CHAPTER 4: BASIC CAPACITIES AND ROUTINGS

Objectives

The objectives are:

- Be able to set up capacity.
- Be able to establish Routings
- Be able to define Routings Advanced Features
- Be able to generate reports such as creating a capacity journal or a capacity report
- Create Capacity Reports

Introduction

This chapter examines the setup of capacity in Microsoft Dynamics® NAV 2009.

The capacity setup can be seen as establishing a model of the production environment.

All the information added in this area is used later when defining routings, as well as when creating capacity journals and reports.
Capacity Setup

Start by looking at the capacity setup features.

![Diagram of Capacity Setup in Microsoft Dynamics NAV 2009](image_url)

**FIGURE 4.1 EXAMPLE OF SOME MANUFACTURING FUNCTIONALITY.**

**Capacity Unit of Measure**

Capacity Unit of Measure codes are specified to define the unit of measure in which a machine or work center is managed. The choices offered are <blank>, 100/hour, minutes, hours, and days.

**NOTE:** Remember that Days is equal to 24 hours, not a work day.
Demonstration 1

Use the following steps to enter a new capacity unit of measure:

1. In the navigation pane, click Departments > Manufacturing Capacities > Setup > Capacity Units of Measure.

![Capacity Units of Measure Dialog Box]

2. Click New.
3. Under Code, enter Seconds. The code is chosen on work and machine center cards.
4. Under Type, leave as blank.
5. Under Description, enter Seconds. The description is usually what prints in reports.
6. Click OK.

Work Shifts

Users can set up one or more work shifts as a means of grouping the working times. Work shifts are used by shop calendars, which is where the actual shift hours are entered. Users must set up work shifts here before shop calendars can be created.

Capacity availability and the efficiency of machine centers and work centers can each be evaluated according to shifts. It is possible to use just one work shift even if your plant operates 24 hours each day.
Use the following steps to create a Work Shift:

1. In the navigation pane, go to **Departments > Manufacturing > Capacities > Setup > Work Shifts**.
2. On an empty row, and in the **Code** field, type 3.
3. In the **Description** field, type 3rd shift and click **OK**.

**Shop Calendars**

As mentioned, shop calendars are set up according to shifts. Enter the working hours for each day, for each shop calendar. Shop calendars are entered on work center cards and are used to calculate the calendars for work and machine centers.

The ending time must be after the beginning time within the span of a day. If a work shift spans midnight, then users must enter two lines for each day, one ending at 11:59:59PM and the next beginning at 12:00:00AM.

If you want to enter a calendar to show a 24 hour period for each day operation, enter a beginning time of 12:00:00 AM and an ending time of 11:59:59 PM.
Chapter 4: Basic Capacities and Routings

Work Center Groups

Before discussing the setup for work center groups, note how work center groups function within the manufacturing process. Note the following areas when discussing where work is done:

- Hierarchy of Work Units
- Work Center Groups
- Work Centers
- Machine Centers

Hierarchy of Work Units

Microsoft Dynamics NAV 2009 allows users the flexibility of defining up to three different levels of work facilities: work center groups, work centers, and machine centers. It is crucial to plan which facilities must be considered to determine the correct total available capacity when setting up the machine center and work center.

![Work Center Group Diagram](image)

FIGURE 4.4 WORK UNITS HIERARCHY

Work Center Groups

Work center groups are broad departments within an organization. A work center group is a reporting unit, such as a production or inventory department, rather than a facility in which work can be scheduled. A plant might have a production department and an inventory department as work center groups. Work centers are assigned to work center groups.

A company must have at least one work center group set up, but can use multiple groups as well.
**Work Centers**

Work centers are specific locations where work can be performed. Users might set up work centers cards for:

- Machines
- Groups of machines
- People

Production orders are scheduled in work centers through routings. Work centers may also have machine centers on a discrete basis, or have the machine centers roll up to include the availability of the work centers (using the consolidated calendar).

Each work center must be assigned a work center group. The work center group calendar is the sum all of the calendars of all of the work centers assigned to it.

If machine centers are used, the total capacity of the work center is the sum of the assigned machine centers.

**Machine Centers**

Machine centers are the lowest level of a facility in the hierarchy and represent the following:

- A machine
- A group of machines with identical characteristics
- A person
- A group of people

The user can define the extent to which a machine center needs to focus. Usually only those resources that need to be monitored, or tend to be bottlenecks, are designated as machine centers. When a production order is scheduled in a machine center, it consumes capacity (reduces availability). A machine center has only its own capacity, since there are no facilities under the hierarchy.

