

# KDD023 - Production Planning in SAP S/4HANA

<b>Status</b>	Approved
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## Issue

This Key Design Decision (KDD) document describes the critical decisions, recommendations, and main pros and cons for the implementation of Manufacturing modules in the ERP Rebuild project.

The document aims to clarify the rationale behind exploring and evaluating SAP PP and SAP PP-PI modules. It highlights the benefits and drawbacks of each solution, including factors such as compliance with Best Practices, available functionalities, scalability, maintainability.

Production Planning for Process Industries (PP-PI) is the SAP module for Process Production.

Production Planning (PP) is the SAP module for Discrete Production.

It is clear that most of the Syensqo Manufacturing activity are best suited to SAP PP-PI. We must define whether use it also for Discrete Production, adapting the PP-PI module to suit them as much as possible, or introduce the implementation of SAP PP for those plants and production lines running Discrete Production.

## Recommendation

The Option 3 emerges as the preferred option by and large: Adopt PP-PI for Plants mainly (or only) running Process Activities, and adopt PP for Plants mainly (or only) running Discrete Activities.

Applying this principle to current Syensqo plants:

- Most of Hybrid plants (Process and Discrete Manufacturing together) will run on PP-PI SAP module. In Syensqo, hybrid plants of Novacare, TS, Aroma, SpP GBUs are predominantly running continuous processes, and thus must use PP-PI. This is the case of Process plants with Discrete operations at the end of the process (e.g. Compounding units).
- Pure Process plants will run on PP-PI
- Predominantly Discrete Plant(s) will run on PP. At the moment this affects only Newark, plus potentially a few Composite plants. Final identification of PP plants is postponed to Detail Design. We consider the realization of the PP model for one single small plant not strategic. Newark will move to PP only if also some other Composite plants will be identified as suitable for PP.

## Background & Context

PP-PI module is the SAP Best Practice for Process Productions: Continuous Flows, Splitting Towers, Reactors, which are the vast majority of processes in Syensqo. PP-PI is also easily adaptable to manage packing activities.

Syensqo Manufacturing Plants in WP1 or PF1 systems are currently managed in 99% of the cases via SAP PP-PI module, with a variety of implementations and different subsets of functionalities activated. The only exception: plant 4048 is currently using Rate Routings and therefore PP Repetitive Manufacturing. It makes no sense for the processes managed in that plant, it must move to PP-PI.

However, Syensqo Manufacturing landscape includes relevant cases of Discrete Production.

The main example of Discrete Manufacturing is Plant Newark, Product Ajedium: extrusion of thermoplastic film. This plant is 100% Discrete Manufacturing. It is not on SAP systems at the moment.

Other Plants in Syensqo have Discrete Production together with Process Production, here some examples (this is not a complete list):

- Case 1: plants with Compounding units: Oudenaarde, Changsu, Kallo, Marietta
- Case 2: Plant Oestringen, filming, pre-pegging and slitting.

For these productions, the SAP Best Practice is SAP PP. They are currently running SAP PP-PI module.

There are specific functionalities that exist only in SAP PP-PI and missing in SAP PP and vice versa, and there are different ways to manage the same activities in the two modules. Here we describe the main differences.

	SAP PP-PI	SAP PP
Master Data	PP-PI Recipe is composed by Operations and Phases. Phases are the actual activities to be performed and confirmed in PP-PI	PP Routing is a sequence of operations, which are the actual activities in PP
	Relationships between operation and phases can be defined as: <ul style="list-style-type: none"> <li>• Finish-Start,</li> <li>• Finish-Finish</li> <li>• Start-Start</li> </ul> <p>The offset between phases can be defined only as a time</p>	In PP the relationship is by default Finish-Start, Start-Start can be achieved via parallel sequences, and offset can be defined both in terms of time and in terms of quantities produced by an operation before the subsequent one can start

