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A Practical Guide to Manufacturing Variances in SAP S/4HANA®

- ▶ Variances in SAP S/4HANA
- ▶ Interpreting variances for manufacturing orders
- ▶ Impact on cost center accounting
- ▶ Configuration tasks

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2 Manufacturing in SAP

SAP has a robust set of functionalities to support the planning and manufacturing of products. The manufacturing order represents a detailed view of the time, resources, and components required to make a specific quantity of a product. Individual orders for products are used to manage manufacturing capacity, production scheduling, demand for components, and cost of manufacturing. Understanding orders and how they work is key to understanding the management of production variances.

2.1 Production planning and execution

The goal of any manufacturing company is to satisfy demand for products by supplying them to the customer in a timely manner. These products are constructed from various raw materials and semi-finished assemblies using special equipment and people who operate and maintain that equipment or who perform manual processes. Procedures are defined for making the product, including a list of required equipment, instructions for running the equipment, the necessary components, the quantity of each component, and when each component should be added.

2.1.1 Baking cookies

Making chocolate chip cookies is a good example of this. The main ingredients (components) of a chocolate chip cookie are flour, water, sugar, butter, and chocolate chips. The first step in the process is to mix the flour, water, sugar, and butter to make a batter. Then, the chocolate chips are added to the batter and are mixed in. The next step is to take small amounts of the mixture and place them on a cookie sheet. When the cookie sheet is full, it is placed in the oven to bake for a period of time. When baking is done, the cookies are allowed to cool, and they are placed on a plate or in a tin, ready to be eaten.

The above example requires five components plus packaging. There are six steps in the production process:

1. Create the cookie dough—use specific quantities of flour, water, sugar, and butter.
2. Mix in chocolate chips—use a specific quantity of chocolate chips.
3. Form the raw cookies on the cookie sheet.
4. Bake for a specified time.
5. Allow cookies to cool.
6. Pack cookies ready for consumption—use a cookie tin for packing.

The amount of each ingredient is important to ensure that the cookies are made correctly, and these ingredients need to be added at the proper point in the process. To determine exactly when the cookies will be ready, the timing of each step in the process must be known. The baking time is most critical; too little time or too much time in the oven will make the cookies inedible.

The quantity of ingredients on hand prior to the baking process is also important. Too little of one ingredient means that fewer cookies can be made, and you may need to buy one or more of the ingredients to make a full batch. If cookie making is an on-going process, plans have to be made to cover when and how much of each ingredient needs to be procured so that the cookie-making process is not delayed.

2.1.2 Manufacturing orders

The cookie example in Section 2.1.1 provides a very simple overview of what can occur during the manufacturing process for a single item. However, when this is translated into a manufacturing environment instead of the home environment, chocolate chip cookies are probably not the only product being made. Multiple types of cookies can be made using the same equipment and similar processes. Production times for each of the processes can be different, and additional types of manufacturing steps might be required for different type of cookie. To satisfy the demand and delivery time requirements for each type of cookie, specific batch quantities for each type must be controlled in order to optimize the use of the preparation areas and ovens. One way of doing this is to restrict the quantity of each

type of cookie being made to a specific amount, and to periodically switch from making one type to another. The cookies are made in batches, and each batch indicates a specific type and quantity of cookie.

Each cookie batch represents what SAP calls a manufacturing order. A *manufacturing order* is a grouping of the component quantities, operating procedures, and scheduling parameters required to make a finite quantity of a product. Orders are scheduled based on customer demand or the need to maintain a certain stock level of a material. A batch of 100 cookies requires a specific amount of flour, water, sugar, butter, and chocolate chips. A batch of 1,000 cookies requires more of each of the components. Mixing time and baking time can depend on the size of the batch that is being made. If there is not enough oven space for 1,000 cookies, the baking time is extended due to capacity constraints.

2.2 Orders and order types

SAP supports multiple different manufacturing scenarios. Each scenario has different informational needs. Within each scenario there can be several variations that require further differentiation.

2.2.1 Process manufacturing

Process industries manufacture product batches by combining one or more components defined in a recipe, using a series of procedural steps to convert the components into the final material. Examples include chemical, pharmaceutical, food, and oil and gas industries. Each procedural step of the process is made up of phases that represent specific actions that take place during that step. An example of this is illustrated in Figure 2.1, where there are two steps and several phases within each one:

1. In Step 1, three components are combined in Mixer 1, and are mixed for a specified amount of time prior to transferring them to another vessel for further processing. There are three phases in this step:
 - ▶ In the first phase, the three ingredients are initially added to Mixer 1.
 - ▶ In the second phase, the temperature is increased in Mixer 1 to a specified level and continues mixing for 30 minutes.
 - ▶ In the third phase, the contents of the mixer are pumped into Vessel 2.

