Welcome to the topic of Production Enhancements in SAP Business One release 9.1. In this course we introduce the enhancements in production module.
Objectives

At the end of this topic, you will be able to:

- Define resources
- Plan and monitor resource capacities
- Track by-products
- Utilize additional quantities
- Update multiple BOMs simultaneously

Please note that the pre-requisite for this topic is a familiarity with the production process in SAP Business One.
A significant part of the production process involves the consumption of resources. To facilitate this, a new resource master data concept is introduced in version 9.1. This enables a resource to be managed by the system and for capacity to be assigned to this resource.

This version also includes other important enhancements such as:
- By-products which can be included in bills of material and production orders,
- Additional quantities for machine setup time or lead component consumption
- And bulk updates of bills of material.

These enhancements allow you to manage additional production scenarios for light manufacturing in SAP Business One. The benefits of these enhancement include:
- The ability to plan and monitor capacity of your resources,
- The possibility to more tightly track costs associated with production
- And thus achieve improved management for all your bills of material.
In this example, we look at the company OC WoodTrend that produces custom wooden doors and windows based on customer specifications. They use a make-to-order production process where deadlines are derived from the delivery date of their customers’ orders.

Managing resources and their capacities is crucial for OC WoodTrend to assure timely deliveries to their customers. They need to identify if production can go ahead as planned or if manual scheduling adjustments need to be made to meet deadlines.
In version 9.1 a new resource module is introduced. In this module you can define different types of resources and manage their capacities. You now have the ability to define the cost components for machines, labor and other resources used in production. Furthermore, you can link this information to fixed assets and employee data.

Defining resources at this level gives visibility of available capacity, allowing you to avoid bottlenecks and to optimize your production plan. Additionally, you can now see resource costs included in the final product cost.
Resource Master Data can be found on menu path Resources > Resource Master Data.

The first step is to set up your resource master data. Resources are categorized by type and group. Here we see a turning machine that is used in producing OC WoodTrend's wood products.

Each resource has a defined unit of measure which will be used to manage scheduling and calculate costs during production. This machine unit of measure is Hour.

A key component of resource definition is the resource standard cost which can include different types of costs like: amortization, maintenance, overhead and so on.
There are three predefined types of resources: machine, labor and other. You can select the relevant type in the Resource Type field in the header of the Resource Master Data.

- When selecting **Machine** as the Resource Type, the Fixed Assets tab is activated in the master data record. One or more fixed assets can be selected for a machine.
- When selecting **Labor** as the Resource Type, the Employees tab is activated (instead of the Fixed Assets tab) and you can select associate employees with this resource.
- **Other** type is used for resources that are not fixed assets or employees.
Each resource type can have a number of resource groups. The resource groups are used to group together machines, employees or other resources used in production that have similar types of costs.

In the Resource Group you have the option to set up the standard resource cost components for that group. You can define up to 10 user-defined cost components. The name of each cost component is defined on the Resource Group level.

You can set default values for these cost components at the group level, but also set different costs at the resource level.

In our business example, OC WoodTrends has five lathe machines that they use in production. Since they have similar types of costs they have been grouped together in the same resource group.

Next we will discuss how each of the cost component can be linked to a different Cost Expense account in G/L Account determination. The sum of the cost elements then contributes to the overall production costs.
A new Resources tab has been added to the G/L Account Determination window. Here you can link a G/L account to the standard cost components.

If you are using standard G/L account determination, there are only ten available standard cost expenses, each of which is tied to a G/L Account. Although they may have different names in the different resource groups, the cost components in the groups are linked directly by number to the cost expense fields in the G/L account definition. In other words, although you may give the name Amortization to Resource Standard Cost 1 in Resource A and give the Lease to Resource Standard Cost 1 in Resource B, both are mapped to the same Standard Cost Expense 1 and therefore always map to the same account.
If you have a need for more complicated mapping of cost components to accounts, then you need to use the **Advanced G/L Account Determination** rules.

To assign different accounts for different Resource Groups or even for specific Resource Code or Warehouse Code, use the Advanced G/L Accounts Determination rules.

