PLATAINE®
people-smart automation

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WHITEPAPER

How AI-based production schedules can easily adjust to changes in demand to increase throughput

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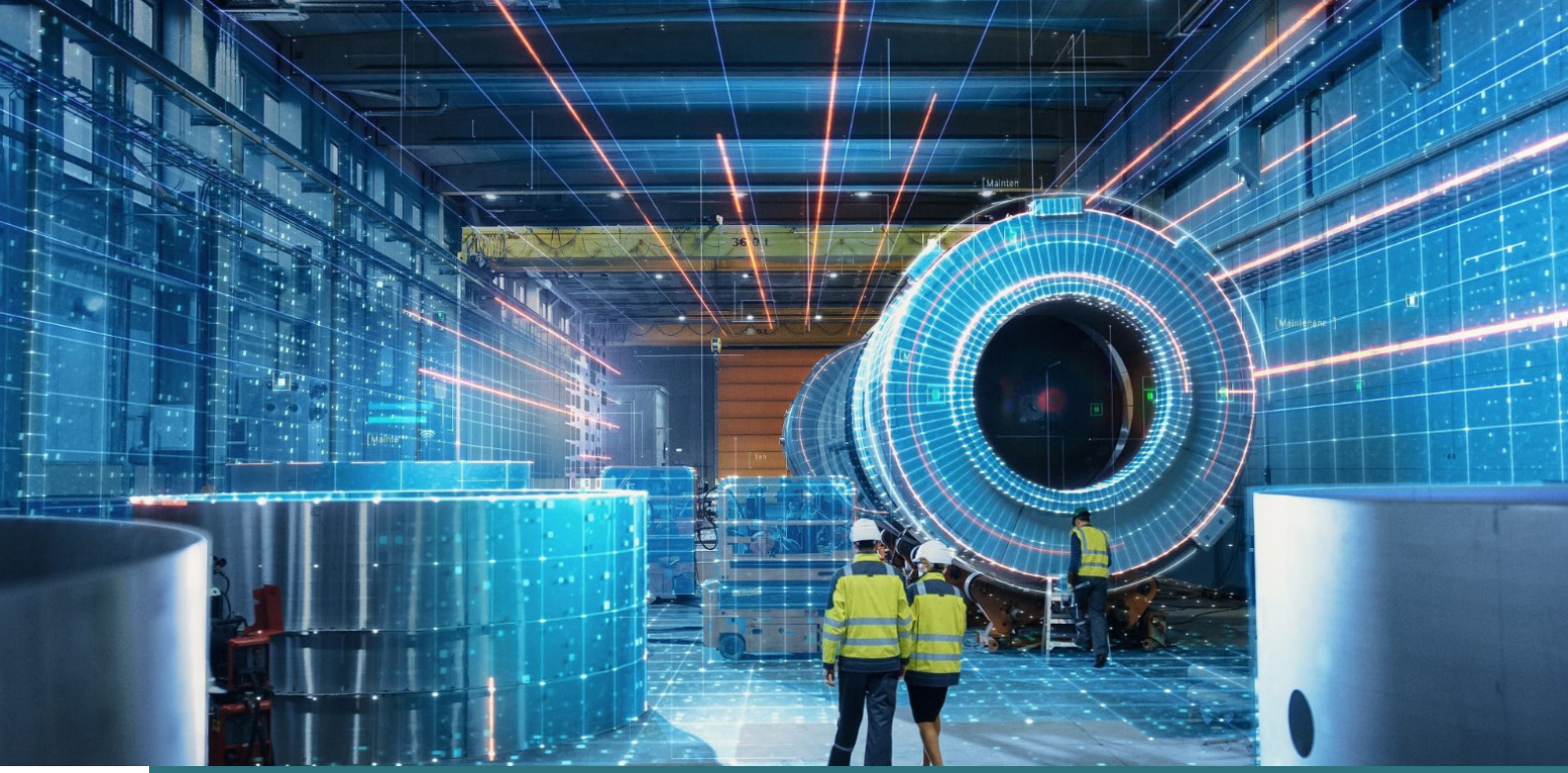


1. Executive summary

Production planners have a central and critical role in the smooth operation of manufacturing operations. With so many competing priorities and demands on their time, they need the best possible tools to assist them in performing their role. As plants become increasingly complex and companies need to be more agile to cope with the rapid changes to supply chains, materials, increased automation, rising costs and labor challenges that characterize the modern workplace, more advanced tools, beyond paper or Excel spreadsheets, are required for production planners to produce optimal plans for their business.

