Tampere University of Applied Sciences

Optimising a production planning system

Case: Update for the production scheduling software at Mölnlycke Health Care Mikkeli factory

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ABSTRACT

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Optimising a Production Planning System
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This thesis was commissioned by the production planning team at the Mikkeli factory of Mölnlycke Health care Oy. As a part of actions directed towards increasing the efficiency of the production planning process, the production planning team has been going through a process to update the software version of the production scheduling system in use at the factory, Infor Advanced Scheduling.

The purpose of this thesis was to optimise the production planning process at the factory by implementing the new software update together with the production planning team, making user side customisation to the updated software and finally constructing a user guide to support the usage of the software.

This thesis consists of two main objectives; first being the implementation of the new software update to the scheduling system, and the second part including the creation of a comprehensive user guide for the software.

The thesis was performed as a case study, following the progress of the software update project. The outcome of this thesis was helping the production planning team to have the production scheduling software up to date, and a user guide for operating the software

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Key words: lean, production scheduling, software update, learning

CONTENTS

1 INTRODUCTION

1.1 Thesis background

The Mikkeli factory of Mölnlycke Health Care is constantly aiming to increase the efficiency of their production in order to succeed in today's rapidly changing markets. Measures to improve are constantly carried out both in production and the supporting processes. This also applies to the production planning department of the factory. There was an ongoing process to optimise the planning process with improvements to the planning system, creating an excellent opportunity for a bachelor's thesis.

The production planning department is going through an update process with the production planning system. Earlier in the production planning process, a scheduling software for resource allocation has been partially used with the aim to simplify the planning. The software has got an update with several welcome changes for improved function and usability. The goal is to fully implement the software along this new update to further streamline the production planning process and improve the efficiency of the department. This project acts as the base for this thesis.

The base of the production planning is the ERP system, in this case SAP. In its current state, the factory's ERP software does not provide an easy to use scheduling platform. The scheduling of orders must be done individually for every stage of the production. To fill this gap a scheduling software, Infor Advanced Scheduling, was acquired to support the operations within the ERP system. This thesis was commissioned to help the update process and the implementation of the updated software.

In addition, there is no comprehensive user manual available to cover the operations of the production planning team. There is a sizeable demand to have the scattered information and small manual texts combined into one user-friendly guide together with the new data covering the changes made to the software during the update process. This would help the planning department in their day-

to-day work and aid the learning of possible new employees joining the production planning team in the future.

1.2 Mölnlycke Health Care Oy

Mölnlycke Health Care is a global company specialising on advanced medical products ranging from wound management and pressure ulcer prevention to operating room equipment. The globally known brands under Mölnlycke include Mepilex and Mepitel wound management products, Safetac technology for wound management products and BARRIER drapes (molnlycke.com).

Mölnlycke was founded in 1849 in Gothenburg, Sweden where its headquarters are still located. 99% of the company is currently owned by Investor AB. Mölnlycke is a global company with presence in 105 countries and annual global sales of €1443 million (2017) (Mölnlycke 2018).

The company has 15 manufacturing plants scattered around the world. The plants are in Finland, Belgium, Czech Republic, Malaysia, Thailand, France, Poland, United Kingdom, with some also established in North America. The production facilities forward the produced goods to distribution centres located in key areas in Europe, Asia and North America (Mölnlycke 2018).

1.2.1 The Mikkeli factory

The Mölnlycke Mikkeli factory was established in 1970 and the factory site has been expanded numerous times since. The factory focuses on the production of the company’s advanced wound care products. The factory also has an expansive R&D department, which can carry out changes and upgrades to the products and manufacturing methods with direct coordination together with the production (Mölnlycke 2018).

The Mikkeli factory currently employs over 500 people and produces up to 85% of the whole range of the company's wound care products. Only about 2% of the goods produced at the Mikkeli factory stay within the Finnish borders. Multiple containerloads of wound care products are being shipped daily to multiple distribution centres located around the world (Mölnlycke 2018).

The factory has proven its capabilities in the past, followed by numerous large and smaller expansion project. The plant has grown rapidly since its establishment in both physical size and output. Today the plant is one of the biggest employers in Mikkeli, a small city of 50 000 inhabitants.

1.3 Infor Advanced Scheduling

Infor Advanced Scheduling (later InforAS), is a software designed to bring an intuitive and user-friendly graphical interface to support the planning process. It allows the planner to schedule production with immediate visual feedback when making changes to the production plan. It is also able to measure the performance of the production and provide a visual set of dynamic and user-friendly statistics (Infor 2015).

InforAS brings the order data from the base ERP software into a graphical planning board. Within this board it is easy to manage the scheduling of the production to match the real-life capabilities of the production lines. It is designed to handle a complex production system with by-products, line capacities and product flows in between lines.

In the planning board it is easy to adjust the scheduling within complex environments. Orders can be relocated in the graphical interface with immediate feedback about possible issues. The planning board also gives a good overview on the available resources at the manufacturing lines and allows the planner to quickly make an accurate plan corresponding to the actual capabilities.

2 OBJECTIVES

2.1 Updating the production scheduling software

The first objective of this thesis was to apply a new update on the factory's production scheduling software InforAS together with the factory's production team. The update would bring many substantial improvements to the usability of the software at the Mikkeli factory. Updating the software would also allow the production planning department to fully utilise the software in its day-to-day planning processes. Due to some factory restrictions the planning department was unable to apply the old version of the scheduling software on all lines of production, but with the update the goal was to fully utilise the software with all the production lines. The update project consisted of three separate stages.

First part of the update project was to have everything set for the update itself. This included planning the update process together with the provider of the software, the factory's IT department and the production planning team. The planning phase was to determine the required tasks supporting the update process before, during and after the implementation. Before applying the update, some changes and additions also needed to be done to the master data in the ERP system. The aspects that should be transferred into the scheduling system were to be specified along what should stay outside of InforAS.

When the preparing tasks were completed the goal was carry out the implementation. During this phase the software firstly needed to be updated to its newest version. When the software was up to date, all the data required to operate the factory scheduling needed to be transferred into InforAS from the ERP system. The objective of the implementation phase was to have the software up and running with all the major functionalities and new features working and ready for further testing.

When the update had successfully been implemented and data imported to InforAS it was time for the third part of the process, the testing phase. It is crucial to go through testing before applying the software in the day-to-day production

planning process. The goal was to have a stable and functioning platform fit for scheduling the full production of the factory. This would first include small scale testing to make sure the functionalities are working as intended. If the updated software would pass the testing phase, the scheduling of the whole factory could gradually be moved to InforAS.

2.2 Building a user guide for the scheduling system

The second objective for this thesis was to provide the production planning team a comprehensive user guide to support the usage of InforAS and scheduling processes. The existing learning materials consisted mainly of several smaller separate texts and guides. The goal was to combine the scattered information into a single user-friendly document, that would support learning, but also aid the processes of the current production planning team if needed. The guide was to include all the main functionalities of InforAS utilised at the Mikkeli factory.

The goal of constructing the guide was to give the planning team a supportive tool that would be up to date and easy to read, while still being sufficiently detailed to help understand how the software really works beneath the surface.

To fit into the scope of this thesis the extent of guide was limited to include all main functionality of the software, providing a good base to start using the updated software. The guide could then be extended if necessary.

3 UPDATING THE PRODUCTION SCHEDULING SOFTWARE

3.1 A framework for analysis

Lean manufacturing is a concept many manufacturing facilities have aimed to implement in their own production systems to increase efficiency and profitability. Mölnlycke has also brought the lean thinking model to their manufacturing sites. The Mikkeli factory is a good example about implementing lean systems. The main goal of this thesis was to help the factory's production planning team to streamline the production scheduling processes according to the lean manufacturing concept. The theoretical foundation for this update process consists of different implementations of lean management.

The motor company Toyota was first to successfully utilise the idea of lean manufacturing with the Toyota production system. It aims to eliminate waste in production to achieve the most efficient system possible. This evolved into the Just-In-Time production idea, where waste is eliminated by only carrying out actions when they are really needed, just in time (Toyota Europe).

Lean is mainly associated with production and manufacturing lines. However, the same principles can also be applied in the office. A good flow of work is the goal of lean management. Waste (Muda in Japanese), is one of the factors decreasing this flow, as seen in the lean management model. Waste can be categorised into seven different aspects as done by Tokkola (2015):

1. Overproduction
2. Inventories, or incomplete work for specialist jobs
3. Waiting
4. Excess motion of workers or materials
5. Transportation
6. Defects
7. Inappropriate over processing.

Analysing how these waste sources are present in one's own workflow, the state of the flow can be questioned, and the amount of waste decreased. Removing

waste is not the main goal itself, but rather a tool helping to reach for efficiency. (Tokkola 2015)

A good lean measure well applicable in project management could be the importance of Information flow. Getting the right information on the right moment is crucial for successful decision making. Having a working flow of information can decrease the risk of crisis in case sudden changes emerge (Ruffa 2008, 51–55).

When planning customisation options, it is important to focus on a smooth user experience (UX design). The user experience covers the functional side of operating the software. Together with good user interface (UI) design, the quality of the user experience can be increased (Software-Nation). These ideas can be combined with the lean principles. Excluding as much waste from the user experience as possible will definitely have an impact on the flow when operating software.

3.2 Before the update

A good plan is essential for any project. In this case there were multiple parties from two companies operating in different countries, highlighting the need for a good plan. Initially there was an existing plan for the rough time frame and implementation of the update. With the time for implementation approaching, a more precise plan for executing the update itself needed to be done. All the major tasks were defined with the party responsible for said task and the time frame in which the task should be accomplished. From the factory point of view the tasks were assigned between the software provider, the factory's IT department and the production planning team.