Each machine center must be assigned to a work center. Machine centers are an option and are not required for manufacturing.

**Demonstration 3**

This demonstration shows you how to set up a work center group.

1. In the navigation pane, click **Departments > Manufacturing Capacities > Setup > Work Center Groups**.
2. Click **New**.
4. Under **Description**, enter Assembly Department.
5. Go to Related Information>Planning>Calendar. The work center group calendar shows the available time for the sum of all the work and machine centers assigned to the group. You can view the information by day, week, month, quarter, year, or fiscal period.

6. In the View by field, select Month.

7. Click Show Matrix.

**NOTE:** Related information for each work and machine center is shown based on the view selected, in this case, on a monthly basis.

There are no calendar entries for the assembly department since it is a new work center group. To add calendar entries to this work center group, double-click on a period (For example, December 2010). This will open the Calendar entry dialog box. Enter relevant information pertaining to the work center and machine center.

8. Click Close.

9. Click OK.

**Standard Tasks**

Standard tasks are used to define the following:

- Tools
- Personnel
- Quality measures for informational purposes

Setting up standard tasks simplifies the creation of routings by listing and providing frequently recurring tasks in this table.

Users can assign a description, which overwrites the description of the work or machine center on the routing line. By clicking the Std Task button in the Standard Tasks dialog box, you can also assign tools, personnel, description, and quality measures.

All assigned definitions default to the routing line when the standard task code is selected. Use the following steps to set up standard tasks:

1. In the navigation pane, click Departments > Manufacturing > Capacities > Setup > Standard Tasks.

2. If appropriate for the task, go to Related Information>Std. Task. Select the relevant option and enter further information.
Routing Links

Routing link codes are used to link a component defined on an item's bill of material (BOM) to an operation on an item's routing. This means that users can specify at which step of a process (operation) inventory must be reduced.

Routing link codes allow for greater just-in-time functionality because they give the flexibility to flush the material (remove the material from inventory) at a specific operational step, rather than all at the beginning or end of the production order. Routing codes are often used in long processes.

The use of routing link codes reduces the amount of time needed to make changes to BOMs and/or routings when components are linked to routing operations. For example, an existing component is now used in a different sequence due to changes in processing. In a program requiring users to link production BOM components directly to various routings, the user needs to make changes to each routing and BOM. With the use of routing link codes, users simply change the routing link code.

Stop Codes

Stop codes are used to define down time during production. After setting up the stop codes, users can enter them in the posting lines of the output journal and the capacity journal. Use codes that are easy to remember and descriptive, for example, material defects or a mechanical breakdown. Users can set up as many codes as they want.

Scrap Codes

Scrap codes are used to define reasons for scrap or waste. Enter a code to identify why an item has been scrapped. After setting up the scrap codes, users can enter them in the posting lines of the output journal and the capacity journal. Use codes that are easy to remember and descriptive, for example, material defects or incorrect measurements in the product design. Users can set up as many codes as they want.

Capacity-Constrained Resources

Where the production planner foresees a risk of overloading a resource, he or she has the option to select that resource as capacity-constrained. This ensures that the machine center or work center in question is only loaded to a specific critical level, a finite load. Such finite loading is typically used for a work center or machine center that the planner has identified as a bottleneck for which he or she wants to monitor a limited load. This feature ensures that no more work is assigned to the resource than it can be expected to execute in a given time.
Machine centers and work centers to be assigned finite loads must be set up in the Capacity Constrained Resources window as shown in the figure.

![Image of Capacity Constrained Resources window]

**FIGURE 4.5 RESOURCES WITH CONSTRAINED CAPACITIES.**

The window contains the following fields that are specific to finite loading:

<table>
<thead>
<tr>
<th>Field</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Load %</td>
<td>Users can enter the percentage of the available capacity of a work center or machine center to which the program is allowed to apply load. Thus, in addition to noting constraint in general, users can account for potential down time.</td>
</tr>
<tr>
<td>Dampener (% of Total Capacity)</td>
<td>Enter the allowable tolerance (as a percentage) by which the critical load can be exceeded. By slightly exceeding the critical load percentage, the program can schedule a load to a work center or machine center at the last possible day.</td>
</tr>
</tbody>
</table>

**Routings**

A routing specifies the sequence of operations to manufacture a product. The operations can be performed at a work center or at a machine center, also referred to as capacities or facilities. Manufacturing companies use routings to manage and show the production process. The routings are the basis for the following:

- Process scheduling
- Capacity scheduling
- Manufacturing documents
The routings are then assigned to the item card in the same manner as production BOMs.