At first the Determination Criteria for Resources have to be selected and activated. Use the menu path **Administration > Setup > Financials > G/L Account Determination > Determination Criteria – Resources.**

Then by defining the relevant rule in Advanced G/L Accounts Determination Rules – Resources, the required G/L accounts can be assigned to relevant cost components. Use the menu path: **Administration > Setup > Financials > G/L Account Determination > G/L Account Determination> Resources tab> Advanced button.**
Managing Resource Capacities

- Standard daily capacities
  - Defined in Resource Master Data on the Planning Data tab
- Set Daily Internal Capacities for specific time period
  - Manually or based on the Standards from the Resource Master Data
- Resource Capacity overview
  - Displays daily capacities based on the selection criteria
  - Internal/Committed/Consumed/Available capacity views
  - Manual adjustments of Internal capacity still possible

You can plan capacities for your resources on the Planning Data tab of each Resource Master Data record. These standard capacities are defined daily. You can enter the daily capacity directly or use the Daily Capacity Factors. There are four factors available for each day. These factors allow easier definition of capacities of specific resource. A factor can be used, for example, to represent the number of working hours in one shift, the number of shifts in the specific day, or the number of employees that can perform the task. The amounts in these four factors are simply multiplied and the result is stored as the daily capacity for the specific day in the week.

The next step is to generate daily internal capacities for a specific time period. This step is done in the Set Daily Internal Capacities window in the Resources menu. Here you can generate capacity values either by copying the standard daily capacities defined in the Resource Master Data or by entering the capacity manually.

The generated internal capacities can be then viewed in the Resource Capacity window and also in the Capacity Data tab on the Resource Master Data. Note that the time frame in the Capacity Data tab in the Resource Master Data and in the Resource Capacity window is defaulted from Resources tab in General Settings. For details, please refer to the Resources How-to Guide.

The Resource Capacity window provides a complete capacity overview of selected resources within a selected time period. A user can select Internal, Committed, Consumed or Available views. In these views you can see the relevant amount of capacities on a specific calendar day. The meaning of the different views is further discussed in the next slide.
Capacity of the specific resource can be also viewed in the Capacity Data tab on the Resource Master data. In this case the capacities are summarized for the capacity period selected at the top of this Tab. The capacities are displayed as Internal, Committed, Consumed and Available.

- Internal
  - Capacities of the resource
- Committed
  - Capacities allocated to Production Orders
- Consumed
  - Capacities issued for production
- Available
  - \( \text{Available} = \text{Internal} - \text{Committed} - \text{Consumed} \)

Note: The Committed resource capacity related to the specific Production Order, is allocated according to the due date of that Production Order.

Note: The capacity is presented on a per warehouse basis. In the Resource Master data, in the Capacity Data tab, the user can maintain the list of warehouses and assign only the relevant ones to the selected resource. At least one warehouse must be assigned. The relevant defaults can be defined in the General Settings > Resources tab.

Please refer to the appendix to learn more about the Resource Capacity window.
Resources in the BOM or Production Order

- New column *Type* is introduced at the row level of the BOM and Production Order
- Three row types are supported
  - *Item* — item from *Item Master Data*
  - *Resource* — resource from *Resource Master Data*
  - *Text* — free text
- Both Manual and Backflush Issue Methods are supported for Resources

<table>
<thead>
<tr>
<th>#</th>
<th>Type</th>
<th>No.</th>
<th>Description</th>
<th>Base...</th>
<th>Planned...</th>
<th>Issued</th>
<th>Ava...</th>
<th>UoM...</th>
<th>Issue Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Item</td>
<td>BAR001</td>
<td>Bar iron</td>
<td>1</td>
<td>50</td>
<td>-70</td>
<td>Manual</td>
<td>Pcs</td>
<td>01</td>
</tr>
<tr>
<td>2</td>
<td>Resource</td>
<td>TUR001</td>
<td>Turning machine</td>
<td>0.5</td>
<td>25</td>
<td>-25</td>
<td>Hour</td>
<td>01</td>
<td>Backflush</td>
</tr>
<tr>
<td>3</td>
<td>Resource</td>
<td>Turners</td>
<td>Employees certified f</td>
<td>0.5</td>
<td>25</td>
<td>-25</td>
<td>Hour</td>
<td>01</td>
<td>Manual</td>
</tr>
<tr>
<td>4</td>
<td>Text</td>
<td>turn the iron bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Resources are assigned to *Bills of Materials* and *Production Orders* as components, like any other child item. Just as you would assign items to a bill of material or a production order, you now have a drop down row type field allowing you to specify if you are adding an item, a resource or text.

All the parameters on the resource type row are similar to the item type row, including the issue method. Both *Manual* and *Backflush* issue methods are supported for resources. This functionality is similar to that of the item issuing method.
Capacity for a resource is measured in the resource units of measure. This UoM can be a time type unit of measure, like hours or minutes, but it can also be any other type of unit, such as a cycle, turn and so on. This resource unit is used when planning and consuming the capacity in bills of materials and in production orders, including all related transactions, such as the *Issue for Production*.