Before the update the main task for the software provider, Infor, was to have the update ready for installation and to assist the factory with preparations for the update itself when needed. The IT department needed to prepare the receiving end of the system. This included software side configurations in cooperation with Infor. The tasks of the production planning team, the focus of this thesis, was to prepare the product master data to match the requirements set for the updated

version of the software. The main task was to define what production data would be transferred into the scheduling system and make the needed changes to the master data. Along this the older existing version of InforAS needed to be cleaned for the update. The possible changes to the software functions and user the interface would also be discussed with the production planning team to have a good view on how the usability of the software should be improved.

In the plan a date was set for carrying out the update. For the software update installation process, the representative of Infor would arrive to the factory to go through the update process together with the factory IT and production planning teams. The plan was to have the software updated and ready for scheduling during this update session.

With the software functional and up to date, the plan was to gradually transfer the scheduling to InforAS and further test the system in order to have the ability to completely move the scheduling of the production to this software. The plan was to first have a small portion of the scheduling moved to the updated system for testing purposes. When the system would be stated stable and fit for full scale, the scheduling for the rest of the production lines would be moved into InforAS.

After the plan and its timing were clear, it was time to start with the preparations towards the update. Some of the more complex products had been decided to be excluded from InforAS for the time being. Most of the products however were to be transferred into InforAS. For the software to be able to import the necessary data, the master data of all products had to be inspected and tweaked if necessary. This stage required a lot of manual work going through every product and making sure they have the correct settings.

When the data was checked and corrected where needed on the ERP side, the aim moved towards cleaning the old version of InforAS and planning the possible changes to the customisation of the user interface. The cleaning included the removal of some old user side customisation. With the new software version, these customisations to the user interface would be reworked and optimised where needed. With the customisation options the InforAS scheduling model can be tailored to fit the needs of the user. To find out the optimal changes that should

be done to the user interface, the production planners were interviewed about what they would like to change from the earlier model and what kind of improvements would make the scheduling processes easier to handle and increase efficiency. As results from these interviews a plan was made to mainly rework some user interface data, optimise the scheduling mechanics for some problematic products and to verify the functionality of the product data in InforAS. These changes and modifications would be carried out during the testing phase after the functioning of the main features has been verified

3.3 Update implementation

Having completed all the necessary tasks before the update, it was time for us to start with the implementation process. The first goal of this step was to have the software update installed and the software itself ready for the import of data from the ERP system. The version update was performed relatively smoothly, and the software was quickly set and ready to receive data from the ERP system. The import of data from the ERP required some tweaking to the master data of some products in addition to the master data tweaks made before the update. There were also a few minor software side issues that had to be solved on the ERP side. After the successful import of data, the software was ready for scheduling actions.

The update brought many new and welcome features to the software, including macro scheduling and a wide array of functionalities to user profiles. To gain access to the newly updated software, some tweaks to the user profile data had to be made. The software clients were installed, and their function was tested. Access was then given to all production planners and the clients would later be installed to their computers. The new features were tested and stated to be ready for use.

To verify the functionality of the base features, scheduling was made for a small amount of individual orders. This would show if there would be any unexpected issues with the scheduling or the order data transferring. The orders were successfully created in InforAS and the data was displayed correctly. The software

would also export the data back to the ERP system without problems. Modifying the schedule would also work as intended.

With the update confirmed to be stable and ready for use, it was time to implement some of the customisation discussed earlier with the production planners. This would include reworking the views of the software's planning board where the scheduling itself happens, along some minor user interface tweaks. Most of the customisation involving product data would then be carried out during the testing phase. Due to a large number of recent changes on the product side, these types of customisation would require more precise testing.

The software update itself was now stated successful and the next step with the update project would be to gradually relocate the daily production scheduling into InforAS.

3.4 Testing and analysing the updated software

Now that the base features were confirmed to function, the scheduling system could be taken into small scale use for more in-depth testing. The goal for the testing phase was to figure out the possible problems with the new version and analyse the function of the new system. The rest of the user customisation would also be done during this phase. The testing commenced with a small portion of scheduling moved to InforAS. Having a limited number of products in the scheduling, the overall situation of all the orders scheduled in InforAS could be analysed, and the effects of done modifications could be monitored closely. The validity of product data could also be verified during the testing phase.

The implementation started with at first moving the scheduling of one production line into InforAS. It was then easy to follow the orders scheduled using the software to track the possible issues with the system. The daily scheduling for the implemented production line was now fully maintained in InforAS. Since the scheduling software imports and exports the transactional data from and back to the ERP system once a day, the results of the scheduling modifications would

not show immediately. Therefore, the initial testing with this limited array of products required multiple days to get the necessary data about the functionalities. This testing then confirmed the software was running well without any critical errors. Some tweaks were made to functions not affecting the daily scheduling. This allowed to continue adding more production lines and products to be scheduled entirely on InforAS.

Due to unfortunate delays based on ERP issues during the initial parts of the project, the testing and customisation of the system could not be finished with the limited time frame set for this thesis work. The further implementation of the scheduling software must be done outside the scope of this thesis. Unfortunately, we were only able to transfer a small portion of the factory's production scheduling to InforAS during this time. However, the project will be continued according to the plan introduced along this thesis.

My main recommendation for finishing the scheduling software implementation, is to follow the plan as done so far, and stick to the planned timeline as strictly as possible. To get this project finished within the schedule, enough resources must be allocated for working with the customisation and finalising the testing, and finally fully implementing InforAS as the main scheduling platform for the factory.

As a part of this update process, the new features of the updated software and the already made customisation will be introduced together with the thesis outcomes to the production planning team. This introduction will also cover the new user guide discussed in the next chapter of this thesis report.

4 USER GUIDE FOR THE SCHEDULING SYSTEM

4.1 Analysing the learning process

The best styles for learning to maximise efficiency is a well discussed subject in today's world. There is a large array of different models on what would be the most beneficial types for people to learn. In many cases it has been understood that learning is based on different characteristics depending on the preferences of the learner. Among the most popular models for learning in the VARK model that separates people's most important learning preferences into different categories (Vanderbilt University).

The VARK model consists of four different characteristics, each of which would be utilised differently by different people; visual, auditory, read/write and kinesthetic modalities as the name of the model (VARK) suggests. The first modality, visual learning, being quite self-explanatory is directed to people who prefer visual stimuli to maximise learning. The people preferring the auditory modality value heard of spoken content. The read/write modality works for the people who find written content to be the best platform to support learning. Finally, the kinesthetic modality values simulation or connection to reality (VARK Learn).

Many of the numerous models about learning styles do share the main theory behind learning styles. The common idea is that everyone could express the most suitable way of learning for them and using these methods would result in maximal effectiveness. These models should however be approached with some caution. There is a lack of solid evidence on how using a certain learning style that is preferred by the learner actually affects the learning process itself (Vanderbilt University).

There are many different aspects affecting the learning processes depending on the circumstances. The audience group and the topic for example should be analysed to find the most suitable techniques. In professional environments, for example, the effectiveness of the learning process can be affected in many ways by the leader and the conductor of the training. According to Knox (2015), learning in professional environments can require more focus on the qualities of the

people who are learning. There should be a clear view on the state of knowledge, attitudes and skills, and their effect to the learning activity. The goals for training must also support the goals of the professionals to maximise effectiveness.

The usage of visual aids in training materials is another much discussed theme when working with user manuals and training materials. According to Clark (2010, 8–9), it is important to have clear and efficient visual, but in addition, it is crucial for the visual materials to support learning. In the worst case, if not in line with the goals of the learning, the visual aids can become a burden and actually have a negative impact on learning. Like stated earlier, many like to categorise people into for example more visual or auditory learners. In the case of visuals, the level of existing knowledge is the most important factor when analysing the effectiveness of graphics in learning. “Not surprisingly, the lessons with added graphics greatly improved learning of novices learning of novices. However, adding graphics did not help individuals with prior knowledge” (Clark 2010, 10).

Planning a visual design model can be separated into five phases as seen below in figure 1 (Clark, 2010, 33–42). The model delivers a good base for planning good visuals that support the learning process.