**Routing Header**

Although the work centers and machine centers are set up in capacities, users must set up the routing in the product design area. In the navigation pane, click the **Routings** button.

To create a routing, define the routing header. This heading information applies to the entire routing. In the routing detail lines, the data is entered for the specific machine center and work center that processes the product at that operation. Define a number (code) and a type.

Open a Routing to view this information. For example, double-click item number 1000 (Bicycle).

![Figure 4.6 Routing for Bicycle](image)

**FIGURE 4.6 ROUTING FOR BICYCLE.**

<table>
<thead>
<tr>
<th>Field</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>This is a unique identifier for the routing. Users can enter a maximum of 20 characters, utilizing both numbers and letters.</td>
</tr>
<tr>
<td>Comment</td>
<td>As seen throughout Microsoft Dynamics NAV 2009, users can access routing card comments by going to Related Information &gt; Routing &gt; Comments. Comments are for internal viewing and do not print on the job card.</td>
</tr>
<tr>
<td>Description</td>
<td>This field contains the Routing description so that its particular use is easily recognized.</td>
</tr>
</tbody>
</table>
### Field | Comments
--- | ---
**Type** | This specifies the routing as serial or parallel.
- **Serial** - indicates that operations are performed consecutively.
- **Parallel** - indicates that two separate, unrelated operations can be performed simultaneously. Parallel operations reduce throughput time, increase efficiency, and help reduce the complexity in the BOM structure.

**NOTE:** In *Microsoft Dynamics NAV 2009*, the definition of parallel processing or parallel scheduling differs from APICS. APICS defines it as "The use of two or more machines or job centers to perform identical operations on a lot of material. Duplicate tooling and setup are required." Microsoft Dynamic NAV’s parallel processing is used for two or more non-identical operations on different lots of material. *Microsoft Dynamics NAV 2009*’s definition of concurrent capacity is closer to the APICS definition of parallel scheduling.

### Field | Comments
--- | ---
**Status** | This field indicates the status of a routing.
- **New** - The status is automatically set to New when creating a new routing that is editable.
- **Certified** - The program allows a routing with the status of certified to be used for production planning and orders. It is not editable and an error message displays if you attempt to use a non-certified routing.
- **Under Development** - This status indicates that a certified routing is undergoing edits or changes. After the edits or changes have completed, the status must be changed back to certified.
- **Closed** - The status of closed indicates that the routing is no longer used.

**Search Description** | This field can be used to search for a routing when its number has been misplaced. It defaults from the description and can be up to a maximum of 30 characters.

**Version Nos** | This field shows the version number series applicable to the routing. You can choose a number series from the No. Series table or leave it blank.

**Active Version** | This field shows the current version in use.

**Last Date Modified** | As used throughout Microsoft Dynamics NAV 2009, this field updates to the system date (not the work date) when a routing is initiated or changed.
The routing lines must be completed with the required operations. Complete as many lines as necessary to finish the routing. Routing lines are discussed later in the section entitled Routing Lines.

**Throughput Time**

There are two types of throughput time: Productive and Non-Productive. It is important to understand the various components of throughput time or manufacturing lead time. Note the following Times:

- **Productive Time**
- **Setup Time**
- **Run Time**
- **Non-Productive Time**
- **Wait Time**
- **Move Time**
- **Queue Time**

**FIGURE 4.7 THROUGHPUT TIME**

There are two types of Productive Time, including setup time and run time.

- **Setup Time** is the time required to set up the machine or work center to convert from production of the last good item in a lot to the first good item of the next lot.
- **Run Time** is the time required to process or manufacture a piece or lot at a specific operation. Run time does not include setup time.
There are three types of Non-Productive Time, including wait time, move time, and queue time.

- Wait Time is defined as the time required between the processing steps (drying processes, for instance). APICS defines wait time as "the time a job remains at a work center after an operation is completed until it is moved to the next operation. It is often expressed as part of move time."

- Move Time is the time a lot or batch of an order spends in transit from one operation to another within the plant.