	PP-PI Recipes allow the usage of complex formulas, to calculate the quantities of produced materials based on the quantity of the components: bottom-up BOM/Recipe composition.	In PP, the BOM logic is always top-down.
	Production Versions are mandatory in both modules, they are automatically generated in PP-PI at Recipe Creation, when a BOM is assigned.	Production Versions are mandatory in both modules, in PP, Production Versions must be explicitly created with a dedicated App.
	The default assignment of components to the first operation is implicit and not flexible in PP-PI. Hence, in PP-PI is mandatory to explicitly assign the components to the operations in the Recipe to use the Fine Scheduling functions	The default assignment of unassigned components to the first operation can be flexibly customized in PP. It can happen automatically if the explicit assignment is missing
Order Management	Process Orders Campaigns exist only in PP-PI.	There is no aggregation object likewise PP-PI Campaign.
Fine Scheduling - Optimizer	<p>Detailed Scheduling is the functionality to dispatch orders precisely in the production plan taking into account capacity constraints and material availability. It can work via two main tools:</p> <ul style="list-style-type: none"> <li>Optimizer is a multi-criteria method to find the best possible solution for the Production Plan using weights of the different criteria (service level, setup optimization, cost reduction, warehouse occupation, etc.)</li> <li>Heuristics are different functions that can be used in sequence or combination, addressing the planning criteria one by one to arrive to an efficient plan via subsequent approximations.</li> </ul> <p>A part for a slightly different management of Setup optimization as explained in the Master Data section, Optimizer functionalities are fully available for both modules.</p>	
Fine Scheduling - Heuristics	<ul style="list-style-type: none"> <li>Some heuristics functions are not available for PP-PI</li> </ul>	<ul style="list-style-type: none"> <li>Full Heuristics functions available for PP</li> </ul>
Production Confirmations and Goods Movements	There are only cosmetic differences between the modules in this domain.	
Month-End Closing and Order Settlement	The simultaneous adoption of PP-PI and PP in different plants or in different production lines of the same plant will require two different order settlement activities to run at Month End Closing, one for Process Orders and one for Production Orders.	

## Order Management

Process Orders Campaigns exist only in PP-PI.

Detailed Scheduling is the functionality to dispatch orders precisely in the production plan taking into account capacity constraints and material availability. It can work via two main tools:

- Optimizer is a multi-criteria method to find the best possible solution for the Production Plan using weights of the different criteria (service level, setup optimization, cost reduction, warehouse occupation, etc.)
- Heuristics are different functions that can be used in sequence or combination, addressing the planning criteria one by one to arrive to an efficient plan via subsequent approximations.
- Some heuristics are only available for PP and some heuristics have more options and flexibility in PP than PP-PI

One of the main differences in the past was the Control Recipes and PI-Sheet functionality: it was the only way to define and collect data from process parameters like temperature, pressure, flux-meters data, etc. It was part of PP-PI only. It is defined as obsolete by SAP and maintained only until 2027, the new functionalities are in Digital Manufacturing and available both for PP and PP-PI

## Assumptions

- The new ERP system will run on SAP S/4HANA 2023 FPS01 or higher version.
- There are some plants in Syensqo currently running on Repetitive Manufacturing, using Planned Order and Product Cost Collector. They will move to PP or PP-PI accordingly to what defined in this document: Repetitive Manufacturing and Product Cost Collector are not in scope.

## Constraints

## Impacts

The adoption of PP for the Discrete Productions currently on PP-PI would have the following impacts:

- Data migration will become more complex, as Recipes must be converted in Routings and open Process Orders in open Production Orders
- Project configuration, testing and training will increase as more objects must be configured and tested and more Fiori Apps must be included in training
- Authorization Matrix will be more complex, as some users of some plants must be able to operate both on Process and Production Orders, both in Recipes and Routings, while users of the other plants will be authorized to Process orders and Recipes only
- Once PP is introduced for Discrete activities in some plants, it can be used all across Syensqo production plants to manage Packing activities, which are compatible with PP-PI, but PP is definitely a better fit for them. Setup optimization is the typical business case for this.

Continue the usage of PP-PI for the plants running both Process and Discrete Manufacturing, and force it to manage also Discrete Production would have the following impacts:

- it will be more difficult to leverage the advantages of all available Apps in S4 system, as their design is tailored on the specific typical requirements of each module. Example: Manage Process Orders App does not allow to book directly confirmations, as in PP-PI they normally comes from Process Control, Manage Production Orders App allows to book directly and quickly confirmations and status updates
- the solution will be less future-proof as the Digital Manufacturing, and the new Fiori Apps are and will be designed to work for each module in different specific ways for Discrete/Process environments
- Some fine-scheduling functions will be unavailable. For instance, it won't be possible to schedule different capacities of the same Work Center on different orders simultaneously, it won't be possible to schedule the start of a subsequent operations based on quantity elaborated by the previous one.
- If a product can be obtained via different sequences of operations, in PP-PI this can be achieved only creating completely different Recipes and Production Versions, while in PP it is also possible the creation of alternative sequences inside the same Routing.

Interfaces: the project will have anyway a huge impact on Production Interfaces (MES, LIMS and other satellite systems). They must be recreated anyway with new technologies, hence, the 3 options are neutral on this aspect.

Reporting: likewise interfaces, there are many new reporting opportunities in the system, we consider the huge impact of the project absorbing any effect of each of the 3 options considered here.

## Business Rules

- Adopt PP-PI for Plants mainly (or only) running Process Activities, and adopt PP for Plants mainly (or only) running Discrete Activities.

## Options considered

### Option 1: Adopt PP-PI for all Discrete Production Activities

The PP-PI module will be the only one used across the company. Discrete activities will be managed via Recipes and Process Orders.