More manual production project scheduling methods are not optimal and require large buffers, which can reduce throughput on production lines. When an unexpected incident occurs, it takes time to create and communicate a new plan that takes changes into account. During this time production lines are often operating in a suboptimal way and productivity is hampered.

Automating the process of production planning and scheduling builds more accurate and efficient production plans able to adapt to changing demand from dynamic and unpredictable factory floor environments. With AI-based software solutions, machine learning algorithms build on knowledge accrued to create fully optimized, tracked weekly schedules for the whole production process that make best use of all machines, workers and resources and deliver 100% real-time production progress visibility.

2. Production planners face an array of challenges

There are many factors to take into consideration when building and scheduling a production plan and no one person can consider them all ,leading to suboptimal plans and potential mistakes that can cost time and money to correct .Unplanned downtime costs industrial manufacturers an estimated $50 billion each year[1] and, because the cost of production is so high, any action that can be taken to minimize risks and errors has the potential to deliver huge savings.
Planners in many advanced manufacturing facilities still working with Excel files or paper can struggle when it comes to responding to disruptions to the project schedule and unplanned events, such as urgent orders or breakdowns. It can be very difficult to gather the information needed to update plans fast and ensure everyone who needs it has access to the latest version of the production plan. It might take production planners several days to build a plan and then many time consuming hours to update it when incidents occur.

Although the specific pain points facing production planners can change depending on the company and from day to day, some of the key challenges that AI-based production scheduling software solutions assist with are outlined below:

a. Meeting demand amid rising orders

Increased orders place additional pressures on composite parts manufacturing production planners to ramp up capacity. Many advanced manufacturers are seeing their order books bounce back from the Covid-19 pandemic, including the hard-hit global aerospace sector. According to data from UK trade association ADS, aerospace saw the highest Q3 orders placed worldwide in 2022 for any third quarter since 2015[2]. Global aircraft orders stood at 670, a 43% YTD increase, and there was a 19% YoY increase in deliveries to 252, with the backlog of aircraft orders remaining above 13,000.

[1] Ravande, S. (2022) 'Unplanned Downtime Costs More Than You Think', Forbes.
Unplanned Downtime Costs More Than You Think (forbes.com)
[2] Tyrell, M. (2022) 'Commercial aircraft orders at highest level since 2015', Aerospace Manufacturing
Commercial aircraft orders at highest level since 2015 - Aerospace Manufacturing (aero-mag.com)

b. Supply chain disruptions and low resource utilization

In the current climate ,global supply chain shortages and constraints ,coupled with raw materials, energy and shipping costs ,require companies to do more with less .Production plans that do not fully utilize raw materials ,particularly expensive and time-sensitive materials such as composites for aerospace manufacturing ,place advanced manufacturers at risk of failing to fulfil orders .Long lead times or poor management of valuable materials can lead to materials being scrapped ,at huge cost ,posing a strategic risk regarding capacity and potentially leading to bottlenecks in production. Good materials management is more critical than ever when materials are in short supply .The Economist surveyed 400 senior supply chain and procurement leaders and found supply chain disruptions had significant financial and reputational costs to businesses and are expected to become more common over the next five years[3].

c. Skilled labor shortages

A poll carried out in August 2022 by the National Association of Manufacturers in the US found over three-quarters of industry leaders selected recruiting and retaining a quality workforce as one of their top business challenges[4]. Enterprises struggle to respond quickly to changes on the shop floor as vacancies and talent shortages limit production capacity. Furthermore, in cases where production scheduling is carried out by one individual on paper or spreadsheets, much of the information needed resides in their head, creating potential business continuity problems. With an AI-based system, data is stored from each production plan, as is any related machine learning.

d. First-time quality, improved production visibility and traceability

As we have seen with composites manufacturing, it is more important than ever to have full visibility and traceability from receiving to the freezer to the autoclave and beyond. Limited visibility and traceability as a result of standard production scheduling can lead to material loss, quality defects, and rework. Without full visibility across the whole production process and an understanding of where each task is in relation to the production plan, there is a significant potential for errors.

e. On-time delivery and efficient task execution

On-time delivery can be challenging for production planners working from paper or Excel and they may struggle to quantify the overall impact of each slippage or alteration to the whole production schedule. Clear oversight of the whole operation results in more accurate forecasting, orders for raw materials and supplies, and better quality control measures, increasing the possibility of orders being delivered accurately, on time, or even early.