- Queue Time is the amount of time a lot or batch of an order spends waiting for setup and processing at a particular machine or work center. Increases in queue time mean direct increases to manufacturing lead time and work-in-process inventory. Queue time is not included in the determination of the start or ending time for a routing operation; it is the amount of time between the end of one operation and the start of the next.

**NOTE:** The various types of throughput time can be defined in different units of measure. For example, run time can be in hours while setup time is in minutes. However, setting different units of measure for the various throughput times has costing implications. See also the Manufacturing Costing training material.

For the purpose of this course, the routings utilize machine centers only. However, routings can be constructed with a work center or a combination of both.

**Routing Lines**

The routing lines allow users to list the user-defined required operations. In other words, this is the area where the steps in the production process are listed. In the navigation pane, click the **Routings** button and double-click and item (for example, bicycle).

**NOTE:** If a field mentioned below does not appear in the screen, click the **Actions** button (thunderbolt icon) from the **Lines** FastTab, select **Choose Columns** and add the missing fields.

- **Types** - There are two types available: Work Center and Machine Center. The different uses of these two types are discussed throughout the chapter. It is possible to view the information that defaults to the routing line based on which type is used. If the type Work Center is selected, the following information defaults to the routing line:
Description

- Setup Time Unit of Meas. Code
- Run Time Unit of Meas. Code
- Wait Time Unit of Meas. Code
- Move Time Unit of Meas. Code

The machine center card is linked to a work center. The following fields, if predefined, default to the routing line from the machine center item card.

Description

- Setup Time and Setup Unit of Measure
- Wait Time and Wait Time Unit of Measure
- Move Time and Move Time Unit of Measure
- Fixed Scrap
- Scrap %
- Send Ahead Quantity
- Minimum Process Time
- Maximum Process Time
- Concurrent Capacities

A description of some of the fields are provided below. For further information, please refer to the Help File by pressing F1.

- **No.** - Based on the selection in the Type field, this field looks up to a list of work centers or machine centers.

- **Standard Task Code** - This field provides the ability to enter frequent operations as a standard task. When you select a standard task code, the description of the standard task is copied into the Description field of the routing detail line. If tools, personnel, descriptions and quality measures have been saved under the standard task, the information is copied to the routing line.

- **Routing Link Code** - For each operation, specify a routing link code to indicate the routing operation on which a production BOM component is used. Enter the routing link code on the routing operation before entry on the production BOM component or an error message is displayed when trying to certify the BOM.

- **Description** - The description fills in and can be modified to improve or enhance the operation's definition. The description is printed on the job card, sometimes called traveler or work order.

- **Fixed Scrap Quantity** - This amount reflects scrap that occurs at the beginning of an operation. For example, if the operation is printing, you might throw away the first 100 pages during the setup of the machine. This increases gross requirements.
• **Scrap Factor %** - This percentage is designed for scrap accounted for at the end of the operation. During the actual running of the operation, you might encounter additional scrap, such as ten out of every 1000 sheets that were printed incorrectly. This can be estimated as a percentage of the total run and is actually accounted for at the end of the operation, which increases gross requirements.

**NOTE**: By default, the scrap factor is placed on all components used in an operation. To place the scrap factor on a specific component only, you have to differentiate that component's operation from the other components by setting different routing link codes in the production BOM and routing lines. Routing Link Codes are discussed later in the manual.

• **Minimum Process Time** - This is the minimum time required by the machine for processing.

• **Maximum Process Time** - This is the maximum time required by the machine for processing.

• **Concurrent Capacities** - This is the total quantity defined of the simultaneously available machines or persons. It is used for the machine center level only and reduces the production lead time of the order. For example, if processing normally requires four hours, the processing time is reduced significantly using two machines. In the APICS dictionary this is called "lot splitting."

• **Send Ahead Quantity** - This field refers to the quantity of the current operation that must be completed before the next operation can be started. It optimizes the lead time of production orders.

• **Unit Cost Per** - This field can be used if the unit cost of the operation is different from the unit cost on the work center item card. When choosing to enter the cost on each routing operation line, the Specific Unit Cost field must be selected on the work center item card. This is available for work centers only. For machine center operation lines, the unit cost may only be specified on the machine center card.

### Routing Versions

• **Minimum Process Time** - This is the minimum time required by the machine for processing.

• **Maximum Process Time** - This is the maximum time required by the machine for processing.

