PlanetTogether

Scheduler Training

PlanetTogether Training

Introduction

Welcome to PlanetTogether Training for Schedulers! The purpose of the training is familiarize you the user with the features and functionalities that are crucial to everyday use of PlanetTogether. Most users are completely unacquainted with the software so at this level this manual will also cover base functionality that may or may not be used in future phases.

As a Master Scheduler, this manual will contain the bulk of the functionality that exists within PlanetTogether, touching basically all points that will overlap with other functional areas, such as purchasing, planning, and management levels.

The training will be centered on introducing concepts that are integral to PlanetTogether, how those concepts are structured in the software and finally around a process for daily use of PlanetTogether.

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Factory Model Elements

PlanetTogether is a highly data-driven Advanced Planning and Scheduling (APS) system. Before we proceed with training on the software, it is important to understand what elements are being imported into PlanetTogether and are driving decision making within the software.

There are typically three categories of elements that are defined within PlanetTogether:

1. Resource objects
2. Items and Inventory objects
3. Job objects

Resource Objects

Resource objects pertain to the physical machines and labor resources that comprise departments that again comprise plants.

Plant: The plant generally represents a physical manufacturing location. It is comprised of one or more departments.

Departments: A department is defined as a group of resources that are grouped together, either because of their physical proximity to one another or because they have similar functions. Each department is comprised of one or more resources.

Resource: A resource is defined as a machine, tool, or laborer that performs work toward production orders. Generally it represents a single machine or tool, but can also be modeled to represent a group of resources like a labor crew. Every resource should have at least one capability.

Capability: A capability is defined as the kind of work that needs to be done. For example, a capability could be “cut” or “sand” or “heat treat”.

Capability Assignments: A capability assignment is the process of tying the type of work to be done (capability) with the correct resources that can perform that kind of work.

Items and Inventory Objects

Items and inventory objects pertain to materials and products that are inventoried in warehouses. It also includes purchase orders, sales orders, transfer orders, and forecasts.

Items: This is defined as a list of all the items that are being used and tracked in PlanetTogether, regardless of whether or not they are raw materials, WIP, or finished goods.

Warehouses: Warehouses are defined as locations used to store item inventories. They can be distinct locations or multiple warehouses can be modeled as a single warehouse depending on factors like travel time and distance between each inventory location.

On-Hand Inventories: This is defined as the current stock levels of the items being stored in any given warehouse.

Sales Orders: This is defined as customer orders that create demand for items in inventory.

Purchase To Stock: These are expected receipts of items that are being purchased to stock in a specified warehouse.

Job Objects

Job objects pertain to the different levels of structure for a production order (AKA work orders, manufacturing orders etc.) It also contains routing and BOM information as well.

Jobs: A job contains the customer information and due date for the customer order. Every job is comprised of one or more manufacturing orders.

Manufacturing Orders: A manufacturing order contains what product is to be made and in what quantities.

- Example: A job may specify that a customer has ordered furniture from us and needs it by the first of the next month. The manufacturing order, however, may specify that we need to build one table and four chairs. In this case, there would be two manufacturing orders: one for the four chairs and the other for the table.

Every manufacturing order is comprised of one or more operations.

Operations: An operation is a specific step in the manufacturing process. It contains a resource requirement, a run rate, and expected quantity for that process.

- Example: Building a chair can be broken down into multiple operations. For example, cutting the wood, sanding the wood, painting, and finally assembling it; each of those steps would be modeled as a different operation.

Every operation has generally one activity, but can also be split. Each operation also has at least one resource requirement.

Activities: An activity specifies the status of an operation. It contains information for tracking the reported good quantity, the reported setup time versus expected setup time, and expected versus reported run times.

Resource Requirement: The resource requirement functions as a way to specify how many resources are required for an operation.

- Example: An operation might have multiple resource requirements. For example, an operation may specify that a saw is needed to cut the wood. However, it may also specify that a master carpenter is required because of intricacies in the design. A master carpenter in this case is another resource that has finite capacity and must be scheduled like any other resource. The operation requires availability on BOTH resources in order to run.

Each resource requirement has at least one required capability.

Required Capability: A required capability is the type of work the resource requirement must be able to fulfill. It MUST match a capability that has been assigned to a resource. If PlanetTogether cannot find a match, the operation and its manufacturing order will fail to schedule.

