it a typical project and individual production company. "Nowadays, a flexible ERP

Precise scheduling presents challenges

The precise, timely processing of an order is a particular challenge in project and individual production. Although Lödige also works in parts with standard assemblies, in the end every machine and subsystem is an individual solution. A simple look at the bills of materials shows just how complex the systems and machines are: They can comprise between 300 and 1000 items. Lödige benefits from what are known as growing bills of materials in PSIpenta. These allow items or assemblies to be added gradually during the design process and transferred to production before the entire list is finalized. At the same time, it is clear that the supply of raw materials and purchased parts, as well as the completion of operations, subassemblies or semi-finished products, are daily factors that are difficult to predict. They are also crucial for meeting completion dates.

Adaptive ERP solutions increase efficiency in production and increase delivery reliability hugely.

established family company is therefore large and highly diverse, ranging from the pharmaceutical, cosmetics and food industries to the building materials industry and from companies in the environment, minerals and ores sectors to the chemical and plastics industry.

system is indispensable in this environment," says Michael Grimme, head of mechanical engineering & costing at Lödige. "It must map the entire process chain, provide options for individual adjustments and, above all, help to meet delivery deadlines with precision and reduce inventory levels."

Continuous simulations are the basis for success

This is exactly where the adaptive expansion modules of the ERP system PSIpenta come into play. They continuously simulate the future utilization situation—with the constant aim of reacting quickly and automatically to changes in production conditions, aligning them with the targets of the ERP system and adapting them dynamically.

Two keystones for this are dynamic production adjustment and ensuring material coverage. The overriding focus: Adherence to the specified de-

The Lödige family business has been keeping the wheels of process engineering production turning with its machines and subsystems for more than 80 years.

livery dates, even in the event of disruptions in the supply chain.

Lödige also masters this balancing act because the first simulations are initiated before finalizing an order. When a customer order is received, production planning determines a placeholder for the actual order; these are called type representatives. This is an order, taken from the history, which achieves the highest possible degree of coverage with regard to the technical parameters from which, among other things, the bills of materials and routing structures are derived. With the help of these comparison orders, the module simulates the expected capacity requirements and provides information, for example, about required bought-in parts with a particularly long purchasing lead time.

By using the system, Lödige can react to various factors that change almost daily. These include fluctuating order levels, supplier bottlenecks or internal factors such as delayed assemblies. Every night, the system compiles all relevant information from production, automatically calculates the resulting new dates and creates a fully automated new production plan. In the event of a critical delay, it provides the relevant orders with priority codes. In this way, the production departments receive specifications for the work supply to be processed as well as the optimal sequence. As a result, the orders processed by production are consistently determined by the final date.

Success hinges on early utilization forecasts

Just how much Lödige benefits from its ERP system is demonstrated by various economic figures. In terms of delivery reliability, the company has improved from 60 percent to more than 85 percent. A significant contribution in this regard is made by greatly reducing ad hoc procurements from as many as 30 per week to no more than ten per month today. Productivity is now over 83 percent, almost ten percent higher than before the solution was introduced. This is also helped by lower stock and circulation, better organization and reduced search and queue times. "Success hinges on the ability to make very early forecasts about the utilization of the departments involved. This simply gives us more time to build up additional capacities or to select suitable suppliers," Grimme explains. ◉

User Report: New Opportunities for Quality Decisions at Ma Steel

One Step Ahead in Quality Management

Quality is not a means or a mechanism. Rather, it is a rational decision based on scientific data—a conviction shared by Chinese steel manufacturer Maanshan Steel (Ma Steel). In 2017, the company began to introduce an integrated planning system and a sustainable quality management system for flat steel production. Both projects have an impressive scope and ambitious goals. Thanks to their industry expertise, unwavering service and a relationship built on trust, PSI Metals was once again selected for the delivery of the planning and quality systems.

Traditional quality management is becoming more vulnerable—as fast-growing market asks for early adopters and better solutions. Ma Steel recognized early on that an IT system with advanced functions covering the entire quality up to and including the fine-tuning of internal quality rules.

Order Dressing reveals "hidden" quality requirements

By segmenting the customer market, Ma Steel receives orders that are

Therefore, in most cases, the "hidden" quality requirements of an order, i. e. the customer-specific needs, must be specifically identified. PSImetals Order Dressing helps to produce the correct quality right from the start. The system creates and maintains the two databases of product specifications and metallurgical specifications to ensure the precise quality required by the customer. Based on the standardized and individual quality data in both databases, PSImetals then automatically rolls out the quality design that meets both the given and the "hidden" requirements.