• **Concurrent Capacities** - This is the total quantity defined of the simultaneously available machines or persons. It is used for the machine center level only and reduces the production lead time of the order. For example, if processing normally requires four hours, the processing time is reduced significantly using two machines. In the APICS dictionary this is called "lot splitting."
• **Send Ahead Quantity** - This field refers to the quantity of the current operation that must be completed before the next operation can be started. It optimizes the lead time of production orders.

• **Unit Cost Per** - This field can be used if the unit cost of the operation is different from the unit cost on the work center item card. When choosing to enter the cost on each routing operation line, the **Specific Unit Cost** field must be selected on the work center item card. This is available for work centers only. For machine center operation lines, the unit cost may only be specified on the machine center card.

**Copy Routing Version**

One can apply the **Copy Routing Header** and **Copy Routing Version** functions to facilitate the creation of new routing version. Once the operations have been copied to the new routing version, users can make any necessary changes.

**Demonstration 4**

This demonstration shows you how to create a new routing version and how to add a step for inspection.

1. In the navigation pane, click the **Routings** button.
2. Double-click item **1000** (Bicycle).
3. Click **Versions**.
4. Click **New**.
5. In the **Version Code** field, enter 1, or accept the default number if a no. series has been set up.
6. In the **Description** field, type "Touring Bicycle".
7. Accept Serial as the type.
8. In the **Starting Date** field, type 11/01/2008 (November 1, 2008).
9. Go to **Actions > Functions > Copy Routing Header**. Select **Yes** to copy the information.
10. Change the routing. Go to the first blank line.
11. Enter a number in the **Operation** field, following the existing sequencing. For example, if the previous steps are numbered 10 through 40, enter a 50 in this field.
12. Select an existing machine center. For example, select **440** (Machine Inspection).
13. Enter a run time of 30 minutes.
14. Change the status from New to Certified.
15. Click **OK**.
16. Close the routing card and open it up again.
Where-Used Feature

To assist in maintenance and troubleshooting, use the Where-Used feature to display where a routing is used throughout the product structures.

This can be illustrated by looking at a routing. From the routing, go to Related Information > Routing > Where used. The program displays all items that use this routing. If the form shows no items, then the routing is not assigned to any item card.

Create a New Routing

To streamline creation of a new routing, users can copy an existing routing. As with production BOMs, users can make any necessary changes after the operations have been copied to the new routing.

Demonstration 5

This demonstration shows you how to create a new routing.

1. In the navigation pane, click the Routings button.
2. Click New.
3. Enter a number in the No., field or accept the default if a number series has been set up.
4. In the description field, type Chain Assembly.
5. Accept the default type of Serial.
6. Click Copy Routing.
7. From the routing list, select Bicycle and click OK. At this point, you can modify the operations.
8. Click the first operation.
9. Click the Action icon (lightning bolt symbol) and go to Operation > Tools.
10. Enter the following routing tools:

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTSW</td>
<td>Wide Tooth Saw</td>
</tr>
<tr>
<td>9mm WR</td>
<td>9 millimeter wrench.</td>
</tr>
</tbody>
</table>

11. Click OK.
12. Change the status from New to Certified and close it.
**Demonstration 6**

This demonstration shows you how to use routing when producing an item, by assigning the routing to an item card.

1. In the navigation pane, click the **Items** button.
2. Select an item (for example, Bicycle). Keep in mind that you might want to use an item you have already created so that the information has more meaning to you.
3. Click the **Replenishment** FastTab and from the **Routing No.** field, change or insert the new routing.
4. Click **OK**.

**Routing Link Codes**

Routing link codes are used to remove, or flush, components from inventory based on a routing step. Although they are not used in all manufacturing facilities, when appropriate, they are useful. Routing link codes link components on a production BOM to the specific routing step in which they are required. MRP uses the routing link code to schedule components based on the start date of the operation in which they are required.

Routing link codes are often used in long processes to allow inventory to be reduced when the items are actually being used. Routing link codes are used in just-in-time (JIT) environments.

Routing link codes must be established on the routing lines prior to entry on the production BOM lines. The flushing method chosen on the component item cards affects the timing.

<table>
<thead>
<tr>
<th>Component Flushing Method</th>
<th>Affect on Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Inventory is affected only when the user posts through the consumption or production journals.</td>
</tr>
<tr>
<td>Forward</td>
<td>Inventory is affected when the routing step is started.</td>
</tr>
<tr>
<td>Backward</td>
<td>Inventory is affected when the routing step is completed.</td>
</tr>
</tbody>
</table>

**Demonstration 7**

This demonstration shows you how to set up routing link codes.

