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oraz BI (Business Intelligence & Information Management)**

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*Special purpose equipment production process  
in SAP S/4 HANA PP*

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# 1. EXECUTIVE SUMMARY

A System Migration into SAP S/4 HANA creates for a company a unique opportunity to redefine its business processes and improve its operational performance through the use of digital tools provided by SAP.

In the presented business case, the discussed department is a part of a well-established original equipment manufacturer (OEM) in the aircraft industry. The department primarily focuses on the development and manufacturing of special tooling, which serves as a resource to support production of the end product.

## **Manufacturing process is inefficient**

The current tooling manufacturing process, especially up the stream, requires substantial manual effort. Some steps are executed with Excel spreadsheets and some with SAP, but with only partial use or even misuse. This results in data redundancy and an inefficient production process.

## **Execution of manufacturing fully in SAP will bring the efficiency**

The concept presented in this work aims to provide an overview of the mechanisms in SAP S/4 HANA that will bring the department to a level, where a transparent and traceable manufacturing process of special purpose equipment (SPE) is a reality. It will focus on use of master data and mechanisms available in SAP as a standard. The 3 main steps will help the SPE department to streamline the process:

1. *Maintain all materials only in SAP*
2. *Introducing serialisation for SPE sets.*
3. *Using standard master data in PP: bill of materials, routings, and production versions.*

In the following document, these 3 points will be presented, together with the necessary system configuration. Using a simplified example of production of SPE, its execution in SAP will be then demonstrated.

## **The way ahead**

Implementing the concept will require at first a significant effort from the team. Given the variability of SPEs, introducing all components into SAP might be frustrating. In the long term though the system will enforce the standardisation and eliminate redundancy of data in various text documents. This will pave the way for the department for further automation and significant increase of efficiency in daily activities.

## 2. CURRENT SPE PRODUCTION PROCESS

The term special purpose equipment refers to equipment utilised as an aid in production to perform one or more operations during the manufacturing of a final product or its components. There are several types of SPEs to be distinguished, including transport trolleys, negative models for composite components, fixtures for machining centres, and gauges for final product structures. These SPEs are either produced internally within a dedicated production division or externally by contracted suppliers. Unlike regular materials, SPEs are not consumed and can be reused.

A basic demonstration of the SPE lifecycle with used software is illustrated below (the size of a bubble corresponds to the usage rate during the step):

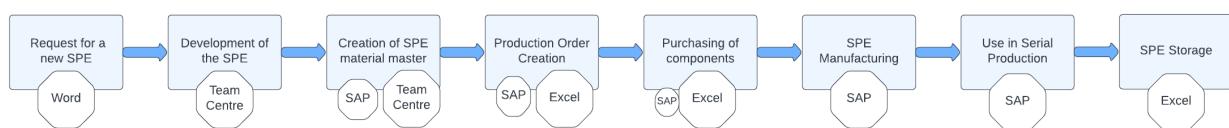


Figure 1 Process flow with Software used

### 2.1 REQUEST FOR A NEW SPE

The request for a SPE arises during the construction of a new serial product or the modification of an existing SPE. A special committee consisting of members from Production Engineering, Production, and Maintenance decides whether the equipment should be produced. The requirements are specified in a formal document, which is subsequently sent with an email to the SPE process engineering. At this point the data is transferred to Access Database with creation of a dossier for the particular SPE for further use during creation of its material master in SAP.

### 2.2 DEVELOPMENT OF THE SPE

After opening the SPE-Material in SAP, its SAP-material number is copied to the PLM tool - Siemens Teamcenter, where all technical drawings, bill of material (BOM) and other technical documents for the SPE are created and modified.

The BOM contains following materials:

- Components/assemblies designed and used specifically in the requested SPE (one time use). These materials have no material master in SAP and are added to the SPE BOM as text data.
- Raw materials used for internal production of SPE or its components. These materials have no material master in SAP and are identified by the SPE material number and additional index, e.g., 60000-1 or 60000-2.

- Components used in serial production on regular bases.

These materials are listed in the BOM with their SAP material numbers 900\* and up.

The bill of materials, when created in Siemens Team Centre, contains all the components. In the illustration below, one can see that some of the components are added as texts and others contain the SPE materials number.

| Pos. | Anzahl<br>Qty | Art. Nr<br>Item ID                | Rev.* | Fremdteil Nr<br>Foreign Part Nr | Beschreibung<br>Description       | Werkstoff<br>Material                            | Bemessungen<br>Dimensions |
|------|---------------|-----------------------------------|-------|---------------------------------|-----------------------------------|--|---------------------------|
| 1    | 1             | 6120021-1                         | -     |                                 | VAKUUM-AUFSpannvorrichtung        | Avional 88.9mm EN AW-2124-T851<br>916.16.36.255  | 130 x 460mm               |
| 2    | 1             | 6120021-2                         | -     |                                 | VAKUUM-AUFSpannvorrichtung        | Avional 127.0mm EN AW-2124-T851<br>916.16.36.262 | 130 x 460mm               |
| 4    | 1             | 6120021-4                         | A     |                                 | VAKUUM-AUFSpannvorrichtung        | PLATTE-AL, 7075, 25.0, FG                        | 152 x 342mm               |
| 5    | 2             | 6120021-5                         | -     |                                 | VAKUUM-AUFSpannvorrichtung        | Blech-LM 4.8mm 916.16.35.122                     | 37 x 53mm                 |
| 302  | 2             | 9302044076                        | B     | DIN912-M12x25-8.8-A1K           | BOLT,SOCK HD,ST,ZN-PL,12.0*25.0   |  |                           |
| 303  | 8             | 9320402030                        | -     | DIN7991-M6x16-8.8               | SCREW,I-HEX,ST,ZN-PL,6.0*16.0     |  |                           |
| 304  | 2             | 9469126019                        | B     | MS28775-019                     | SEAL,O-RING,NBR,20.3*1.8          |  |                           |
| 305  | 4             | 9010101233                        | A     | DIN179A/12.0/18*12              | BUSH,DRILL GUIDE,ST,12.0*12.0     |  |                           |
| 306  | 1             | 9372254111                        | -     | ISO4026-M10x10-45H              | PIN,I-HEX,EXTHR,ST,10.0*10.0      |  |                           |
| 307  | 1             | DICHTSCHNUR TRIAG D_4MM           | -     | 11 201 00                       | Dichtschnur Triag ø 4mm           | TRIAG AG   | ca. 1600mm                |
| 311  | 1             | Linsenkopf Alu-Schraube Rot M6x10 | -     | KG-LK-M6x10-Ro                  | Linsenkopf Alu-Schraube Rot M6x10 | Easyelox   |                           |

Figure 2 Bill of Material in Team Centre

The BOM is then saved as a pdf document and sent with other technical documentation to a responsible process engineer for procurement and production planning and execution.

## 2.3 MATERIAL MASTER CREATION

A SPE is created with a customised Material Type "ZBET" (special resources). The new Material is assigned with the next available number from a defined range, which is from 600000 to 699999. One of the pain points that the department needs to deal with is the fact that in case of sets of the identical SPEs, each will still receive a different material number.

The SPE-specific data is organised in material master as follows:

- Basic Data 1:
  - Description field – this field is used to describe the product produced with the SPE
  - Old material number field – represents the latest design revision of the SPE.
  - X-Plant Mat. Status field - the functional maturity level of the SPE used for control purposes of its application during manufacturing of the serial product.
- MRP 1:
  - MRP Type – ND – no planning.
- MRP 2:
  - Procurement Type E-internal production, F-external procurement, X-both (external procurement and internal production).
  - Production Storage location – the central storage location of the SPE is maintained. / Receiving storage location for which the receipt of the SPE is posted.
- Plant data/ Storage 1:
  - Storage Bin – storage location in the SPE- dedicated warehouse.

## **2.4 PROCUREMENT OF THE COMPONENTS**

Due to long lead times and limited information on the required SPE delivery date for the serial production, it often happens that components and raw materials are ordered even if no production order for the SPE is in the system. Since there is no demand created for the SPEs, no material requirements planning and no BOM, the procurement of components is not fully managed in SAP.

The SPE process engineer manages the purchasing of components and raw materials as follows:

- Procurement of SPE- specific materials

To request an offer for the raw materials or components without an SAP material master, the responsible employee uses Excel forms provided by suppliers. Twice per week material requirements are collected with a goal of reaching minimum order quantity.

The purchase order for corresponding materials will be then created in SAP (ME21N) with use of DUMMY in the Material field and detailed material and requirements description in the item text field.

Status of the purchase order is managed with two folders: Order Confirmation-Pending and Order Confirmed. Depending on the status the PO document will appear in the corresponding folder.

In the incoming goods, the goods receipt is generated for the purchase order and the ordered materials are delivered to the SPE department where the delivered goods are quantitatively and qualitatively controlled.

- Procurement of standard materials

Standard materials are standardised screws, nuts, and bolts. The materials with 900\* numbers are managed with consumption-based planning strategy (with Re-Order Point ) and proposed for replenishment after falling below the reorder point.

## **2.5 SPE MANUFACTURING**

The responsible SPE process engineer opens a new production order by copying one of the previous production orders for a similar SPE. He has an Excel list available with approx. 20 production order drafts that he will use as a basis and adapts the new order according to the new requirements.

A new production order is created without header material, but the required SPE will be allocated as a component to the operation 0010 in the order. The SPE description, reference technical drawing and end product information are added in the material description field in the header. Other materials required in the production process of SPE are allocated to the first operation or noted in text fields.

Figure 3 Production Order in Current Situation

All the routings are created with a sequential order of operations, though some of them are in fact executed in parallel. Required documents, such as production orders and technical specifications or drawings, are printed multiple times to ensure their availability during parallel operations.

All the manufacturing operations of the SPE are coded with 10, 20, 30, etc., whereas the Quality Control and Logistics steps, after the product is finished, are numbered with 1000 and up.

The components are allocated to the first operation. Usually only the standard materials generally used in serial production are allocated. The other materials, specific for the SPE, are added as texts.

Figure 4 Material Allocation to a Production Order

Components picked in the central warehouse are collected in small trays and then placed in the manual storage area. The shelves in the manual storage are organised according to an identification system with small trays – each tray receives a post-It note with the first 3 digits of the Production Order number. DIN standard parts and small gauges are stored in drawers at the workstations.

The workers do a partial confirmation at a terminal in production at the end of each operation and the shift supervisor does final confirmation of all using CO11N. The actual duration times are tracked with the confirmations.

The SPE process engineer then updates the production order with factual data from the production and confirms technical completion of the production.

The quality control is performed as a First Article Inspection of the serial production part and is scheduled with a month buffer before an estimated requirement date. When reaching Operation Nr 1000 the SPE is practically ready for use. The current Quality Inspection process is though not discussed in this work.

## 2.6 USE IN SERIAL PRODUCTION

As mentioned previously each unit of SPE sets receives a separate material number, however any changes done to the tooling, e.g., its usage history is documented in Basic Data Text in Material Master and repeated for each of them.

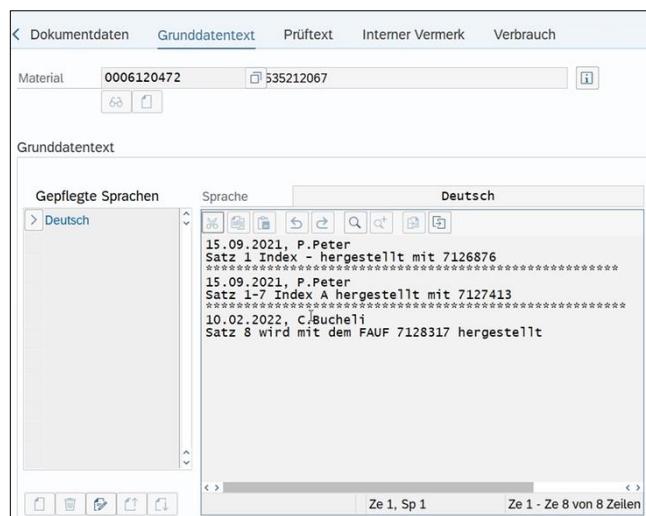


Figure 5 SPE Change History in MM Text Field

## 2.7 STORING IN SPE WAREHOUSE

The finished and released for use SPE is then either delivered directly to the workstation or is placed in the SPE warehouse. The warehouse has no management system available and the location of a new SPE is entered in the material master's section - Plant Data/ Warehouse 1 – General Data.

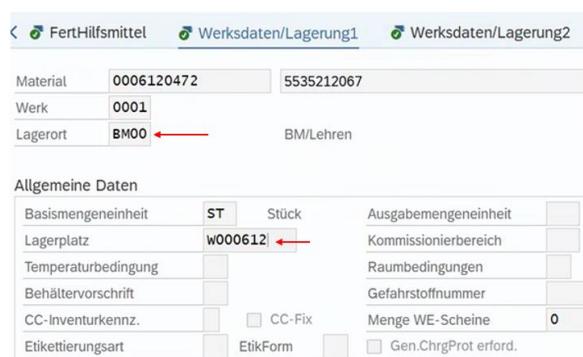


Figure 6 Stock location in Material Master

When the SPE is needed for serial production, production employees can retrieve it independently from the warehouse. He needs to write down the relevant information on a paper list hanging by the entrance to the warehouse. Later on, the responsible warehouse employee enters the following information into the SAP:

- Post Goods Issue (MB1A) – Movement Type (333 – Withdrawal of unrestricted stock for Sampling)
- Material Change (MM02) – Additional Data – Long text – Production Order Number, SPE number from the Set if applicable, when and by whom it is withdrawn.

After use of the SPE for serial production, it is then returned to the warehouse. The transport is recorded with the Goods Receipt transaction and Movement Type 334 – Booking back the sample.