In order to translate the quantity in this unit of measure into time, a user has to define the specific time period it represents. This is defined in the *Time per Resource Units* field that represents the quantity in the resource unit of measure and the *Resource Units per Time Period* field that represents the number of run times possible for the resource in the time per resource defined.
Let us examine this scenario: The resource usually runs in 15 minute cycles. Unit of Measure for this resource is **Cycle**. The capacity of the resource is measured in **Cycles** and the quantities in the bill of materials are also in **Cycles**.

In the bill of materials we define that to produce **1 final product** we need **3 cycles** of this resource.

In order to define the run time of this resource in a specific **Production Order** we need to convert **Cycle** units of measure into time. The definition of the conversion between the Resource unit of measure (**Cycle**) and time is as follow:

When the **Time per Resource Units** is 15 minutes, the **Resource Units per Time Period** equals to **1 cycle**.

When the **Time per Resource Units** is 1 hour the **Resource Units per Time Period** equals to **4 Cycles**.

This settings allows us to calculate the run time of the specific resource needed to produce required quantity of the final product. In our case, **3 cycles** of this resource are needed to produce **1 final product**. The resource run time calculation for producing **1 final product** is as follow: the bill of material quantity X (**Time per Resource Units / Resource Units per Time Period**). In our example it is **45 minutes**.
Because different types of resources (Machine/Labor/Other) can be included in one production order, a simplified calculation of the total production order run time is applied. The total production order run time is the maximum value of run times of individual resources in the production order.

The run time of the specific resource is an estimated time required for the production run and is calculated as follow:

\[(\text{parent planned Qty} \times \text{base Qty}) \times \frac{\text{Time Per Resource Units}}{\text{Resource Units Per Time Period}}\]

The Additional Time is an Additional Qty converted to time and is calculated as follow:

\[\text{Additional Qty} \times \frac{\text{Time Per Resource Units}}{\text{Resource Units Per Time Period}}\]

The Total Time = Run Time + Additional Time.

Note: Additional quantity will be explained in more details later in this presentation.
Resource Consumption

- Resources are consumed using the *Issue for Production* document.
- When the *Manual* issue method is used for a resource component, the consumed resource quantity can be manually adjusted on the *Issue for Production* document.
- When the *Backflush* issue method is used for a resource component, the consumed resource quantity is derived from received quantity of the final product on the *Receipt from Production* document and the *Issue for Production* document is created automatically in the background.

In the example, we can see the *Issue for Production* with an item component on the first row and resource component on the second row.

- Resources are consumed using the *Issue for Production* document along with items used in production.
- When the *Manual* issue method is used for a resource component, the consumed resource quantity can be manually adjusted on the *Issue for Production* document. However, when the Backflush issue method is used for resource component, the consumed resource quantity is derived from received quantity of the final product on the *Receipt from Production* document and the *Issue for Production* document is created automatically in the background. No adjustments to the quantity are possible.
- In the example, we can see an *Issue for Production* with an item component on the first row and resource component on the second row.
By-Products

What is a by-product?

- In the production process, one or more by-products can be produced along with the main final product within a single production order.
- These by-products are then stored in the warehouse as separate items and later are sold or used again as a component in production.

Examples:

- Production of window and door frames, where the remains after cutting are re-used for production of smaller sizes of final products.
- Production of chemicals, where beside the main chemical also some side chemicals can be produced.
- Production of food which produces side products.
- Metal plate cutting, where remains are re-used.

So What is a by-product?

- In the production process, one or more by-products can be produced along with the main final product within a single production order.
- These by-products are then stored in the warehouse as separate items and later are sold or used again as a component in production.

In our business example, production of window and door frames involves cuts that leave wood remains that can be re-used for producing smaller sized items. Other examples include:

- Production of chemicals, where beside the main chemical also some side chemicals can be produced.
- Production of food, where also side products can be produced.
- Metal plate cutting, where the remains are re-used for production.
By-products are defined in bill of materials and production orders as items, but with a negative quantity.

Both the Manual and Backflush Issue Methods are supported for by-products.

By-products are received to warehouse by Receipt from Production, like the main final product.

Here we see a by-product item with a negative quantity of 1 entered on a production order row. Since the planned quantity for the finished product is 20, the total of by-products produced during manufacturing will be -20. Because we know that this quantity is always produced when making this finished product, we choose to backflush the by-product.
Receiving By-Products

- By-products are received from production into the warehouse by a Receipt from Production, along with the main final product.
- When the Manual Issue Method is used, then the Quantity can be manually adjusted.
- When the Backflush Issue Method is used, then the Quantity is derived from the Quantity of the main final product.
- The unit price (item cost) of the receipt is defaulted from the selected pricelist, but can be manually adjusted.

