

Product report: PSIPenta/Leitstand with Qualicision®

## From the pegboard to multi-criteria optimisation

Anyone who remembers knows what this means. The pegboard is a classic among planning systems and serves to determine sequences of various work processes. In this system, cards for individual tasks are pegged or moved to different rows (= workplaces) at different points (= times). As a result, every employee can see at a glance which tasks are scheduled at which workplaces for the near future. However, the ability to fit in express orders or react to malfunctions is severely limited and inconvenient. In most companies, programs are therefore used to plan and control sequences of operations.

### Planning board in finite capacity scheduling

The PSIPENTA finite capacity scheduling module allows sequences to be planned digitally within the system. Interacting with a leading ERP system, it serves to improve the production flow and is suitable for planning both various manufacturing typologies and maintenance. Planning can be carried out completely manually by means of drag and drop or fully automatically according to set rules. The resulting sequence plan is visualised as a planning board which is available to all company staff as required, at

least as information. If express orders need to be inserted or to react to malfunctions, a new plan generates a new sequence plan that takes the new circumstances into account. This new plan can be generated either manually or automatically. If an operation has been added at the front of the queue, the update function performs the laborious adjustment of all affected operations at the push of a button.

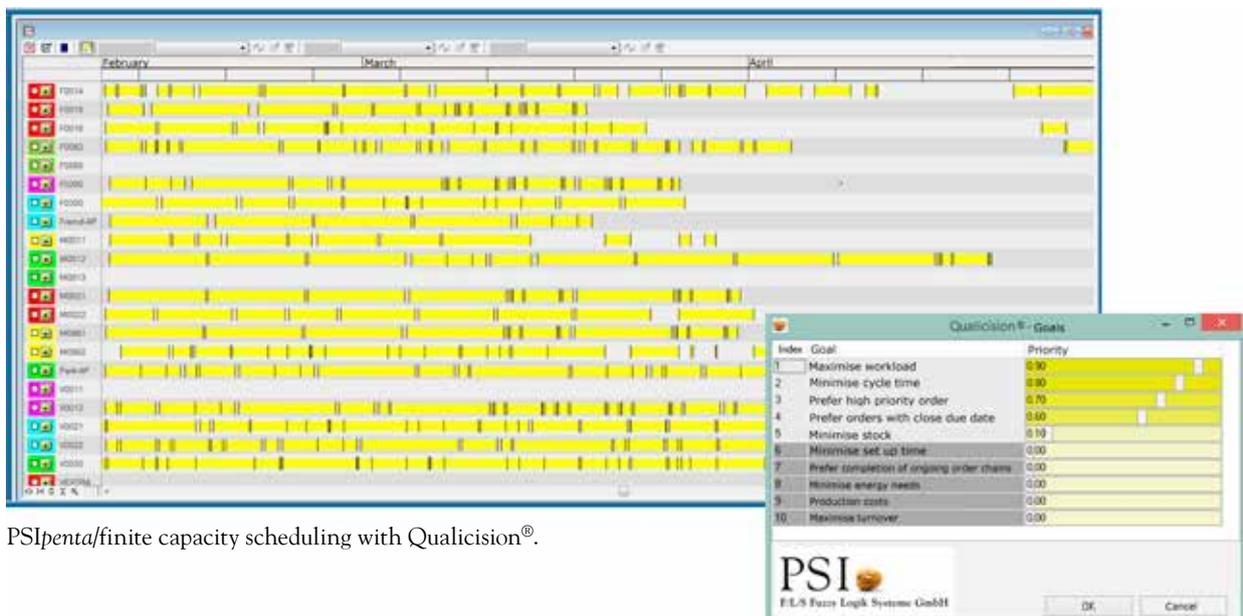
### Sequence planning in finite capacity scheduling

Automatic sequence planning imitates a planner's decision process. For

a pool of orders that is to be planned, it is first decided which operation in the pool is the most important. Next, the ideal workplace and time for this operation is determined. The respective decisions are based on configurable rules. For example, the most important operation could be the one that has the earliest desired deadline. If two operations have the same desired deadline, the algorithm could be allowed to make the decision in the next step based on default priority. Various rules, which can also be combined, are available for evaluating importance and deciding the best position. In the simulation, the results of different rule settings can be compared to determine appropriate settings for custom planning.