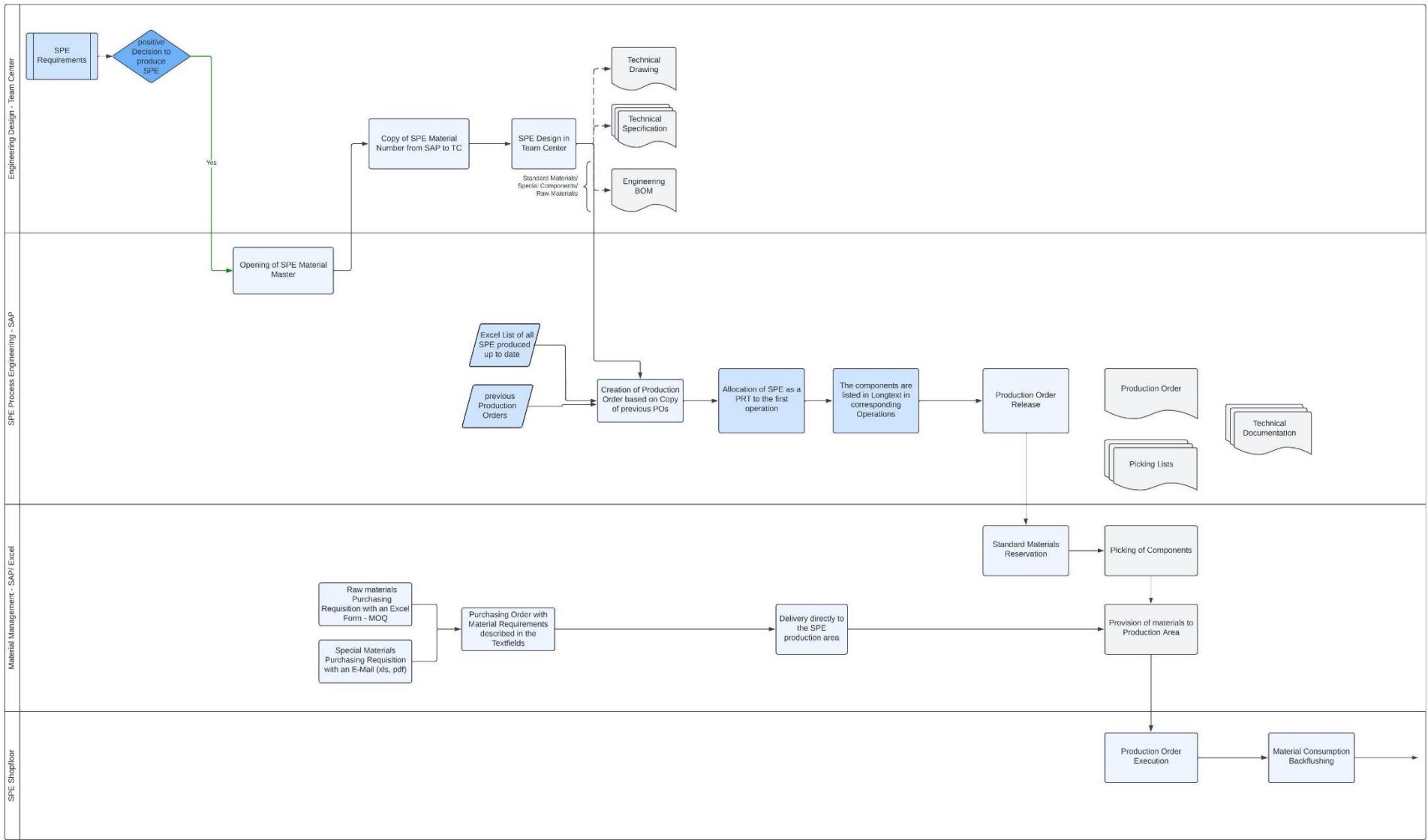


Figure 7 Special Purpose Equipment Current Production Process Part 1

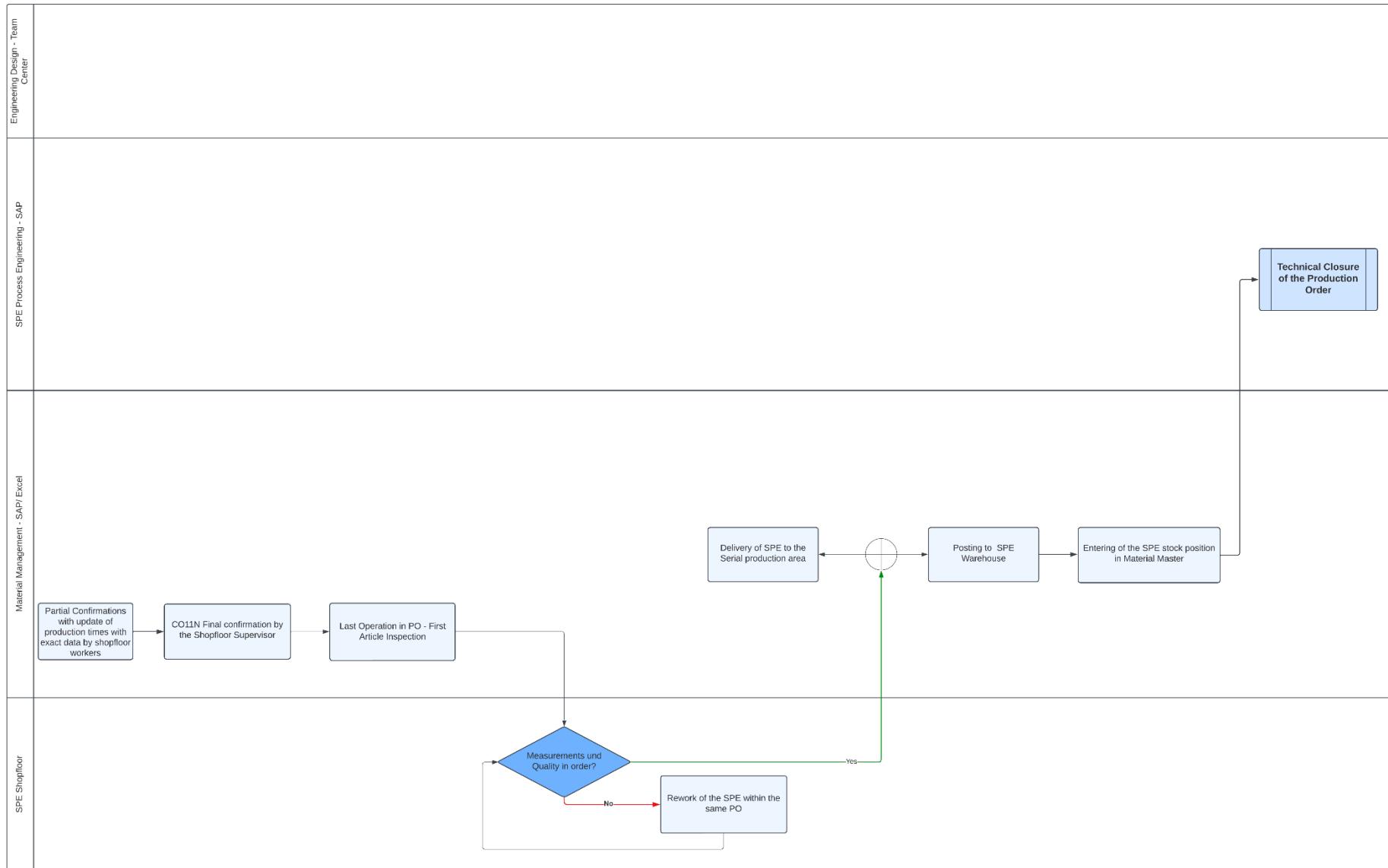


Figure 8 Special Purpose Equipment Current Production Process Part 2

### 3. CONCEPT OF SPE MANUFACTURING PROCESS

After closely examining the current way of executing the SPE manufacturing process, one can conclude that SAP system is indeed in use. However, many steps are either “semi-standard” such as final product added as a component to the first operation in production order. Other steps in process are “text-heavy,” with the majority of information recorded in text fields in material master. As a result, obtaining the up-to-date information or automating the SPE production process becomes time consuming and inefficient.

The aim of further part of this work is to present a manufacturing process mock-up with use of prepared master data and standard solutions available in SAP S/4 HANA. It is the author's sincere hope that the reader will acquire knowledge on how to configure the system and implement specific concepts in order to achieve a transparent and straightforward SPE production process.

At the highest level, the E2E process stays the same, but the majority of steps are executed in SAP:

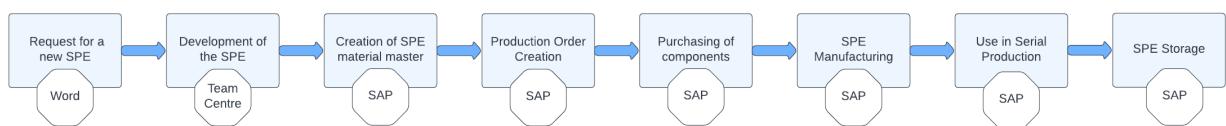


Figure 9 Process flow with used Software

#### 3.1 REQUEST FOR A NEW SPE

The Special Purpose Equipment serves as a production resource for the manufacturing of the main end product. The standard material type designated by SAP for this purpose is Production Resource/ Tool (FHM). Therefore, the SPEs receive this material type.

Other current material master settings are not considered in the concept and will not be further discussed. Considering that demand for the SPE occurs spontaneously, the ND (no planning) MRP Type seems to make the most sense.

In current situation, the material master needs to be first created in SAP to obtain the material number and then the number is copied to Team Centre for the SPE design and construction steps. Until the interface between the two software systems is established, this part of the process must remain unchanged. Once it is indeed in place, the material number for the SPE can be established in Team Centre first and then transferred to SAP.

In the suggested solution, the Bill of Material is created in the Team Centre and all the components are copied to/ created and always managed in the SAP system. This is an important precondition for the successful implementation of the concept discussed. Additionally, once the interface between the TC and SAP is established also the BOM data can automatically transferred and material master created.

## **3.2 PROCUREMENT OF THE COMPONENTS**

SAP offers several options for managing procurement of “non-standard” components by offering multiple material types in material master or item categories in bill of material. Consequently, the thesis will concentrate on SAP standard solutions that provide transparency and avoid unnecessary use of DUMMY type of materials and Excel spreadsheets for ordering materials.

In presented case, the user can choose from following options:

- Non-stock Item Category/ Non-Stock Material (N-S)

Components that are used only once for the specific SPE and not kept on stock are managed through the use of Non-Stock Item Category. Non-stock items can be entered in the BOM with or without a master record. To enter a non-stock item without a master record, a descriptive text must be entered in the BOM. For these types of components SAP automatically generates purchasing requisitions in the planning run or directly when production order is created. As the N-S materials are booked in upon delivery, they are directly withdrawn in the production order. This eliminates the need for DUMMY data or long texts in purchasing orders, as all necessary information is automatically copied from the material master.

- Variable-Size Item Category (V-S)

Raw materials ordered in blocks, sheets, or metal bars can be set as Various-Size Items. In the position details in BOM, the component's dimensions must be maintained. It allows then the system to calculate the sum of demand and trigger a purchasing requisition, in case of material shortages. A more detailed description of V-S Items will be provided later in the text.

The procurement of materials with a reorder point remains the same as they are managed with central procurement for the entire facility.

To simplify the material requirements planning for components in the SPE, it is suggested to use the same MRP controller for SPE to each of the materials. It is recommended that the planner runs the MRP Live transaction for the materials specified in the BOM using the SPE MRP Controller type.

### **3.3 SPE MANUFACTURING**

The presented production process anticipates that all components are maintained in the SAP system.

Until now the SPE department has manufactured and stored around 40'000 equipment units and gauges. This is a starting point and valuable data base for categorization of SPEs and standardisation of their production process.

After the SPEs are categorised by the use or manufacturing process, the production can be standardised with use of reference routings. In the future a responsible SPE engineer can combine them into a routing in the new equipment production and only adjust necessary fields based on the construction information. Copying of old production orders and cleaning them from components allocations, texts, costs, etc. can then be eliminated, as the reference routings contain only operations.

SAP allows to maintain standard and parallel sequences in the production. Since in the baseline case both types are present, the proposed solution utilises the standard and consequently will ensure that what is set in the system exactly reflects the factual production process.

The Quality Check no longer occurs as an operation within the production order; instead, the finished SPE will be first transported to the Quality Stock and eventually released for use and stored in SPE Warehouse.

Additionally, the system is configured to automatically create an Equipment Master once the material production order is saved or released. The material receives a serial number that is synchronous with the Equipment number.

Quality Management of SPE is not part of the presented concept.

The Production Version is a mandatory master data element for executing the production process in SAP S/4 HANA and will be discussed in further detail later.

One of the important challenges faced in the current situation are sets of SPEs that have the same material number and the history of use and changes is tracked in a long text field in material master. Furthermore, in this case a user can benefit from SAP standard solution, which is serialisation of each SPE. At the point of creation or release of a production order the equipment master is created and receives a number synchronous with the serial number in the material master.

### **3.4 SPE STOCK KEEPING**

Since there are no means or intention to implement a warehouse management system for the SPE warehouse, the storage location needs to be maintained elsewhere. The Equipment Master provides an opportunity for this, as the "Room" field can contain any text information. In the Equipment Selection transaction IE05, the equipment storing location can be easily found.

Having an Equipment set in the system, it can be then maintained in Production Maintenance module, however, it is out of the scope of our concept.

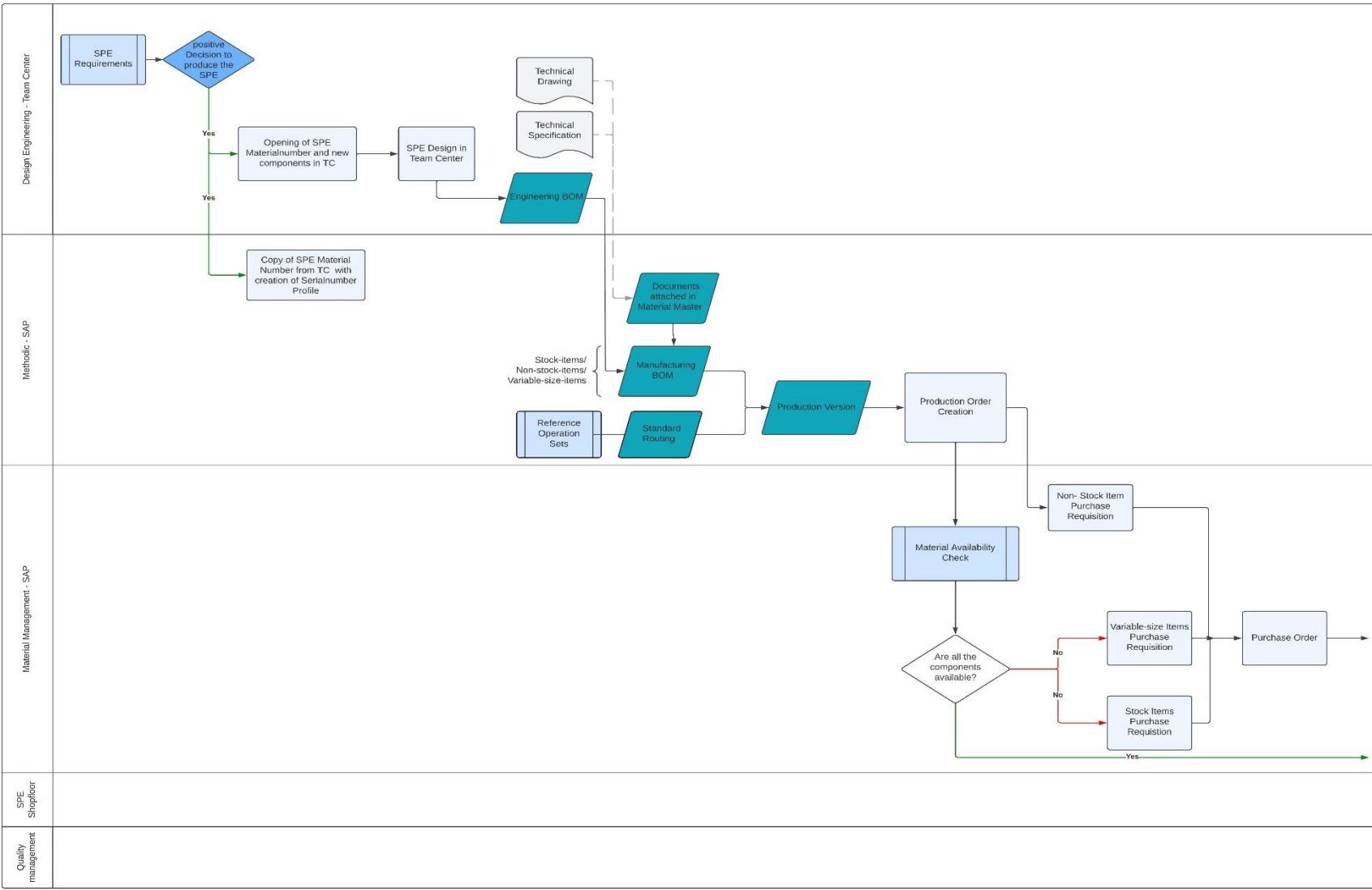


Figure 10 Concept Production Process Flow Part 1

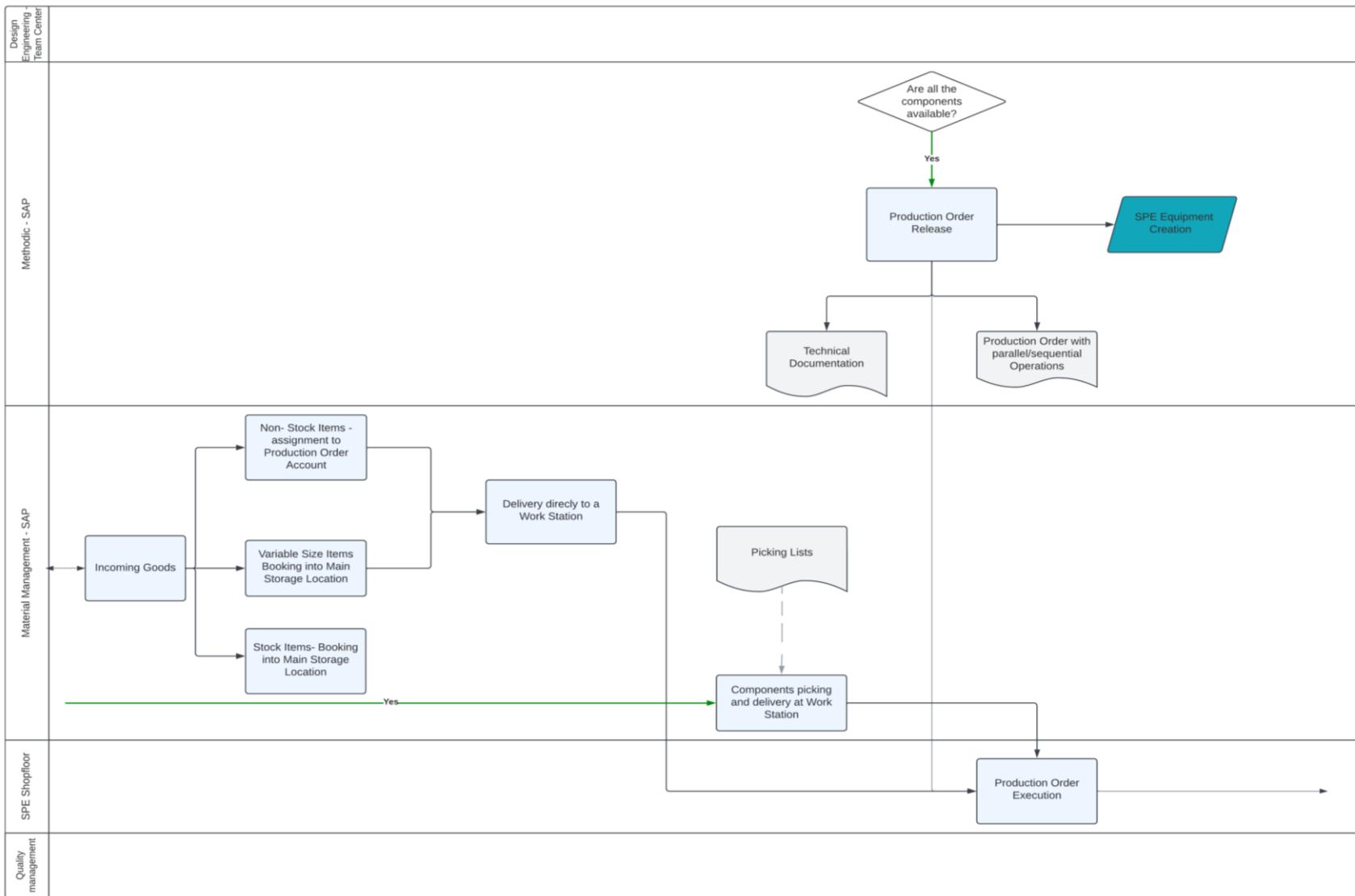


Figure 11 Concept Production Process Flow Part 2

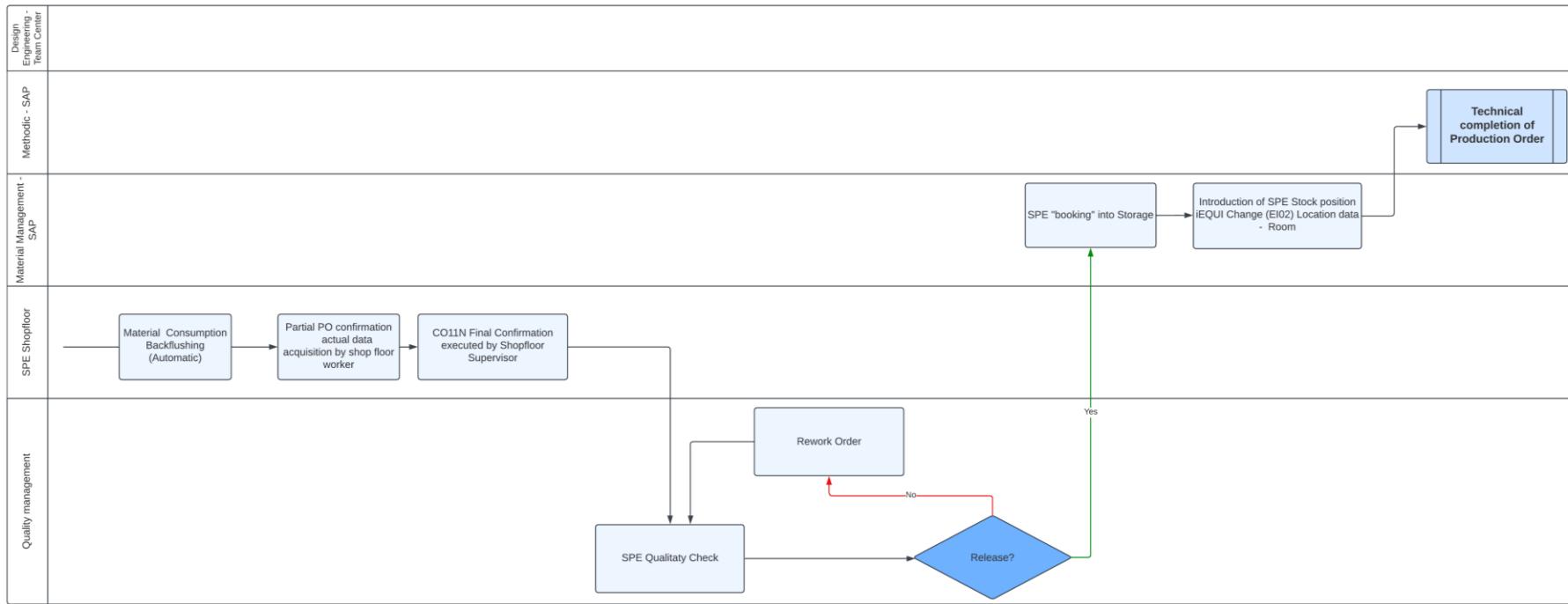


Figure 12 Concept Production Process Flow Part 3

## 4. SPE SYSTEM CUSTOMISING

In the following chapter the required configuration will be presented. A Serial Number Profile, necessary to distinguish each unit of SPE set, as well as settings for Equipment Master creation will be described in part 4.1.