2. In Step 2, the contents continue to be heated under pressure for 5 hours in Vessel 2. There are three phases in this step:
 - In the first phase, the vessel is pressurized.
 - In the second phase, the temperature is maintained for 5 hours.
 - In the third phase, the finished contents are pumped into drums. The content of these drums represents a single batch of the product XYZ.

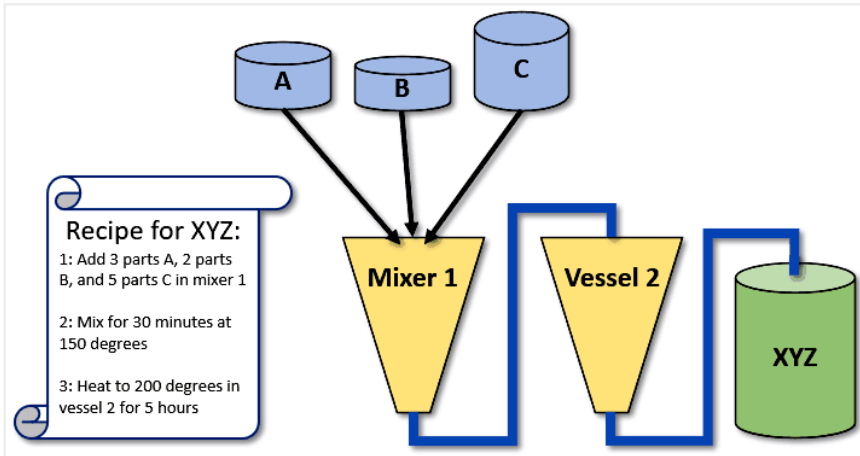


Figure 2.1: Process manufacturing

A special class of manufacturing order known as a *process order* is used for production planning and execution for these types of materials. The master data for describing the process uses a recipe to define the operational phases and a bill of materials (BOM) that is connected to the product's recipe in order to define the component quantities. Figure 2.2 shows the GENERAL DATA section of a process order. Area ❶ contains a list of order statuses. Progress of the order is tracked by setting and resetting the statuses. These statuses play an important role when looking at order variances. Area ❷ shows both the planned and delivered quantities for an order. Area ❸ shows a set of dates that indicate when certain actions occurred for that order. These dates can be used to select orders for reporting.

Scheduling of OrderDetermine CostsGenerate Control RecipeMaterialCapacityWM Material StagingM

Process Order: 1003212

Material: H102Black Ink

System Status: REL CNF DLV PRC GMPS MACM SETC

1

General DataAssignmentGoods ReceiptControlDates/QtiesMaster DataAdministr. Items

Quantities

2

* Total Qty: 10,000LShort/Exc. Rec.: 0

Delivered: 9,891

Dates/Times

3

Basic DatesScheduledConfirmed

End: 01/29/202124:00:0001/29/202100:00:0001/29/2021

Start: 01/29/202100:00:0001/29/202100:00:0001/29/202100:00:00

Release: 01/29/202101/29/2021

Figure 2.2: Process order general data

When a process order is created, the recipe phases and BOM items are assigned to the order and quantities are adjusted for the planned order size. Figure 2.3 shows an example of the recipe operations of a process order for producing ink. Operation 0010 only has one phase (0020) for mixing the ink. Multiple phases are possible. Each phase has its own parameters that are used for planning, scheduling, and costing purposes. Production reporting is performed via apps or transactions that are specific to the process order class.

Scheduling of OrderDetermine CostsGenerate Control RecipeMaterialCapacityWM

Process Order: 1003212

Material: H102Black Ink

Process inst.

OperationOverview

	Acti...	Ph...	Sup...	Ct...	Resource	* Co...	Short text	System Status	Latest start d...
<input type="checkbox"/>	0010				MIXER	YPI1	Mix Ink	CNF REL	01/29/2021
<input type="checkbox"/>	0020	<input checked="" type="checkbox"/>	0010	01	MIXER	YPI1	Mix Ink	CNF REL	01/29/2021

Figure 2.3: Process order operation phases

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