Choose a manufactured item that has at least two operational steps and two components. A manufactured item must have both a production BOM no. and a routing no. on the **Replenishment** tab.

1. In the navigation pane, click the **Routings** button. Select item 1000 (Bicycle).
2. Change the status to Under Development.

3. On the row for the first operation (Wheel assembly), go to the Routing Link Code field.

**NOTE:** If the Routing Link Code field does not appear in the screen, click the Actions button (thunderbolt icon) from the Lines FastTab, select Choose Columns and add the missing field.

4. Select a routing link code that relates to the manufacturing process in question. If you do not see one, insert a row and you can create a unique code and description. Since this is the correct routing, just leave it as is.

5. For the second operation (Chain assembly), click the drop down arrow in the Routing Link Code field and select code 100 (Assembling).

6. Change the routing status back to certified.

7. Click OK.

8. In the navigation pane, click the Production BOMs button.

9. Double-click item 1000 (Bicycle).

10. Change the status to Under Development.

11. On the row for the first item, enter the same routing link code as on the routing line for the first operation. In this case, routing link code 100 (Assembling).

12. On the row for the second item, enter the same routing link code as on the routing line for the second operation.

13. Change the status to Certified.

14. Click OK.

In this training manual, the creation and use of production orders are examined. If you use this master item on your production order, it shows that the first item is consumed in the first operation and the second item is consumed in the second operation.

**Reports**

Standard reports have been created under the product design menu for routings and under the capacities menu for capacities.
Routing Sheet Reports

The routing sheet prints the detailed routings specified in the report filters. The routing sheet can be used to verify correctness of routings or a basis for new routings or versions. To view a routing sheet, in the navigation pane, go to **Routings > Reports > Routing Sheet**.

On the **Item** FastTab, the **No.** field defaults as a filter. In the filter column, enter the item number that uses the filter you want to see. On the **Options** FastTab, there are more choices.

<table>
<thead>
<tr>
<th>Production Quantity</th>
<th>Enter the quantity of items to manufacture for which you want the program to calculate the total time of the routing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Print</strong></td>
<td>Place a check mark on the fields that you want printed. Select from the following: Comments, Tools, Personnel, and Quality Measures.</td>
</tr>
<tr>
<td><strong>No. of Copies</strong></td>
<td>Enter the number of copies you want in addition to the original sheet. The Copies print with the word Copy at the top and a number next to it.</td>
</tr>
</tbody>
</table>

Select **Print**, **Tools**, **Personnel** and **Quality Measures** if you want to see what is being used. You can use filters to narrow the results.

Click **Print** to print the report. To preview the report on the screen before printing, click **Preview**. If printing of the report must now be cancelled, click **Cancel** to close the window.

**NOTE**: Quality measures minimum value, maximum value, and mean tolerance do not print on the Routing Sheet report, but can be added with a simple modification.

Machine Center List

In the navigation pane, go to **Departments > Manufacturing > Capacities > Lists > Machine Centers > Reports > Machine Center List**.

This report displays basic information about machine centers including: machine center number, name, work center number that it is assigned to, capacity, and efficiency.

On the **Machine Center** FastTab, users can enter filter information for:

- Machine center number
- Work center number
- Any other added filter

Select either **Print** or **Preview** to view the results.
Work Center List

In the navigation pane, go to Departments > Manufacturing > Capacities > Lists > Work Centers > Reports > Work Center List. This report displays the following information about work centers:

- Number
- Same
- Alternate work center
- Work center group
- Unit costs
- Unit of measure
- Capacity
- Efficiency
- Shop calendar code

On the Work Center FastTab, users can enter filter information for the following:

- Work center no.
- Work center group code
- Shop calendar code
- Any other added filters

Select either Print or Preview to view the results.

Capacity Task List

In the navigation pane, go to Departments > Manufacturing > Capacities > Reports > Capacity Task List. This report displays basic information about capacity.

From the Prod. Order Routing Line FastTab, users can filter information for:

- Expected Capacity Need
- Expected Capacity Overhead Cost

Select either Print or Preview to view the results.
Capacity Gantt Chart

In the navigation pane, go to Departments > Manufacturing > Capacities > Reports > Capacity Gantt Chart. This report displays basic information about work centers.