As the Special Purpose Equipment is intended to be used as a resource in the production process of a main product, the Material Category is chosen according to its purpose - as FHMI. The equipment though is produced in-house, which implies further configuration in Production settings. Chapter 4.2 will explain how to enable in-house production of Resource and Tooling materials. It will cover introduction of a new order type that distinguishes the SPE production in the system and then it will focus on its parametrization, scheduling, material availability check and confirmation of completion.

### 4.1 SERIALISATION OF SPECIAL PURPOSE EQUIPMENT

On top of the use of SPEs in the new planes production, its further purpose is their maintenance and overhaul. Consequently, the SPE needs to be established in SAP as Equipment, too.

Currently, when SPEs are manufactured, each identical unit receives a separate material number, which results in an overflow of material masters for the same SPEs. However, this can be avoided by introducing serialisation for the manufactured sets.

#### 4.1.1 Serial number profile and assignment to the equipment.

The serial number profile acts as a prerequisite for identifying materials with serial numbers. Each profile controls the following:

- The business procedures during which serial numbers can be assigned.
- Whether serialisation is mandatory, optional, performed automatically or not at all.
- Definition whether equipment master record should or should not be created for each serial number.
- Information about stock check and how the system should react in the event of inconsistencies.

Customization path:

*Logistics-General → Material Master → Sales and Distribution → Basic Functions → Serial Numbers → Determine Serial Number Profiles*

Serial number profile ZSPE defines that the serial number is created with SPE production order creation or release processing. The serial numbers always refer to the order item.

| Serial number profile                    |                   |                    |                          |                              |                     |                          |  |
|--|-------------------|--------------------|--------------------------|------------------------------|---------------------|--------------------------|--|
| Prof.                                    | Profile text      | Serial preparation | ExistReq.                | C Equipment CatDesc.         | StkCk               | Warehouse Se...          |  |
| <input checked="" type="checkbox"/> ZSPE | Serial number SPE |                    | <input type="checkbox"/> | P Production resources/tools | No stock validation | <input type="checkbox"/> |  |

Figure 13 Serial Number Profile in IMG

The serial number will be assigned to the Production resource/tools Equipment type. No stock validation is required.

Following procedures are in place:

- PPAU - Serial Numbers are Created when the order is Created used in PP order.
- PPRL - Serial Numbers are Created when the order is Released used in PP order. If a serial number requirement exists and no or not all serial numbers have been assigned, the order cannot be released.

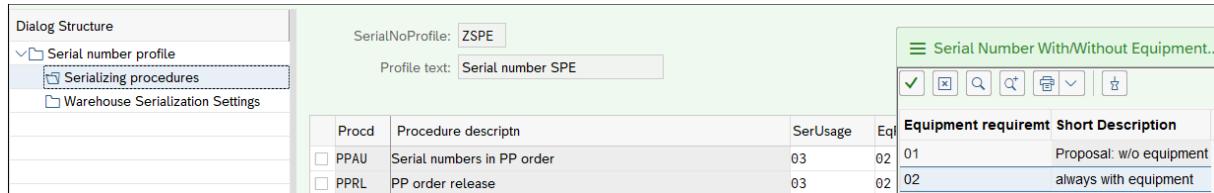


Figure 14 Serializing Procedures

#### 4.1.2 Synchronisation of serial number profile and equipment number

The serial number and equipment number are kept synchronous. In the material master record in **Plant Data/Storage 2** the indicator **Serialization Level - 1** is set.

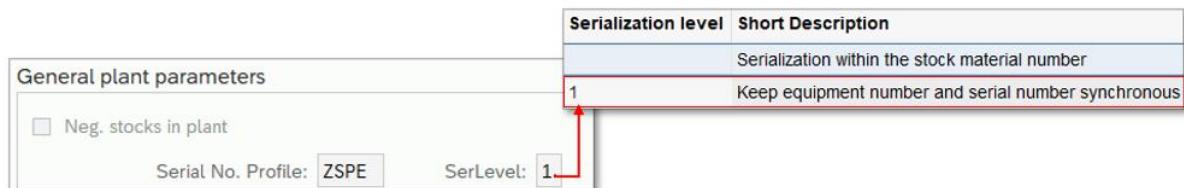


Figure 15 Serialisation Level

Synchronisation of the equipment number with the material serial number allows to simplify identification of the equipment in the shop floor. One can also identify the equipment with the material number in transaction IE05.

## 4.2 CUSTOMISING OF MATERIAL ASSIGNMENT TO ROUTING TYPE

To enable manufacturing of Special Purpose Equipment as a FHMI Material type, the link between the material and routing needs to be established.

The FHMI Material can be assigned to a Routing in IMG catalogue in the following path:

*Production → Basic Data → Routing → General Data → Define Material Type Assignments*



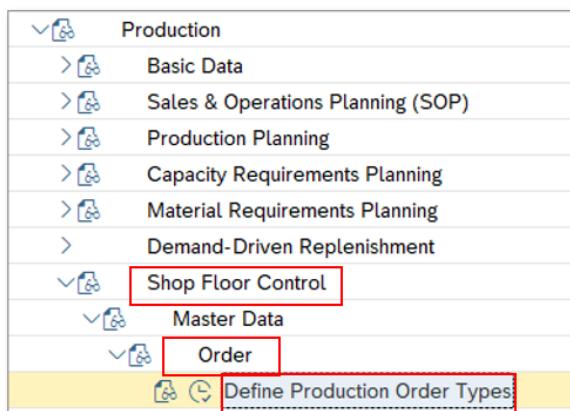
| TLType |         | Description | MTyp | Material Type Description |
|--------|---------|-------------|------|---------------------------|
| N      | Routing |             | FHM1 | Production Resource/Tool  |

Figure 16 Assignment of Material Types

## 4.3 PRODUCTION ORDER TYPE DEFINITION

In general, SAP distinguishes three types of production: Make-to-Stock, Make-to-Order and Engineer-to- Order. In the discussed case, the special purpose equipment is manufactured to stock, as there are no customer orders triggering the demand. In order to differentiate the SPE manufacturing process, an individual Order Type ZSPE was created:

*Production → Shop Floor Control → Order → Define Production Order Types*



The configuration screen includes the following fields:

- Order category: 10
- Order Type: ZSPE
- Short Text: MTS SPE Production Order
- Control Indicator:
  - CO Partner Update: Semi-active
  - Commitments Mgmt:
- Reorganization:
  - Residence Time 1: 1
  - Residence Time 2: 1
- Cost Controlling:
  - Settlement Profile: YBMFP1
  - Functional Area: YB20
  - PP Valuated to COPA
  - Production
  - Coll.Order with Goods Movement:

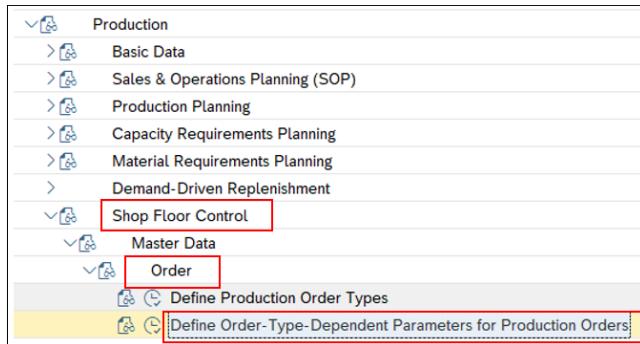
Figure 17 Production Order Type

All the parameters: the Control Indicator, Reorganisation, Order Status and Cost Controlling settings are copied from SAP standard MTS production order type (YBM1).

## 4.4 DEFINITION OF ORDER-TYPE-DEPENDENT PARAMETERS

Next, we define what data will be selected for the ZSPE order type when creating a production order.

*Production → Master Data → Order → Define Order Type Dependent Parameters*



In section Planning:

- System selects automatically the first available Production Version.
- Selection ID determines the ranking or routing selection priority, its usage and key status of the routing. For order type ZSPE a routing (N), with Status (4) Released (General) for Production has a first priority and with Status (2) Released for Order has a second priority.
- Check Operation detail defines whether operation detail screens are to be checked when the operations are transferred to the order.
- Routing text defines if the text from the routing header is copied into the production order.
- BOM application defines what type of usage the BOM alternatives are automatically selected.

The screenshot shows the SAP Planning View interface. At the top, it displays 'Plant: 1010 Plant 1 DE' and 'Order Type: ZSPE MTS SPE Production Order'. Below this, there are tabs for 'Planning' (which is selected), 'Implementation', 'Cost Accounting', and 'Display Profiles'. The main area is titled 'Master Data' and contains several sections: 'Production Version' (with a note about automatic selection), 'Routing' (showing a table with columns: SelID, SelPr, Type, Usage, Description, Status, Description of the Status. It includes fields for Application (P), Selection ID (01), Sequence Exchange, Alternative Sequences, Check Op. Details, and Routing Text), 'Operation' (with fields for Entry tool, Operation Increment (0010), Reduction Strategy, and a note about BOM applications), and 'Bill of Material' (with fields for BOM Application (PP01), Production - General, and BOM Explosion). A red arrow points from the 'Selection ID' field in the Routing section to the 'SelID' column in the table.

Figure 18 Order Type Dependent Parameters for PO. Planning View.

In section Implementation:

- Status change documents are created for all status changes, at each of the four levels.
- Shop Floor Information System I01 is standard selection for data update. One can carry out reports for materials, orders, work centres, etc.
- Documentation of goods movements specifies whether GR documents should be created in reference to objects.

The screenshot shows the SAP Implementation View for Order Type Dependent Parameters. The 'Implementation' tab is active. The interface is divided into several sections:

- Status Change Documents:** Contains checkboxes for "For Order Header", "For Operation", "For Material", and "For Production Resource/Tool", all of which are checked.
- Shop Floor Information System:** Shows an "Update" button and a dropdown menu set to "I01". Below it is a "Release Versions" section with checkboxes for "Header", "Item", and "Operation", where "Header" is checked.
- Documentation of Goods Movements:** Contains checkboxes for "GR for Purchase Order", "GR for Production Order", "Planned Goods Issue", and "Unplanned Goods Issue", all of which are checked.

Figure 19 Order Type Dependent Parameters for PO. Implementation View.

### Cost Accounting Tab:

The screenshot shows the SAP Cost Accounting View for Order Type Dependent Parameters. The 'Cost Accounting' tab is active. The interface includes:

- Cost Accounting:** Fields for "Planned Costs Costin:" (PYG1), "Prod. Order Planned", "Actual Costs Costing:" (PYG2), "Prod. Order Actual", "Results Analysis Key:" (MBMF01), "WIP actual cost", "Planned Cost Calcul.:" (Determine Planned Costs When Saving), and "Net Order Price". There are also checkboxes for "Event-Based Posting" and "Split Actual Costs".
- Distribution Rule:** A field showing the default rule as "PP1 Production Mat.Full settlement".

Figure 20 Order Type Dependent Parameters for PO. Cost Accounting View.

### Display Profiles Tab:

| Planning   | Implementation | Cost Accounting | Display Profiles |
|--|----------------|-----------------|------------------|
| Collective order display   |                |                 |                  |
| Graphics Profile: <input type="text" value="000001"/> <input type="button" value="Q"/> <input type="text" value="I01"/>  |                |                 |                  |
| Graphic  |                |                 |                  |
| Group: <input type="text" value="PP"/> Display orders<br>Name: <input type="text" value="STANDARD"/><br>Index: <input type="text" value="2"/>  |                |                 |                  |
| Missing Parts List   |                |                 |                  |
| ProfMissPrtsLstOrdNo: <input type="text" value="000001"/> Profile 1 Avail.check for pln/prod.order<br>Missing Parts Prof.: <input type="text" value="000002"/> Profile 2 Avail. check collective order |                |                 |                  |

Figure 21 Order Type Dependent Parameters for PO. Display Profiles View.

## 4.5 PRODUCTION SCHEDULING PROFILE

SAP provides a standard Production scheduling profile to configure order controls to automatically execute various actions, e.g., release of order on its creation, confirmation of material availability for partial quantities or automatic goods movements. The production scheduling profile is set at material level in Working Scheduling. In this way, a different set of control for different kinds of producible materials can be defined. The production scheduling profile is then copied into the order during order creation.

*Production → Shop Floor Control → Master Data → Define production scheduling profile for DM*

| Plant | Description | Prod. Sched. Profile | Text                      |
|-------|-------------|----------------------|---------------------------|
| 1010  | Plant 1 DE  | ZSPE                 | SPE Make to Stock Profile |

Figure 22 Production Scheduling Profile

In Profile ZSPE the order is automatically scheduled on release and document links for materials are created. Other actions, such material availability check or goods receipt, capacity planning or confirmations are set in master data.

Following controls can be set:

- Production Scheduler

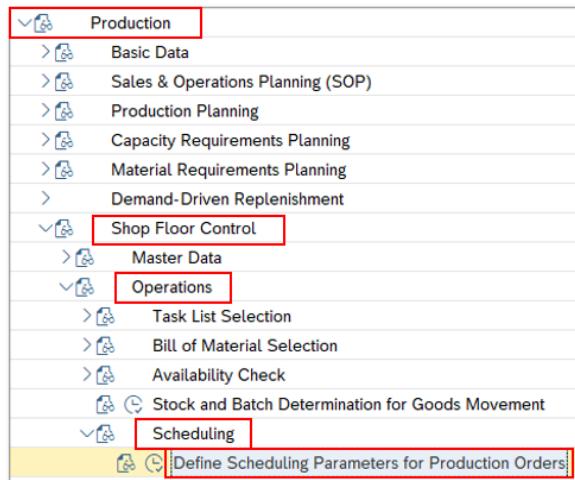
*Production → Shop Floor Control → Master Data → Define production supervisor for DM*

| Plant | Pr.Superv. | Description           | ProdProfile | Prod.Profile Description  |
|-------|------------|-----------------------|-------------|---------------------------|
| 1010  | SPE        | SPE MTS DI - Valuated | ZSPE        | SPE Make to Stock Profile |

Figure 23 Production Supervisor definition

- Scheduling Parameters for Production Orders

*Production → Operations → Scheduling → Define Scheduling Parameters for Production Orders*



The scheduling parameters are set at the plant level for the order type and a production scheduler. We can define that all the production supervisors can control ZSPE order type scheduling parameters by adding “\*”.

| Plant | Ord... | PrSup | Prod. Supervisor |
|-------|--------|-------|------------------|
| 1010  | ZSPE   | *     |                  |

Figure 24 Production Supervisor control

In Detail Scheduling we tick Generate Capacity Regulations to use a lead time of scheduling. In regular type of scheduling the system check parameters set in Adjust scheduling field and Availability of raw materials. In detail scheduling or so-called lead time scheduling the system considers also timings given in each operation.

The screenshot shows the 'Scheduling Parameters' configuration screen. It includes sections for 'Detailed Scheduling' (with 'Scheduling' and 'Generate Capacity Regs.' checked), 'Adjust scheduling' (with 'Adjust Dates:' and a date range from 10.07.2023 to 11.07.2023), 'Scheduling control for detailed scheduling' (with 'Scheduling Type: Backwards' and various checkboxes like 'Automatic Scheduling'), 'Requirements Date Determination for Components' (with 'Operation Segment: Setup' and 'Latest Staging Date' checkbox), and 'Reduction' (with 'Reduction type: All operations in the order will be reduced' and 'Maximum reduction level: Do not reduce'). A red arrow points from the 'Adjust Dates:' field in the 'Detailed Scheduling' section to the 'Basic Dates' table in the 'Dates/Times' section. The 'Dates/Times' section shows the following data:

|          | Basic Dates      | Scheduled        | Confirmed        |
|----------|------------------|------------------|------------------|
| End:     | 11.07.2023 00:00 | 10.07.2023 24:00 | 05.07.2023 05:00 |
| Start:   | 10.07.2023 00:00 | 10.07.2023 23:16 | 05.07.2023 14:57 |
| Release: |                  | 10.07.2023       | 05.07.2023       |

Figure 25 Scheduling Parameters

The Dates/ Times information in the Production Order Header is controlled with parameters in Adjust scheduling.

## 4.6 MATERIAL AVAILABILITY CHECK

SAP determines the material availability in 2 ways:

- Against independent requirements:
  - Used with, for example, strategy 50, 60, 52, 63, 74. (All other strategies use ATP check.)
  - Only planned independent requirements are taken into account
  - No MRP elements (for example, stock) are taken into account
  - No requirement to customise the checking rule
  - The field Availability check is only used to determine the requirements passing (daily or individual requirements)
- according to the ATP (available-to-promise) method. The system checks if the material requirements can be covered on the requirements date. In case of material shortage, it checks when the coverage can be ensured.

The ATP method takes into account available inventory in the required time based on following formula:

$$ATP = (Quantity\ on\ Hand + Future\ Supply\ Quantity) - Demand$$

- *Quantity on Hand* – the inventory available for immediate use
- *Future Supply Quantity* – the inventory ordered or planned to produce, that will be available on the required date
- *Demand* – all projected or already confirmed use of materials

The following applies only to the ATP checking method:

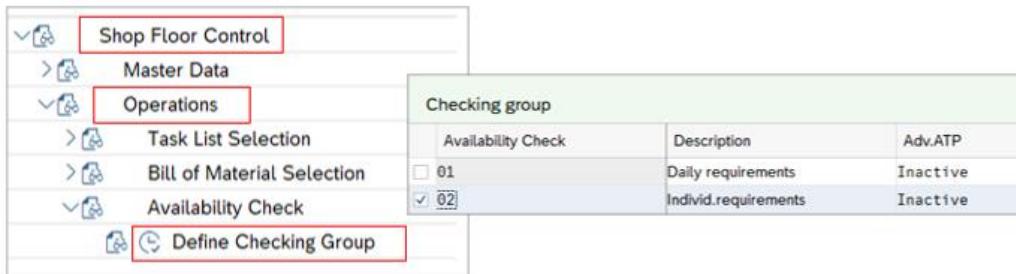
All the materials that need to be checked for their availability require setting a Checking Group Key. It is allocated in Material Masters and determines how the system checks availability and generates requirements for materials planning.