Materials: This is a list of all the material requirements for the operation, which warehouse to draw from (optional), and how much of that material is required for the operation. This is specified on the operation but is not **required** information.

Products: This is a list of all items being produced at the operation's completion as well as the quantity of the output and which warehouse to store it in.

Alternate Paths: Alternate paths are alternative routings on the manufacturing order.

Planning Cycle

There is a general cycle that users of Planettogether will go through, though there may be slight deviations from the cycle from user to user. The planning cycle steps are broken into three steps:

1. Creating the schedule
2. Updating the schedule
3. Publishing the schedule

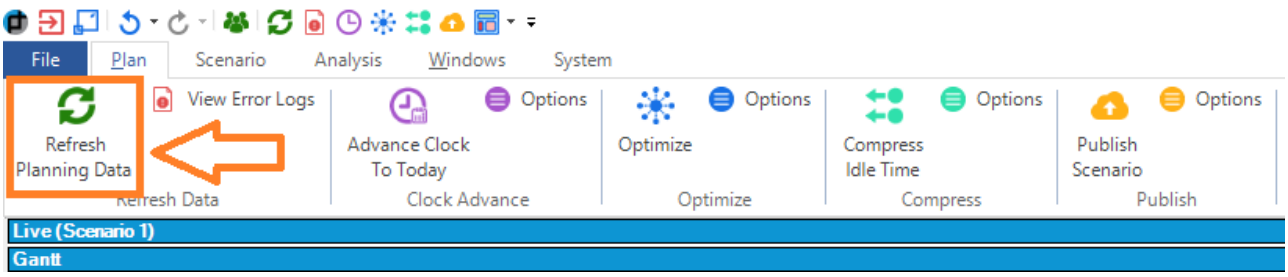
Within each step are a number of sub-steps that a user must perform, which the following sections will cover.

Creating the Schedule

This section will cover how to create your first schedule using PlanetTogether functionality. The manual will walk a user through the process step by step, covering the necessary functions and tools that are available in the software to accomplish each step.

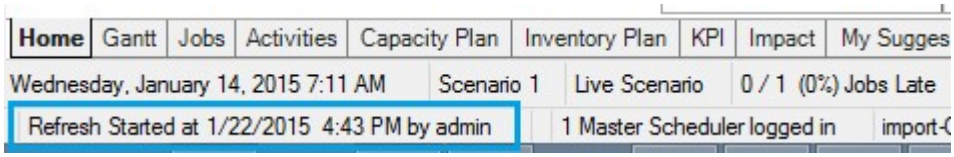
Refresh Data

Once the user has opened up the Production Scheduling workspace, an option to Refresh the Planning Data will appear in the toolbar towards the top of the screen.



As you already know, most data used for PlanetTogether resides in your ERP system and needs to be imported into PlanetTogether. This is the purpose of the Refresh function; it will import updated work order information such as job progress and new work orders that need to be added to the schedule as well as items and inventory updates such as on-hand counts, new sales orders, and new purchase orders.

Triggering the Refresh will cause PlanetTogether to import information for all Factory Modeling Elements that were selected for import. The Refresh function notifies the user both when the function has started and also when it's been completed at the bottom left corner of the screen.



Once the Refresh has been completed, the Jobs View will provide us with a way to view the new information that has come in since the refresh.

Jobs View

The Jobs View groups work orders into categories designated on each tab (All, Scheduled, Unscheduled, Overdue, Late, etc.), allowing the user to manage work orders and proactively respond to potential problems. Immediately, the user will note that there are numerous columns, all with information that is either imported or calculated by PlanetTogether. The first thing to be done is to customize the layout of the Jobs View to show only the information that the user wants to see.

Layouts and Customization

Just as the roles of a planner and scheduler will differ from each other, so does the information that each role requires. Customizing the views and Layouts to display only the information that is relevant to your role cuts through the noise to give you the right data quickly and easily.

