ISTOS
A MEMBER OF DMG MORI

Service Description I Version 4.20

PRODUCTION PLANNING & CONTROL - PRO (OnPremise)

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1. PRODUCTION PLANNING & CONTROL - PRO General description of services

ISTOS GmbH offers an easy way to optimise production planning and control with PRODUCTION PLANNING & CONTROL - PRO. The solution includes digital PRODUCTION PLANNING (GANTT diagram), feedback from production (PDA) and visualization (graphical control station) and enables the creation of interfaces to order management/ERP. These create the foundation for optimised planning and transparent production.

Challenges in planning are always limited resources, timely feedback from the workstations and ensuring transparency on the shop floor and in management. The solution consists in the applications PRODUCTION PLANNING, PRODUCTION FEEDBACK and PRODUCTION COCKPIT.

The PRODUCTION PLANNING application is an intelligent planning system, enabling automated production planning according to defined optimisation goals and with limited resources. PRODUCTION FEEDBACK is the application for direct feedback of production progress from the workplace. Together, they create a continuous flow of information between planning and production and allow rapid reaction and direct intervention in the situation on the shop floor. In addition, planning and machine data can be visualised in the PRODUCTION COCKPIT, so that transparency can be guaranteed throughout the entire production process.

The solution also benefits from the open technology, the modular microservice architecture with apps and the Manufacturing Service Bus (MSB), which make it possible to integrate existing systems such as an ERP system as required and to communicate between shop and office floor. For many customers, this is also the first crucial step towards end-to-end networking of their systems and thus towards Industry 4.0.

Overview of PRODUCTION PLANNING & CONTROL - PRO applications:

- PRODUCTION PLANNING
- PRODUCTION FEEDBACK
- PRODUCTION COCKPIT
- MANUFACTURING SERVICE BUS

PRODUCTION PLANNING is installed on a local server (OnPremise). The Customer-Service application helps the customer to execute processes like installation, deinstallation an updating their purchased products by themselves. In addition, the Customer Service application provides you with an easy way to create backup copies and perform a system restore based on them.

PRODUCTION FEEDBACK and PRODUCTION COCKPIT are web-applications and are offered as Software-as-a-Service.

2. Description of services PRODUCTION PLANNING & CONTROL - PRO Modules

2.1 PRODUCTION PLANNING – installed OnPremise

PRODUCTION PLANNING is an APS software (APS=Advanced Planning & Scheduling). The software offers an easy introduction into optimising production planning while taking limited resources into account.

During the planning process, PRODUCTION PLANNING takes limited resources, such as workstations, machines, assembly stations and employees into account during the planning process. External supplies of materials can also be considered.

Taking limited resources into account, PRODUCTION PLANNING determines the sequence of production orders according to the following optimisation goals: Set-up time & costs, employee costs, production costs, lead time, work in progress, adherence to deadlines and capacity utilisation.

The complexity of PRODUCTION PLANNING is resolved in such a way that the user is able to automatically plan with limited resources and easily move orders by drag-and-drop, and all processes are recalculated automatically according to the defined optimisation goals.

The interactive PRODUCTION PLANNING tool is firmly established in the digital network between ERP (Enterprise Resource Planning) and the shop floor.

For order and production optimisation, PRODUCTION PLANNING offers customers:

- Order optimisation through a multi-variable planning algorithm – based on ISSOP optimisation technology
- Innovative multi-resource planning (machinery, personnel & production resources and tools)
- Classification of leader jobs (prioritisation) in the ongoing planning
- Visualisation of downtimes and malfunctions
- Congestion management
- Observance of quality assurance
- Visualisation of planning results in the graphical control station
- Overall analysis of all production orders with planning information
- Simulative Scenario Manager

2.2 PRODUCTION FEEDBACK – web-based

PRODUCTION FEEDBACK is a web-based software for production data acquisition (PDA). The following core functionalities are included:

1. View of all orders
2. Recording of actual data from production
3. Report of possible errors

PRODUCTION FEEDBACK can be used to report the status of production orders, their results with time used and number of parts produced as well as possible malfunctions back to production planning. This makes it possible to respond to changes quickly and flexibly, which in turn enables agile production. The aim here is to fulfil customer expectations at short notice while also taking adherence to deadlines, costs and quality assurance into account.

PRODUCTION FEEDBACK is divided into two areas. Firstly, the actual status is entered directly by the operator via a terminal, this is called production data acquisition (PDA). All Feedback can be exported in CSV file format. Secondly, data can be taken directly from the machine as a status, this is called machine data acquisition (MDE). For use: Recorded operational status of the machines and connectivity are required.