Another important setting for material availability check is the Checking Rule.

Following settings need to be in place:

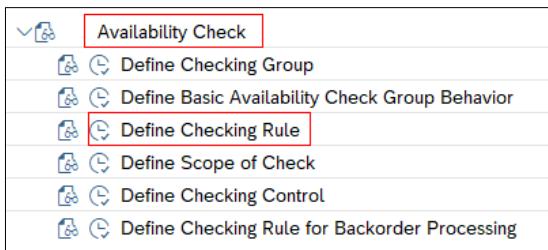
- Checking Group – 02 – individual requirements

*Production → Shop Floor Control → Operations → Availability check → Define checking group*



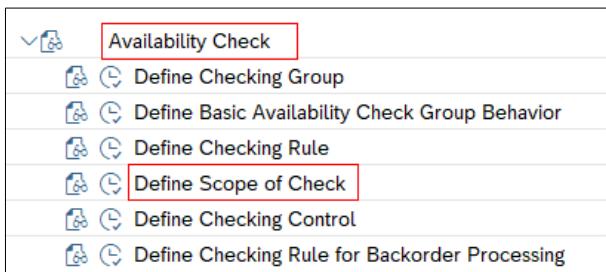
- Checking Rule – In the standard system in production orders is PP.

*Production → Shop Floor Control → Operations → Availability check → Define checking rule*



- Checking group and checking rule together specify the scope of the check:

- elements relevant to MRP (inward goods movements/outward goods movements) are taken into account (for example, purchase requisition, purchase order, planned order)
- which stock categories are taken into account
- whether replenishment lead time is checked

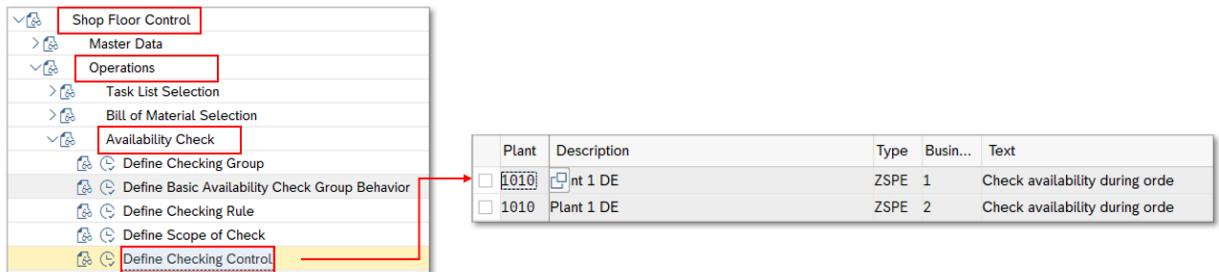


The screenshot shows the 'Change View "Scope of Availability Check": Details' dialog box. It includes sections for 'Stocks', 'Future Supply', 'Delayed Supply', 'Requirements', 'Replenishment Lead Time', 'Special Scenarios', and 'Missing Parts Processing'. Several checkboxes and dropdown menus are present, such as 'With Safety Stock', 'With Stock Transport Reqs: Exclude', and 'With Production Orders: X All'.

Figure 26 Scope of Availability Check

- In Order Control the connection between the Availability Check and the Plant with Order Type is made.

*Shop Floor Control → Operations → Availability Check → Define Checking Control*



For Order Type ZSPE the material availability is checked during order creation (1):

Plant: 1010 Plant 1 DE  
Order Type: ZSPE MTS SPE Production Order  
Availability Check: 1 Check availability during order creation

**Material availability**

No check:   
Check when saving:   
Checking Rule: P2 Production: Order Creation  
Component Check Type:  ATP check  
Collect. conversion: 2 Creation even though no material is available

**PRT availability**

No check:   
Checking Rule:   
Collect. conversion:

**Capacity availability**

No check:

Figure 27 Material Availability Check 1

and during order release (2):

Plant: 1010 Plant 1 DE  
Order Type: ZSPE MTS SPE Production Order  
Availability Check: 2 Check availability during order release

**Material availability**

No check:   
Status check:   
Check when saving:   
Checking Rule: P3 Production: Order Release  
Component Check Type:  ATP check  
Release material: 1 User decides on release if parts are missing

Figure 28 Material Availability Check 2

## 4.7 CONFIRMATION PARAMETERS

Confirmations are used to book the completion of production quantities at each operation (partial completion or final completion). Confirmation is not a receiving goods in stock, but a declaration of production at each operation and of booking cost incurred.

For our order type ZSPE the confirmations are configured as shown below:

Generally Valid Settings:

In Checks under Operation Sequence one can define, if the system allows changes (e.g., skipping an operation) and what type of response it generates – message, information, termination, error, or warning. In the selection chosen, the operations are allowed to take place in any order.

Plant: 1010 Plant 1 DE  
Order Type: ZSPE MTS SPE Production Order

Generally Valid Settings Individual Entry General Indiv. Entry of Operation w. Init. Screen

Control

Process Control:

Generated Confirmations w/o Quantity Adjustments

Conf. Profile:

Checks

Operation Sequence: Warning when operation sequence is not adhered to

Underdelivery: Underdelivery tolerance is not checked

Overdelivery: Overdelivery tolerance is not checked

Results Rec. (QM): No message if no insp. results exist

Dates in Future

HR Update Selection

No HR Update  Open Orders

Propose Time Units Goods Movements

Automatic Optimization  All Components

Hours  GR for Co-Products

Minutes

Figure 29 Confirmation Configuration Setting View 1

Automatic backflush of all components for the ZSPE production orders, no matter what is set in MM or Routing.

Individual Entry General:

- System automatically suggests Partial Confirmations as a default.
- The Error Logs are created in case of faulty Goods Movements (COGI)

\*Plant: 1010 Plant 1 DE  
\*Order Type: ZSPE MTS SPE Production Order

Generally Valid Settings **Individual Entry General** Indiv. Entry of Operation w. Init. Screen

Confirmation Function Excluding Single-Screen Entry  
Confirmation Type: Partial confirmation  
 Clear Open Reservations

Error Handling/Logs  
 Actual Costs  Termination for Incorrect Actual Costs  
 Goods Movements  Termination for Incorrect Goods Movements

Shift  
Proposal: Shift Not Used  
 Shift in Header Confirmation

Customer-Specific Fields  
 Operation Confirmation  
 Header Confirmation

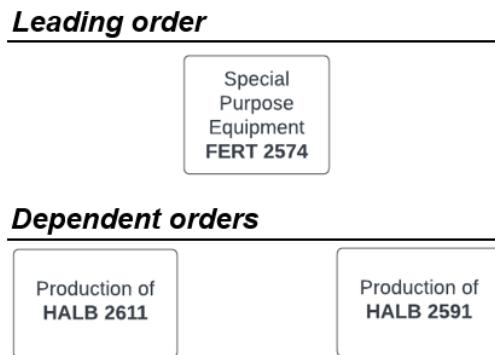
Subdivision of Quantities  
Define Quantity Layout  
Assign Quantity Layout  
 Header Confirmation

Notification Type  
Type:

Figure 30 Confirmation Configuration Setting View 2

## 4.8 COLLECTIVE ORDERS (WITH AUTOMATIC GOODS MOVEMENT)

A collective order is a network of planned or production orders across several manufacturing levels. It is used for materials produced in-house and an order for the top-level material in the hierarchy automatically generates orders for its semifinished products.



Collective orders can be used in:

- Make-to-Stock production
- Sales-order-related production (Sales-order-based mass production and MTO)

SAP distinct two ways of processing a collective order:

- CO with automatic good movements
- CO without automatic GM.

In the presented example we will use a collective order with automatic good movements.

In order to successfully process a collective order, the following configuration needs to be set:

- Special procurement type for collective orders needs to be added in Configuration.

*Production → Material Requirements Planning → Master Data → Define Special Procurement Type*

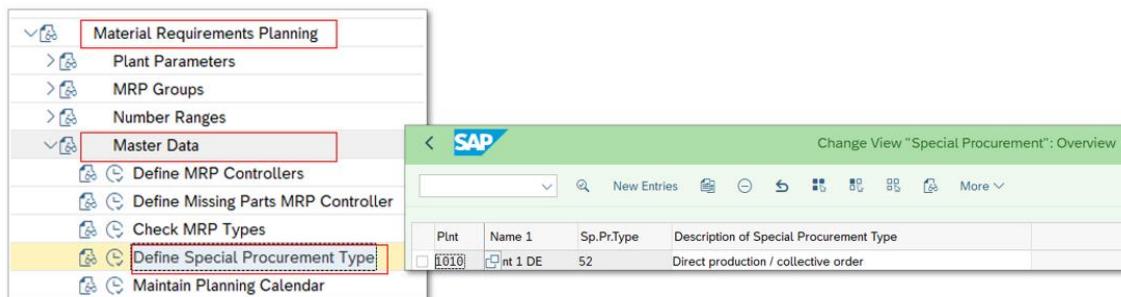


Figure 31 Special Procurement configuration

This configuration allows to indicate materials that will be processed in the collective order. Materials that are manufactured with the lower-level order have the Special Procurement indicator set in MRP 2:

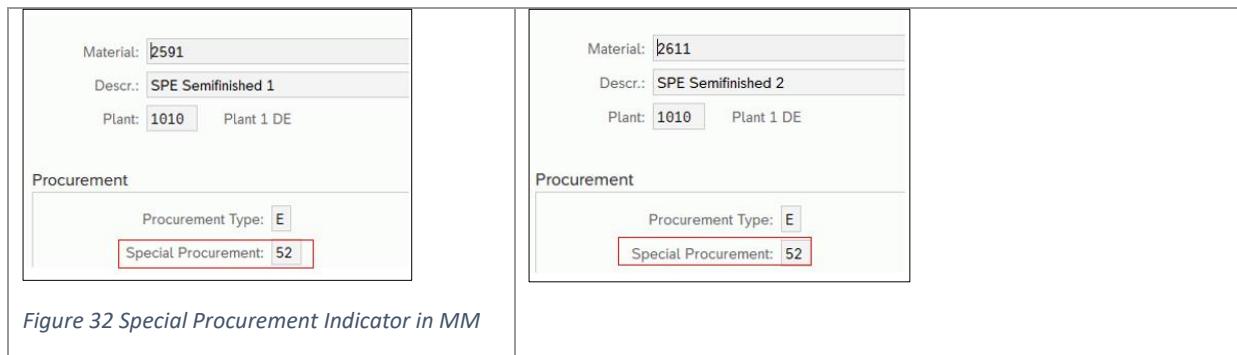


Figure 32 Special Procurement Indicator in MM

The Automatic Goods Movement is set in Controlling configuration:

*Controlling → Product Cost Controlling → Cost Object Controlling → Product Cost by Order → Manufacturing Orders → Check Order Types*

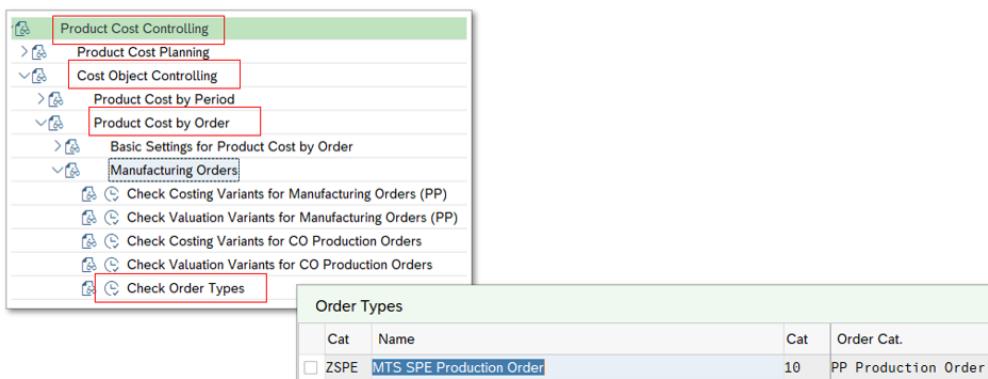


Figure 33 Check Order Types general view

The goods movements between manufacturing levels are enabled in Cost Controlling . This indicator is transferred into the order header (master data) of the orders. If there are differing order types within the collective order, the setting of the indicator of the order type of the leading order takes precedence. This indicator is transferred to all lower-level orders and overrides their original indicators.

|                                |   |
|--------------------------------|---|
| Order category:                | <input type="text" value="10"/>                       |
| Order Type:                    | <input type="text" value="ZSPE"/>                     |
| Short Text:                    | <input type="text" value="MTS SPE Production Order"/> |
| Control Indicator              |   |
| CO Partner Update:             | <input type="text" value="Semi-active"/>              |
| Commitments Mgmt:              | <input type="checkbox"/>                              |
| Reorganization                 |   |
| Residence Time 1:              | <input type="text" value="1"/>                        |
| Residence Time 2:              | <input type="text" value="1"/>                        |
| Cost Controlling               |   |
| Settlement Profile:            | <input type="text" value="YBMFP1"/>                   |
| Functional Area:               | <input type="text" value="YB20"/> Production          |
| CoL.Order with Goods Movement: | <input checked="" type="checkbox"/>                   |

Figure 34 Check Order Types detailed view

## 5. PRODUCTION MASTER DATA

Having covered technical details, the Chapter 5 will present material master data, such as raw, semi-finished or non-stock materials, as well as production master: bill of materials, work centres, routings, and production version.

The production order for SPE will be created, together with equipment master and serial number. We will observe collective order creation for semifinished materials, material reservations for stock materials and purchasing requisitions for non-stock materials. As we execute the production orders and confirm the finalisation of each operation, we will be able to observe the automatic goods movements and material consumption at allocated operation levels.

Based on the chosen scenario of a SPE production process, it will be shown how to leverage SAP features: parallel sequencing and collective orders.

For the process simulation following materials were created:

- Finished material: 2574 – Special Purpose Equipment
- Raw materials
  - 2581 – SPE Aluminium Block (0.5m x 0.5m x 0.2m), 20kG, B.U.M. = M3, MRP Type VB, Planning Strategy 10
  - 2582 – SPE Stainless Steel 5mm sheet (1m x 1m x 0.005m), 5kG, B.U.M. = M3, MRP Type VB, Planning Strategy 10
  - 2585 - SPE Label plate with inscription, MRP Type VB, Planning Strategy 10
  - 2587 SPE O-Ring, MRP Type VB, Planning Strategy 10
- Semifinished materials:
  - 2591 SPE Semifinished 1, MRP Type PD, Planning Strategy 70
  - 2611 SPE Semifinished 2, MRP Type PD, Planning Strategy 70
- Non-stock materials
  - 2583 – SPE red aluminium oval-head screw M6x10
  - 2592 – SPE cylindrical head screw M10

All the created materials are allocated to SPE Controller .

### 5.1 BILL OF MATERIAL

Schematic representation of Bill of Material used in the exemplary scenario:

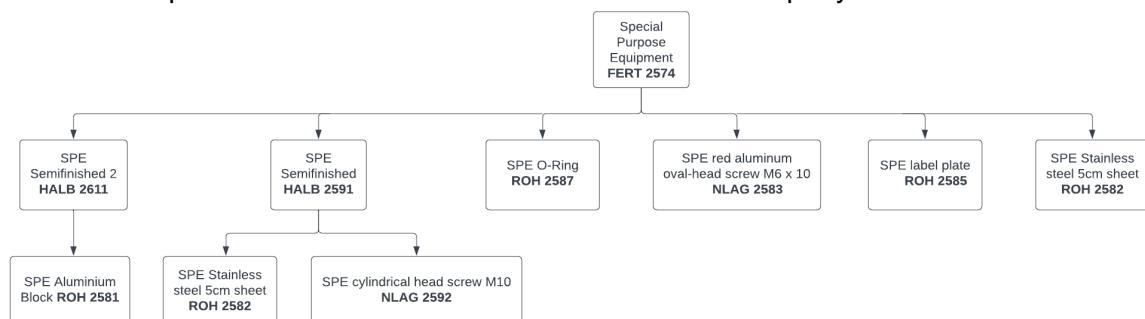


Figure 35 Exemplary Bill of Material diagram

## Material 2574 Special Purpose Equipment BOM with quantities:

| Material: <b>2574</b>   |  Special Purpose Equipment |               |   |          |     |                                     |
|---|---|---------------|---|----------|-----|-------------------------------------|
| Plant: <b>1010</b>  | Plant 1 DE  |               |   |          |     |                                     |
| Alternative BOM: <b>1</b>   |   |               |   |          |     |                                     |
| Position  | Effectivity Initial Screen  |               |   |          |     |                                     |
| <a href="#">Material</a> <a href="#">Document</a> <a href="#">General</a> |   |               |   |          |     |                                     |
| Item  | ICt   | Component     | Component description                   | Quantity | UoM | Asm                                 |
| <input type="checkbox"/>  | 0010  | L <b>2591</b> | SPE Semifinished 1                      | 1        | PC  | <input checked="" type="checkbox"/> |
| <input type="checkbox"/>  | 0020  | L <b>2611</b> | SPE Semifinished 2                      | 1        | PC  | <input checked="" type="checkbox"/> |
| <input type="checkbox"/>  | 0030  | L <b>2587</b> | SPE O-Ring                              | 10       | PC  | <input type="checkbox"/>            |
| <input type="checkbox"/>  | 0040  | N <b>2583</b> | SPE red aluminium oval-head screw M6x10 | 10       | PC  | <input type="checkbox"/>            |
| <input type="checkbox"/>  | 0050  | L <b>2585</b> | SPE Label plate                         | 1        | PC  | <input type="checkbox"/>            |
| <input type="checkbox"/>  | 0060  | R <b>2582</b> | SPE Stainless steel 5cm sheet           | 1        | PC  | <input type="checkbox"/>            |

Figure 36 Finished material - Bill of Material in SAP

## Material 2591 SPE Semifinished 1 BOM with quantities

| Material: <b>2591</b>   |  SPE Semifinished 1 |               |                                |          |     |
|---|--|---------------|--------------------------------|----------|-----|
| Plant: <b>1010</b>  | Plant 1 DE   |               |                                |          |     |
| Alternative BOM: <b>1</b>   |  |               |                                |          |     |
| Position  | Effectivity Initial Screen   |               |                                |          |     |
| <a href="#">Material</a> <a href="#">Document</a> <a href="#">General</a> |  |               |                                |          |     |
| Item  | ICt  | Component     | Component description          | Quantity | UoM |
| <input type="checkbox"/>  | 0010   | R <b>2582</b> | SPE Stainless steel 5cm sheet  | 1        | PC  |
| <input type="checkbox"/>  | 0020   | N <b>2592</b> | SPE cylindrical head screw M10 | 4        | PC  |

Figure 37 Semifinished material 1 - Bill of Material in SAP

## Material 2611 SPE Semifinished 2 BOM with quantities

| Material: <b>2611</b>   |  SPE Semifinished 2 |               |                       |          |     |
|---|--|---------------|-----------------------|----------|-----|
| Plant: <b>1010</b>  | Plant 1 DE   |               |                       |          |     |
| Alternative BOM: <b>1</b>   |  |               |                       |          |     |
| Position  | Effectivity Initial Screen   |               |                       |          |     |
| <a href="#">Material</a> <a href="#">Document</a> <a href="#">General</a> |  |               |                       |          |     |
| Item  | ICt  | Component     | Component description | Quantity | UoM |
| <input type="checkbox"/>  | 0010   | R <b>2581</b> | SPE Aluminium Block   | 1        | PC  |

Figure 38 Semifinished material 2 - Bill of Material in SAP

In two of the BOMs, the Raw Materials 2581 and 2582 are set as Variable-Size items. Let's shortly concentrate on the demand calculation for these types of items.