This option simplifies and accelerates the implementation, but sacrifices the Best Practice concept for the sake of cost and time savings.

Pro's	Con's
<b>Training:</b> The same set of Apps and the same Master Data objects will be used across the company for Manufacturing activities	<b>Far from Best Practice:</b> using PP-PI for Discrete operations is a forcing and implies reduced functionalities
<b>Change Management:</b> little change management required, as all plants already in SAP are running production on PP-PI	<b>Not Future-Proof:</b> New Fiori Apps and new SAP Functionalities will likely be hard to adopt for the Discrete operations managed on PP-PI. Specific PP improvements that can be beneficial for those production lines and plants won't be available
<b>Simplicity:</b> the implementation is limited to the set of objects required by PP-PI module, we do not need to customize PP objects	<b>Integration:</b> most of third party MES systems and SAP Digital Manufacturing work on the assumption that the discrete processes are modeled by Discrete Production Orders and Continuous/Batch processes are modeled by Process Orders. Forcing PP-PI to adapt to Discrete operations will generate complexity and constraints integrating the ERP with Shop Floor control applications. It's very likely that most of the standard connectors cannot be used.
	<b>Planning:</b> usage of SAP PP-PI instead of PP affects mainly Planning related functionalities, like Setup Optimization, Order Dispatching and Fine Scheduling, Alternative Sequence Selections. All these PP functionalities become more complex, some of them even impossible, in PP-PI.

### Option 2: Adopt PP-PI for Process Activities and PP for Discrete Manufacturing

This is the option that better adopts the Best Practice concept. It requires the most complex implementation and the largest investment in training and Change Management.

Pro's	Con's
<b>Best Practice:</b> using PP for Discrete operations is 100% compliant with SAP Best Practice and allow to leverage all functionalities in S4 and, in case, in Digital Manufacturing.	<b>Training:</b> Users must be trained to two different sets of Apps and Master Data to be used. For the hybrid plants, where both Process and Discrete production co-exist, some users must become familiar with twice the Apps and ways of working.
<b>Future-Proof:</b> New Fiori Apps and new SAP Functionalities can be quickly introduced for Discrete operations managed on PP. Specific PP improvements that can be beneficial for those production lines and plants will be available.	<b>Change Management:</b> huge change management is required, as the plants where PP will be introduced will need new ways of working for Master Data Management, Production Planning, Production Execution, Reporting.
<b>Integration:</b> most of third party MES systems and SAP Digital Manufacturing work on the assumption that the discrete processes are modeled by Discrete Production Orders and Continuous-Batch processes are modeled by Process Orders. The integration of Shop Floor applications will be easier and standard connectors can be largely used.	<b>Complexity:</b> the implementation effort to design, validate and implement both a PP model and a PP-PI model in the project is roughly estimated 1.5 times bigger than a single PP-PI model.
<b>Planning:</b> Setup Optimization, Order Dispatching, Fine Scheduling, Alternative Sequence Selections. All these PP functionalities will be available.	

### Option 3: Adopt PP-PI for Plants mainly running Process Activities, also for the Discrete Operations they run; and adopt PP for Plants mainly running Discrete Activities (Newark, and potentially Composite plants)

This option allows the plant(s) with pure discrete manufacturing to run on the Best Practices and leverage all functionalities, while the plants with mixed activities will have a simplified model and reduced efforts and training as they keep the current PP-PI module and will deal with familiar concepts. This is strictly related to the current Syensqo status: all plants with both Process and Discrete activities have a vast majority of Process operations.

The opportunity of this option comes from the fact that the only pure Discrete plant in the company, Newark, is not on SAP yet. The option to introduce SAP in the plant here at the same time of the project Go-Live is considered.