By-products are received from production into the warehouse by a Receipt from Production, along with the main final product.

- When the Manual issue method is used, then quantities can be manually adjusted. However, when the Backflush issue method is used then the quantity is derived from the quantity of the main final product.
- The unit price (item cost) of the receipt is defaulted from the selected pricelist, but can be manually adjusted.
- By-products automatically appear on the document.
- By-products with Backflush issue method are added or removed together with the parent item, they are bound together.
- By-products with Manual issue method can be added or removed from the document as independent lines.
- The transaction type can also be set for by-product, though it has no direct effect on stock or accounting. It is recommended to receive rejected by-products into a different warehouse with different accounts.
- A new column is available in the Form Setting window called By-Product that indicates if the item is a by-product or not.
Additional Quantities

What is an Additional Quantity?

- Additional Quantity (Setup Quantity) are items or resources that need to be consumed at the beginning or at the end of a production process.
- Additional Quantities are not affected by the number of parent items produced
- In release 9.1 it is now possible to add additional quantities to BOMs and production orders

Examples

- Machine startup time (Resource)
- Lead component used to set up the machine (Item)

Planned Quantity = (Parent Planned Qty x Base Qty) + Additional Qty

This rule applies for both Items and Resources

What is Additional Quantity?

- Additional Quantity (also known as Setup Quantity) is an amount of items or resources that needs to be consumed at the beginning or at the end of a production process, and is not affected by the number of parent items to produce.

Examples include:

- Machine startup time (Resource)
- A lead component used to adjust the machine (Item)

The Planned Quantity of Component in Production Order is calculated using this formula:

- Planned Quantity = (Parent Planned Qty x Base Qty) + Additional Qty
- This rule applies for both items and resources
Here is an example of calculating an additional quantity. Here the additional quantity represents the setup time for the resource.

In our business example, we use a turning machine in the production process. In the bill of materials we define the quantity as 0.5 hours for running the turning machine, but add an additional quantity of 0.25 hours for the time taking to set up the machine.

In our production order we produce a quantity of 10 items, therefore the total time for manufacturing the final product is 5 hours based on 10 times 0.5 hours. However we must add the additional time for the machine set-up. Since the setup is not dependent on the number of items produced, we just add the additional time to the 5 hours manufacturing time and receive a total of 5.25 hours.
There is a new functionality for mass changes to components in bills of material. In the *Bill of Materials - Component Management* window you can perform mass changes in multiple existing bills of material simultaneously.

You can:
- Add new components to selected bills of material,
- Delete specific components from selected bills of material,
- Change parameters (such as quantity, warehouse, issue method, etc.) for selected bill of material components,
- And replace bill of material components.
Simulating Routings on BOMs

- Possibility to change the order of the lines on BOM
- The order of the rows in the BOM can simulate the basic routing

The new row type field that we mentioned previously when discussing resources is also very useful for simulating routings on bills of material. Because the three types of rows are supported (items, resources and text), you can put the bill of material components in the correct order to simulate routings. The buttons on the right give you the option to move items up or down within the bill of materials so that the order of the rows simulates the basic routing.

Here we see an example of a bill of material that has simulated a routing by the order of the rows. The fourth row has a text field that gives instructions for making the finished product.
The WIP (Work in Process) account can be added on the bill of material and/or production order row level.

- Enable setting a WIP account that will be used for specific item/resource component.
  - By default the field is empty and the WIP account from the master data is used (standard G/L account determination rules).
  - When a specific WIP account is entered, then it has higher priority than other G/L determination rules.
There is a new tab on the item master data for production.

- The Production tab contains all production relevant data.
- Phantom Item and Issue Method fields have been moved from the General Tab.
- New fields for BOM Type, No. of Item Components and No. of Resource Components have been added to this tab.
One of the enhancements for backflush is that the *Issue for Production* document is now generated automatically for backflush components.

- Reporting the completion of the final product via *Receipt from Production* document generates an *Issue for Production* document in the background for item and resource components with the backflush issue method.
- This enhancement improves the transparency and traceability of the consumption of components with backflush issue method.
New enhancements in production functionality make it significantly more relevant to the light manufacturing market.