Functional areas of the Ma Steel QMS project.

management process is the answer to the quality requirements of its customers. That is why the company wants to achieve a "total" Quality Management System (QMS) by means of quality design, quality decision-making, defect tracking and deviation management,

increasingly following the trend of "small batch sizes, special requirements, high quality and after-sales guarantee". However, the order usually only specifies which steel grade is to be supplied; detailed quality requirements are rarely described.

Supporting the quality decision

Traditional quality decisions are rather static and do not take into account dynamic changes in process conditions during production. In this regard, Ma Steel has relied on the two concepts of Quality Indicator (QI)

The Ma Steel plant.

and Quality Process Snapshot (QPS). QI is a set of rules for deciding on process quality, while QPS provides complex data for these rules. Both QI and QPS contain the quality process data of the mother slab and the mother hot coil.

In just a few months since the system was put into service, Ma Steel has already introduced dozens of QIs as base units for assessing coil quality. For example, three different QIs reflecting the "hot rolling final temperature" were defined. This is an important indicator for determining whether the delivered coil can withstand the upcoming processing at automobile manufacturers. The temperature process data are therefore evaluated in three different dimensions in order to allow a more precise quality decision.

Reliable defect tracking

The "material genealogy" in PSImetals Advanced Quality Management allows defects to be tracked and therefore enjoys wide acceptance at Ma

Steel. Genealogy is a kind of family tree of the end product and also maps the quality parameters on key nodes. When the compiled data is converted from the timeline to the longitudinal axis, the defect can be traced back in PSImetals along its "family tree."

Analysis tools for continuous improvement

Using data mining tools for quality analysis completes the quality management cycle. Ma Steel uses the process analysis tool Statistical Process Control (SPC) to analyze process stability and perform a further root cause analysis. Through various analytical views, the SPC tool shows quality engineers the trends in process stability and allows them to see all quality-relevant process data over a certain period of time or for a certain material.

Lessons learned

The QMS project at Ma Steel includes the No. 4 steel and rolling mill and the cold rolling mill in Maanshan, as

well as the flat steel production plant in Hefei. There are almost two years between the kick-off and the market launch. Huang Kai, PSI project manager for Ma Steel, is delighted: "This is a super cool project," he says. "The enhanced quality management functions give me a sense of fulfillment every day when carrying out challenging tasks."

For Jörg Hackmann, Managing Director of PSI Metals, the QMS project is also a strategic project for PSI: "The depth and breadth of this project are incomparable on the global scale!" He adds, "Ma Steel does not use local quality analysis tools, nor does it treat quality as a closed black box that no other department can touch. Instead, quality data, process parameters and material deformation data are regarded as the foundations for quality decisions."

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User Report: Warehouse Management System Ensures Highly Efficient Production Processes at LPP

Robust Basis for Continuous Growth

In the central logistics center of the leading Polish fashion company LPP, the warehouse management system PSIwms ensures highly efficient production processes for up to 1.8 million pieces of clothing per day. It allows the automated material flow technology, coordinated order picking system and integrated forklift truck control system to be directly controlled. Artificial intelligence algorithms also optimize picking and order preparation.

Every two months or so, the Polish clothing group LPP brings new collections to the market. The dynamic growth of the company, however, has also brought bigger challenges—especially in logistics. Supplying markets and customers according to schedule requires robust logistics processes for storage, sorting and distribution. Against this backdrop, LPP decided to set up a central logistics and distribution center near its headquarters in Gdansk. By 2007, several warehouse locations were concentrated there.

This includes one of the largest warehouses in Central and Eastern Europe, occupying approximately 91 000 square meters—an area equivalent to more than twelve football fields. From the very beginning, LPP has been using warehouse management system PSIwms from the PSI Logistics Suite for warehouse management, intelligent resource planning and coordinated process control.

Coordinated processes through standardized material flow control

Every day, the approximately 1000 employees at the LPP logistics center pick up to 1.8 million garments and accesso-

ries for daily shipping to the networks of trading partners. For storage and order preparation, the building complex is equipped among other things with an 18-meter-high automatic small parts store with more than one million container storage spaces. In addition, manually operable block storage areas and high-bay racking, several kilometers of automatic conveyors, a picking warehouse with more than 56 000 pick positions, four sorters with a total of

Dashboard view in PSIwms.