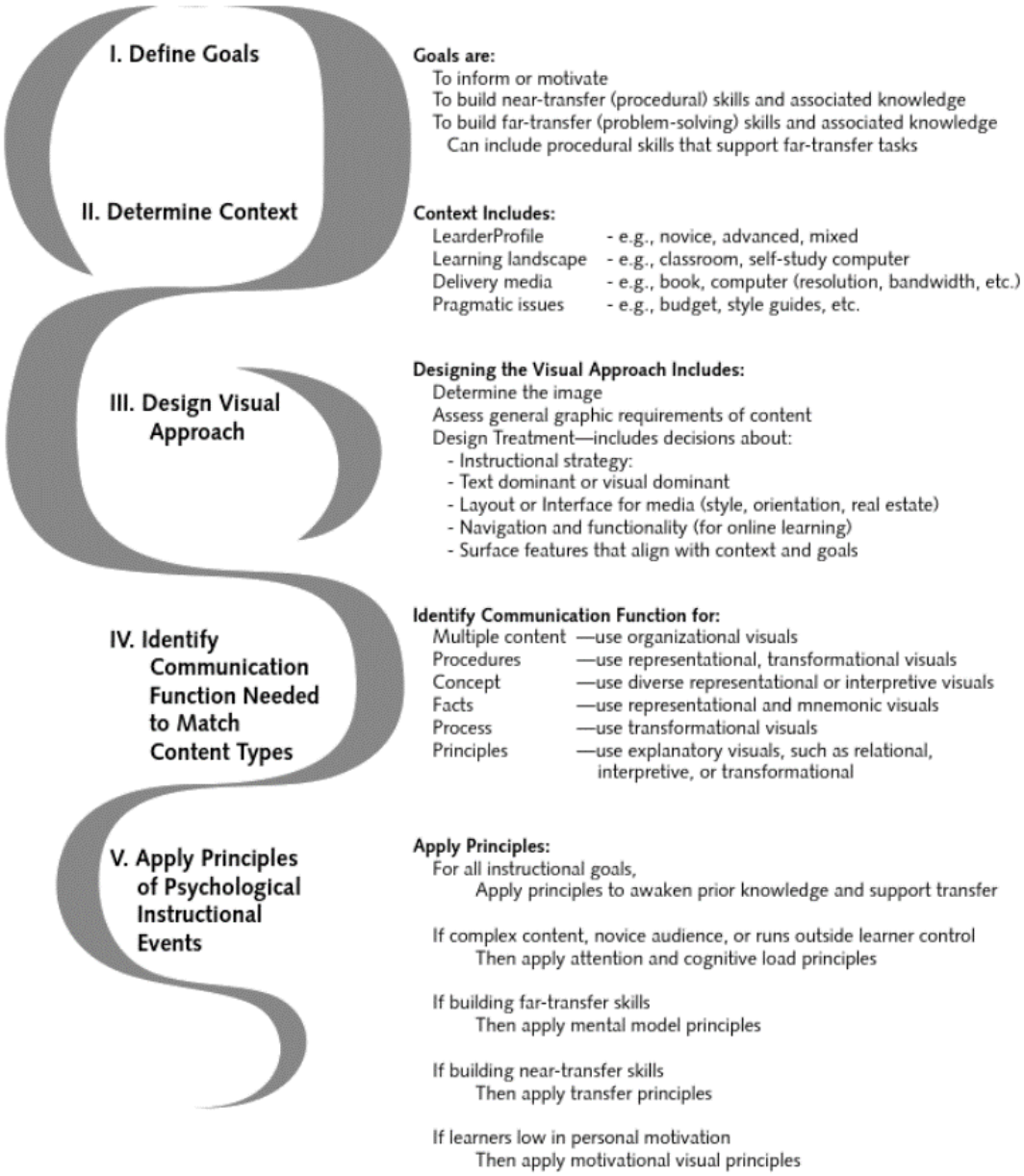

Figure 1. A visual design model. (Clark 2010, 33)

This model separates the planning of a visual model into five different parts. During the first part, the goals for the visuals in the training material should be defined. This will determine what kind of visuals fit best into the specific learning material. The second phase is to determine the context for the training. How is it delivered, and can the visuals be used in a supportive role in the specific situation? This requires defining the audience and the environment for the training. The third part is to design the visual approach. Here the main design choices are defined. Number four includes identifying the required communication function for the specific content types. The fifth and final step is to apply the principles of psychological instructional events. This includes directing attention, managing

cognitive load, activating existing knowledge, encouraging transfer of learned knowledge to be applied in the working environment and finally assisting motivation (Clark 2010, 33–42).

4.2 Analysing the best practises

To find the best ways to build the user guide, it is important to define the goals of the training. The main function behind this guide would be to act as a supporting tool for planners with existing experience from InforAS, but also aid the training of possible new employees in the production planning team. This means the target audience for this guide may vary. This affects the way the guide should be built, requiring it to be accessible by learners with no existing knowledge about the software. At the same time, it should have enough details to create value for the current production planners.

For the guide to succeed as an introduction for learners without prior knowledge, all the basic functions required to operate the software should be gone through. This would include explaining the user interface and navigation within the software first. When the basics are covered, more in-depth views can be brought under examination.

Being an introduction to the ways to operate a software, a highly visual guide with direct comparison to the real user interface would be the best approach in this situation. Having real life examples would help the newcomers to form an understanding of the function of the software. At the same time the memory of the users with prior knowledge would also be activated with the examples.

The design choices should support learning with having a clear structure for the guide, user-friendly visuals and a design that does not overload the cognitive processing of the learner.

4.3 Building the user guide

The process of making the user guide was naturally started with a plan to answer the questions about what is needed in the guide, the best way to make it happen, and how to have a clear layout and structure that support learning. The first step in the planning process was to go through the software and find out all necessary functions to be added into the guide; what are the main features in the layout needed in the everyday scheduling work, how to perform basic functions, and finally all of the steps in the scheduling process itself.

To be a comprehensive guide suitable for induction of new employees, the instructions had to go into enough detail to allow understanding with minimal prior knowledge. Clear illustration of functions was chosen to be the main body of the guide to ensure an understandable form. This would be achieved with direct comparison and real-life examples on the functions of the software. The visual connection to the system would be acquired with screen captures from the user interface.

The goal was to have a comprehensive guide to the software, with all the basics covered first and gradually moving towards more complex topics. This would mean the basic layout information to begin with. With the user interface covered, the guide would move its focus to the transferring of data between InforAS and the ERP system, and the scheduling process itself. The guide was to also include the new and modified functions introduced with the version update. The next step after having the daily scheduling operations covered by the guide was to introduce the available customisation options to modify the user interface and data within the software. Due to limitations in the time frame of the project explained in the software update part of this thesis, the customisation part of the guide could not be included within the scope of this thesis.

To document the functions of the software, all the possible tasks in the daily production planning process were gone through in the software and the examples were saved in picture form with a screen capture ability to be included in the final guide. The documentation part required inspection of all necessary options and views to be able to form a comprehensive understanding of the interface. Example data transfers and order scheduling were made to have all the necessary steps involved in the daily planning process documented for the guide.

As mentioned before, the customisation part had to be excluded from the scope of this thesis. The user guide was completed with the necessary instructions to operate the software in the day-to-day production planning process. It can also be used to train new employees as planned with the thesis objectives. This guide can be expanded in the future to include a more precise take on some subject is needed. It is recommended to add the instructions for user-side customisation into this existing guide along any desired additional features to have a centralised guide for all functions of the software.

4.4 The outcome of the user guide

As an outcome from this thesis, an initial version of the user guide for InforAS at the Mölnlycke Mikkeli factory (Appendix 1.) was completed. The scope of this thesis only allowed the inclusion of the main features and operations for InforAS to this user guide.

As seen in Appendix 1, the guide relies heavily on visual aids to support learning. To work as a base for operating the system, the basic tasks within the software were described in high detail. Since the guide can be used for training people with no existing knowledge on the software, it was made to be as straight forward and comprehensible as possible. This would also support the employees with existing knowledge of the system in case a reminder on the how to carry out certain tasks is needed.

The user guide starts with a cover page including the software information and the topic of the document. It is followed by a table of contents to help with navigating the document. The overall layout of the guide is designed to be minimalistic to minimise the possibility to negatively impact the learning process. The aim was to have a layout that is easy to read, but with some subtle design features to fill in some of the open spaces. The colour palette was designed to follow the Mölnlycke brand to create some contrast to the document.

The focus on the guide is to visualise how the tasks required in the planning processes will be done in InforAS. This was accomplished by capturing pictures of example scheduling tasks. This allows the learner to easily connect the guide with the actual software and to have a good understanding on how these tasks are executed within the software.

The first part of the guide gives the learner a brief overview on the software and the reasons why it has been implemented in the planning process. Continuing with the basics, a getting started chapter was included to describe the main features and the layout of the software. This would serve as base for learning the more specific tasks and operations for running the scheduling.

With the basics covered, a description on how information flows within the system. A successful import and export of data to and from InforAS is needed to allow scheduling tasks. The imports and exports are done automatically, but the planners need to be able to carry them out manually if needed to allow scheduling.

The next part of the guide covers the main scheduling tasks. This includes all the daily operations for running the scheduling of production. The aim of this part was to describe in detail all necessary parts of the scheduling, from creating orders to modifying an existing schedule. This was done with the help of images describing and showing the exact methods for fulfilling the said scheduling tasks.

The last chapter of this initial version of the guide contains details on some of the most important additional features and the most notable new additions introduced by the software update. Continuing with the visual focus, these features have been captured from the software in form of images, supplemented by text descriptions.

In the following, more detailed versions of this user guide, a broader view beyond basic functions is needed. The in-depth background processes of the software and customisation are not present in this version of the guide but are a crucial part of a comprehensive user guide. Changes in products and production methods happen constantly, requiring modifications and additions in master data for

example. How to get a new or updated product working in the software, and how to adapt in case of all kinds of changes in the planning environment. This was unfortunately out of the scope of this thesis work, but a base for a comprehensive user guide is now available and ready to be supplemented with additional topics.

5 DISCUSSION AND RECOMMENDATIONS

This thesis was commissioned by the production planning team at the Mölnlycke Health Care Mikkeli factory. The planning department was undergoing a process to update the production scheduling software, Infor Advanced Scheduling, used in the production planning process.

The thesis had two main objectives. The first objective was to implement the software update to InforAS and include some user customisation to the new version with the goal to have all the production scheduling actions done with Advanced Scheduling. The second objective of this thesis was to create a comprehensive user guide for InforAS to support the daily planning process. The guide was to replace the current instructional texts scattered into multiple separate documents.

The purpose of this thesis during the software update process was to preform necessary preparing and supporting tasks to allow the version update for the scheduling software to be implemented. To continue the implementation, user-side customisation was to be made to streamline the scheduling process. Also included in the update process, was an in-depth testing phase to verify the correct functioning of the software.