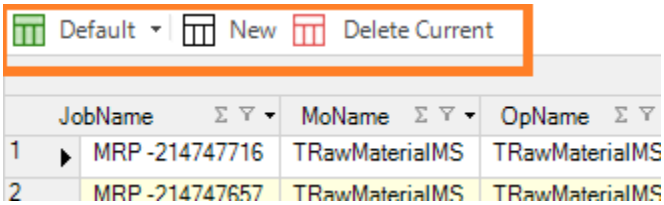
PlanetTogether allows for the creation of any number of Layouts and Alerts, allowing agile reaction to different situations that require your attention. Just as the type of information you require at a given moment might differ, different layouts can be used to quickly access the right data for the right situation.

For example, one layout might show all the orders that are currently on the schedule and are assigned to a resource. For this tab, having the work order name, due date, and expected finish date would be of utmost importance. On a different layout, however, the information that's more pertinent might be the number of late work orders and the average lateness of those work order and.

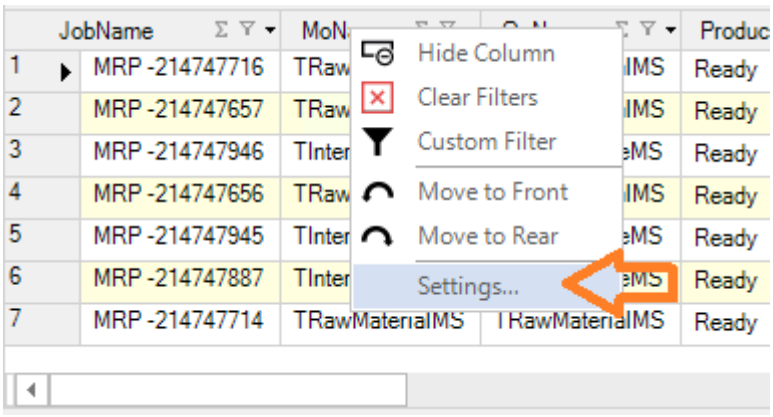
Creating a Layout

Creating a layout is a simple process that is available in any part of the software that is formatted as a grid.