[3] GEP & The Economist (2021), The 'Business Costs of Supply Chain Disruption'.
The Business Costs of Supply Chain Disruption – GEP (economist.com)

[4] National Association of Manufacturers (2022) '2002 3rd Quarter Manufacturers 'Outlook Survey'.
2022 3rd Quarter Manufacturers' Outlook Survey | NAM

3. There is a solution to production scheduling problems

All companies involved in advanced manufacturing and composite parts manufacturing use production planning in order to maintain an overview of the factory floor and the whole manufacturing process. It is crucial to have a plan against which performance is monitored and that takes into account stations capacity and availability, materials, tools, labor, timescales, work orders, and other factors.

Advanced manufacturing companies are seeing their order books recover post-Covid-19 and are having to ramp up production to cope with rising demand and backlogs. There are multiple competing trends currently affecting manufacturing process planning, including rising interest rates, energy prices and materials costs, supply chain shortages and constraints, forecasts of a possible economic downturn in 2024, growing legislation around the use of technology and the environment, and labor shortages relating to both skilled and unskilled workers. Production planning is a highly skilled and responsible role and increasing demands are being placed on planners **to do more with less,** while responding to constantly changing external factors, meeting rising levels of demand and complying with increasingly stringent regulations. **In these circumstances, standard production scheduling tools are often not fit for purpose.**

The adoption of agile manufacturing methods, which involve frequent, incremental changes to production schedules based on real-time data and customer demand, requires a dynamic and agile production process optimization solution. An AI-based software solution for production planning complements and utilizes data from other Industry 4.0 solutions such as machine and tool optimization, resource optimization, and cutting and nesting applications, to deliver a holistic smart solution to the many challenges planners and managers face.

4. AI-based production scheduling solutions leverage Industry 4.0 innovations

Not all production scheduling solutions are the same .AI-based automated production scheduling like Plataine's Production Scheduler ,an Industry 4.0 solution ,leverage the latest developments in machine learning and IIoT to deliver optimal production plans from thousands of options .But how does it work and what can it do that traditional methods like spreadsheets and paper documents can't ?How does it bring value to an organization by addressing the challenges outlined?

a. It is AI-based

Artificial Intelligence (AI) refers to computer systems capable of performing tasks that usually require human intelligence, such as problem-solving and learning, through the use of statistical models, data and complex algorithms. AI-based solutions in production scheduling use machine learning algorithms to learn patterns of operation and deliver optimal production plans that take into account a wide range of factors, making sure production output is capable of meeting rising demand. AI-based manufacturing scheduling software provides planning expertise and can help less experienced planners to perform work in an optimal manner to make their operations more efficient, assisting organizations struggling with skilled labor shortages and allowing inexperienced planners to respond quickly to changes on the shop-floor.

b. It uses the cloud and IIoT technologies

IIoT (the Industrial Internet of Things) covers internet-connected devices, including sensors and actuators, that are used to monitor, analyze and control machines and technologies within industrial settings. In manufacturing, IIoT sees the collection and exchange of data (often processed through the use of AI) in order to optimize production processes. As IIoT technology becomes increasingly widespread, it plays a key role in production planning. To use an example, predictive maintenance reports can feed into production scheduling optimization to allow for downtime when machines are being worked on. This increases the potential for meeting, or even exceeding, delivery times, by minimizing downtime and ensuring efficient execution of tasks.