For the user guide part, the task was to plan a good design and build a comprehensive manual supporting the usage of InforAS. The plan was to have a guide that would support the production planners in their daily planning processes, but also aid learning for possible new employees in the future. The guide was to include all the main functionalities of the software, including the scheduling process, new features introduced with the version update and customisation options.

The objectives of the thesis were accomplished well to the most part. Due to limitations within the time frame of the thesis after delays in the update project, not all the assigned goals were possible to be achieved within the scope of this thesis project. The main objectives, however, were completed with minor limitations. The software update itself was successful and some customisation could be carried out. For the testing side of the project, the most crucial tests were

successfully carried out, verifying the main functionality of the scheduling software. However, further implementation of the software must be done by the production planning team outside of the scope of this thesis. Due to the same difficulties concerning the available time, the customisation part of the user guide had to also be left outside of the scope of this thesis. This too requires actions from the production planning team to expand the guide if necessary.

The software update and the completion of the user guide helped the InforAS project to gain noticeable momentum towards the production planning department's main objective of fully moving the production scheduling process to be fully managed through InforAS. To achieve this objective, it is recommended that the production planning team will continue with the plan and keep the priority of the project in order to not face additional delays with the implementation. The scheduling of the rest of the products and manufacturing lines should be gradually moved to InforAS as planned to be able to streamline the planning processes. More of the customisation should be modified constantly with along the advances in the testing phase. The user guide should also be updated to include instructions for the user-side customisation and other features when necessary.

The biggest obstacles have been passed and the largest steps taken by the software update project during this thesis. If the production planning team will continue to follow the existing plan, the full move into scheduling in InforAS can be achieved in a reasonable time.

REFERENCES

Clark, R. C. 2010. Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials. Pfeiffer.

Infor. 2015. Infor Advanced Scheduling brochure. https://webassets.infor.com/resources/Brochures/Infor-Advanced-Scheduling.pdf?noRedirect=1

Knox, A. B. 2015. Improving Professional Learning: 12 Strategies to Enhance Performance. Stylus Publishing.

Learning styles. Nancy Chick. N.d. Vanderbilt University. Read on 28.4.2019. http://cft.vanderbilt.edu/guides-sub-pages/learning-styles-preferences/

Mölnlycke Health Care. 2018. Mikkeli factory information brochure.

Products and solutions. N.d. Mölnlycke Health Care. Read on 10.03.2019. https://www.molnlycke.com/products-solutions/

Ruffa, S. A. 2008. Going Lean: How the Best Companies Apply Lean Manufacturing Principles to Shatter Uncertainty, Drive Innovation, and Maximize Profits. American Management Association.

The importance of UX/UI design. 07.03.2017. Software-Nation. Read on 12.03.2019. http://www.software-nation.com/uxui-design/

The VARK modalities. N.d. VARK Learn. Read on 28.04.2019. http://vark-learn.com/introduction-to-vark/the-vark-modalities/

Tokkola, S. 2015. Lean asiantuntijatyön johtamisessa. Talentum Media Oy.

Toyota Production System. N.d. Toyota. Read on 12.03.2019. https://global.toyota/en/company/vision-and-philosophy/production-system/

APPENDICES

Appendix 1. The user guide for InforAS

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USER GUIDE

Infor Advanced Scheduling 19.2.5

Mölnlycke, Mikkeli factory

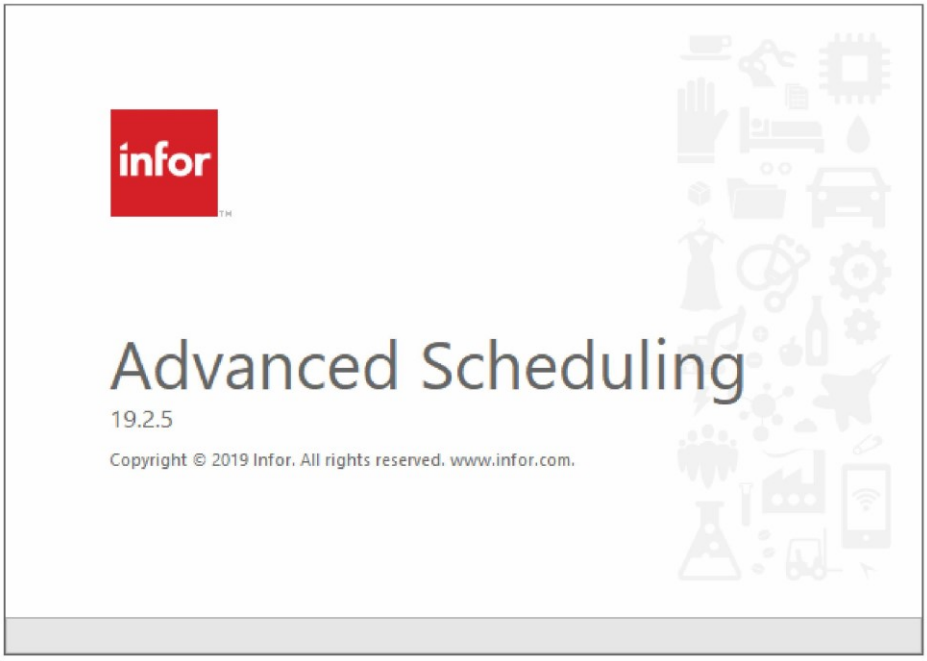

Table of contents

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1 Introduction

InforAS provides a graphical user interface to help the production planning process. It is used to create detailed scheduling for most of the factory's production lines. It allows the planner to make all changes to order scheduling and quantities within one visual interface. The software has been chosen to give a straightforward alternative to the time-consuming scheduling made inside the factory ERP system. All the changes in scheduling and quantities should be made with InforAS, from where the data will finally be exported back to SAP. The software is in use to allow planning and scheduling in a way that supports Just-In-Time production.

This guide is made to support the day-to-day production planning tasks and aid the learning process of possible new production planners in the future.

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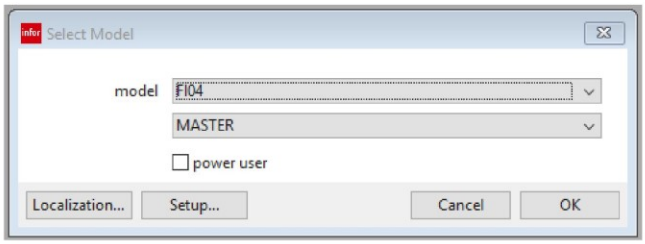
2 Getting started

2.1 Launching

After launching InforAS, the program will ask which model to open. The software will use the user's windows login details automatically. There is no need for a separate login.

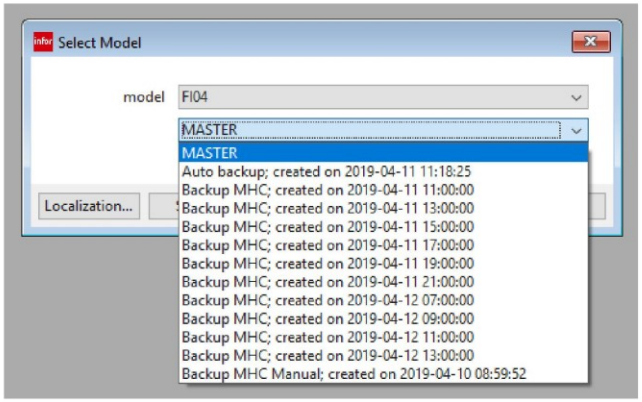


Choosing FI04 will open the Mikkeli plant scheduling model.

Opening the model as a power user by checking the tab will open extra options in the model if power user rights have been given to the user.

The power user option should only be chosen when there is a need for the extra options.

It is also possible to open a backup version of the model if needed.



Pressing OK will open the model.

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2.2 Layout

The planning board is the main hub for Infor AS. From here orders can be added in AS for scheduling and the existing schedules can be modified.

The main schedule planning will be made from this view. It allows the planner to immediately see the effects of the done scheduling actions. The system will show warnings when possible discrepancies with the schedule are spotted to give immediate feedback and allow the planner to modify the schedule how needed.

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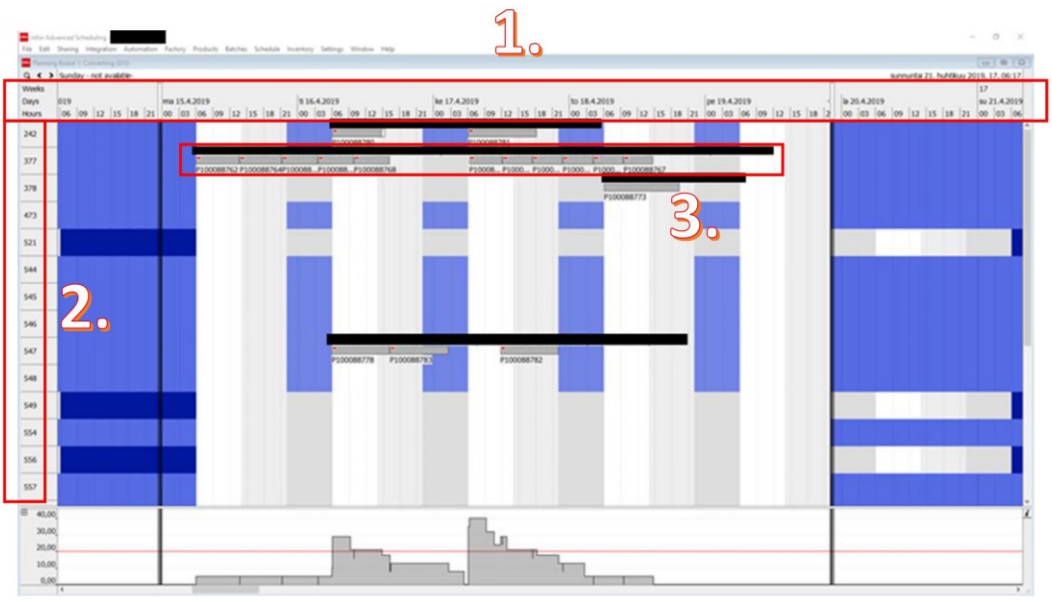
The board shows the schedule of specified production lines on a timeline for easy recognition.