Pro's	Con's
<b>Best Practice PP Plants:</b> using PP for Discrete operations is 100% compliant with SAP Best Practice and allow to leverage all functionalities in S4 and, in case, in Digital Manufacturing for the Plant characterized by pure Discrete Production	<b>Complexity:</b> the implementation effort to design, validate and implement both a PP model <b>for a single plant</b> and a PP-PI model in the project is roughly estimated 1.3 times bigger than a single PP-PI model.
<b>Future-Proof:</b> New Fiori Apps and new SAP Functionalities can be quickly introduced for Discrete operations managed on PP for the pure Discrete Production Plants. Specific PP improvements that can be beneficial for those production plants will be available. Having a PP model in the system, will allow the company to roll-out it to new Plants completely or predominantly running Discrete production and to the Discrete productions of existing Plants after the completion of the project.	
<b>Integration PP plants:</b> most of third party MES systems and SAP Digital Manufacturing work on the assumption that the discrete processes are modeled by Discrete Production Orders and Continuous-Batch processes are modeled by Process Orders. The integration of Shop Floor applications will be easier and standard connectors can be largely used, but only in the fully Discrete Production plants adopting PP.	<b>Integration PP-PI Plants :</b> most of third party MES systems and SAP Digital Manufacturing work on the assumption that the discrete processes are modeled by Discrete Production Orders and Continuous-Batch processes are modeled by Process Orders. Forcing PP-PI to adapt to Discrete operations will generate complexity and constraints integrating the ERP with Shop Floor control applications. It's very likely that most of the standard connectors cannot be used.
<b>Planning PP Plants:</b> Setup Optimization, Order Dispatching, Fine Scheduling, Alternative Sequence Selections. All these PP functionalities will be available.	<b>Planning PP-PI Plants:</b> usage of SAP PP-PI instead of PP affects mainly Planning related functionalities, like Setup Optimization, Order Dispatching and Fine Scheduling, Alternative Sequence Selections. All these PP functionalities become more complex, some of them even impossible, in PP-PI.
<b>Training:</b> Users of each Plant will be trained on a single production model: PP-PI for most of the plants, PP for the purely Discrete Production Plants.	

**Change Management:** little extra change management is required, as the plants already running in PP-PI will remain on it and we introduce PP on a PLant currently not on SAP.

Note: in all cases, we consider to move plants currently on Repetitive Manufacturing to PP-PI. Repetitive is not a good solution for any of the Syensqo processes.

## Evaluation

The simple decision matrix lists all considered criteria and the estimated weights and scores for each of the 3 options. The total is the sum of each score multiplied by the weight of the criteria and gives a global evaluation of the options across the different points of view.

Criteria	Weight	Option 1 Full PP-PI for all plants	Option 2 PP for all Discrete Productions, PP-PI for all Process Prod.	Option 3 PP for pure Discrete Plant(Newark), PP-PI elsewhere
Future Proof and Scalability	VH	Very Low	Very High	High
Best Practice	H	Medium	Very High	High
Planning Functionalities	M	Medium	Very High	High
Shop Floor integration: DMC &3P MES	VH	Medium	Very High	High
Simplicity	M	Very High	Very Low	High
Training	M	Very High	Very Low	High
Reduce Change Management	M	High	Very Low	Medium
<b>Total</b>		Medium	Medium	High

The Option 3 - introduce PP only in the Pure Discrete plant(s), and use PP-PI across all other plants, also for Discrete Productions operations that a few of them are running, emerges as the preferred options by large. Hybrid plants (Process and Discrete Manufacturing together) will run on PP-PI SAP module.

Although all options have their advantages and disadvantages, the Option 3 has the indisputable merit of introducing a PP model in the new ERP system, opening the door for leveraging it for future Discrete Production Plants that may be acquired, rolling it out to progressively to the Discrete operations running in the current plant and keeping the company up to date with all SAP innovations and new functionalities that will be introduced in that area by SAP. It is also the best balance between the aim for Best Practice and the containment of complexity and costs.

## See also

See Plant Details Tab of: [Business Process Questionnaire - Manufacturing v3 - Google Sheets](#) for a full map of production processes in the Syensqo plants as assessed in the AS-IS phase.

## Change log

Version	Published	Changed By	Comment
<b>CURRENT (v. 57)</b>	<b>Oct 02, 2024 14:36</b>	<b>NICASTRI-ext, Michele</b>	
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v. 52	Aug 27, 2024 09:54	NICASTRI-ext, Michele	
v. 51	Aug 26, 2024 16:48	NICASTRI-ext, Michele	
v. 50	Aug 06, 2024 09:40	NICASTRI-ext, Michele	

v. 49	Aug 05, 2024 10:50	<a href="#">NICASTRI-ext, Michele</a>
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Oct 02, 2024	Actor	Type	Activity	Version
Approved	<a href="#">WENNINGER-ext, Sascha</a>	State	changed state to <a href="#">Approved</a> at 2:39 pm	<a href="#">v57</a>
Pending SteerCo Review	<a href="#">WENNINGER-ext, Sascha</a>	State	gave <i>Final Approval</i> approval at 2:39 pm	
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Pending Stakeholder Review	<a href="#">WENNINGER-ext, Sascha</a>	State	gave <i>Stakeholder Review</i> approval at 2:39 pm	
		State	changed expiry date to '09 Oct, 2024 02:39 pm' at 2:39 pm	
		State	changed state to <a href="#">Pending Stakeholder Review</a> at 2:39 pm	<a href="#">v57</a>
Edited following DA Endorsement	<a href="#">WENNINGER-ext, Sascha</a>	State	gave <i>Minor change</i> approval at 2:39 pm	
	<a href="#">NICASTRI-ext, Michele</a>	Edit	updated the page at 2:36 pm	
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