- It is now possible to include resources in the BOM definition and in the production order.
- Resource capacities and their consumption in the production process are the basis for production planning and monitoring.
- Resource costs contribute to overall production costs and are split into underlying cost elements.
- Various by-products can be produced within one single production order.
- Machine setup time or lead component consumption can be managed using additional quantities.
- Mass BOM update makes BOM management much easier and more efficient.
- Row shifting allows defining simple routings in BOMs and production orders.
- Many other enhancements improve the visibility and traceability of the entire production process.
For more information on topics discussed in this lesson, see the following references:

- 9.1 How-To Guide: How to Work with Resources

For more information on topics discussed in this lesson, see the How-To Guide on how to work with resources.
Thank you

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Appendix

Using the Resource Capacity window

This appendix provides detailed explanations and scenarios for using the Resource Capacity window.
This Resource Capacity window displays the capacity of the Lathe machine. In the Capacity Type field we can choose to view the Internal, Committed, Consumed or Available resource quantity. In addition to these options, we can also choose to view all types of capacities at the same time. To do that, we choose the option All and then expand the view as shown in the image.

Note that in the Committed and Consumed rows, cells that contain values appear as push buttons. When clicking these buttons, the Resource Capacity Quantity Details window appears, showing the source documents that generated these numbers.

In our example, we see that the committed quantity of 20 cycles is originated from two production orders, due on 10.11. The consumed quantity of 10 cycles comes from an Issue for Production document that was posted the same day.
The production manager uses this window to plan and manage the capacity of the Lathe machine.

He sees that on the 13th the machine will not be able to fulfill the entire commitment.

Using the All capacity type view he can also see that on the 12th and 11th, no work is currently planned for the machine.

To balance the workload of the machine he decides to change the due date of the production orders from the 13th to the 12th and 11th.

We can see the affect of this action in the lower image. After changing the production due date, there are no negative quantities in the available capacity row.

Note that the internal capacity is editable. Therefore, the production manager could also change the internal capacity. For example, he could add more shifts on the 13th to increase internal capacity. This would increase the resource availability for the machine on that day.
In the Resource Capacity window we saw in the former slides, the committed quantity was allocated according to the due date of the production order. However, another option is to have the system allocate committed quantity also according to the internal quantity defined for the resource. This means that the committed quantity of a certain day can be spread automatically over several days when the commitment is higher than the internal capacity.

For each resource we can define if it is allocated according to the production order due date or automatically. This is done in the Resource Master Data → General tab → Resource Allocation field. We can, however, also change the allocation method in each row of the production order as shown in the image.
Let us compare the two methods for one scenario.

In this scenario, the resource has an internal defined capacity of 36 cycles each day.

In addition, two production orders due on the 13th were issued for 40 cycles each. These production orders created a commitment of 80 cycles of the resource.

When we look at the upper table, we can see that when the resource allocation type is On Due Date, the full committed quantity appears on the 13th. This caused a negative available quantity of 44 cycles. When the production manager spot a negative quantity and see that there is unused available capacity on the previous two days, he can quickly reallocate the work to those days.

When working with the Automatic resource allocation, a similar action is done automatically by the system. When the committed quantity of a production order is higher than the internal quantity, the system allocates only a partial quantity on the original due date and the rest is allocated to the prior day. The system continues to allocate the resource quantity and move any remaining quantity to the prior day as long as the committed quantity of the production order is higher than the internal quantity.

Note that the system does not check the total committed quantity of the day but only the committed quantity of each production order.

In our scenario we have an internal quantity of 36 cycles for the machine. Therefore when the system plans for a production order with a committed quantity of 40 cycles, it will schedule 36 for the original due date and 4 cycles for the preceding day. When there are two production orders for the same date, the system will do the same for both orders. We see this in the graphic. The system allocated 72 cycles on the 13th (36 cycles from each order) and the 4 remaining cycles from each order are allocated to the 12th.

It is also important to know that the system checks only the internal and committed quantity and not the consumed quantity. This means that if the internal quantity is already fully or partially consumed, the available quantity can still be negative.

We can conclude by saying that when the resource allocation method is On Due Date, negative available quantity does not necessarily indicate a problem with the resource.
availability because production can be moved to an earlier date. However, negative quantity in automatic allocation is more likely to indicate a real problem with the resource availability.
The Resource Capacity window also provides a cumulative capacity view. In this view, all the capacity quantities are accumulated daily. Each day shows an accumulation from the preceding days. When working with the On Due Date resource allocation method, this view can be helpful in spotting when a machine’s capacity is overcommitted.

To switch to the cumulative capacity view, select the Show Cumulative Capacity from Today checkbox.

In the upper image we see the resource capacity window with the allocation method On Due Date. Notice that on the 12th, there is a negative available quantity of -4. But is that a real overload? The production manager can easily bring forward the production to the day before.

The cumulative view, as shown in the lower image, can more clearly indicate a real resource overload. In our case no negative available quantity appears since the quantity is accumulated from today forward. A negative available quantity, however, indicates that the total available quantity up to that date is negative and that the total commitment is higher than the total internal capacity.
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