The three base items on the planning board are:

1. **Timeline** Shows the time of the schedule in for Week, day, hour

2. **Production lines** Lists the production lines according to the selected view.

3. **The orders** Orders added to the schedule will appear on the timeline

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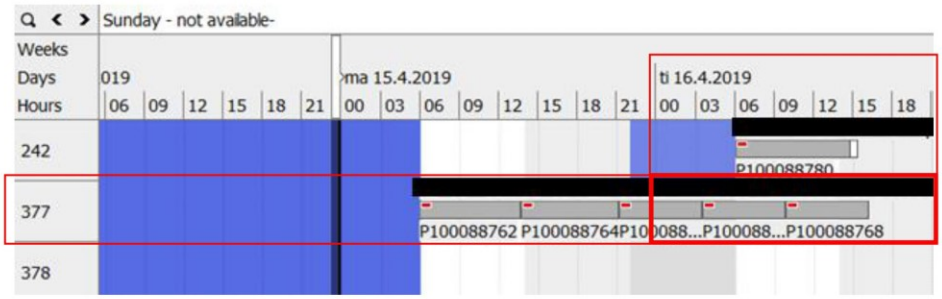
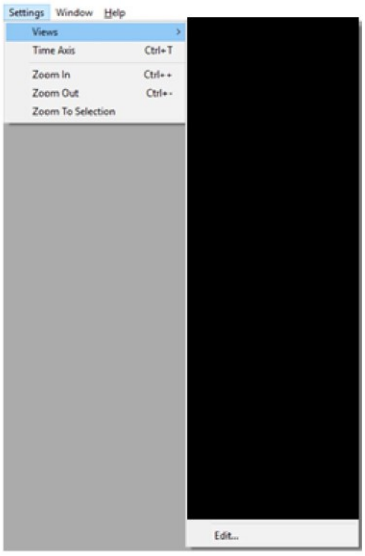
Every machine line is given its own row displaying the current schedule within the timeline.

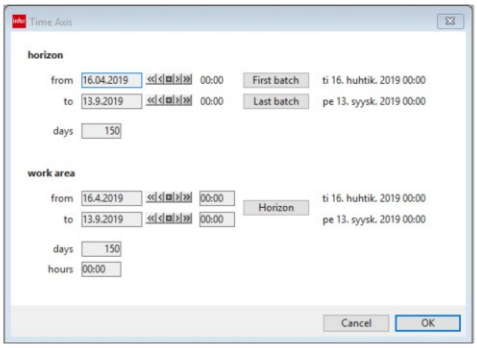


The view and the time axis of the planning board can be modified to include the desired machine lines within a certain time frame.

The horizontal bars inside the planning board each represent a specific order. Every order is connected to a specific production line and will be shown in the timeline area for the machine line in question.



The views and the time axis can be changed via the settings tab located in the navigation bar in the top of the window.



The horizon will define the time frame available in the planning board.

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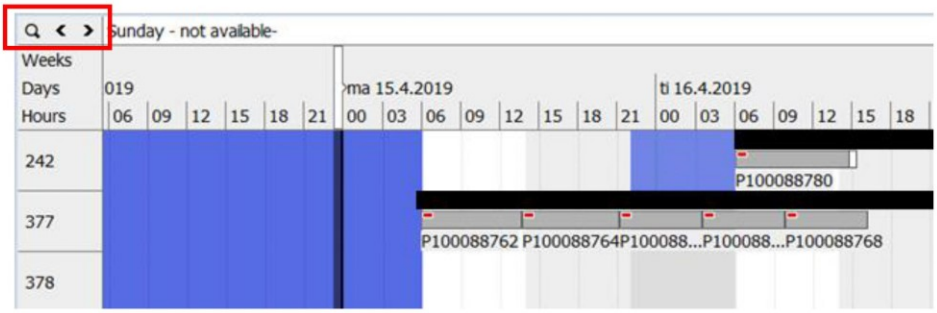
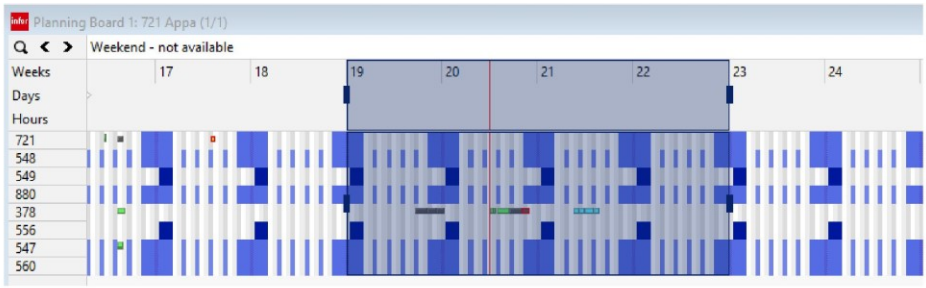
The zoom of the schedule can be altered with the zoom button on the top left corner of the board.



This will allow the user to select the desired time frame within the set horizon



The zoom of the view can also be altered with [Ctrl + Mouse wheel]. Specific week(s), day(s) and hour(s) can also be chosen by pressing down [Ctrl] and clicking or painting the desired spots in the timeline.

In the example the Wednesday morning shift has been selected and after releasing [Ctrl] it will be shown on the planning board.

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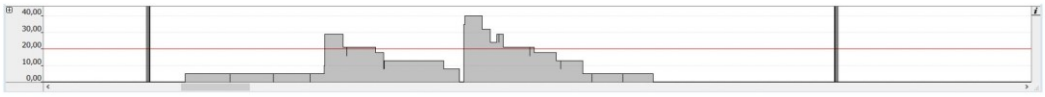
The bottom part of the planning board will show additional performance data if applied to the view.

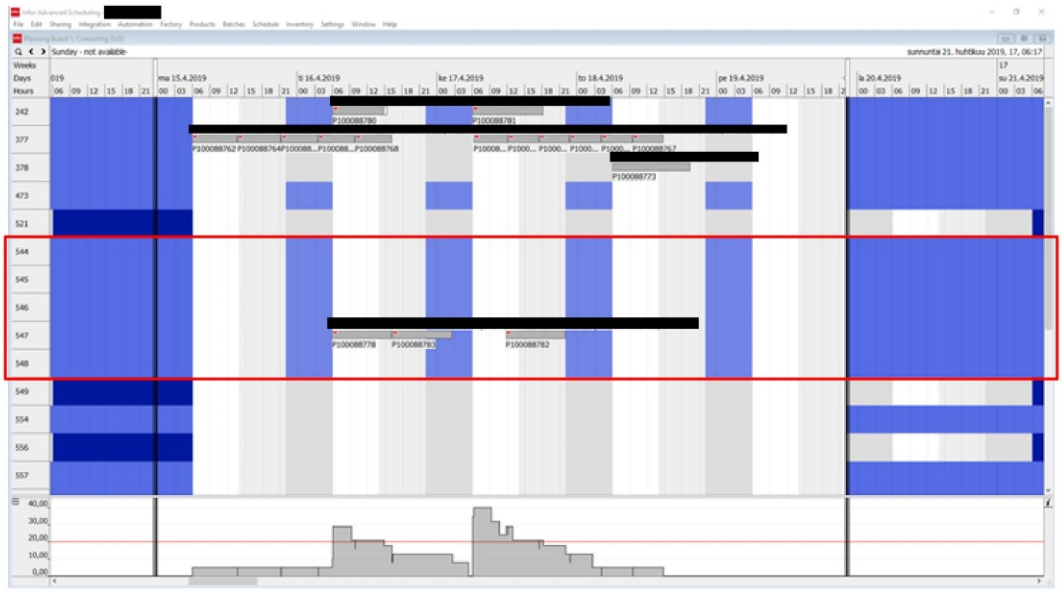


The desired utility can be chosen from a list accessed through the info sign on the top right corner of this view.

The main view of the planning board shows the shift patterns applied to specific machine lines.

Areas marked with white/grey are the times of the day the machine line is available for production.

During the times marked in blue the machine line is not operating. For example, during weekends and night shifts the machines highlighted in the following picture are not operating, thus marked in blue.