1200 target points, as well as several automatic carton handling units, integrated scanners and automatic weighing systems are installed.

The distinctive feature of this is that, during warehouse consolidation, LPP transferred various conveyor system components from different suppliers

from the old inventory warehouses to the new distribution center. For coordinated process control directly from the PSIwms, the software was therefore designed for standardized material flow control for a variety of divergent device and plant control systems. "PSIwms manages all processes in the LPP distribution center and optimally handles the highly complex processes," emphasizes Jacek Kujawa, second CEO of LPP S.A. "The system controls all goods handling phases—from goods receipt and distribution between domestic and customs warehouses, pallet storage and the automatic small parts store, to sorting and shipping the goods to individual brand stores and countries."

AI-based WMS with dynamic resource planning

In view of its dynamic growth, LPP also wants to use the Warehouse Management System to cover the continuous automation of intralogistic processes without any significant outlay. As early as 2013, the distribution center was expanded, with two new sorters and a minload unit installed. In 2020, LPP finalized a second extension phase of the plant. On the basis of artificial intelligence (AI) algorithms, the system was designed to further improve the picking routes and optimize the use of warehouse resources.

By using AI tools, picking and order preparation times could be minimized. This is how LPP has responded to the sharp rise in online orders and the increasing shifting of distribu-
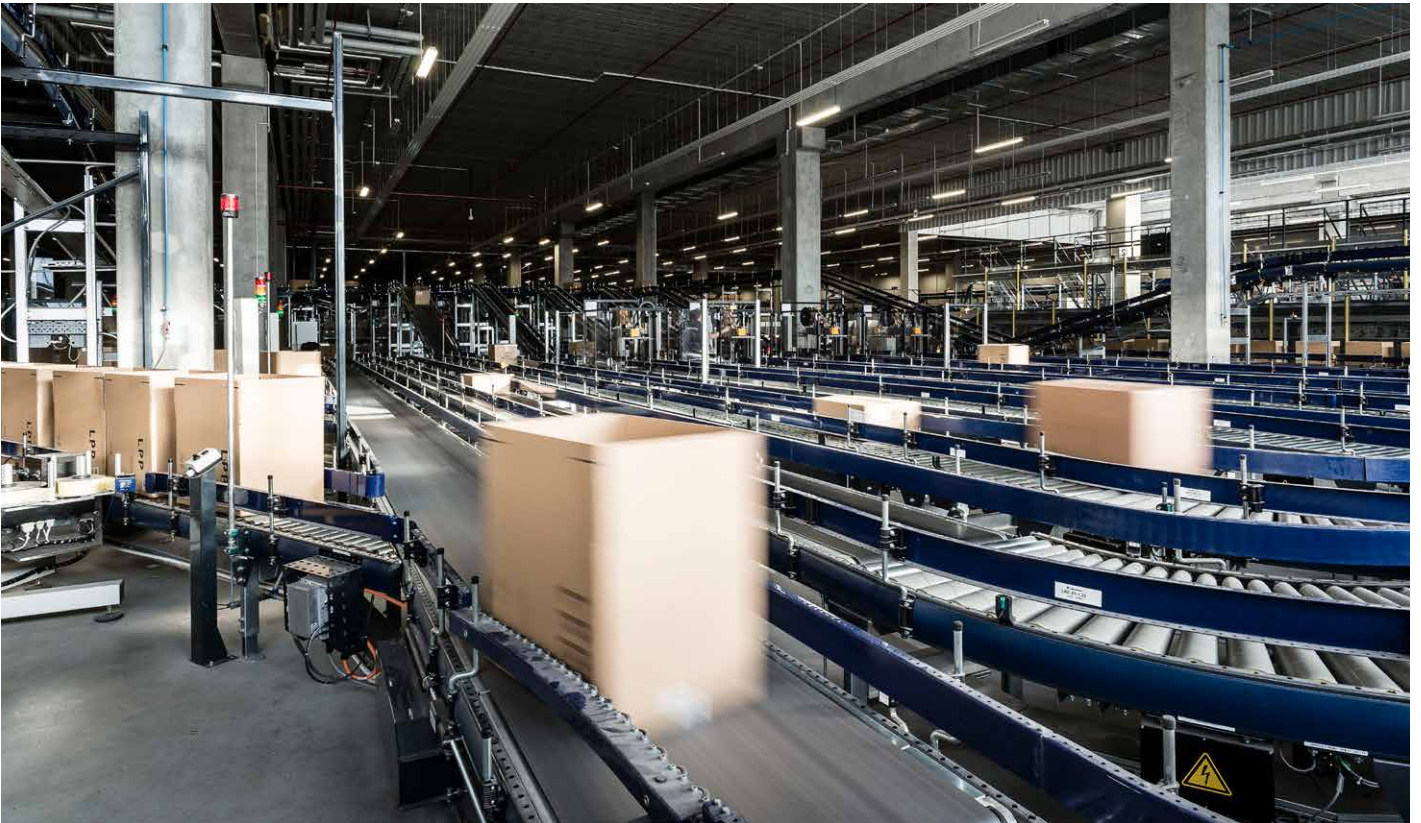
PSIwms manages nearly 1.3 million storage spaces in the LPP distribution center.