An example of this process could be:

production orders are created in an ERP system. These are transferred to a planning system for detailed planning, which plans the orders in detail and then transfers them to PRODUCTION FEEDBACK. These production orders are now available to the user at the terminal or the machine. Continuous feedback of current status can now take place during the production process. Based on this real-time feedback, the planner can adjust and update schedules directly.

Communication with other systems takes place via the Manufacturing Service Bus – MSB.

2.3 PRODUCTION COCKPIT – web-based

PRODUCTION COCKPIT is an application that accesses data and information from a wide variety of applications to be defined in the requirements workshop and bundles them in an overview (hereinafter referred to as the dashboard).

The dashboard is created using a Dashboard Designer that allows you to display different information in the form of widgets and configure them in terms of size, position and widget specific options. Predefined widgets are provided via PRODUCTION COCKPIT. These are widgets that display data from PRODUCTION PLANNING & CONTROL - PRO applications as well as from other DMG MORI or CELOS applications. They can be selected and, if necessary, configured in the Dashboard Designer.

PRODUCTION COCKPIT is the frame application that uses widgets from other applications (currently: PRODUCTION PLANNING & PRODUCTION FEEDBACK). Each user can compile dashboards and overviews for his specific use case. There are plans to create widgets for other applications, but these must be purchased along with the application. PRODUCTION COCKPIT consists of the following components:

- A configurable dashboard panel on which all dashboards are displayed
  - Overview of all dashboards
  - Can be configured according to individual needs

- A Dashboard Designer that allows you to create your own overviews/views by adding predefined widgets and the ability to customise their size and position. This allows relevant information to be mapped to an overview.

- Standard widgets, which can display information independently of other applications and be added to the dashboard, are used to display custom text fields or graphics.
- DMG MORI widgets, which display the relevant information, e.g. Planning Gantt Chart from PRODUCITON PLANNING, in a widget, in order to add it to a dashboard and to adapt it to a certain extent
  - Access information from other PRODUCTION PLANNING & CONTROL - PRO applications as well as from other DMG MORI or CELOS applications
  - Adaptability of the predefined widget according to position and size

This application and its features offer a tool for visualisation and communication of information for the customer in a wide variety of applications and the option for individual configuration.

This service description only covers the frame application, with which it is possible to create individual dashboards with the aid of widgets. It provides standard widgets. The requirements for the individual DMG MORI widgets are not part of this product description.

2.4 Manufacturing Service Bus & Core Services

2.4.1 Manufacturing Service Bus

Many manufacturing companies plan on networking applications and machines in order to make production more efficient and flexible. This radically changes the demands on the IT infrastructure. Moving forward, the IT infrastructure must be continually able to adapt to changing data structures and new business requirements to enable permanent end-to-end communication between applications in companies and beyond and to ensure interoperability between all systems.

On the other hand, implementing different software solutions today is often very time-consuming and costly since each solution provider works with their own data formats and a proprietary data structure. What's more, the interfaces of new applications and cloud services must be extensively adapted in order to establish communication among each other.

The Manufacturing Service Bus (MSB) from ISTOS is a consistent integration layer with a standardised data structure and data description. It replaces the complicated network of end-to-end connections in the application landscape with a communication infrastructure that is used by all connected endpoints (applications, service providers and users), allowing them to communicate with each other on the basis of the recognised data format (JSON Schema), industry standard ISA 95 and an ISTOS – specific extension.

Compared to other Enterprise Service Bus systems, the special feature of the ISTOS MSB is the fact that it specialises in the manufacturing industry and therefore specifically allows scenarios where applications can be integrated in production processes and data-intensive applications in production.

Details on functionalities:

- Common data formats (described by JSON Schema)
- Recognised industry standards (ISA 95)
- Communication protocol (Kafka)

Note: The MSB cannot be purchased separately. It is used to exchange data between the individual applications of PRODUCTION PLANNING & CONTROL - PRO and cannot be used as a stand-alone product.

2.4.2 Core Services

The Core Services are a subset of the MSB. They translate the complex data structure, which is based on ISA 95, into a comprehensible and user-friendly interface.