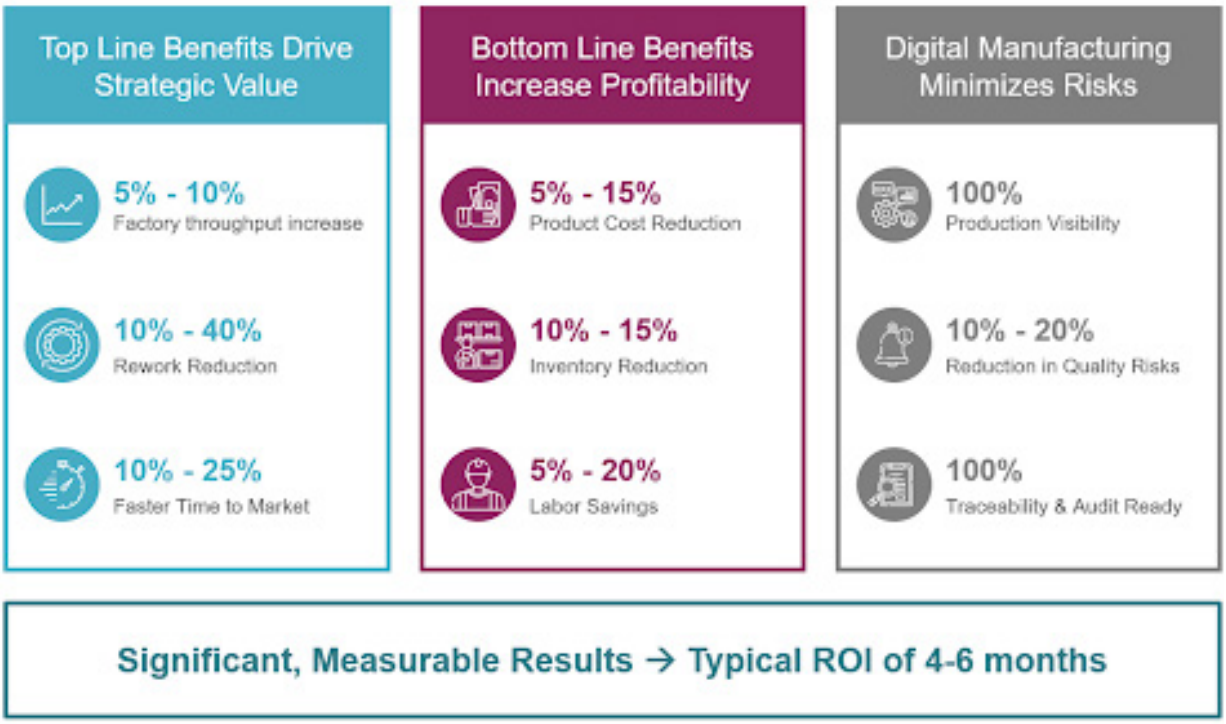
The cloud provides access to information and resources from anywhere in the world via a network of remote servers hosted on the internet that store, manage and process data. By accessing applications such as manufacturing production scheduling software via the cloud, users can access information in real-time as it updates and changes. Cloud solutions are cost-effective, flexible and scalable, providing a holistic overview of the production process and all its component parts. Production Scheduler delivers a production schedule that can be accessed by everyone who needs to see real-time information, providing updates and alerts to ensure first-time quality and full traceability of materials every time.

c. It complements other Digital Manufacturing applications

You can use Plataine's AI-based production scheduling solution alongside other Industry 4.0 digital manufacturing applications to create a central database of your equipment through Equipment Optimization ,make the best use of composites and low resource utilization with Material Optimization ,or deliver 100% visibility via the Digital Thread for Traceability and Quality. Digital twin applications work alongside production scheduling solutions providing a virtual replica of a system using real-time data and simulation to model, analyze and predict what might happen in a range of manufacturing scenarios, ensuring efficient task execution.

d. Industry 4.0 and extreme automatio

Digital solutions, transformation and goals Leveraging the potential of Industry 4.0 technology can have a substantial, quantifiable impact on your production operations. The infographic below, taken from data relating to Plataine's customer base, shows Industry 4.0 digitization and extreme automation result in impressive increases in throughput and asset efficiency from efficient task execution, alongside significant labor savings and cost reductions.



5. Automated AI-based production scheduling solutions deliver big benefits

Below are some of the key opportunities to maximize production and minimize inefficiencies smart production scheduling applications can provide:

a. Automatically produce optimal scheduling

Automated production scheduling solutions can be used to reflect business strategies in the production schedule, including prioritization, constraints and regulations. Target values can be set for any mix of business goals, including on-time delivery, overall equipment efficiency (OEE), or make-span. In addition, manufacturing production scheduling software is capable of taking into account the availability of machines (optimizing the use of manufacturing machines that come with the highest running/energy/environmental costs), tools, human capacity, materials availability and supply chain disruptions, specific legislation or business rules, and other constraints. Automated, AI-based manufacturing scheduling solutions leverage machine learning to help manufacturers not only achieve but even overachieve on their KPIs, meeting rising demand for aircraft orders.

b. React in real-time to unexpected events

Each of the potential disruptions and unplanned events below can be factored easily and quickly into manufacturing production scheduling software in order to update plans and notify teams of any changes, making businesses more likely to meet their commitments and complete a production plan on time.