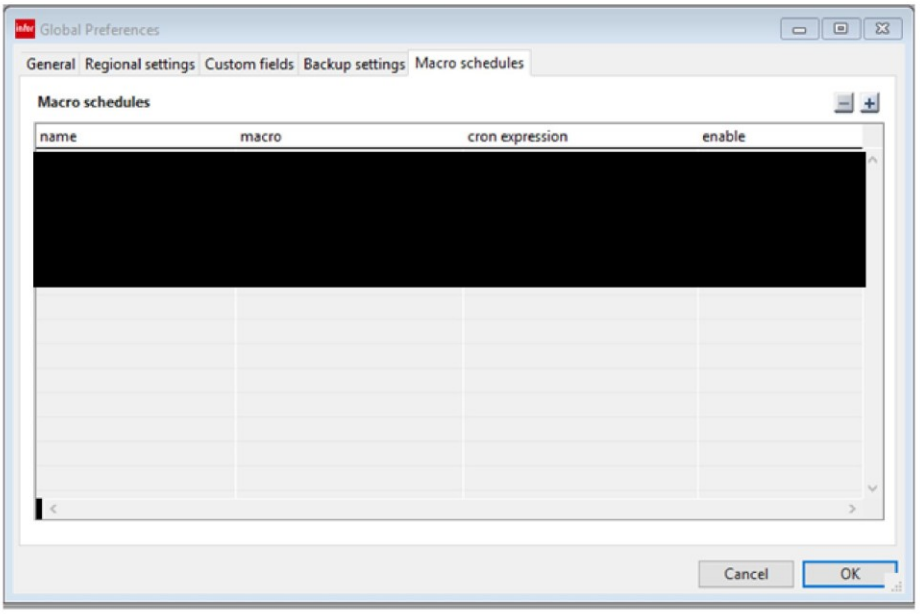


3 Transferring Data between AS and SAP

Data will automatically be moved between AS and SAP daily. The import to AS from SAP will happen before starting the daily scheduling actions. This will make sure AS is up to date with the possible changes taken place in SAP. The import needs to happen once every day before making any scheduling actions.

After the model is in a ready state with all the day's scheduling actions carried out, the data will be exported back to SAP. This will transfer the changes made in the schedule into SAP.

The transfers are made with AS macros. The system will automatically run the macros according to set schedules. Transactional data, containing planned and production orders from SAP, is made daily. A full load import of master data is made every Monday, while on other weekdays a smaller delta load of master data is sufficient.



At the end of the day when all scheduling actions necessary are done, the data will be exported from AS back to SAP. Exporting of process batches to SAP is made every evening Monday to Friday. The export sends all the firmed planned and production orders to SAP.

A macro execution log can be found under "Automation" in the navigation bar.

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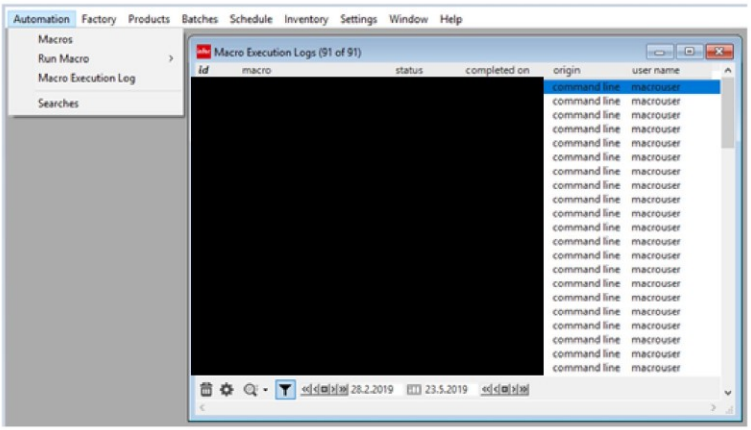
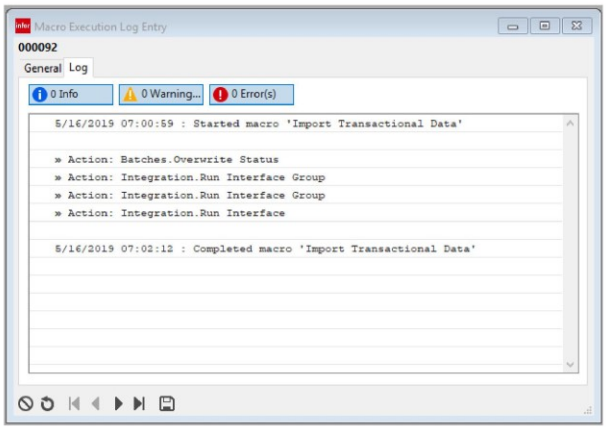


A log is created every time when a macro is run, including data about the macro execution and information on possible errors.



3.1 Manually transferring data

The import and export macros can also be run manually, if for example, the timing of a macro schedule is not suitable for the situation.

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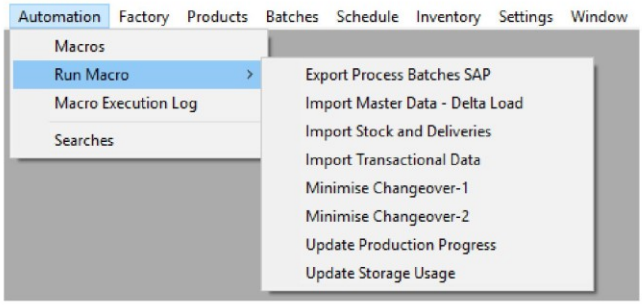
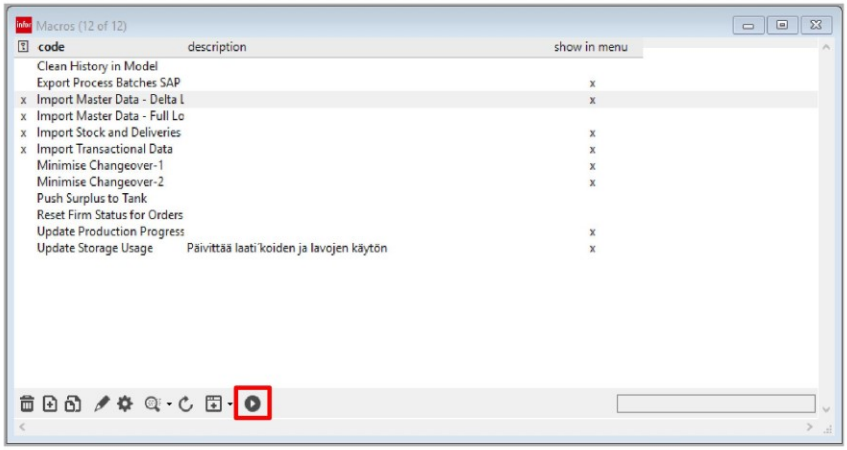
In this case the scheduling of the macros should be turned off to avoid unnecessary running of the macros. More about macro schedules in chapter 5.1.

Macros can be run from the “Run Macro” list under “Automation”



“Macros” will open up a full list of all macros available if the desired macro is not on the “Run Macro” list. After selecting a macro, it can be run with the “Run Macro” button in the toolbar.



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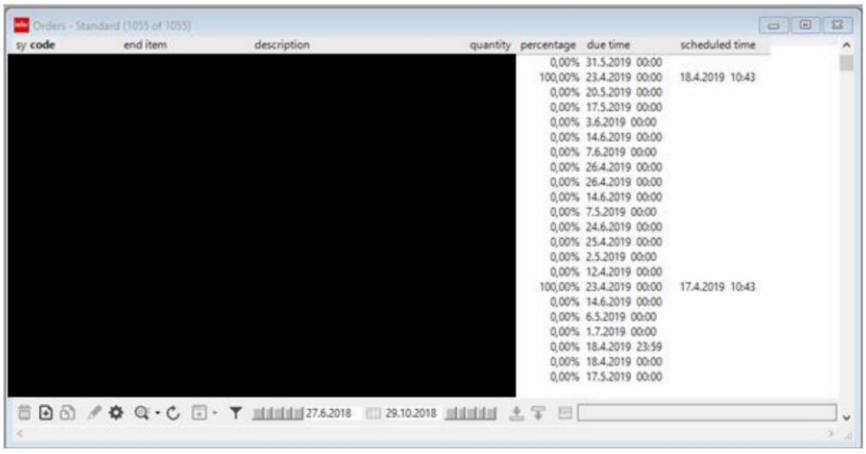
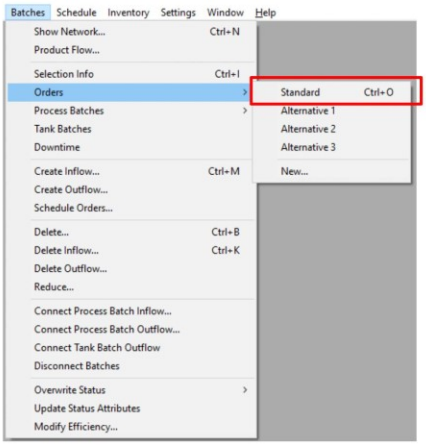
4 Scheduling Production

InforAS will gather planned orders from SAP. An inflow needs to be done to the orders gathered to form the orders into AS process batches. These process batches are generated into the planning board for scheduling and placed according to their due time.

The inflows are made for the end product orders. When making the inflow, AS will also generate a process batch for the earlier stages required in the end product orders (orders semi-finished products).



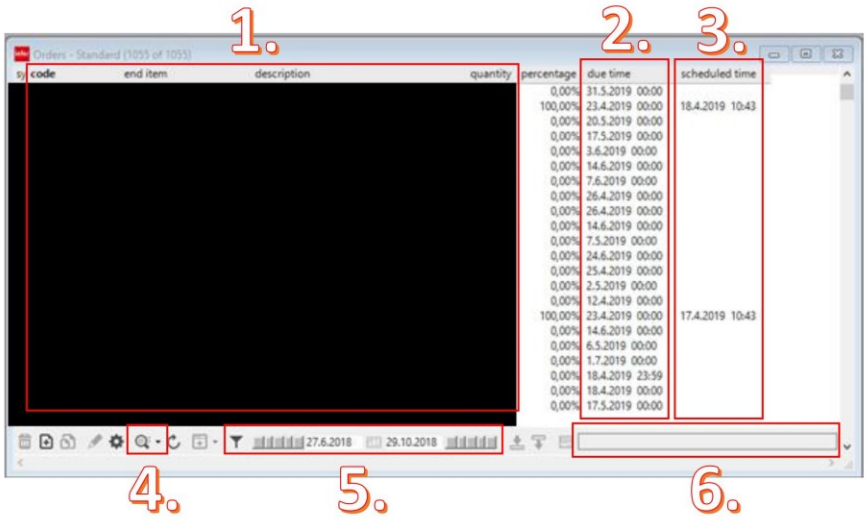
After the inflow has been done for the order, all the stages will appear in the planning board where the scheduling itself can be modified.