For the case of Variable-Size Items, the system automatically calculates the total quantity of the raw materials required based on the sizes and the formula entered in the BOM.

The formulas can be defined in Customising in Production by choosing:

*Bill of Material → Item Data → Define formulas for variable-size items*

The two raw materials are aluminium block and stainless-steel sheet that have rectangular parallelepiped shape. The used formula is presented below:

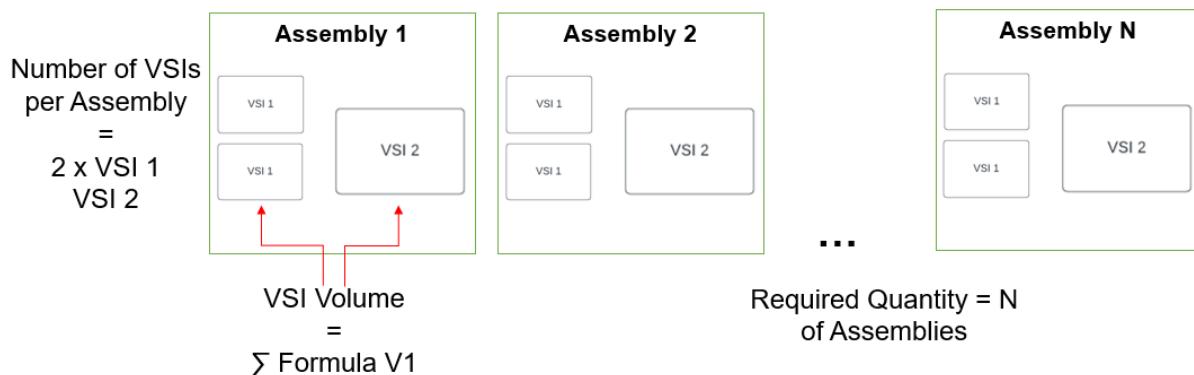
| Change View "Variable-Size Item Formulas": Overview |                       |        |  |
|---|-----------------------|--------|--|
| Formula   | Formula               | DimRes | Formula text                           |
| F1  | ROMS1 * ROMS2         | SURFAC | Area of a rectangle                    |
| F2  | ROMS1 * ROMS1 * PI    | SURFAC | Area of a circle                       |
| U1  | ROMS1 + ROMS2 + ROMS3 | LENGTH | Perimeter of a triangle                |
| U2  | 2 * ROMS1 + 2 * ROMS2 | LENGTH | Perimeter of a rectangle               |
| V1  | ROMS1 * ROMS2 * ROMS3 | VOLUME | Volume of a rectangular parallelepiped |

Figure 39 Variable Size Material calculation formula

The raw material requirement is calculated with following formula:

$$\text{Raw material requirement} = \text{No. of VSI per Assembly} * \text{VSI Volume} * \text{Required Quantity}$$

where:



One can assign the calculation formula for the material in BOM:

|                         |                   |                    |  |   |
|-------------------------|-------------------|--------------------|--|---|
| BOM item                | Item Number: 0010 | Component: 2581    | SPE Aluminium Block                          | Formula Key for Variable-Size Items (2) 5 Entries |
|                         | Item Category: R  | Variable-size item | Restrictions                                 |   |
|                         | Item ID: 00000001 |                    |  |   |
| Variable-size item data | * Size 1: 0,250   | M                  | VSI Formula: <input type="text" value="V1"/> | Formula   |
|                         | Size 2: 0,250     |                    | * Number Required: 1                         | Formula   |
|                         | Size 3: 0,200     |                    | VSI Quantity: 0,013                          | Formula text                                      |
|                         |                   |                    |  | Area of a rectangle                               |
|                         |                   |                    |  | Area of a circle                                  |
|                         |                   |                    |  | Perimeter of a triangle                           |
|                         |                   |                    |  | Perimeter of a rectangle                          |
|                         |                   |                    |  | Volume of a rectangular parallelepiped            |

Figure 40 Variable Size Material BOM details

## 5.2 WORK CENTRES

Following work centres were created:

| Work Centers | Description             |
|--------------|-------------------------|
| SPE_MIL1     | Milling 1               |
| SPE_MIL2     | Milling 2               |
| SPE_ASS1     | Assembly 1              |
| SPE_ASS2     | Assembly 2              |
| SPE_INSC     | Label plate inscription |
| SPE_4EYE     | Final four-eyes control |

## 5.3 ROUTINGS

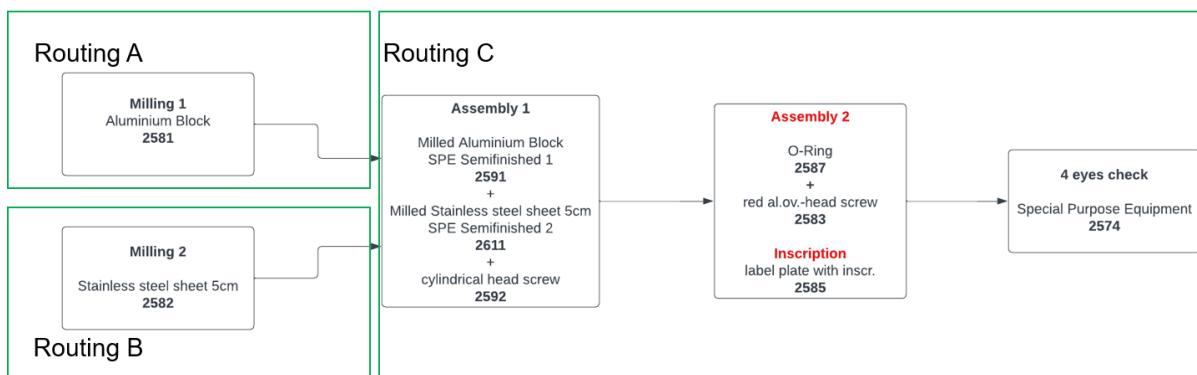
Having defined a bill of material with required components and their properties, it is now necessary to specify how they will be transformed to a final product. The routing describes the sequence of the individual operations in the production.

In discrete manufacturing two types of Routing can be distinguished:

Routing – outlines sequence of operations in order to manufacture a material. A single material can be created with several different routings, depending on a lot size ranges or used processing techniques.

Rate Routing – is a reference set of operations not assigned to a material, as it is in a routing. It comprises a frequently repeated operations in a production process to which a recourse is made on a regular basis. The rate routing can be used as a template in material-bounded routings in order to reduce the data entry effort. On top of it, the “normal” routings are automatically updated every time linked rate routings are changed.

In our case, we will use material-related routing. An exemplary production process is presented in the illustration YY.



In this example, each semi-finished component requires a separate routing for the milling operation.

### SPE Semifinished product 1 (Routing A):

| Group:                        | 50000067 | Group Counter:     | 2     | SPE Semifinished 1                |
|-------------------------------|----------|--------------------|-------|-----------------------------------|
| Material:                     | 2591     | SPE Semifinished 1 |       |                                   |
| Sequence:                     | 0        | Sequence Desc.:    |       |                                   |
| <b>Operation Overview</b>     |          |                    |       |                                   |
| Ope...                        | SOOp     | Work Center        | Plant | Cont... Standard T... Description |
| <input type="checkbox"/> 0010 | SPE_MIL1 | 1010               | PP01  | Milling 1                         |

Figure 41 Semifinished product 1 Routing

### material allocation:

| Material:            | 2591     | SPE Semifinished 1             |          |       |       |                                     |          |      |   |                                |             |      |                     |
|----------------------|----------|--------------------------------|----------|-------|-------|-------------------------------------|----------|------|---|--------------------------------|-------------|------|---------------------|
| Plant:               | 1010     |                                |          |       |       |                                     |          |      |   |                                |             |      |                     |
| Group:               | 50000067 | Sequence: 0 SPE Semifinished 1 |          |       |       |                                     |          |      |   |                                |             |      |                     |
| BOM:                 | 00000228 | material backflush Alt. BOM: 1 |          |       |       |                                     |          |      |   |                                |             |      |                     |
| <b>Item Overview</b> |          |                                |          |       |       |                                     |          |      |   |                                |             |      |                     |
| Le...                | Item...  | Component                      | Quantity | Un... | It... | B...                                | Activity | Seq. | C | Material Description           | Componen... | A... | BOM Header Material |
| 0                    | 0010     | 2582                           | 0,003    | M3    | R     | <input checked="" type="checkbox"/> | 0010     | 0    |   | SPE Stainless steel 5cm sheet  | 00000228    | 1    | 2591                |
| 0                    | 0020     | 2592                           | 4        | PC    | N     | <input checked="" type="checkbox"/> | 0010     | 0    |   | SPE cylindrical head screw M10 | 00000228    | 1    | 2591                |

Figure 42 Semifinished product 1 material allocation

### SPE Semifinished product 2 (Routing B):

| Group:                        | 50000067 | Group Counter:     | 1     | SPE Semifinished 2                |
|-------------------------------|----------|--------------------|-------|-----------------------------------|
| Material:                     | 2611     | SPE Semifinished 2 |       |                                   |
| Sequence:                     | 0        | Sequence Desc.:    |       |                                   |
| <b>Operation Overview</b>     |          |                    |       |                                   |
| Ope...                        | SOOp     | Work Center        | Plant | Cont... Standard T... Description |
| <input type="checkbox"/> 0010 | SPE_MIL2 | 1010               | PP01  | Milling 2                         |

Figure 43 Semifinished product 2 Routing

### Material allocation:

| Material:            | 2611     | SPE Semifinished 2             |          |       |       |                                     |          |      |                      |             |      |                     |
|----------------------|----------|--------------------------------|----------|-------|-------|-------------------------------------|----------|------|----------------------|-------------|------|---------------------|
| Plant:               | 1010     |                                |          |       |       |                                     |          |      |                      |             |      |                     |
| Group:               | 50000067 | Sequence: 0 SPE Semifinished 2 |          |       |       |                                     |          |      |                      |             |      |                     |
| BOM:                 | 00000233 | material backflush Alt. BOM: 1 |          |       |       |                                     |          |      |                      |             |      |                     |
| <b>Item Overview</b> |          |                                |          |       |       |                                     |          |      |                      |             |      |                     |
| Le...                | Item...  | Component                      | Quantity | Un... | It... | B...                                | Activity | Seq. | Material Description | Componen... | A... | BOM Header Material |
| 0                    | 0010     | 2581                           | 0,013    | M3    | R     | <input checked="" type="checkbox"/> | 0010     | 0    | SPE Aluminium Block  | 00000233    | 1    | 2611                |

Figure 44 Semifinished product 2 material allocation

## SPE final product (Routing C)

| Group:   | 50000068 | Group Counter:                   | 1     | Special Purpose Equipment |               |                  |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
|--|----------|----------------------------------|-------|---------------------------|---------------|------------------|-------------|-------|---------|---------------|-------------|------|--|----------|------|------|--|------------|------|--|----------|------|------|--|------------|------|--|----------|------|------|--|------------|------|--|----------|------|------|--|------------------|
| Material:  | 2574     | Special Purpose Equipment        |       |                           |               |                  |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| Sequence:  | 0        | Sequence Desc.: Sequential order |       |                           |               |                  |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| <b>Operation Overview</b>  |          |                                  |       |                           |               |                  |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| <table border="1"> <thead> <tr> <th>Ope...</th> <th>SOp</th> <th>Work Center</th> <th>Plant</th> <th>Cont...</th> <th>Standard T...</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0010</td> <td></td> <td>SPE_ASS1</td> <td>1010</td> <td>PP01</td> <td></td> <td>Assembly 1</td> </tr> <tr> <td>0020</td> <td></td> <td>SPE_ASS2</td> <td>1010</td> <td>PP01</td> <td></td> <td>Assembly 2</td> </tr> <tr> <td>0030</td> <td></td> <td>SPE_ASS2</td> <td>1010</td> <td>PP01</td> <td></td> <td>Assembly 3</td> </tr> <tr> <td>0040</td> <td></td> <td>SPE_4EYE</td> <td>1010</td> <td>PP01</td> <td></td> <td>SPE 4 eyes check</td> </tr> </tbody> </table> |          |                                  |       |                           | Ope...        | SOp              | Work Center | Plant | Cont... | Standard T... | Description | 0010 |  | SPE_ASS1 | 1010 | PP01 |  | Assembly 1 | 0020 |  | SPE_ASS2 | 1010 | PP01 |  | Assembly 2 | 0030 |  | SPE_ASS2 | 1010 | PP01 |  | Assembly 3 | 0040 |  | SPE_4EYE | 1010 | PP01 |  | SPE 4 eyes check |
| Ope...   | SOp      | Work Center                      | Plant | Cont...                   | Standard T... | Description      |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| 0010   |          | SPE_ASS1                         | 1010  | PP01                      |               | Assembly 1       |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| 0020   |          | SPE_ASS2                         | 1010  | PP01                      |               | Assembly 2       |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| 0030   |          | SPE_ASS2                         | 1010  | PP01                      |               | Assembly 3       |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |
| 0040   |          | SPE_4EYE                         | 1010  | PP01                      |               | SPE 4 eyes check |             |       |         |               |             |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |            |      |  |          |      |      |  |                  |

Figure 45 Finished product Routing

and components allocation to operations 10 and 20:

| Material:  | 2574     | Special Purpose Equipment             |          |         |           |                                     |          |       |        |   |             |      |                      |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
|--|----------|---------------------------------------|----------|---------|-----------|-------------------------------------|----------|-------|--------|---|-------------|------|----------------------|-------------|------|---------------------|---|------|------|---|----|---|-------------------------------------|------|---|--|--------------------|----------|---|------|---|------|------|---|----|---|-------------------------------------|------|---|--|--------------------|----------|---|------|---|------|------|----|----|---|-------------------------------------|------|---|--|------------|----------|---|------|---|------|------|----|----|---|-------------------------------------|------|---|--|---|----------|---|------|---|------|------|---|----|---|-------------------------------------|------|---|--|-----------------|----------|---|------|---|------|------|-------|----|---|-------------------------------------|------|---|--|-------------------------------|----------|---|------|
| Plant:   | 1010     |                                       |          |         |           |                                     |          |       |        |   |             |      |                      |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| Group:   | 50000068 | Sequence: 0 Special Purpose Equipment |          |         |           |                                     |          |       |        |   |             |      |                      |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| BOM:   | 00000229 | Alt. BOM: 1                           |          |         |           |                                     |          |       |        |   |             |      |                      |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| <b>Item Overview</b> <table border="1"> <thead> <tr> <th>Le...</th> <th>Item...</th> <th>Component</th> <th>Quantity</th> <th>Un...</th> <th>It...</th> <th>Bac...</th> <th>Activity</th> <th>Seq.</th> <th>C</th> <th>Material Description</th> <th>Componen...</th> <th>A...</th> <th>BOM Header Material</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0010</td> <td>2591</td> <td>1</td> <td>PC</td> <td>L</td> <td><input checked="" type="checkbox"/></td> <td>0010</td> <td>0</td> <td></td> <td>SPE Semifinished 1</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> <tr> <td>0</td> <td>0020</td> <td>2611</td> <td>1</td> <td>PC</td> <td>L</td> <td><input checked="" type="checkbox"/></td> <td>0010</td> <td>0</td> <td></td> <td>SPE Semifinished 2</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> <tr> <td>0</td> <td>0030</td> <td>2587</td> <td>10</td> <td>PC</td> <td>L</td> <td><input checked="" type="checkbox"/></td> <td>0020</td> <td>0</td> <td></td> <td>SPE O-Ring</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> <tr> <td>0</td> <td>0040</td> <td>2583</td> <td>10</td> <td>PC</td> <td>N</td> <td><input checked="" type="checkbox"/></td> <td>0010</td> <td>0</td> <td></td> <td>SPE red aluminium oval-head screw M6x10</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> <tr> <td>0</td> <td>0050</td> <td>2585</td> <td>1</td> <td>PC</td> <td>L</td> <td><input checked="" type="checkbox"/></td> <td>0010</td> <td>0</td> <td></td> <td>SPE Label plate</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> <tr> <td>0</td> <td>0060</td> <td>2582</td> <td>0,008</td> <td>M3</td> <td>R</td> <td><input checked="" type="checkbox"/></td> <td>0010</td> <td>0</td> <td></td> <td>SPE Stainless steel 5cm sheet</td> <td>00000229</td> <td>1</td> <td>2574</td> </tr> </tbody> </table> |          |                                       | Le...    | Item... | Component | Quantity                            | Un...    | It... | Bac... | Activity                                | Seq.        | C    | Material Description | Componen... | A... | BOM Header Material | 0 | 0010 | 2591 | 1 | PC | L | <input checked="" type="checkbox"/> | 0010 | 0 |  | SPE Semifinished 1 | 00000229 | 1 | 2574 | 0 | 0020 | 2611 | 1 | PC | L | <input checked="" type="checkbox"/> | 0010 | 0 |  | SPE Semifinished 2 | 00000229 | 1 | 2574 | 0 | 0030 | 2587 | 10 | PC | L | <input checked="" type="checkbox"/> | 0020 | 0 |  | SPE O-Ring | 00000229 | 1 | 2574 | 0 | 0040 | 2583 | 10 | PC | N | <input checked="" type="checkbox"/> | 0010 | 0 |  | SPE red aluminium oval-head screw M6x10 | 00000229 | 1 | 2574 | 0 | 0050 | 2585 | 1 | PC | L | <input checked="" type="checkbox"/> | 0010 | 0 |  | SPE Label plate | 00000229 | 1 | 2574 | 0 | 0060 | 2582 | 0,008 | M3 | R | <input checked="" type="checkbox"/> | 0010 | 0 |  | SPE Stainless steel 5cm sheet | 00000229 | 1 | 2574 |
| Le...  | Item...  | Component                             | Quantity | Un...   | It...     | Bac...                              | Activity | Seq.  | C      | Material Description                    | Componen... | A... | BOM Header Material  |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0010     | 2591                                  | 1        | PC      | L         | <input checked="" type="checkbox"/> | 0010     | 0     |        | SPE Semifinished 1                      | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0020     | 2611                                  | 1        | PC      | L         | <input checked="" type="checkbox"/> | 0010     | 0     |        | SPE Semifinished 2                      | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0030     | 2587                                  | 10       | PC      | L         | <input checked="" type="checkbox"/> | 0020     | 0     |        | SPE O-Ring                              | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0040     | 2583                                  | 10       | PC      | N         | <input checked="" type="checkbox"/> | 0010     | 0     |        | SPE red aluminium oval-head screw M6x10 | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0050     | 2585                                  | 1        | PC      | L         | <input checked="" type="checkbox"/> | 0010     | 0     |        | SPE Label plate                         | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |
| 0  | 0060     | 2582                                  | 0,008    | M3      | R         | <input checked="" type="checkbox"/> | 0010     | 0     |        | SPE Stainless steel 5cm sheet           | 00000229    | 1    | 2574                 |             |      |                     |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                    |          |   |      |   |      |      |    |    |   |                                     |      |   |  |            |          |   |      |   |      |      |    |    |   |                                     |      |   |  |   |          |   |      |   |      |      |   |    |   |                                     |      |   |  |                 |          |   |      |   |      |      |       |    |   |                                     |      |   |  |                               |          |   |      |

Figure 46 Finished product material allocation

### 5.3.1 Parallel sequence of operations

In Routing C there are two production steps – assembly 2 and label inscription – that require parallel execution. This type of sequence starts at operation 20 (assembly 2) in the routing C and a parallel operation 10 (inscription) is triggered.