tion channels within the market—a reality that has been accelerated by the Covid-19 pandemic. For example, LPP processes around 11 million orders a year, of which 12 percent were placed through online sales last year. Since the start of the pandemic, the clothing manufacturer has seen a four-fold increase in sales through this distribution channel. This sharp rise was successfully handled by the AI extensions. "The introduction of the solution based on AI algorithms significantly improves the efficiency of processing online orders," explains Mirosław Hoffmann, Head of Logistics IT Systems at LPP S.A. "Without this innovative IT system, our distribution center would not work."

Planning time reduced by 40 percent

LPP was also one of the first users ever to implement the PSIwms func-

tion of dynamic resource planning. This module can be used to optimize the use of employees, devices and systems, taking into account their specific qualifications and characteristics. In addition, plant utilization can be improved and the timing of the automated, backward calculation of the start of order preparation can be scheduled with even more precision.

Just a few months after it was introduced, LPP had already recorded a planning time reduction of almost 40 percent for logistics operations. "The planning module in the PSIwms provides us with a unique tool for intelligent recording and processing of all specific warehouse data and for maximum flexibility in order to be able to react to various, unpredictable situations," says Hoffmann.

In the LPP distribution center, PSIwms manages 1.3 million stor-

age spaces. The orders from the LPP branches are forwarded to the system from the higher-level ERP system. The system then initiates the picking processes for order preparation in all warehouse areas in a coordinated manner and according to schedule. It guides employees through the individual process steps and automatically monitors the execution of all orders.

"With automation controlled by PSIwms, we have achieved a scale of process repeatability that would have otherwise not been possible," says Hoffmann. "All in all, it's a professional solution that further facilitates the strong performance of our distribution center." ◉

News: PSImetals Quality on the Way to Advanced Quality Management

Enjoy the Sound of Silence

Have you ever experienced the magnificent calm before dawn? Or the expectant silence in a room full of people when someone is about to speak? Noise in steel and aluminum production, on the other hand, is more deafening, especially when customer satisfaction slumps or production costs rise due to unfulfilled quality expectations. Here, digitalization offers a remedy, meaning you can take a deep breath and enjoy the silence of smooth production.

The new PSImetals Service Platform opens the door to holistic quality management through offers from third parties: For example, the start-up CoilDNA promises nothing less than the creation of the "Internet of Metals", while the technology of the BFI (VDEh-Betriebsforschungstechnik GmbH) gives a new meaning to root cause analysis in the production environment.

A winning combination

For a long time, mass data has been collected during production. But how to use them to produce goods of the best possible quality? Of course, the key to smooth production is not the mass data itself, but the ability to use it to identify quality problems. Rootcause analysis provides information on how negative effects can be mitigated in the future. A new recipe for success is the combination of the BFI's "noise mapping" model with the PSImetals Factory Model. The model uses the data stored in the Factory Model to create a "noise map." Clustered anomalies in the products are then located on this map. This allows users to identify defect causes along the entire process chain.

This brings about transparency, puts mass data in the right context and thus creates added value!

Come with us into the realm of silence!

Want to find out more? Follow our "Enjoy the sound of silence" campaign, which includes a series of informative blog articles and exclusive webinars to help you enjoy smooth production processes!