From the Prod. Order Routing Line FastTab, users can filter information for the following:

- Critical Path
- Setup time
- Run time

Select either Print or Preview to view the results.

Summary

This chapter discusses the importance of properly scheduling work shifts, shop floor calendars, as well as selecting the proper routing for an optimal production flow.
Lab 4.1 - Routing

Scenario

Create New Routing

Create a new certified routing using existing facilities, called New Path, with operations as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Center</td>
<td>410</td>
<td>420</td>
<td>440</td>
</tr>
<tr>
<td>Setup Time</td>
<td></td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Run Time</td>
<td>1.5</td>
<td>2.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Step by Step

Answer

1. In the navigation pane, click the **Routings** button.
2. Click **New**.
3. Enter New Path in the **No.** field.
4. Enter New Path in the **Description** field.
5. Leave the other default fields in the header.
6. Go to the **Lines** FastTab.
7. In the **Operation No.** field type 10.
8. Set Type to Machine Center.
9. Type 410 in the **No.** field.
10. In the **Setup Time** field type 20.
11. In the **Run Time** field type 1.5.
12. Move to the next row and type 20 in the **Operation No.** field.
13. Set Type to Machine Center.
14. Type 420 in the **No.** field.
15. In the Setup Time field type 30.
16. In the **Run Time** field type 2.0.
17. Move to the next row and type 30 in the **Operation No.** field.
18. Set Type to Machine Center.
19. Type 440 in the **No.** field.
20. Do not enter time in the **Setup** field.
21. In the **Run Time** field type 1.0.
22. In the **Status** field, change New to Certified.
23. Click **OK**.
Create New Version

Create version 1 of the routing created in Lab 4.1 with a work date of 11/14/2010. Create version 2, to become effective on 12/01/2010, with the following modifications: Procedures have been modified so that drilling (operation 10) is no longer necessary, and the CNC machine in operation 20 can do that step, but the run time becomes 2.5 minutes.

Step by Step

Answer

1. In the navigation pane, click the **Routings** button.
2. Double-click **New Path**.
3. Click **Versions**.
4. Click **New**.
5. Type 1 in the **Version Code** field.
6. Type a Description of Version 1.
7. Type 11/14/2010 in the **Starting Date** field.
8. Go to **Actions > Functions > Copy Routing Header**.
9. Select Yes, copy from routing header.
10. Click in the **Status** field and change it to Certified.
11. Click **OK**.
12. Click **New** to insert a new version header.
13. Type 2 in the **Version Code** field.
14. Type a Description of Version 2.
15. Type 12/01/2010 in the **Starting Date** field.
16. Go to **Actions > Functions > Copy Routing Version**.
17. Select version 1 from the list.
18. Click **OK**.
20. Press **Ctrl+D** to delete the row.
22. Change the Run Time to 2.5.
23. Click in the **Status** field and select **Certified**.
24. Click **OK**.
Create Routing with Parallel Production

Create a routing that demonstrates a parallel production. Start at a single facility. Describe the operation any way you want. Use any facility, adhering to the rules for establishing a parallel route. Operations 20 and 30 are made in parallel. The following table describes the operations and execution times. The facility is just a suggestion:

<table>
<thead>
<tr>
<th>Operation</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
<td>MC 110</td>
<td>MC 110</td>
<td>MC 120</td>
<td>MC 130</td>
<td>MC 130</td>
</tr>
<tr>
<td>Description</td>
<td>Prep frame</td>
<td>Front wheel</td>
<td>Rear wheel</td>
<td>Final assembly</td>
<td>Packing</td>
</tr>
<tr>
<td>Setup</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Run Time</td>
<td>10</td>
<td>60</td>
<td>120</td>
<td>120</td>
<td>90</td>
</tr>
</tbody>
</table>