The orders can be found under “Batches” in the navigation bar. **Orders > Standard**

Shortcut for the Orders - Standard view is [CTRL + O]

Orders – Standard has all the orders gathered from SAP. This includes all planned orders within the specified time frame.



4. Order details Basic details of the end product orders

5. Due time Time when the specific order is due

6. Scheduled time Time when the production of the order is scheduled to start. Only visible for the orders with already made inflows in AS.

7. Order search Allows searching specific orders with different filters. For example, by order number or article number.
Also possible to search with premade filters. For example, choosing a search with all products for a single production line.

8. Time filter Showing all orders within a specific time span. Activated with the Time Filtering button on the left.

9. Open search Searching with key words. Shows all orders with data matching with the search.

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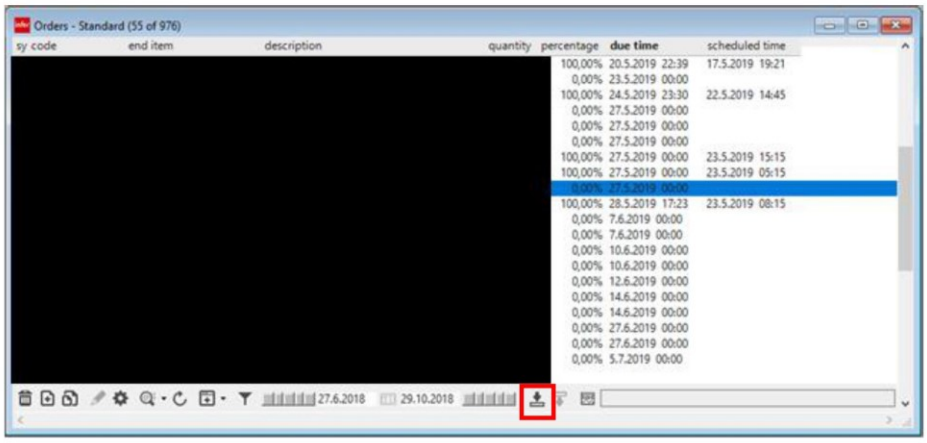
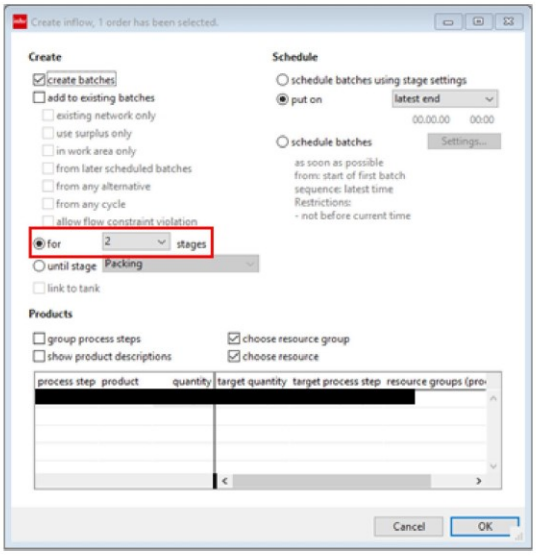
4.1 Adding orders to planning board

The orders without scheduled time require an inflow to get added into the planning board enabling scheduling.

Selecting an order with no inflow activates the “create inflow” button in the bottom toolbar.





When creating the inflow for an order, the amount of stages has to be specified.

The base stage is always the end product or packing stage. If there are separate converting orders connected to the packing order, AS creates the process batches for as many stages as needed.

In this example 2 stages are needed. First converting and finally packing

Pressing OK after selecting the amount of stages needed creates the inflow for the required stages

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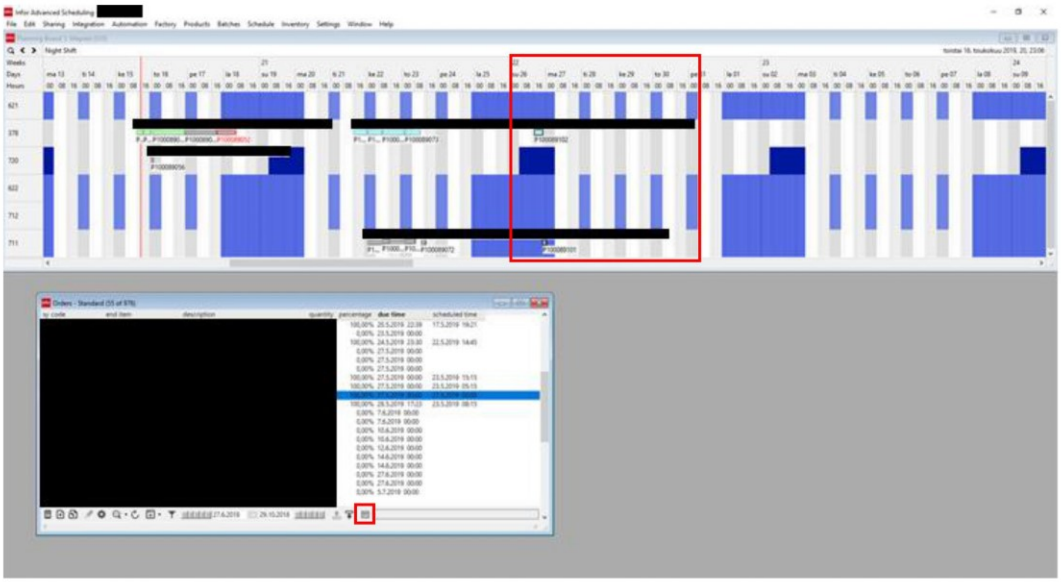
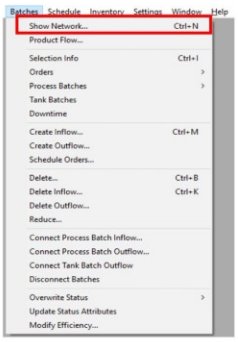
4.2 Scheduling items on planning board

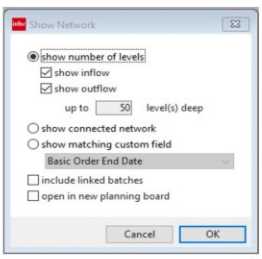
After creating the inflow, the orders will now appear into the planning board and are ready for scheduling.

The order can easily be located with the Orders – Standard view by pressing the “Planning Board” button located in the bottom toolbar. This makes the view jump to the packing order in the planning board and selects it.



Before moving the order within the schedule, it is wise to also select the stages connected to the packing order to easily keep them grouped in the schedule. All connected stages can be selected with the “Show Network” option under “Batches” in the navigation bar. Hotkey [Ctrl + N].





Pressing OK will select the stages connected to the selected order along with the selected order itself.

The selected orders are now highlighted on the planning board.

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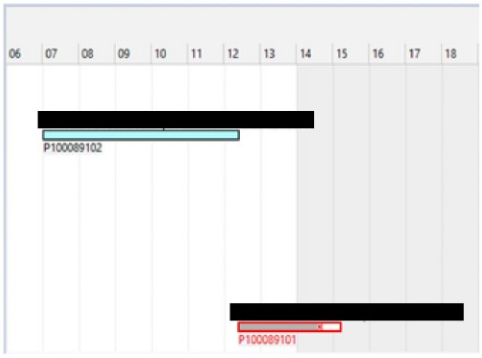
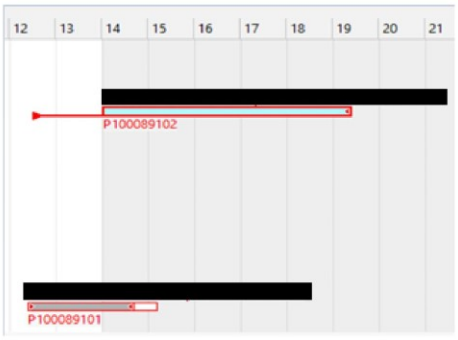
The orders can now be moved by dragging them with the mouse on the planning board to schedule them in a suitable place.

Latest changes can be undone and also redone using the undo function found under “Edit” in the navigation bar. Hotkeys [Ctrl + Z] and [Ctrl + Y]



If the packing order is moved beyond the due time, the order will change its colour to red on the planning board to alert about a discrepancy.



The earlier stages will react the same way if scheduled to take place later than the following stage.

Now the orders can be scheduled within the model to form a working production plan.

The changes made to the scheduling of the orders will be copied into SAP with the next data export.