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Product Report: PSImetals Release 5.20—A Cornerstone for Future Developments

Flexibility by Design

With the new PSImetals Release 5.20, PSI has reached a new phase of continuous product development. On top of a long list of functional improvements, Release 5.20 includes the new PSImetals Service Platform (SP), which provides the basis for future developments and thus represents a real milestone.

The PSImetals Service Platform is designed to provide our customers with more flexibility in business process modeling and communication. This means that it already supports the integration of all common AI frameworks and, together with the process data in our factory model, becomes the ideal ecosystem. Traditional business processes such as quality evaluation and scheduling can be combined with new data analysis options. In this way, we offer a platform for AI-specialized partners, but at the same time we also develop our own AI solutions, such as for quality prediction or automated surface defect detection.

Flexible process coordination

In addition, in Release 5.20, we have begun to integrate our sales and demand management services into our new workflow management system. This helps to ensure the high flexibility required for coordinating the order confirmation process. In the upcoming releases, we will gradually introduce the workflow management along the entire PSImetals functionality.

Cross-platform connectivity with PSIbus

The good news for our customers with ongoing maintenance installations is that integration into our workflow management system will work both for newly developed services that are fully SP-based and for our proven existing modules. The backbone of communications is the new PSIbus component that provides flexible connectivity between different platforms, including our PL/SQL and C++-based components. ◉

Want to know more about PSImetals Release 5.20? Please scan the QR code!

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Product Report: Triple Boost for Data Consistency and Increased User-Friendliness (part 3 of 3)

Duplicate detection with Deep Qualicision AI

In the last two issues of PRODUCTION manager, two modules for the triple boost for data consistency and increased user-friendliness based on the Deep Qualicision AI Framework have been discussed: The auto-completion at time of data entry and the input validation during transfer to the database. Both lead to a measurable improvement in consistency of data and user-friendliness—individually but also in combination. However, the use of this combination only adds value for data that is newly collected in the process. In a database that has been in existence for many years, remaining duplicates can thus counteract overall consistency. At this point, duplicate detection based on the Deep Qualicision AI Framework comes into account. For this purpose, the syntax and semantics of the datasets learned from historicized data as well as from the data entered and checked during data entry are immediately used to detect duplicates in already existing databases.

In almost any business process today, data is the basis for acting efficient and effective. Maintaining a continuously high level of data quality is a major challenge both for editors and administrators of such databases. In the case of partially unmonitored data collection—for example without the use of auto-completion or automated data input validation—inconsistencies are generated more and more over time. Sometimes it can lead to disruptions in the process itself and those that follow. This often results in manual rework having to be carried out or even the occurrence of planning errors.

A customer use case: Address management of suppliers

For many years, addresses of suppliers operating worldwide were collected in a database. The entries were always made manually and by many different editors. Addresses that were supposedly not found, a new one was created.

Over the course of time, duplicates of the same supplier were generated due to different spellings.

One example is a supplier in Italy whose street name can be entered in many different ways: In the local language as "Via delle Fabbriche" or as a German translation in the variants "Fabrikstr.", "Fabrikstrasse" or "Fabrikstraße." In addition, the company name can likewise be entered in the local language or as a German translation as well. In this way alone, there are eight possible entries for the same information. Additionally, variants with upper and lower case letters can also be created. Consistency in address management thus steadily decreases over time, which reduces user-friendliness as well as the process itself.

Duplicate detection with Deep Qualicision AI.

Searching for duplicate data on the basis of similarity metrics

In case of a constantly growing database that has existed for years, a manual search for duplicates to maintain consistency is out of the question due to the amount of time involved. A first approach is to use similarity metrics. For this purpose, the contents of data sets are interpreted as text objects with a sequence of letters and then the distances between them are calculated. If this deviation does not exceed a specified rate, the two checked objects are treated as duplicates. However, this represents a method approach searching for well-defined anomalies. In essence, this is a threshold check for a similarity comparison, which also depends on the length of the word. In addition, such processes have weak runtime behavior for large amounts of data, which limits applicability in the context of Big Data. Moreover, similarity metrics are sometimes unstable regarding semantics when processes change over time. Instead, a mechanism is needed that automatically detects anomalies in the structures of a data set comparison and can continuously adapt to the current conditions.