Step by Step

Answer

1. In the navigation pane, click the **Routings** button.
2. Click **New**.
3. In the **Description** field, enter Finishing.
4. Change the **Type** field to Parallel.
5. Move to the **Lines** FastTab.
6. In the **Operation No.** field, type 10.
7. Set Type to Machine Center.
8. Type 110 in the **No.** field.
9. Change the Description to Prep Frame.
10. In the **Run Time** field enter 10.
11. Move to the next row and type 20 in the **Operation No.** field.
12. Set Type to Machine Center.
13. Type 110 in the **No.** field.
14. Change the Description to Front Wheel.
15. In the **Setup Time** field type 30.
16. In the **Run Time** field type 60.
17. Move to the next row and type 30 in the **Operation No.** field.
18. Set Type to Machine Center.
19. Type 120 in the **No.** field.
20. Change the Description to Rear Wheel.
21. Type 30 in the **Setup** field.
22. In the **Run Time** field type 120.
23. Move to the next row and enter 40 in the **Operation No.** field.
24. Set Type to Machine Center.
25. Type 130 in the **No.** field.
26. Change the Description to Final Assembly.
27. Type 30 in the **Setup** field.
28. In the **Run Time** field type 120.
   Move to the next row and type 50 in the **Operation No.** field.
29. Set Type to Machine Center.
30. Type 130 in the **No.** field.
31. Change the Description to Packing.
32. Type 30 in the **Setup** field.
33. In the **Run Time** field type 90.
34. Place your cursor in the **Lines** FastTab, right-click and select **Choose Columns**.
35. Add **Next Operation No.**
36. Click **OK**.
37. Go to the first row, for Operation 10.
38. In the **Next Operation No.** field type 20|30.
39. In Operations 20 and 30, type 40 for next operation.
40. For operation 40, type 50 in the **Next Operation** field.
41. Change the status from New to Certified.
42. Click **OK**.

### Create Routing with Send Ahead

1. Create a routing for the Water bottle assembly 2000. It must have the following characteristics:

<table>
<thead>
<tr>
<th>Operation</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Center</td>
<td>410</td>
<td>110</td>
<td>120</td>
</tr>
<tr>
<td>Description</td>
<td>Drill bracket</td>
<td>Bend bracket</td>
<td>Mount bottle</td>
</tr>
<tr>
<td>Setup Time</td>
<td>20</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Run Time</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

2. Assign this routing 2000 to item 2000.
3. Create a new version of this routing so that the above routing allows for a send-ahead quantity of 10 in operation 20.

### Step by Step

**Answer**

1. In the navigation pane, click the **Routings** button.
2. Click **New**.
3. Type 2000 in the **No.** field.
4. In the **Description** field, type "Water Bottle Assembly."
5. Do not change the remaining fields in the header.
6. Move to the Lines FastTab.
7. In the Operation No. field, type 10.
8. Set Type to Machine Center.
9. Type 410 in the No. field.
10. Change the Description to Drill Bracket.
11. In the Setup Time field type 20.
12. In the Run Time field type 0.5.
13. Move to the next row and type 20 in the Operation No. field.
14. Set Type to Machine Center.
15. Type 110 in the No. field.
16. Change the Description to Bend Bracket.
17. In the Setup Time field type 30.
18. In the Run Time field type 0.5.
19. Move to the next row and type 30 in the Operation No. field.
20. Set Type to Machine Center.
21. Type 120 in the No. field.
22. Change the Description to Mount Bottle.
23. In the Run Time field enter 1.0.
24. Click in the Status field and change it to Certified.
25. Click OK.
26. In the navigation pane, click the Items button.
27. Select the item, water bottle mounting bracket.
28. Open the Replenishment FastTab.
29. Type 2000 in the Routing No. field.
30. Click Advanced.
31. Go to Actions > View.
32. Select Versions.
33. Click New.
34. Type SA in the Version Code field.
35. In the Description field, type Send Ahead.
36. Go to Actions > Function > Copy Routing Header.
37. Click Yes.
38. In the row for Operation 20, type 10 in the Send-Ahead Quantity field.
39. Click OK
40. Close all open windows.

Use Copy Routing
1. Create a new routing for item 1001, Touring Bicycle, by copying item 1000.
2. Assign routing 1001 to item 1001.
**Step by Step**

**Answer**

1. In the navigation pane, click the **Routings** button.
2. Click **New**.
3. In the **No.** field, type 1001.
4. In the Description field, type Touring Bicycle.
5. Click **Copy Routing**.
6. Select routing 1000.
7. Click in the **Status** field and select Certified.
8. Click **OK**.
9. In the navigation pane, click the **Items** button.
10. Select item 1001, Touring Bicycle.
11. Open the **Replenishment** FastTab.
12. In the **Replenishment** FastTab, type 1001 in the **Routing No.** field.
13. Click **OK**.
Quick Interaction: Lessons Learned

Take a moment and write down three key points you have learned from this chapter

1. 
2. 
3. 

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