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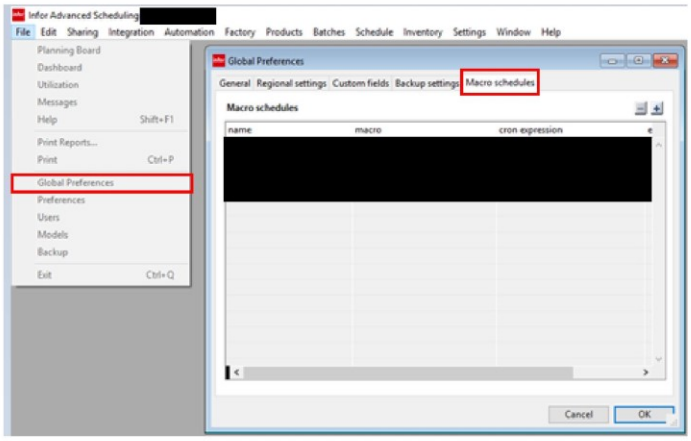
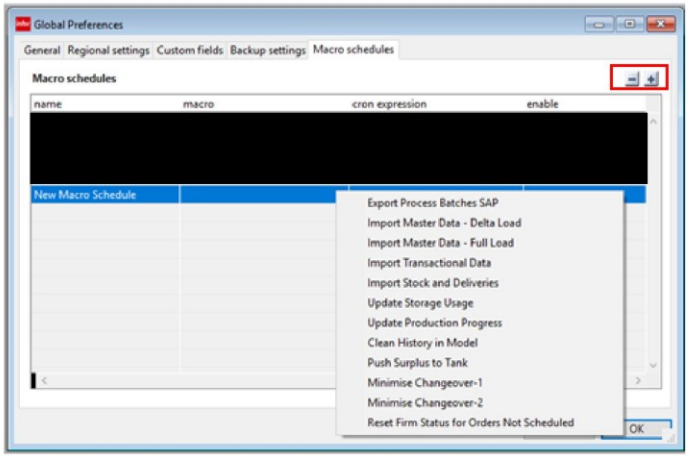
5 Additional features

5.1 Scheduling macros

Macros can be scheduled in the system to be executed with defined intervals. Macro scheduling can be found from “Global Preferences” under “File” in the navigation bar.



A new macro schedule can be created with the + symbol in the top right corner of the window.



The schedule can be named and assigned a specific macro to run at the times specified. The macro running times are set in CRON expression format.

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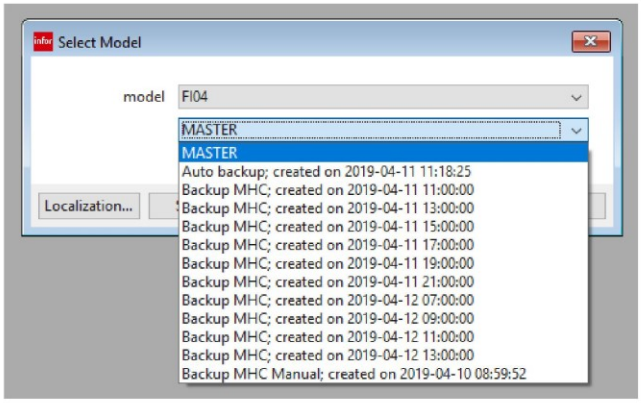
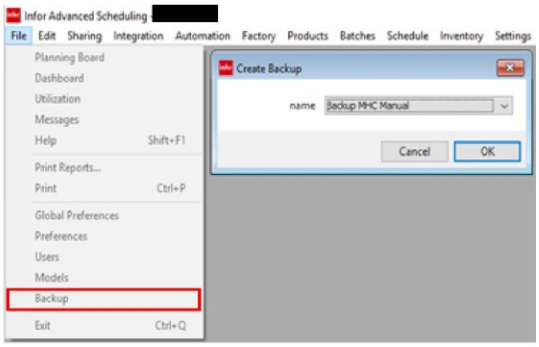
5.2 Backups

A backup of the model can be opened when launching the software during model selection.



AS will currently make a backup of the model every two hours during daytime. A maximum of ten of the latest automatic backups are kept in the system.

It is also possible to make manual backups when necessary. Backup creation can be found under “File” in the navigation bar.



A backup setting must be selected to determine the name.

Pressing OK will create the backup.

Backup settings can be found from “Global Preferences” under “File” in the navigation bar.

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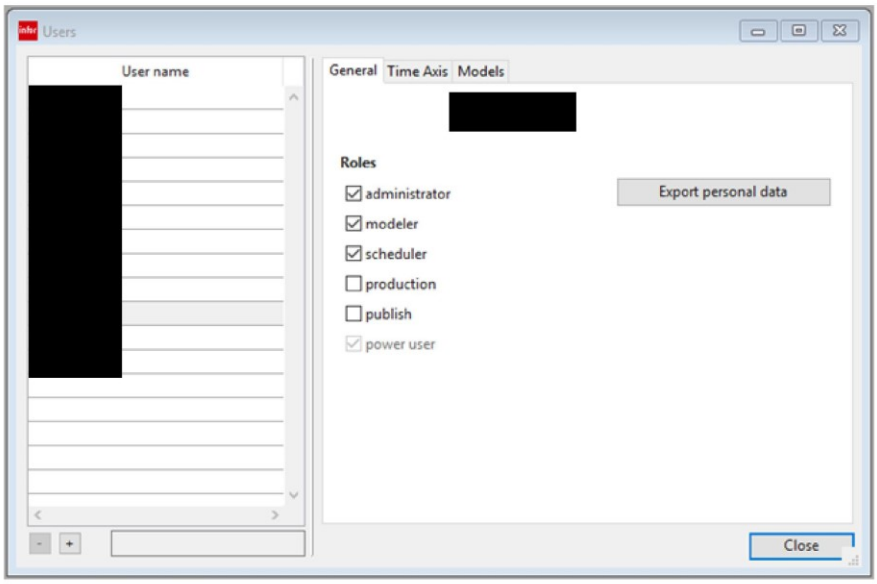
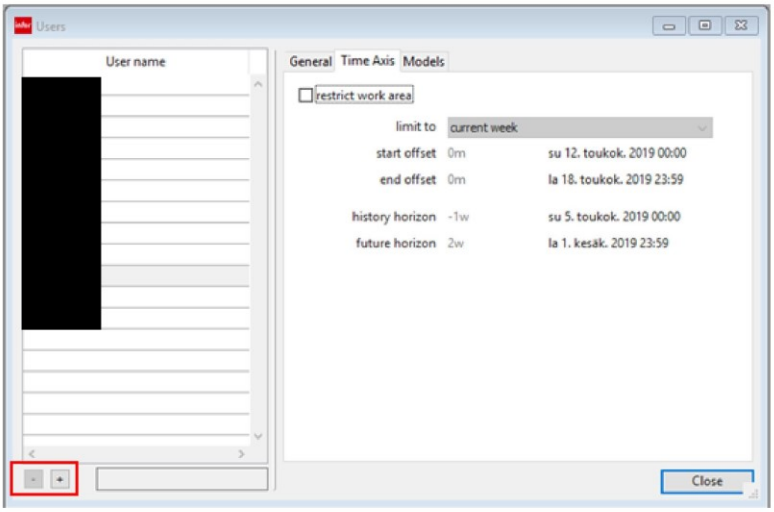
5.3 Users

AS allows creation of users with different levels of access and varying rights.



- **The administrator** Has the right to operate and customise the whole model freely.
- **Modeler** Gives access to the model but does not allow scheduling.
- **Scheduler** Is able to do scheduling actions but not modify the model.
- **Production** Restricted access to the scheduling on a restricted time frame.
- **Publish** Gives the ability to publish the model.
- **Power user** An administrator can be given power user rights to open additional settings. Can only be assigned by an existing power user.
- **View only** The default role. Can only view the model.

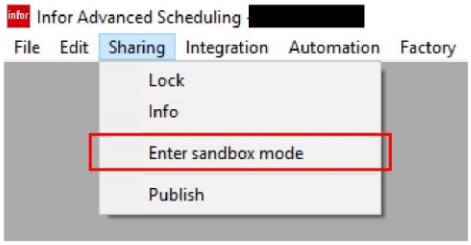
The work area of a single user can also be limited or kept unrestricted.



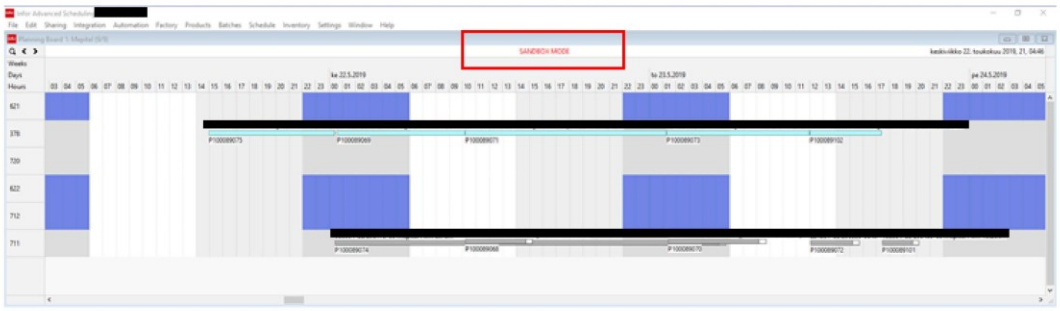
Users can be added with the + symbol under the list of users. The user name should be the user's windows username to allow login to AS.

5.4 Sandbox mode

InforAS comes with a sandbox mode for experimenting with the schedule without consequences. The sandbox mode can be activated under "Sharing" in the navigation bar.



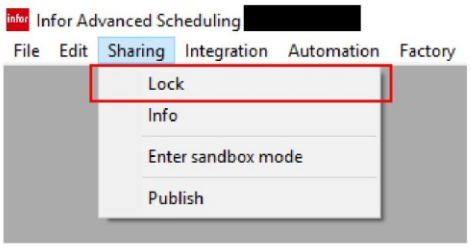
The mode allows the planner to make changes to the model without a risk of disturbing the production. All changes made while having the sandbox mode active will be discarded when closing the mode.



The sandbox mode can be closed from the “Sharing” tab or by exiting the model.

5.5 Locking the model

The model can be locked from changes if necessary. The locking function can be found under “Sharing” in the navigation bar.



This will reserve the model solely to the planner applying the lock until turned off. During this time other users cannot make changes to the model.

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