Data-based duplicate detection using Qualitative Labeling combined with Machine Learning

In most business processes, a broad base of historicized data already exists. Through Qualitative Labeling combined with Machine Mearning based on the Deep Qualicision AI Framework, the structures of an entire database can be learned from past data in a process-specific manner. Data-driven methods offer many advantages, especially for detecting multilevel relationships and complex similarities in data—such as finding a supplier that is listed with several entries in address management.

KPI-based self-learning duplicate detection as part of a Deep Qualicision complete AI system

The fundamentals for duplicate detection based on the Deep Qualicision AI Framework are the combination of Qualitative Labeling with a knowledge base of historicized data trained by Machine Learning. In addition, similarity metrics are used to make comparisons between text objects. However, the framework also enables decision support by simply giving preference to different evaluation KPIs. In this way, not only syntactic similarities, but also semantic analogies—as with different spellings of street names or company names—can be included for detecting duplicates. This kind of KPI-based self-learning inspection mechanism can thus provide an automatic way for continuously detecting duplicate data entries, based on a data history and including a knowledge base that is constantly growing in the process. For the process itself and those that follow, this ensures that planning can be carried out with consistent data to reduce manual rework and avoid errors.

Deep Qualicision-based duplicate detection as an extension of auto-completion and data input validation

A system already in operation with auto-completion and data input validation can be extended in a modular manner using the common Deep Qualicision AI Framework for duplicate detection. This enables a further measurable increase in user-friendliness and data consistency.

A complete AI system with triple boost for data consistency and user-friendliness

The modular linking of the auto-completion, data input validation and duplicate detection components—which can also be operated individually—creates a constantly self-learning and expanding knowledge base for automated support in data collection, verification and storage. This provides the triple boost for date consistency and user-friendliness based on the Deep Qualicision AI Framework. ◉

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Benefits of duplicate detection

+ Detection of duplicates as anomalies in an entire database
+ Automated detection of duplicate data sets
+ Significant time savings and planning reliability in downstream processes
+ Consistency across the entire database
+ Qualitative standardization and plausibility analyses
+ Continuous relearning of the knowledge base to maintain a current data status

Product Report: How Companies with Adaptive Production Control Optimize Production

Adaptive planning and control of processes

Digital transformation is making it even more important for manufacturing companies to be faster, more efficient and smarter than their competitors. If you want to be that crucial step ahead of the competition, you have to plan better than your competitors and adapt again and again to the market conditions. The key to future success will therefore be adaptive planning and control of production processes. But what kind of companies reap the rewards of adaptive solutions?

In principle, adaptive solutions are of interest to all companies that use discrete manufacturing. Manufacturers across the spectrum—from mass to individual production and from automotive suppliers to plant construction firms—can benefit from adaptive solutions.

Particularly if your company assembles a product from one or more individual components and works with (growing) bills of materials and parts or assemblies, investing in smarter planning is a wise decision. Fundamentally, the size of the company is irrelevant, because small, medium-sized and large companies all have great potential for optimization with adaptive tools.

What added value do companies with adaptive control components have?

Adaptive software solutions can be used to achieve and implement many different optimization goals. The system adapts itself independently to changing market conditions and order levels. For this purpose, the production networks are continuously optimally aligned and, for example, material planning is adapted automatically. Companies must decide individually which problems they wish to address and which areas they want to optimize. In principle, the range of conceivable options includes simple additions to the ERP system, a self-learning system, or even an intelligent real-time system that is entirely self-regulating. Definite added value can be achieved in the following areas:

1. More efficiency in production

Production is optimized by means of intelligent, learning sequence plan-

Optimize production with Advanced Planning & Scheduling.

ning and dynamic adaptation of production control in the event of changing conditions and parameters. As a result, production is optimally utilized and process costs are massively reduced.

2. Reducing capital tie-in & conserving liquidity

By optimizing inventory, the costs for warehousing can be cut and the WIP (Work In Progress) can be reduced. At the same time, optimized planning conserves liquidity.

3. Avoiding and resolving bottlenecks

Bottleneck management can be used to visualize and automatically resolve bottlenecks. An optimized process chain ensures a higher throughput, avoids delays and allows production targets to be met.

4. Increasing transparency in the ERP system

An adaptive solution allows planners to take early action on emerging issues and to proactively avoid errors.