The Core Services are used for global data management and represent master systems. This means that they can serve the same objects in different data sources and thus offer maximum flexibility and stability in communication between applications. A Core Service has been developed for each data object. The following Core Services are delivered:

- **Production Order Service** – For order data, such as product, quantity and delivery date.
- **Material Service** – For purchasing and production parts
- **Equipment Service** – For manufacturing resources such as machines and tools
- **Routing Service** – For master data or order-related routings
- **Calendar Service** – For calendar entries such as vacations or machine maintenance intervals
- **Confirmation Service** – For feedback from production into planning
- **Schedule Service** – For planning data of the planned production orders
- **Organization Units Service** – For grouping individual resources
- **Employee Service** – For production employees
- **Shiftmodel Service** – For the definition of shift models
- **Shift-Model Assignment Service** – For assigning shift models to resources
- **Bill of Material Service** – For master and order related bills of material
- **Purchase Order Service** – For purchase orders
- **Demand Service** – For customer orders and stock requirements
- **Material Relation Service** – For material relations in planning
- **Time Log Service** – For time recording of secondary times

Each core service is built the same way in its endpoints and has the common CRUD interfaces.

3. Services

3.1 Requirements workshop at the customer's site

The implementation effort for PRODUCTION PLANNING depends on the specific wishes and circumstances of the customer. Expect an average effort of around 20 days for planning up to 50 resources (machines and manual workstations).

Before PRODUCTION PLANNING & CONTROL - PRO or individual products can be introduced, an inventory of the existing IT system landscape and desired requirements must be taken. One to two-day workshops are offered, depending on the scope. This inventory and requirements analysis includes comprehensive on-site advisory services to the customer regarding the implementation and mapping possibilities of existing machines, work steps and production processes using PRODUCTION PLANNING & CONTROL - PRO, organises the planned implementation project into the first phases of implementation and works with the customer to define the preliminary measures required. The customer also receives a list of requirements, which constitutes the basis for the resulting project realisation.

A binding offer for implementing PRODUCTION PLANNING & CONTROL - PRO can be made to the customer at the basis of the workshop.

3.2 Adaptors and interfaces

Workshop results are used to calculate the cost of developing interfaces from inventory systems, e.g. ERP/TDM/BOM to the Manufacturing Service Bus (MBS), in the form of customised solutions depending on the complexity of the project. The service includes:

- Data mapping and transformation (adapters)
- Adapters for Software-as-a-Service (SaaS) and locally installed applications.

3.3 Technical Requirements / System recommendation

Please find detailed technical information in the "IT-Operations-Manual".

3.4 Implementation and training

As part of implementation, we offer the following approach:

Project step 1: Project launch
Further details on introducing PRODUCTION PLANNING & CONTROL - PRO and fine-tuning the work packages and milestones for all those involved in the project will be provided at the start of the project.

Project step 2: Interface programming
In this step, the interfaces for data exchange between the Manufacturing Service Bus (MSB) of PRODUCTION PLANNING & CONTROL - PRO and the enterprise-specific third-party systems at the customer company are programmed or adapted in line with the definitions in the detailed specification.

Project step 3: Installation and set-up of the test position
Once the interfaces have been completed, a PRODUCTION PLANNING & CONTROL - PRO test position is set up in the customer's company to test their functionality. The Customer-Service Application serves as a software management tool for the software products of the PRODUCTION PLANNING & CONTROL - PRO.

Project step 4: System validation and initial operation
After successfully completing project step 3, the entire system is put into operation. Close cooperation with the customer is necessary in this phase. The customer's obligation to cooperate is to provide the required internal resources. The test with live data provides the basis for analysing the planning results achieved. The planning quality is continuously improved over several iteration steps. The result is a customised installation of the solution that corresponds to the goals defined in the detailed specification and is adapted to the customer's individual requirements.

Project step 5: Training
The training package includes an introduction to the fundamentals of working with PRODUCTION PLANNING & CONTROL - PRO and user training. Special attention is paid to the creation of planning scenarios, their interpretation, the use of control parameters and target criteria to optimise the results of the PRODUCTION PLANNING product. Training is also provided on content for simulating scenarios, evaluation options in the control station, working with the existing analysis tools and generating the required reports.

3.5 Managed Service Linux-Server

ISTOS also offers a subscription with the service of updating customer-operated Linux operating systems on which PRODUCTION PLANNING & CONTROL products are installed, as well as updating the software components necessary for the use of ISTOS products.

This includes:

- Weekly checking of updates of the Linux operating system, normally the distribution Ubuntu, as well as the software components necessary for the operation of PRODCUTION PLANNING & CONTROL PRO.

- Installation of necessary updates in coordination with the customer.

- Checking for any incompatibilities with PRODCUTION PLANNING & CONTROL before carrying out the update.

In urgent cases (BSI risk level 4 and 5) the Linux server is updated immediately after checking for updates, in all other cases the operating system and the dependent components are updated once a month.

This service must be ordered additionally and is billed separately.

If you have any further questions about our products, please contact your personal contact or send an E-mail to: info@istos.com