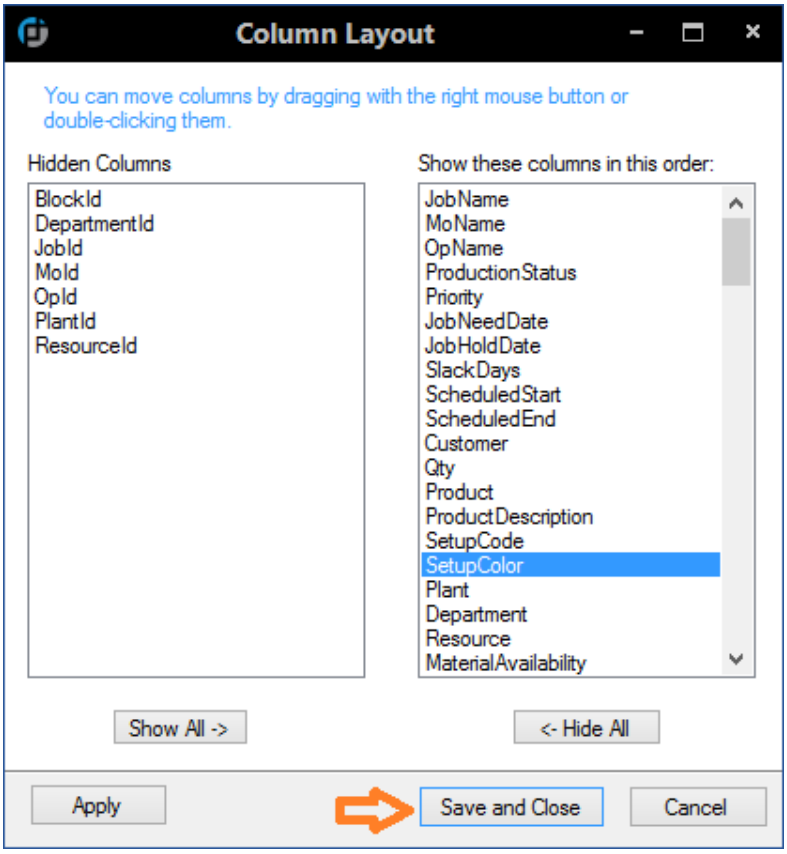
1. Click ‘New’ in the layouts toolbar



2. Customize the column names by right-clicking on column name and selecting Customize



3. Select what Columns you’d like displayed
4. Click ‘Save’



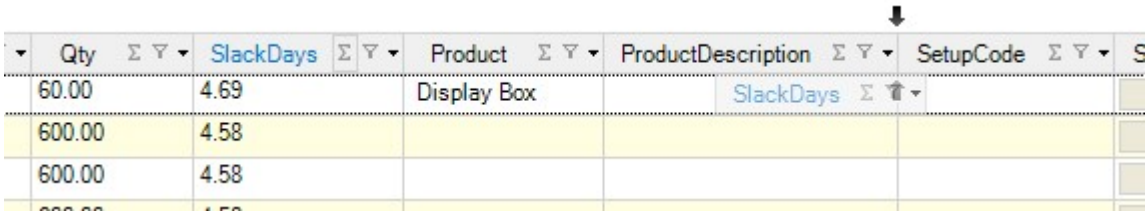
Column Order

There are two ways that the order of the columns can be rearranged: drag-and-drop and column switching.

Columns can be rearranged by simply dragging and dropping the columns in the desired order. An arrow will appear to alert the user where the new column will reside.

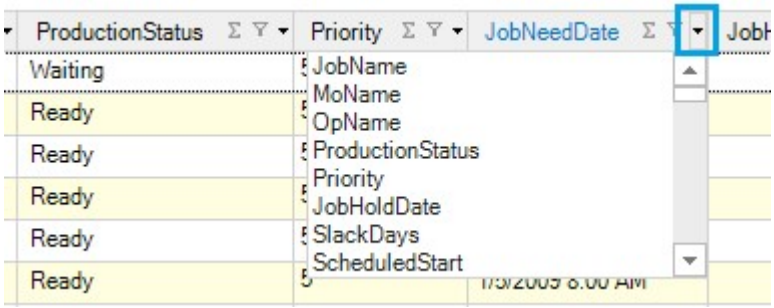
1. Select the column
2. Left-click and hold the column
3. Drag to the right or left
4. Release the left-click to drop the column in the desired location

See the image below:



Drag-and-drop can be very useful when the columns being rearranged are in close proximity to the front of the order of columns. There are cases, however, when a desired column is at the far end of the scroll bar. In situations like this, drag-and-dropping is not an efficient way of rearranging the order of columns.

On every column are a number of buttons that allow additional customizations such as filtering and summation. The third button from the left is a small, downward-facing triangle. See image below:



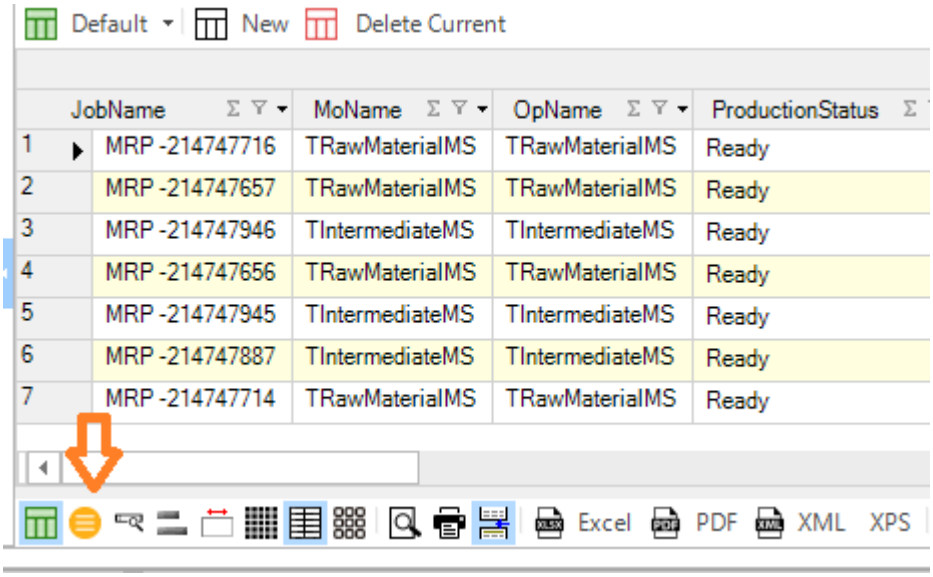
When pressed, a dropdown with a list of every column in the current tab is displayed. Selecting a column from this list instantly swaps the column with the one selected. This is particularly useful when a less pertinent column is closer to the front of the column order and can be safely swapped with something at the very end like a user-defined field (UDF).