5. Realistic delivery schedule calculation

By calculating the earliest possible delivery date, you can give realistic information on readiness for delivery. This in turn enables higher delivery reliability and avoids penalties.

6. What conditions do companies need to meet prior to introduction?

The consistent digitalization of processes is a basic prerequisite for adaptive production control. This means that an ERP system must be present as the backbone of digital processes. Optimizations are only possible if a time model is available, together with the
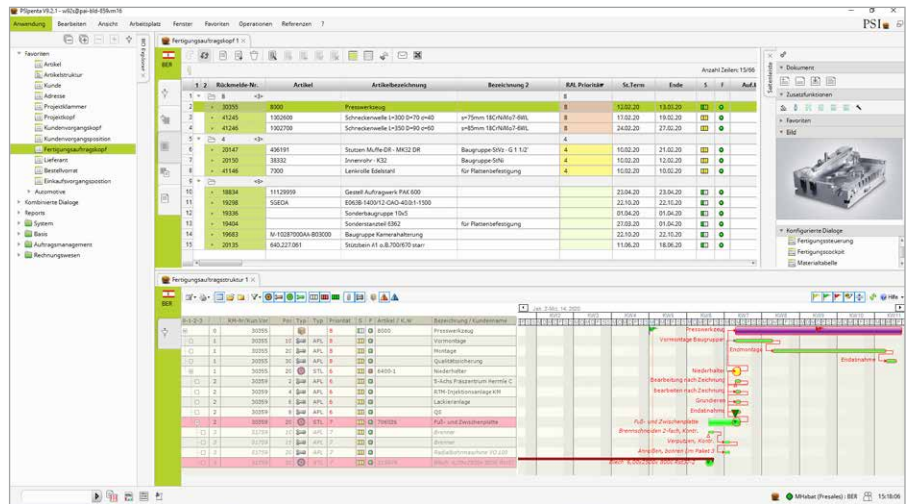
Example of adaptive planning with Advanced Planning & Scheduling.

correspondingly prepared basic data. In practice, this means the existence of routings and (multi-level) bills of materials, which are transferred to production lists and can then be put in a sensible order.

What should be considered during introduction?

When introducing adaptive solutions, we see three recurrent issues.

• Adaptations in the ERP system

Individual adaptations of the ERP system can lead to problems during the introduction of adaptive control components, because a stable value flow model is essential. Adaptations must therefore be considered in detail and, if necessary, modified accordingly.

• Inadequate change management

According to an old saying: Changing processes is easy, bringing employees up to speed is the real challenge. Psychological inhibitions must be addressed in order for this to succeed. Adaptive solutions affect almost all processes in a company, and this makes adaptation problems even more likely.

• Maintaining basic data

Whereas in the past, viewing and adapting all basic data was a large and laborious part of project outlay, today an agile approach is possible. The relevant, important processes are at the start. The actual data in the production area is evaluated using a digital shadow and synchronized with the ERP.

Why is it sensible to integrate an APS solution with the ERP?

Many APS solutions serve to supplement the ERP system; they are docked via an interface. But adaptive modules go one step further by fully integrating with the ERP system. This unique solution performs the necessary calculations directly in the system using a standardized database. Interfaces are completely omitted. In addition, integrated, adaptive solutions avoid incompatibilities, because further developments are carried out in a standardized manner. ◉

News: Koenig & Bauer Kammann Counts on WMS and ERP from Single Supplier

Optimal storage and production supply

Following the successful implementation of the PSIwms warehouse management system from the PSI Logistics GmbH, the decoration machine manufacturer Koenig & Bauer Kammann GmbH is running the processes for warehousing and production supply in an integrated IT infrastructure in the new central production site in Löhne.

More than 35 000 different assembly parts are stocked at the new location in Löhne, to which the company moved in October. Koenig & Bauer Kammann uses the PSIpenta ERP system as the superimposed software system for production planning and control. The warehouse management system was implemented for the process control of the material storage and picking as well as the supply of the assembly stations on time and in line with demand. With the two PSI systems, the company now has an integrated, holistic IT infrastructure from materials receiving to production to shipping.

PSwms functionalities such as event management, warehouse visualization and PSI click design.