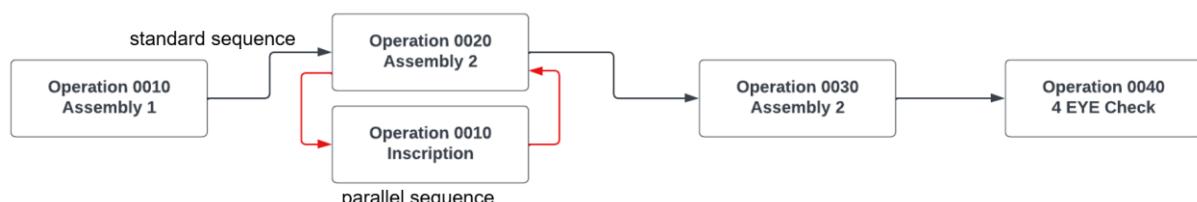


Figure 47 Standard and parallel sequences diagram

## SAP differentiate sequence types with sequence category key

The screenshot shows a SAP interface for defining sequences. At the top, there are fields for 'Group' (50000068), 'Group Counter' (1), 'Special Purpose Equipment', 'Material' (2574), and 'Special Purpose Equipment'. Below this is a table titled 'Sequences' with columns: Seq., SeqCat, A..., Referen..., Bran..., Retu..., Sequence Description. Two rows are shown: row 0 (Sequential order) and row 1 (Parallel..). Row 1 has a red box around its SeqCat value '1'. An arrow points from this value to a pop-up window titled 'Sequence Category Description' which lists three options: 0 (Standard sequence), 1 (Parallel sequence), and 2 (Alternative sequence).

|                                       |            |                |            |                           |         |                        |
|---------------------------------------|------------|----------------|------------|---------------------------|---------|------------------------|
| Group:                                | 50000068   | Group Counter: | 1          | Special Purpose Equipment |         |                        |
| Material:                             | 2574       |                |            | Special Purpose Equipment |         |                        |
| Sequences                             |            |                |            |                           |         |                        |
| <input type="checkbox"/> Seq.         |            |                |            |                           |         |                        |
| <input type="checkbox"/> 0            | SeqCat     | A...           | Referen... | Bran...                   | Retu... | Sequence Description   |
| <input checked="" type="checkbox"/> 1 | Parallel.. | 2              | 0          | 0020                      | 0020    | SPE parallel processes |

SC ▾ Sequence Category Description

|   |                      |
|---|----------------------|
| 0 | Standard sequence    |
| 1 | Parallel sequence    |
| 2 | Alternative sequence |

Figure 48 Parallel Sequence Setting in Routing

It is worth mentioning that parallel sequences can be created in routings and rate routings only and not in reference operation sets or reference rate routings.

## 5.4 PRODUCTION VERSION

A production version is the link between the bill of material (BOM) of a product and the routing. It determines which BOM relates to the relevant routing to produce a material or plan a material. Depending on the lot sizes and validity dates there may be different production versions for the same end product.

The screenshot shows the 'Production Version Details' screen. At the top, it displays 'Production Version: PV01' and a 'Check' button. To the right, the date '26.06.2023' is shown. The form is divided into several sections: 'Basic data' (Prod. Vers. locked: Not locked, Minimum Lot Size: 0,000, Maximum Lot Size: 0,000, Valid from: 26.06.2023, Valid To: 31.12.9999), 'Planning data' (Task List Type: Routing, Group: 50000068, Group Counter: 1, Check stat: OO), and 'Bill of material' (Alternative BOM: 1, BOM Usage: 1, Apportionment Struct: [empty]).

Figure 49 Production Version

## 6. PRODUCTION EXECUTION

The demonstration of a solution in the system starts with creating a production order with transaction Production Order Create (CO01). In the example one unit of Special Purpose Equipment will be produced.

The screenshot shows the SAP CO01 Production Order Creation screen. At the top, it displays the order number (%00000000001), material (2574), type (ZSPE), and plant (1010). Below this, there are tabs for General, Assignment, Goods Receipt, Control, Dates/Quantities, Master Data, Long Text, Administration, Items, and Fast Entry. The General tab is selected. Under Quantities, it shows Total Qty: 1 EA, Scrap Portion: 0.00 %, Delivered: 0, and Short/Exc. Rcpt: 0. Under Dates/Times, it shows Basic Dates (End: 12.07.2023 00:00, Start: 11.07.2023 00:00, Release: 11.07.2023), Scheduled (11.07.2023 24:00, 11.07.2023 23:16, 00:00), and Confirmed (empty). Under Dates in Collective Order, it shows Outline Dates (End: 12.07.2023 00:00, Start: 11.07.2023 00:00) and Scheduled (12.07.2023 00:00, 11.07.2023 00:00). Under Scheduling, it shows Type: Backwards, Reduction: No reduction carried out, Note: No scheduling note, Priority: (empty), and Floats: Sched. Margin Key: (empty), Float Bef. Prdn: Workdays, Float After Prdn: Workdays, Release Period: Workdays.

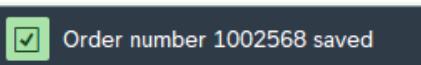
Figure 50 Production Order Creation (CO01)

In the moment of saving the production order the serial number allocation takes place:

The screenshot shows the SAP Maintain Serial Numbers dialog. It has fields for Order: (%00000000001), Item No.: 1, Material: 2574, Plant: 1010, and No.serial no.: 1 / 1. Below this is a table with columns for Serial Number, E..., and checkboxes. The first row contains the value 10002751. At the bottom are buttons for Create serial number automatically, and standard SAP toolbar icons.

Figure 51 Serial number creation

The production order is created:



Example of Production Order document with standard and parallel sequences:

| Object list<br>Original  |  |   |                                  | Material number<br>2574 |                             |  |  |  |  |
|--|--|---|----------------------------------|-------------------------|-----------------------------|--|--|--|--|
| Material description<br>Special Purpose Equipment  |  | Order number<br>1002520                 |                                  | Order quantity<br>1 EA  |                             |  |  |  |  |
| MRP controller<br>SPE<br>SPE Controller  |  | Production scheduler<br>ZSPE<br>MTS SPE |                                  | Start<br>10.07.2023     | Finish<br>10.07.2023        |  |  |  |  |
| Status<br>REL MSPT PRT PRC CSER RINeSETC   |  | Plant<br>1010<br>Plant 1 DE             | Reservation number<br>0000013895 |                         | Creation Date<br>30.06.2023 |  |  |  |  |
| Order number   |  | Material number                         |                                  |                         |                             |  |  |  |  |
|  |  |   |                                  |                         |                             |  |  |  |  |
| Collective order<br>Leading order  |  |   |                                  |                         |                             |  |  |  |  |
| Serial number<br>1002751   |  |   |                                  |                         |                             |  |  |  |  |
| Information on routing<br>Special Purpose Equipment  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Seq. 0</b><br>Sequence type<br>Std.seq.   |  |   |                                  |                         |                             |  |  |  |  |
| Information on sequence<br>Sequential order  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Operation 0010 Seq. 0</b><br>Work center Pint Description Start Fin. Confirmation no.<br>SPE_ASS1 1010 Assembly 1 10.07.2023 10.07.2023 0000013045  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Components for Op. 0010 Seq. 0</b><br>Item no. Material Qty Date<br>0010 2591 SPE Semifinished 1 2 PC 10.07.2023<br>SPE Semifinished 1<br>0020 2611 SPE Semifinished 2 1 PC 10.07.2023<br>0030 2587 SPE O-Ring 10 PC 10.07.2023<br>0040 2583 SPE red aluminium oval-head screw M6x10 10 PC 10.07.2023<br>SPE red aluminium oval-head screw M6x1<br>0050 2585 SPE Label plate 2 PC 10.07.2023<br>0060 2582 SPE Stainless steel 5cm sheet 0,008 M3 10.07.2023 |  |   |                                  |                         |                             |  |  |  |  |
| <b>Operation 0020 Seq. 0</b><br>Work center Pint Description Start Fin. Confirmation no.<br>SPE_ASS2 1010 Assembly 2 10.07.2023 10.07.2023 0000013046  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Operation 0030 Seq. 0</b><br>Work center Pint Description Start Fin. Confirmation no.<br>SPE_ASS2 1010 Assembly 3 10.07.2023 10.07.2023 0000013049  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Operation 0040 Seq. 0</b><br>Work center Pint Description Start Fin. Confirmation no.<br>SPE_4EYE 1010 SPE 4 eyes check 10.07.2023 10.07.2023 0000013047  |  |   |                                  |                         |                             |  |  |  |  |
| <b>Seq. 2</b><br>Sequence type<br>Parallel..   |  |   |                                  |                         |                             |  |  |  |  |
| Sequence type<br>Parallel..<br>0<br>0020<br>0020   |  |   |                                  |                         |                             |  |  |  |  |
| Information on sequence<br>Parallele Folge Test SBM ZAA  |  |   |                                  |                         |                             |  |  |  |  |

User: ZAWADIGA

Date: 30.06.2023 14:28

Page: 001/002

The Non-Stock Materials receive automatic Purchase Requisition can be viewed in Stock Overview Transaction (MD04):

|  |   |                                       |                    |                  |      |               |               |
|--|---|---------------------------------------|--------------------|------------------|------|---------------|---------------|
| Material:  | <input type="text" value="2583"/>       | <input type="button" value="Search"/> |                    |                  |      |               |               |
| Description:   | SPE red aluminium oval-head screw M6x10 |                                       |                    |                  |      |               |               |
| MRP Area:  | <input type="text" value="1010"/>       | 工厂 1 - DE                             |                    |                  |      |               |               |
| Ex. manuf.:  | <input type="text"/>                    |                                       |                    |                  |      |               |               |
| Plant:   | <input type="text" value="1010"/>       | MRP type: <input type="checkbox"/>    |                    |                  |      |               |               |
| Material type:   | <input type="text" value="NLAG"/>       |                                       |                    |                  |      |               |               |
| Unit:  | <input type="text" value="PC"/>         | <input type="checkbox"/>              |                    |                  |      |               |               |
| <input type="button" value="Σ"/> <input type="button" value="63"/> <input type="button" value="P"/> <input type="button" value="A"/> <input type="button" value="B"/> <input type="button" value="C"/> <input type="button" value="D"/> <input type="button" value="E"/> <input type="button" value="F"/> <input type="button" value="G"/> <input type="button" value="Date"/> <input type="button" value="GR"/> <input type="button" value="ST On"/> <input type="button" value="On"/> <input type="button" value="Vendor"/> <input type="button" value="Cust."/> |   |                                       |                    |                  |      |               |               |
| <input type="checkbox"/>   | A... Date                               | MRP el...                             | MRP element data   | Rescheduling ... | E... | Receipt/Reqmt | Available Qty |
| <input type="checkbox"/>   | 11.07.2023                              | ----->                                | Direct Procurement |                  |      |               | 0             |
| <input type="checkbox"/>   | 11.07.2023                              | PurRqs                                | 0010001548/00010 * |                  |      | 10            | 10            |
| <input type="checkbox"/>   | 11.07.2023                              | OrdRes                                | 2574               |                  |      | 10-           | 0             |

*Figure 52 Purchase Requisition of NLAG Items*

The Purchase Order is assigned to the created Leading Production Order :

MRP eL... MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty

|        |                    |  |     |    |
|--------|--------------------|--|-----|----|
| .....> | Direct Procurement |  |     | 0  |
| POItem | 4500001486/00010   |  | 10  | 10 |
| OrdRes | 2574               |  | 10- | 0  |

Display Scope: All Items Char. Display:

| S...                     | Itm | Global... | A | I | Material | Short Text                        | PO Quantity | OUin | S... | C          | Deliv. Date |
|--------------------------|-----|-----------|---|---|----------|-----------------------------------|-------------|------|------|------------|-------------|
| <input type="checkbox"/> | 10  | 0         | F |   | 2583     | SPE red aluminium oval-head sc... | 10PC        |      | D    | 10.07.2023 |             |
| <input type="checkbox"/> |     |           |   |   |          |                                   |             |      |      |            |             |
| <input type="checkbox"/> |     |           |   |   |          |                                   |             |      |      |            |             |
| <input type="checkbox"/> |     |           |   |   |          |                                   |             |      |      |            |             |

Item: [10] 2583, SPE red aluminium oval-head screw M6x10

Material Data Quantities/Weights Delivery Schedule Delivery Invoice Conditions Account Assignment Texts

AccAssCat: Order Distribution: Single Account Assignment CoCode: Company Code -

Unloading Point: G/L Account: 65100000 Recipient:

G/L Account: 65100000

CO Area: A000

Cost Center:

Order: 1002568

Assignment to Production Order

*Figure 53 Purchasing Order allocation to leading Production Order*

Material reservations and results of Variable-Size Items Demand calculation can be viewed in Stock Overview (MD04):

|                                       |   |   |                                      |                                      |                                      |                                       |                                      |
|---------------------------------------|---|---|--------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| Material:                             | <input type="text" value="2581"/>               | <input type="button" value="🔍"/>          |                                      |                                      |                                      |                                       |                                      |
| Description:                          | SPE Aluminium Block                             |   |                                      |                                      |                                      |                                       |                                      |
| MRP Area:                             | <input type="text" value="1010"/>               | 工厂 1 - DE                                 |                                      |                                      |                                      |                                       |                                      |
| Plant:                                | <input type="text" value="1010"/>               | MRP type: <input type="text" value="VB"/> |                                      |                                      |                                      |                                       |                                      |
|                                       | Material type: <input type="text" value="ROH"/> | Unit: <input type="text" value="M3"/>     |                                      |                                      |                                      |                                       |                                      |
|                                       |   | Ex. manuf.: <input type="text"/>          |                                      |                                      |                                      |                                       |                                      |
|                                       |   | <input type="text"/>                      |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Delete"/> | <input type="button" value="Edit"/>             | <input type="button" value="New"/>        |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Print"/>  | <input type="button" value="Print"/>            | <input type="button" value="Print"/>      |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Down"/>   | <input type="button" value="Up"/>               | <input type="button" value="Date"/>       |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="GR"/>     | <input type="button" value="ST On"/>            | <input type="button" value="On"/>         |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Vendor"/> |   | <input type="button" value="Cust."/>      |                                      |                                      |                                      |                                       |                                      |
| A... Date                             | MRP el...                                       | MRP element data                          | Rescheduling ...                     | E...                                 | Receipt/Reqmt                        | Available Qty                         | Stor...                              |
| <input type="button" value="Search"/> | <input type="text" value="05.07.2023"/>         | Stock                                     |                                      |                                      |                                      | 14,987                                |                                      |
| <input type="button" value="Search"/> | <input type="text" value="11.07.2023"/>         | OrdRes                                    | <input type="text" value="2611"/>    |                                      | 0,013-                               | 14,974                                | 101A                                 |
|                                       |   |   |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Delete"/> | <input type="button" value="Edit"/>             | <input type="button" value="New"/>        | <input type="button" value="Print"/> | <input type="button" value="Print"/> | <input type="button" value="Print"/> | <input type="button" value="Vendor"/> | <input type="button" value="Cust."/> |
| <input type="button" value="Down"/>   | <input type="button" value="Up"/>               | <input type="button" value="Date"/>       | <input type="button" value="GR"/>    | <input type="button" value="ST On"/> | <input type="button" value="On"/>    | <input type="button" value="Vendor"/> | <input type="button" value="Cust."/> |
| <input type="button" value="Print"/>  | <input type="button" value="Print"/>            | <input type="button" value="Print"/>      |                                      |                                      |                                      |                                       |                                      |
| <input type="button" value="Search"/> | <input type="text" value="05.07.2023"/>         | Stock                                     |                                      |                                      |                                      | 14,900                                |                                      |
| <input type="button" value="Search"/> | <input type="text" value="11.07.2023"/>         | OrdRes                                    | <input type="text" value="2574"/>    |                                      | 0,008-                               | 14,892                                | 101A                                 |
| <input type="button" value="Search"/> | <input type="text" value="11.07.2023"/>         | OrdRes                                    | <input type="text" value="2591"/>    |                                      | 0,006-                               | 14,886                                | 101A                                 |

*Figure 54 Variable-size materials reservations*

Production Orders for Semi-finished materials can be viewed in Stock Overview transaction MD04:

**Screenshot 1 (Material: 2611):**

| Date       | MRP el... | MRP element data     | Rescheduling... | E... | Receipt/Reqmt | Available Qty | Pro... | Stor... |
|------------|-----------|----------------------|-----------------|------|---------------|---------------|--------|---------|
| 05.07.2023 | Stock     |                      |                 |      |               | 0             |        |         |
| 11.07.2023 | ----->    | Direct Production    |                 |      |               | 0             |        |         |
| 11.07.2023 | OrdRes    | 2574                 |                 |      |               | 1-            | 1-     | 101A    |
| 12.07.2023 | PrdOrd    | 000001002567/ZSPE/Re |                 |      |               | 1             | 0 PV01 | 101A    |

**Screenshot 2 (Material: 2691):**

| Date       | MRP el... | MRP element data     | Rescheduling... | E... | Receipt/Reqmt | Available Qty | Pro... | Stor... |
|------------|-----------|----------------------|-----------------|------|---------------|---------------|--------|---------|
| 05.07.2023 | Stock     |                      |                 |      |               | 2             |        |         |
| 11.07.2023 | ----->    | Direct Production    |                 |      |               | 0             |        |         |
| 11.07.2023 | OrdRes    | 2574                 |                 |      |               | 2-            | 2-     | 101A    |
| 12.07.2023 | PrdOrd    | 000001002566/ZSPE/Re |                 |      |               | 2             | 0 PV01 | 101A    |

Figure 55 Semifinished materials reservations

As an example, for planning other components, a MRP Live function is presented. All the materials can be selected for planning with the MRP Controller SPE. It is executed in transaction MD01N:

**Planning Scope**

|                                     |                          |
|-------------------------------------|--------------------------|
| Plant: 1010                         | to: <input type="text"/> |
| Material: <input type="text"/>      | to: <input type="text"/> |
| Product group: <input type="text"/> | to: <input type="text"/> |
| MRP Controller: SPE                 | to: <input type="text"/> |
| Material Scope: A                   |                          |

**Also to be Included in Planning**

Changed BOM Components  
 All Order BOM Components  
 Stock Transfer Materials

**Control Parameters**

Regenerative Planning  
 Scheduling  
**\* Planning Mode: 3** Planning Mode – 3- Delete and Recreate Planning Data  
 Name for Performance Log  
 Output Material List (Job Log):

In the chosen Planning Mode, the system deletes all the planning data and recreates the planning data.