- Breakdown and stoppages
- Demand changes
- Rush orders
- Missing tools
- Personnel shortages
- Material shortages

With Plataine's Production Scheduler the 1-click powerful algorithm can be used to take corrective action and producing optimal scheduling within seconds. Planners can use real-time tracking to see how one task or order will affect another, meaning resources can be redeployed to doable tasks when delays or stoppages arise so that downtime is minimized.

c. Real-time production progress visibility

AI-based production scheduling takes visibility from 0-100%, compared with Excel and paper-based systems and you can use your smartphone, tablet or desktop to track progress in real-time. Storing plans in the cloud means they are visible whenever they are needed, and production scheduling solutions like Plataine's can be used to set varied levels of access for individuals and teams so that they are able to view exactly the information required to perform their role. In addition, the machine learning algorithms will identify bottlenecks and inefficiencies within the system so that you can take action to address them.

d. Goals-based planning and scheduling to overachieve on your KPIs

Using goals-based planning and scheduling means that resources, such as expensive composites or valuable machinery, can be used more efficiently. In fact, Plataine's Production Scheduler includes autoclave scheduling optimization for operational cost savings. You can choose which priorities to set so that resources such as equipment and labor are deployed in a more efficient way, mitigating labor skills shortages, and saving time and money. Using goals-based planning and scheduling provides a valuable tool for highly-skilled production planners, freeing them up to oversee the production process, react to disruptions and ensure plans remain on track or even exceed delivery times and KPIs.

6. Plataine's Production Scheduler - the optimal AI-based solution to planning challenges

There is a solution to all these challenges that encompasses the many benefits offered by AI, IIoT and Industry 4.0 solutions. Plataine's Production Scheduler helps production planners improve their processes and goal setting, make more efficient use of the resources available to them, respond better to unplanned events, and reduce costs, all with 100% visibility and 95% time savings.

With our AI-based production scheduling software, the scheduler sets the rules and receives AI-driven alerts and updates. The solution minimizes risk and runs 1000s of updates and scenarios before helping to select the best one. In addition to many qualitative benefits, there are quantitative benefits too. We have found, having implemented Production Scheduler, manufacturers immediately gain 100% visibility of the production process, 95% time savings on optimized planning, a 15% increase in throughout, and a 5% rise in due data compliance.

Plataine's Practimum-Optimum™ AI algorithm is a breakthrough in optimizing production scheduling. It has an AI core and built-in machine-learning algorithms to combine unprecedented levels of optimized KPIs with a practical, robust planning application. The patent-pending algorithm builds optimal schedules that integrate practical considerations, including trade-offs between competing goals and patterns of demand sets. It adapts its planning capabilities and improves its performance over time, and the schedules produced are optimal and practical to execute.

As part of Plataine's TPO (Total Production Optimization) cloud-based suite of interconnected applications, Production Scheduler integrates manufacturing scheduling with shop-floor operations management, while optimizing all production resources such as materials, equipment and tools. It provides a visual interactive Gantt chart and graphic indicators to track a plan throughout the production process, automatically prioritizing and scheduling every task needed to complete a work order, from raw material to a ready-to-ship product.

We work directly with planners to optimize the factory floor and free their time up to work on more important tasks. Plataine's connected intelligent Digital Assistants are on-hand throughout the

process to help with schedule execution, providing alerts for deviations from the plan, and offering recommendations and insights so remedial action can be taken. Scheduler comes complete with a raft of features, including scale enabler and guarded manual adjustments, to improve on-time delivery, and captures and stores organization knowledge and best practices.

Plataine's Production Scheduler is ideal for companies that execute in excess of 20 work orders per week, those whose planners spend more than 5 hours a week preparing the schedule, and those with more than 5 working stations, in particular manufacturers with an autoclave in their facility. If you are dissatisfied with the percentage of executed work orders per plan, see room for improvement in due date compliance, or postpone more than 5% of your tasks each week, then Scheduler can help you get back on track. The TPO suite offers virtual Industry 4.0 solutions based on a rich digital thread and detailed digital twins to help manufacturers optimize all aspects of production.

Time to take the next step:

At Plataine, we provide IIoT solutions to some of the world's largest OEMs, as well as Tier 1 & 2 manufacturers, including Airbus, GE, IAI, Triumph, MRAS (an ST Engineering company) and Alestis.

To learn more about how we can drive your factory's efficiency – bringing you the benefits of the 4th industrial revolution – continue the conversation directly with one of our Digital Transformation Specialists here.