Coordinated control of driverless transport systems

PSIwms has the relevant core and additional functions according to VDI 3601, as well as competition-differentiating functionalities such as event management, warehouse visualization and the modern PSI Click Design. It also offers interfaces to the enterprise resource planning system (ERP), to the material flow computer of the intralogistics provider Jungheinrich AG for controlling the semi-automatic narrow-aisle truck. This enables the driverless transport system (AGV) to be managed, which supports internal transport in the central warehouse. In a second project step, 18 Kardex shuttles will be integrated into the process organization.

Koenig & Bauer Kammann GmbH belongs to Koenig & Bauer AG and is a supplier of flexible, precise and efficient decoration machines for finishing glass, plastic and metal packaging using screen printing, hot stamping, digital printing and labeling. ◉

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News: PSIairport Supports New Innovation Platform InnoAirport in Rostock-Laage

# Modern functionalities for baggage handling

PSI Logistics is supporting the innovation platform InnoAirport at the Rostock-Laage regional airport with a holistic IT infrastructure and modern functions for baggage handling from the PSIairport product portfolio.

Together with the professional association of the German airport industry GATE, the airport Rostock-Laage with InnoAirport provides a platform for pre-business testing and last-mile product development under real conditions. On this platform, project partners can test, optimize and standardize their concepts, products and services in a real environment.

The PSI software systems for automatic baggage sorting (PSIairport/BHS), the baggage reconciliation (PSIairport/BRS) and the flight information system (FIDS), including the hardware equipment, form the decisive basis. The systems, based on the PSI Java
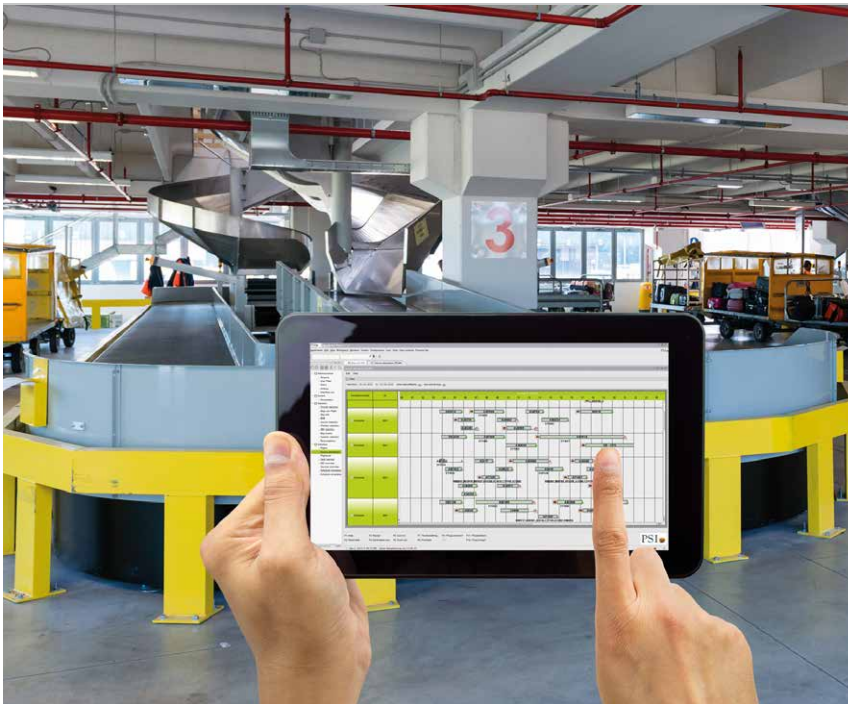
Automatic baggage sorting with PSIairport.

Framework, offer high configurability of intuitive user interfaces with PSI Click Design and optimize AI-based tasks in baggage handling.

In addition to the necessary server, PSI is suppling a control center and a wide range of peripheral equipment such as hand scanners, printers and terminals as well as display and camera systems. Among other things, the systems will enable check-in processes for the luggage of passengers arriving in Rostock via ferries and cruise ships at the cruise terminal in the port of Rostock. This includes efficient process control for baggage handling and end-to-end trace-ability up to loading into the aircraft.

In addition, the range of functions of PSIairport/BRS within the airport will be expanded by surveillance camera systems (CCTV). This technology offers a state-of-the-art visual tracking of baggage without the usual barcode capture and documentation of the process steps from check-in, through the conveyors to the drop-off on the sorting carousel. Flight information systems and PSI's display hardware also reduce baggage processing time. ◉

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