The raw materials are now available; therefore, a collective order can be released. This action is then performed in Production Order Change transaction (CO02):

| Material | Order   | Sys.Status             | Target Qty | SchedStart | Sched.Fin. |
|----------|---------|------------------------|------------|------------|------------|
| 2574     | 1002568 | REL PRC MACM RINe SETC | 1          | 11.07.2023 | 11.07.2023 |
| 2591     | 1002566 | REL PRC MACM SETC      | 2          | 11.07.2023 | 11.07.2023 |
| 2611     | 1002567 | REL PRC MACM SETC      | 1          | 11.07.2023 | 11.07.2023 |

Figure 56 Collective order release

### Leading Production Order Routing with Standard Sequence in detailed view :

| Op.                      | SOOp | Start      | Start    | Work Center | Plant | Cont... | Operation Short Text | Text                     | COMP                                | PRT                      |
|--------------------------|------|------------|----------|-------------|-------|---------|----------------------|--------------------------|-------------------------------------|--------------------------|
| <input type="checkbox"/> | 0010 | 11.07.2023 | 23:16:00 | SPE_ASS1    | 1010  | PP01    | Assembly 1           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | 0020 | 11.07.2023 | 23:38:00 | SPE_ASS2    | 1010  | PP01    | Assembly 2           | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | 0030 | 11.07.2023 | 23:40:00 | SPE_ASS2    | 1010  | PP01    | Assembly 3           | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| <input type="checkbox"/> | 0040 | 11.07.2023 | 24:00:00 | SPE_4EYE    | 1010  | PP01    | SPE 4 eyes check     | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

Figure 57 Routing with standard sequence

### And parallel operations:

| Seq.                                | SeqCat | Bran...    | Retu... | Short Text                  | Text                     | Alignment Key            | Cha...                   | Change No. |
|-------------------------------------|--------|------------|---------|-----------------------------|--------------------------|--------------------------|--------------------------|------------|
| <input checked="" type="checkbox"/> | 0      | Std.seq.   |         | Sequential order            | <input type="checkbox"/> | Alignment with latest .. | <input type="checkbox"/> |            |
| <input type="checkbox"/>            | 2      | Parallel.. | 0020    | 0020 SPE parallel processes | <input type="checkbox"/> | Alignment with latest .. | <input type="checkbox"/> |            |

Figure 58 Routing with parallel sequence

For the demonstration purposes purchased materials are delivered and booked with Incoming Goods transaction (MIGO) for Non-Stock Materials:

| Line | Mat. Short Text                         | W OK                     | Qty in UnE | EUn | S...                     | SLoc | Order   | Profit Center | G/L Account | Stock Segment |
|------|---|--------------------------|------------|-----|--------------------------|------|---------|---------------|-------------|---------------|
| 1    | SPE red aluminium oval-head screw M6x10 | <input type="checkbox"/> | 10         | PC  | <input type="checkbox"/> |      | 1002568 | 99999         | 65100000    |               |

Prod. Order  
Allocation

No Stock  
Assignment

Figure 59 NLAG material allocation to PO

Non-Stock Materials are surpassing the stock and are directly withdrawn at the production order level:

| Item      | Component | Description                         | Reqmt Qty | UoM | It... | Ope... | Seq... | Plant | Stor... | A... | Bu... | S... | D... | De... | Co... | Ph... | D... | B... | Text | Fin...   | Item ID  | Ref... | Committed Quantity | Quantity Withdrawn |
|-----------|-----------|-------------------------------------|-----------|-----|-------|--------|--------|-------|---------|------|-------|------|------|-------|-------|-------|------|------|------|----------|----------|--------|--------------------|--------------------|
| 0040 2583 |           | red aluminium oval-head screw M6x10 | 10        | PC  | N     | 0010   | 0      | 1010  |         |      |       |      |      |       |       |       |      |      |      |          | 00000003 | 0000   | 0                  | 10                 |
| 0050 2585 |           | SPE Label plate                     | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      |      |       |       |       |      |      |      | 00000004 | 0000     | 2      | 0                  |                    |
| 0060 2582 |           | SPE Stainless steel 5cm sheet       | 0,008     | M3  | R     | 0010   | 0      | 1010  | 101A    |      |       |      |      |       |       |       |      |      |      | 00000005 | 0000     | 0,008  | 0                  |                    |
| 0010 2591 |           | SPE Semifinished 1                  | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      |      |       |       |       |      |      |      | 00000001 | 0000     | 2      | 0                  |                    |
| 0020 2511 |           | SPE Semifinished 2                  | 1         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      |      |       |       |       |      |      |      | 00000007 | 0000     | 1      | 0                  |                    |
| 0030 2582 |           | SPE O-Ring                          | 10        | PC  | L     | 0020   | 0      | 1010  | 101A    |      |       |      |      |       |       |       |      |      |      | 00000002 | 0000     | 10     | 0                  |                    |

Figure 60 NLAG material direct withdrawal

First the dependent orders production is performed and confirmed. The Operation Confirmations are then executed in Enter Time Ticket for Production Order transaction (CO11N). As set out in the configuration the goods movements are executed automatically.

The screenshot shows the 'Operation Confirmation' screen. It displays details for order 1002567, material 2611, operation 0010, sequence 0, work center SPE\_MIL2, and plant 1010. The 'Confirm.type' field is set to 'Final confirmation'. Below this, there are sections for 'Quantities' and 'Activities'. The 'Quantities' section shows 'To Be Confirmed' with a yield of 1 PC. The 'Activities' section shows 'To Be Confirmed' with setup time of 8 MIN. At the bottom right, a message box states 'Confirmation saved (Goods movements: 1, failed: 0)'.

Figure 61 Operation Confirmation

Collective Order Status after confirming production orders for semifinished materials:

| Material | Order   | Sys.Status                            | Target Qty | SchedStart | Sched.Fin. |
|----------|---------|---------------------------------------|------------|------------|------------|
| 2574     | 1002568 | REL_PRC_CFCO_GMCO_GMPS_MACM_RINe_SETC | 1          | 11.07.2023 | 11.07.2023 |
| 2591     | 1002566 | REL_CNF_DLV_PRC_GMPS_MACM_SETC        | 2          | 11.07.2023 | 11.07.2023 |
| 2611     | 1002567 | REL_CNF_DLV_PRC_GMPS_MACM_SETC        | 1          | 11.07.2023 | 11.07.2023 |

Figure 62 Collective Order Status after completing production orders for Semifinished materials

Next the Operation 10 in leading order is confirmed in CO11N:

Confirmation: 13217  
Order: 1002568 Material: 2574  
Special Purpose Equipment  
Operation: 0010 Sequence: 0 Assembly 1  
Work Center: SPE\_ASS1 Plant: 1010 Assembly 1  
Confirm.type: Final confirmation  Clear open reservations

**Quantities**

| To Be Confirmed  | Unit |
|------------------|------|
| Yield: 1         | EA   |
| Scrap:           |      |
| Rework:          |      |
| Reason for Var.: |      |

**Activities**

| To Be Confirmed | Unit | Finished                 |
|-----------------|------|--------------------------|
| Setup: 2        | MIN  | <input type="checkbox"/> |
| Machine: 15     | MIN  | <input type="checkbox"/> |
| Labor: 5        | MIN  | <input type="checkbox"/> |

Figure 63 Leading order operation 10 confirmation

All materials are allocated to operation 10 and with the confirmation they're withdrawn:

Order: 1002568 Material: 2574 Type: ZSPE Plant: 1010

**Component Overview**

| Item | Component | Description                           | Reqmt Qty | UoM | It... | Ope... | Seq... | Plant | Stor... | A... | Bu... | S... | D... | Co... | Ph... | D... | B... | Text | Fin... | Item ID  | Ref...   | Committed Quantity | Quantity Withdrawn |    |
|------|-----------|---------------------------------------|-----------|-----|-------|--------|--------|-------|---------|------|-------|------|------|-------|-------|------|------|------|--------|----------|----------|--------------------|--------------------|----|
| 0040 | 2583      | E red aluminium oval-head screw M6x10 | 10        | PC  | N     | 0010   | 0      | 1010  |         |      |       |      |      | 1     |       |      |      |      | ✓      | ✓        | 00000003 | 0000               | 0                  | 10 |
| 0050 | 2585      | SPE Label plate                       | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      |      | ✓     |       |      |      |      | ✓      | ✓        | 00000004 | 0000               | 2                  | 2  |
| 0060 | 2582      | SPE Stainless steel 5cm sheet         | 0,008     | M3  | R     | 0010   | 0      | 1010  | 101A    |      |       |      | ✓    |       |       |      |      | ✓    | ✓      | 00000005 | 0000     | 0,008              | 0,008              |    |
| 0010 | 2591      | SPE Semifinished 1                    | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      | 2    |       |       |      |      | ✓    | ✓      | 00000001 | 0000     | 2                  | 2                  |    |
| 0020 | 2611      | SPE Semifinished 2                    | 1         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      | 2    |       |       |      |      | ✓    | ✓      | 00000007 | 0000     | 1                  | 1                  |    |
| 0030 | 2587      | SPE O-Ring                            | 10        | PC  | L     | 0020   | 0      | 1010  | 101A    |      |       |      | ✓    |       |       |      |      | ✓    | ✓      | 00000002 | 0000     | 10                 | 0                  |    |

Figure 64 Material withdrawal after confirming the operation 10

Confirmation of the parallel sequence:

Confirmation: 13220  
Order: 1002568 Material: 2574  
Special Purpose Equipment  
Operation: 0010 Sequence: 2 Inscription on the label plate  
Work Center: SPE\_INSC Plant: 1010 SPE Label plate inscription  
Confirm.type: Final confirmation  Clear open reservations

**Quantities**

| To Be Confirmed  | Unit |
|------------------|------|
| Yield: 1         | EA   |
| Scrap:           |      |
| Rework:          |      |
| Reason for Var.: |      |

**Activities**

| To Be Confirmed | Unit | Finished                 |
|-----------------|------|--------------------------|
| Setup: 5        | S    | <input type="checkbox"/> |
| Machine: 30     | S    | <input type="checkbox"/> |
| Labor: 5        | S    | <input type="checkbox"/> |

Figure 65 Confirmation of parallel sequence operation

Automatic Goods Movement takes place:



Return to standard sequence and confirmation:

|   |   |
|---|---|
| Order: <input type="text" value="1002568"/>                   | Material: <input type="text" value="2574"/>         |
| Special Purpose Equipment                                     |   |
| Operation: <input type="text" value="0020"/>                  | Sequence: <input type="text" value="0"/> Assembly 2 |
| Work Center: <input type="text" value="SPE_ASS2"/>            | Plant: <input type="text" value="1010"/> Assembly 2 |
| Confirm.type: <input type="text" value="Final confirmation"/> | <input type="checkbox"/> Clear open reservations    |

Figure 66 Confirmation of operation in standard sequence

Last material is now withdrawn:

| Component Overview                            |           |                                       |           |     |       |        |        |       |         |      |       |      |      |        |          |        |                    |                    |
|---|-----------|---------------------------------------|-----------|-----|-------|--------|--------|-------|---------|------|-------|------|------|--------|----------|--------|--------------------|--------------------|
| Item  | Component | Description                           | Reqmt Qty | UoM | It... | Ope... | Seq... | Plant | Stor... | A... | Bu... | D... | Text | Fin... | Item ID  | Ref... | Committed Quantity | Quantity Withdrawn |
| 0040 <input checked="" type="checkbox"/> 2583 |           | E red aluminium oval-head screw M6x10 | 10        | PC  | N     | 0010   | 0      | 1010  |         |      |       |      | ✓    | ✓      | 00000003 | 0000   | 0                  | 10                 |
| 0050 <input checked="" type="checkbox"/> 2585 |           | SPE Label plate                       | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    | ✓    |       |      | ✓    | ✓      | 00000004 | 0000   | 2                  | 2                  |
| 0060 <input checked="" type="checkbox"/> 2582 |           | SPE Stainless steel 5cm sheet         | 0,008     | M3  | R     | 0010   | 0      | 1010  | 101A    | ✓    |       |      | ✓    | ✓      | 00000005 | 0000   | 0,008              | 0,008              |
| 0010 <input checked="" type="checkbox"/> 2591 |           | SPE Semifinished 1                    | 2         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      | ✓    | ✓      | 00000001 | 0000   | 2                  | 2                  |
| 0020 <input checked="" type="checkbox"/> 2611 |           | SPE Semifinished 2                    | 1         | PC  | L     | 0010   | 0      | 1010  | 101A    |      |       |      | ✓    | ✓      | 00000007 | 0000   | 1                  | 1                  |
| 0030 <input checked="" type="checkbox"/> 2587 |           | SPE O-Ring                            | 10        | PC  | L     | 0020   | 0      | 1010  | 101A    | ✓    |       |      | ✓    | ✓      | 00000002 | 0000   | 10                 | 10                 |

Figure 67 Leading Order material withdrawal

Further confirmations of completing production operations:

|  |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
|--|--|---|---|---------------------------|--------------------------------|---------------------------------------|--|---|--|--|---|---------------------------------------|---|--|--|--|--|--|--|--|--|-----------------|------|--------------------------------|---------------------------------|--------|--|--------|--|---------|--|------------------|--|--|--|--|--|--|--|-----------------|------|----------|---------------------------------------|----------------------------------|--------------------------|--|----------------------------------|--------------------------|---------------------------------------|----------------------------------|--------------------------|--|--|---|---|---------------------------|--|--|--|---|--|--|--|--|---|--|--|--|--|--|--|--|--|-----------------|------|--------------------------------|---------------------------------|--------|--|--------|--|---------|--|------------------|--|
| <table border="1"> <tr> <td>Confirmation: <input type="text" value="13221"/></td> <td>Order: <input type="text" value="1002568"/></td> <td>Material: <input type="text" value="2574"/></td> </tr> <tr> <td colspan="3">Special Purpose Equipment</td> </tr> <tr> <td>Operation: <input type="text" value="0030"/></td> <td>Sequence: <input type="text" value="0"/> Assembly 3</td> <td></td> </tr> <tr> <td>Work Center: <input type="text" value="SPE_ASS2"/></td> <td>Plant: <input type="text" value="1010"/> Assembly 2</td> <td></td> </tr> <tr> <td>Confirm.type: <input type="text" value="Final confirmation"/></td> <td><input type="checkbox"/> Clear open reservations</td> <td></td> </tr> <tr> <td colspan="3"><br/><input type="button" value="Quantities"/> Quantities</td> </tr> <tr> <td colspan="3"> <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> </tr> <tr> <td><input type="text" value="1"/></td> <td><input type="text" value="EA"/></td> </tr> <tr> <td>Yield:</td> <td></td> </tr> <tr> <td>Scrap:</td> <td></td> </tr> <tr> <td>Rework:</td> <td></td> </tr> <tr> <td>Reason for Var.:</td> <td></td> </tr> </table> </td> </tr> <tr> <td colspan="3"><br/><input type="button" value="Activities"/> Activities</td> </tr> <tr> <td colspan="3"> <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> <td>Finished</td> </tr> <tr> <td>Setup: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Machine: <input type="text" value="10"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Labor: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> </table> </td> </tr> </table> | Confirmation: <input type="text" value="13221"/>             | Order: <input type="text" value="1002568"/> | Material: <input type="text" value="2574"/> | Special Purpose Equipment |                                |                                       | Operation: <input type="text" value="0030"/> | Sequence: <input type="text" value="0"/> Assembly 3 |  | Work Center: <input type="text" value="SPE_ASS2"/> | Plant: <input type="text" value="1010"/> Assembly 2 |                                       | Confirm.type: <input type="text" value="Final confirmation"/> | <input type="checkbox"/> Clear open reservations |  | <br><input type="button" value="Quantities"/> Quantities |  |  | <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> </tr> <tr> <td><input type="text" value="1"/></td> <td><input type="text" value="EA"/></td> </tr> <tr> <td>Yield:</td> <td></td> </tr> <tr> <td>Scrap:</td> <td></td> </tr> <tr> <td>Rework:</td> <td></td> </tr> <tr> <td>Reason for Var.:</td> <td></td> </tr> </table> |  |  | To Be Confirmed | Unit | <input type="text" value="1"/> | <input type="text" value="EA"/> | Yield: |  | Scrap: |  | Rework: |  | Reason for Var.: |  | <br><input type="button" value="Activities"/> Activities |  |  | <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> <td>Finished</td> </tr> <tr> <td>Setup: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Machine: <input type="text" value="10"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Labor: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> </table> |  |  | To Be Confirmed | Unit | Finished | Setup: <input type="text" value="5"/> | <input type="text" value="MIN"/> | <input type="checkbox"/> | Machine: <input type="text" value="10"/> | <input type="text" value="MIN"/> | <input type="checkbox"/> | Labor: <input type="text" value="5"/> | <input type="text" value="MIN"/> | <input type="checkbox"/> | <table border="1"> <tr> <td>Confirmation: <input type="text" value="13219"/></td> <td>Order: <input type="text" value="1002568"/></td> <td>Material: <input type="text" value="2574"/></td> </tr> <tr> <td colspan="3">Special Purpose Equipment</td> </tr> <tr> <td>Operation: <input type="text" value="0040"/></td> <td>Sequence: <input type="text" value="0"/> SPE 4 eyes check</td> <td></td> </tr> <tr> <td>Work Center: <input type="text" value="SPE_4EYE"/></td> <td>Plant: <input type="text" value="1010"/> SPE four eyes check</td> <td></td> </tr> <tr> <td>Confirm.type: <input type="text" value="Final confirmation"/></td> <td><input type="checkbox"/> Clear open reservations</td> <td></td> </tr> <tr> <td colspan="3"><br/><input type="button" value="Quantities"/> Quantities</td> </tr> <tr> <td colspan="3"> <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> </tr> <tr> <td><input type="text" value="1"/></td> <td><input type="text" value="EA"/></td> </tr> <tr> <td>Yield:</td> <td></td> </tr> <tr> <td>Scrap:</td> <td></td> </tr> <tr> <td>Rework:</td> <td></td> </tr> <tr> <td>Reason for Var.:</td> 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<input type="text" value="1"/> | <input type="text" value="EA"/> | Yield: |  | Scrap: |  | Rework: |  | Reason for Var.: |  |
| Confirmation: <input type="text" value="13221"/>   | Order: <input type="text" value="1002568"/>                  | Material: <input type="text" value="2574"/> |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Special Purpose Equipment  |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Operation: <input type="text" value="0030"/>   | Sequence: <input type="text" value="0"/> Assembly 3          |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Work Center: <input type="text" value="SPE_ASS2"/>   | Plant: <input type="text" value="1010"/> Assembly 2          |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Confirm.type: <input type="text" value="Final confirmation"/>  | <input type="checkbox"/> Clear open reservations             |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <br><input type="button" value="Quantities"/> Quantities   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> </tr> <tr> <td><input type="text" value="1"/></td> <td><input type="text" value="EA"/></td> </tr> <tr> <td>Yield:</td> <td></td> </tr> <tr> <td>Scrap:</td> <td></td> </tr> <tr> <td>Rework:</td> <td></td> </tr> <tr> <td>Reason for Var.:</td> <td></td> </tr> </table>   |  |   | To Be Confirmed                             | Unit                      | <input type="text" value="1"/> | <input type="text" value="EA"/>       | Yield:                                       |   | Scrap:                                   |  | Rework:   |                                       | Reason for Var.:  |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| To Be Confirmed  | Unit   |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <input type="text" value="1"/>   | <input type="text" value="EA"/>                              |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Yield:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Scrap:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Rework:  |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Reason for Var.:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <br><input type="button" value="Activities"/> Activities   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> <td>Finished</td> </tr> <tr> <td>Setup: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Machine: <input type="text" value="10"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Labor: <input type="text" value="5"/></td> <td><input type="text" value="MIN"/></td> <td><input type="checkbox"/></td> </tr> </table>   |  |   | To Be Confirmed                             | Unit                      | Finished                       | Setup: <input type="text" value="5"/> | <input type="text" value="MIN"/>             | <input type="checkbox"/>                            | Machine: <input type="text" value="10"/> | <input type="text" value="MIN"/>                   | <input type="checkbox"/>                            | Labor: <input type="text" value="5"/> | <input type="text" value="MIN"/>                              | <input type="checkbox"/>                         |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| To Be Confirmed  | Unit   | Finished                                    |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Setup: <input type="text" value="5"/>  | <input type="text" value="MIN"/>                             | <input type="checkbox"/>                    |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Machine: <input type="text" value="10"/>   | <input type="text" value="MIN"/>                             | <input type="checkbox"/>                    |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Labor: <input type="text" value="5"/>  | <input type="text" value="MIN"/>                             | <input type="checkbox"/>                    |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Confirmation: <input type="text" value="13219"/>   | Order: <input type="text" value="1002568"/>                  | Material: <input type="text" value="2574"/> |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Special Purpose Equipment  |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Operation: <input type="text" value="0040"/>   | Sequence: <input type="text" value="0"/> SPE 4 eyes check    |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Work Center: <input type="text" value="SPE_4EYE"/>   | Plant: <input type="text" value="1010"/> SPE four eyes check |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Confirm.type: <input type="text" value="Final confirmation"/>  | <input type="checkbox"/> Clear open reservations             |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <br><input type="button" value="Quantities"/> Quantities   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <table border="1"> <tr> <td>To Be Confirmed</td> <td>Unit</td> </tr> <tr> <td><input type="text" value="1"/></td> <td><input type="text" value="EA"/></td> </tr> <tr> <td>Yield:</td> <td></td> </tr> <tr> <td>Scrap:</td> <td></td> </tr> <tr> <td>Rework:</td> <td></td> </tr> <tr> <td>Reason for Var.:</td> <td></td> </tr> </table>   |  |   | To Be Confirmed                             | Unit                      | <input type="text" value="1"/> | <input type="text" value="EA"/>       | Yield:                                       |   | Scrap:                                   |  | Rework:   |                                       | Reason for Var.:  |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| To Be Confirmed  | Unit   |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| <input type="text" value="1"/>   | <input type="text" value="EA"/>                              |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Yield:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Scrap:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Rework:  |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |
| Reason for Var.:   |  |   |   |                           |                                |                                       |  |   |  |  |   |                                       |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |  |  |  |  |  |  |                 |      |          |                                       |                                  |                          |  |                                  |                          |                                       |                                  |                          |  |  |   |   |                           |  |  |  |   |  |  |  |  |   |  |  |  |  |  |  |  |  |                 |      |                                |                                 |        |  |        |  |         |  |                  |  |

Figure 68 Confirmation of further operations

The Leading Order is now confirmed and SPE is delivered:

| Syst. Status                        |        |                               |
|-------------------------------------|--------|-------------------------------|
| X                                   | Status | Text                          |
| <input checked="" type="checkbox"/> | REL    | Released                      |
| <input checked="" type="checkbox"/> | CNF    | Confirmed                     |
| <input checked="" type="checkbox"/> | DLV    | Delivered                     |
| <input checked="" type="checkbox"/> | PRC    | Pre-costed                    |
| <input checked="" type="checkbox"/> | CFCO   | Confirmation in Coll. Order   |
| <input checked="" type="checkbox"/> | GMCO   | Goods Movement in Coll. Order |
| <input checked="" type="checkbox"/> | GMPS   | Goods movement posted         |
| <input checked="" type="checkbox"/> | MACM   | Material committed            |
| <input checked="" type="checkbox"/> | RLNe   | Release in Collective Order   |
| <input checked="" type="checkbox"/> | SETC   | Settlement rule created       |

Figure 69 Leading Order Status after production completion

The Stock levels after production can be viewed in Stock Overview transaction (MD04):

- Aluminium Block 2581:

|  |                                  |  |
|--|----------------------------------|--|
| Material: <b>2581</b>  | Description: SPE Aluminium Block | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE                        | Plant: 1010 MRP type: VB Material type: ROH Unit: M3               |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |                                  |  |
| A... Date  | MRP el...                        | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 14,974   |                                  |  |

- Stainless steel sheet 2582:

|  |  |  |
|--|--|--|
| Material: <b>2582</b>  | Description: SPE Stainless steel 5cm sheet | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE                                  | Plant: 1010 MRP type: VB Material type: ROH Unit: M3               |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |  |  |
| A... Date  | MRP el...                                  | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 14,886   |  |  |

- SPE Semifinished product 2591:

|  |                                 |  |
|--|---------------------------------|--|
| Material: <b>2591</b>  | Description: SPE Semifinished 1 | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE                       | Plant: 1010 MRP type: PD Material type: HALB Unit: PC              |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |                                 |  |
| A... Date  | MRP el...                       | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 2  |                                 |  |

- SPE Semifinished product 2611:

|  |                                 |  |
|--|---------------------------------|--|
| Material: <b>2611</b>  | Description: SPE Semifinished 2 | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE                       | Plant: 1010 MRP type: PD Material type: HALB Unit: PC              |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |                                 |  |
| A... Date  | MRP el...                       | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 0  |                                 |  |

- Raw material O- Ring 2587:

|  |                         |  |
|--|-------------------------|--|
| Material: <b>2587</b>  | Description: SPE O-Ring | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE               | Plant: 1010 MRP type: VB Material type: ROH Unit: PC               |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |                         |  |
| A... Date  | MRP el...               | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 470  |                         |  |

- Label plate 2585:

|  |                              |  |
|--|------------------------------|--|
| Material: <b>2585</b>  | Description: SPE Label plate | Ex. manuf.: <input type="text"/>                                   |
| MRP Area: 1010   | 工厂 1 - DE                    | Plant: 1010 MRP type: VB Material type: ROH Unit: PC               |
| <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/> Date <input type="button"/> GR <input type="button"/> ST On <input type="button"/> On <input type="button"/> Vendor <input type="button"/> Cust. |                              |  |
| A... Date  | MRP el...                    | MRP element data Rescheduling ... E... Receipt/Reqmt Available Qty |
| <input type="button"/> 05.07.2023 Stock 48   |                              |  |

- Non-stock material has no stock:

Material: 2583

Description: SPE red aluminium oval-head screw M6x10

MRP Area: 1010 工厂 1 - DE

Plant: 1010 MRP type:  Material type: NLAG Unit: PC

Ex. manuf.:

Buttons: GR, ST On, On, Vendor, Cust.

Navigation: A..., Date, MRP el..., MRP element data, Rescheduling ..., E..., Receipt/Reqmt, Available Qty

- Special Purpose Equipment Stock level:

Material: 2574

Description: Special Purpose Equipment

MRP Area: 1010 工厂 1 - DE

Plant: 1010 MRP type: ND Material type: FHMI Unit: EA

Ex. manuf.:

Buttons: GR, ST On, On, Vendor, Cust.

Navigation: A..., Date, MRP el..., MRP element data, Rescheduling ..., E..., Receipt/Reqmt, Available Qty

Search: 05.07.2023 Stock 2

Figure 70 Components Stock Levels after production is completed

As set in the system the Equipment and Material Serial Number are identical. The Product Structure can be viewed in the material master in Environment view.

| Product Structure | Short Text                |
|-------------------|---------------------------|
| 2574              | Special Purpose Equipment |
| Equipment         | Special Purpose Equipment |
| 10002751          | Special Purpose Equipment |
| Serial Nos        |                           |
| 2574 10002751     | Special Purpose Equipment |

Figure 71 SPE Product Structure View

Though there's no warehouse management system available for the SPEs, the department can still "book" the equipment in Change Equipment transaction (IE02) in Location view:

Equipment: 10002750 Category: P Production resources/tools

Description: Special Purpose Equipment

Status: AVLB

Valid From: 05.07.2023 Valid To: 31.12.9999

General Location Organization Structure PRT data SerData

Location data

MaintPlant: 1010

Location:

Room: A20B23

Plant Section:

Work center:

ABC Indic.:

Sort Field:

Figure 72 Equipment Change with Room field

The Production Order is then set as technically completed.

## 7. FURTHER SUGGESTIONS FOR IMPROVEMENT

The table below presents the comparison of the current situation with the concept and gives an overview on further improvements/ open points that can be addressed once the SPE department starts the digital transformation journey with SAP solutions.

| Category               | Details                    | Current Situation   | Concept  | Open Points                          | Details   |
|------------------------|----------------------------|---|--|--------------------------------------|---|
| Material Master<br>SPE | Material creation          | First created in SAP and copied to TC.  | same as in the current process   | Interface between Teamcenter and SAP | Once the interface between TC and SAP is set, the optimal way would be to create all the materials with their Master Data and transfer them to SAP through this interface with automatic creation of the necessary objects in the system.   |
|                        | Material Type              | ZBET  | FHMI   | Material type with Costing Views     | the FHMI doesn't have Costing Views in its Material Master (cannot assess the consequences)   |
|                        | MRP-Type for SPE           | ND  | ND   | SPE Production planned in SAP        | Ideally the SPE should be planned acc. to the requirement date in the serial production. This requires transparency in serial production scheduling and standardised lead times for SPE components or increased stock levels of raw materials in order to quickly react to the demand from serial production. |
|                        | Storage location           | Material Master / Storage location text field   | Equipment Master / Room text field   | Production Maintenance Module        | The equipment shall be maintained in Production Maintenance Module  |
|                        | Additional Data/ Long text | used for tracking of allocation and deallocation of SPE set units to final production                             | Changes are tracked in Equipment Master data   |                                      |   |
|                        | Sets of SPE                | each unit of a set receives a new material number, changes of all are noted in Additional Information / Long text | Sets have the same material number, but different serial numbers, that identify single units. The serial number in MM is synchronised with Equipment number. | Production Maintenance Module        | The equipment shall be maintained in Production Maintenance Module  |

| Category                   | Details                                    | Current Situation   | Concept   | Open Points                               | Details   |
|----------------------------|--|---|---|---|---|
| Material Master Components | Components                                 | introduced in Team Centre, not all managed in SAP through MM  | all components have MM  | Centralised Procurement of SPE Components | Maintaining procurement in centralised Procurement Department can bring better prices coming from procuring in higher volumes, faster lead times due to exposition to larger supplier base, as well as decrease in stock levels as a result of using dedicated KPIs |
|                            | Assemblies                                 | Text information in BOM / no MM   | own material number with production in a collective order   |   |   |
|                            | SPE Raw materials                          | Text information in BOM / no MM   | MM with dimensions  |   |   |
|                            | Standard Raw materials                     | MM exists, but purchased independent from central procurement team  | MM exists, strongly advised to involve central procurement in the material management                                       |   |   |
| Procurement                | Components specific for SPE / one time use | no MM, material procured with DUMMY code and description of material requirements in purchasing order text  | MM with NLAG material type, all the data maintained in MM   |   |   |
|                            | SPE Raw materials                          | RFQ and ordering process maintained in Excel  | Materials specified in BOM as Variable-Size Items, system calculates the total demand                                       |   |   |
|                            | Purchasing Orders                          | Purchasing Order created in SAP, pdf stored in one of two folders (confirmation pending/ confirmed)   | Purchasing Orders created in SAP, delivery dates maintained in the system   |   |   |
| Production                 | Parallel Sequence                          | Standard Sequence of operations, though some are in reality parallel. Production documents are printed several times and distributed to the work centres, where the parallel operations take place. | Standard routing with parallel sequence as in real production process   | Manufacturing Execution System            | In order to further improve performance of the SPE production, the MES can be introduced together with digital devices.   |
|                            | Production Version                         | Not required in ECC   | Mandatory in SAP S/4 HANA   |   |   |
|                            | Production Order                           | new production orders are created by copying old ones and adjusting them to the new requirements  | production order with automatic choice of first available production version for the certain quantities or other conditions |   |   |
|                            |  | No material allocation to the order header  | production order created with SPE material in the header  |   |   |

| Category             | Details   | Current Situation  | Concept  | Open Points                 | Details  |
|----------------------|---|--|--|-----------------------------|--|
| Production           | Production Order Type                                     | customised FS  | customised ZSPE to distinguish SPE production orders                                       |                             |  |
|                      | Confirmations   | partial confirmations in operations, final confirmation at the end of the production with CO11N - all done at one computer station in the shop floor | confirmations with automated backflush of materials in CO11N                               | MES and smart devices       | The confirmations can be done at the work centre just after the operation was executed by using wireless smart devices   |
|                      | Quality Control   | First Item Inspection as an operation in Production Order  | not in the scope of work   | Quality Management of SPEs  | The SPEs Quality Management shall include Quality Inspection after Production and later on as a part of Equipment Maintenance.   |
| Stock management     | Storage location  | noted in the General information in MM   | noted in Room information in Equipment Master  | Warehouse Management System | The WMS can help to optimize the storing and goods movements of SPEs. It presents information on stock location levels and supports maintenance of KPIs.   |
|                      | Stock levels  | Over 40.000 stored SPEs  | not in scope   |                             | In order to decrease the number of stored SPEs, the responsible team will need to assess the usability of the currently stored ones and decide on criteria for scrapping   |
|                      | Stock in shopfloor area                                   | small boxes with post-it cards   | not discussed  | Lean Six Sigma              | The responsible team may introduce Lean Six Sigma in order to streamline logistics. A potential way to eliminate waste is DMAIC method. The first area to work on are all small parts storages next of work centres. The stock levels, rotation of materials as well as timely delivery of materials from central warehouse may be addressed next. |
| Equipment Management | Equipment number synchronisation with Serial Number in MM | not available  | allows to physically identify the equipment with the material number and its serial number |                             |  |

## **8. SUMMARY**

Today, many actions in the production process rely heavily on manual effort and use of various software tools. The utilisation of SAP is limited to specific tasks and is not fully implemented. In result the production execution of SPEs is slow, needs loops of communication to confirm various data, and exhibits a high level of redundancy.

Presented concept, if implemented, can enhance the production process by leveraging SAP standard solutions. This requires though ensuring that comprehensive data maintenance is achieved within the SAP system.

Further improvement of the production process can be achieved with use of production versions based on standardised BOMs and rate routing. First though a significant effort needs to be put into analysing BOMs and categorising already produced SPEs that had identical routings.

Implementing changes and leveraging SAP to optimise the production process also carries certain risks:

- Change Management: Introducing new processes may require changes in the way employees work, which can cause resistance or difficulties in adaptation. In order to meet these risks, the management team can introduce training programs to address the challenges and doubts.
- Data Accuracy and Integrity: Depending on the quality and accuracy of the data entered into the SAP system, there is a risk of incorrect or incomplete information being used for production processes. The risks can be avoided by establishing the interface between Teamcenter and SAP, so the material master information is no longer manually maintained.
- Implementation Time and Cost: Implementing SAP standard solutions and additional automation may be a time-consuming process. In order to meet this risk, the department shall set priorities for the system improvements projects, as well as schedule each change one at a time.

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