### Ranking with Qualicision®

Let us use this example again. The most important operation has been determined through the desired deadline and, in the second stage,



PSIPenta/finite capacity scheduling with Qualicision®.

using default priority. The opposite would also work: concerning the priority first and concerning the desired deadline in the second stage. What would happen, though, if both were ranked? Can a combination of desired deadline and default priority be used to evaluate importance? This is where ranking with Qualicision® comes into play. Multiple criteria with different weights can be included in ranking evaluation. A target function is defined for each criterion describing the importance of each value range. Users can control the relative weighting of criteria using a slider. Qualicision® provides a multi-criteria ranking based on the criteria and their weights. Sequence planning can then use this ranking as a basis for further planning.

### Planning with Qualicision®

Let us go a little further. What happens if we want a complete plan instead of just ranking based on multiple criteria? Typical requirements for planning are: high utilization, short mean lead times, high compliance with delivery deadlines, small inventory. As is well known, these requirements conflict. How can a good compromise be found nevertheless? And what does a good compromise even mean? When planning with Qualicision®, users can weight the various criteria for evaluating the entire plan using slide controls. In this case, Qualicision® provides the entire sequence plan. The mathematical foundation—in concrete terms, the extended fuzzy logic of Qualicision®—calculates occurring target conflicts to support traceability. To give an impression of the plan results, a special view containing a kiviät diagram illustrates the feasibility

of the weightings for the individual criteria.

### In practice

Version 8.4 of PSIpenta/finite capacity scheduling includes automatic sequence planning with adjustable rules, a simple version of Qualicision® ranking and a simple version of Qualicision® planning. Criteria and their target functions are preconfigured. Users can adjust the weighting of any element.

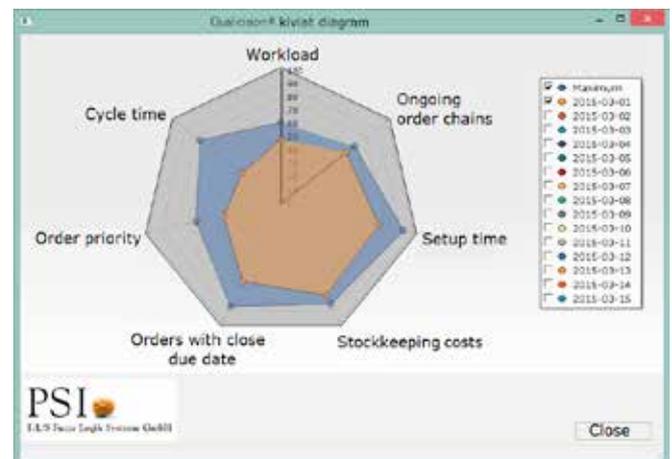
Users who have purchased the full version of Qualicision® ranking can easily supplement additional criteria. Target functions for each individual criterion can also be adjusted. Users who have purchased the full version of Qualicision® planning can develop custom criteria specifications and interactions in collaboration with us.

### Qualicision® modelling

Qualicision® technology is based on complementary extended fuzzy logic. This software supports the optimisation and control of business processes. The diversity of possible interactions when controlling business processes means that variances arise even when all basic business process data is known with absolute certainty. Business process goals are expressed using key performance indicators (KPIs). For Qualicision®-based optimisations, interactions are derived from the process data in the form of impact matrices. Based on these impact matrices,

mathematical conflict and compatibility analysis (CC analysis) is used to calculate which courses of action are best suited to achieving the process goals. The results of the CC analysis are represented in relation matrices. In technical terms, CC analysis makes the combinatory variety of KPI control options manageable. In this way, the software helps users to make better and more strategic decisions faster.

Qualicision®-based modelling is performed with the help of the Qualicision® Functional Decision Design



Qualicision® targets as a kiviät diagram.

Engine (QFDD). It uses a range of modelling functions, which are now also integrated and available in a specially adapted form in PSIpenta/finite capacity scheduling. 

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