1. Select the Column
2. Click the swapping button on the column header
3. Left-Click the desired column to swap positions with.

Columns Displayed

Not only can columns be rearranged, but they can be hidden altogether. When a user knows that a specific column won't ever be needed, at least in the near future, he or she can choose to hide the column altogether. While the preconfigured layouts will hide many of the columns by default, a user might want to hide additional columns.

1. Locate the toolbar towards the bottom of the screen
2. Left-Click the Customize Column Layout button



3. Double left-click any field in the right-hand column (Show these Columns in this Order:) to hide the column
4. Repeat for all the columns that need to be hidden
5. Left-Click 'Save and Close'

Now that we know how to rearrange and customize the column order and layout, how do decide which columns to hide? The answer lies in understanding the differences between the tabs and the information that they are meant to convey.

Tabs and Definitions

Each of the different tabs in the Jobs View is dynamic created, meaning that the tabs do not appear when there are no work orders that fit into the given categorization. For example, if there are no work orders set to finish Late, the Late tab would not appear. This is intended to reduce the amount of clutter on the screen and allow users to focus specifically on the relevant tabs.

The possible tabs are listed and defined below:

All: Lists all the work orders in PlanetTogether regardless of categorization.

New: Lists all the work orders that are brand new and have not yet been added to the schedule.

Scheduled: Lists all orders that have successfully been added to the schedule.

Excluded: Lists all orders that have been excluded from the schedule for one reason or another.

Templates: Lists all orders that have been marked as templates. A template is a ready-made routing for a specific SKU often used in Express MRP.

Unscheduled: Lists all orders that have been unscheduled either automatically upon Refresh or manually by the user. An order would be unscheduled upon Refresh if the routing changed on the refresh.

Failed to Schedule: Lists all orders that could not be scheduled for various reasons. Some reasons would include a work order that specify a required capability that has not been assigned to any resources, or a work order with constraint requirements that cannot be met by any of the resources.

Finished: Lists all orders that have been marked as completed.

Cancelled: Lists all orders that have been marked as cancelled.

Overdue: Lists all orders that have due dates that are in the past from the current day.

Late: Lists all orders that have due dates that are later than their need date. Late orders and overdue orders often overlap.

Started: Lists all orders that have some good quantity reported to the order.

Slow Performance: Lists all orders that are running slower than expected.

On-Hold: Lists all orders that have been put on hold.

Entered Today: Lists all orders that have been brought into PlanetTogether in the current day.

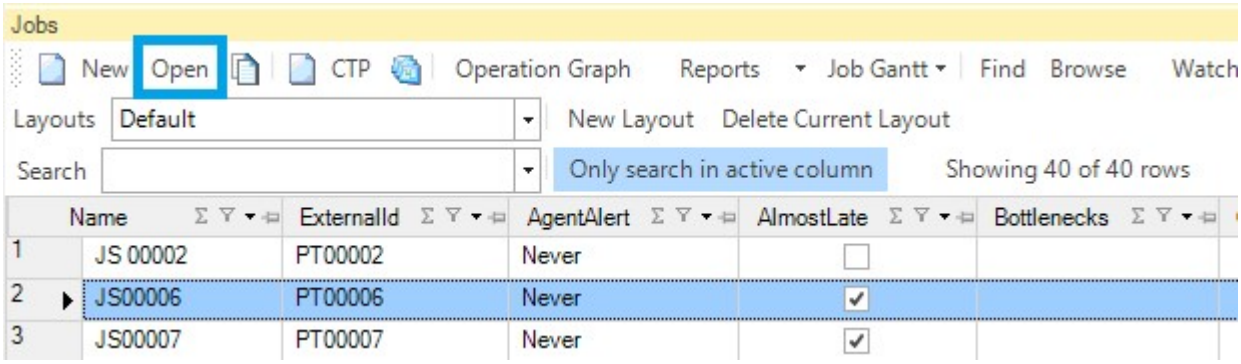
Past Planning Horizon: Lists all orders that are currently past the planning horizon. An order past the planning horizon is generally indicative of a material constraint that cannot be satisfied.

Job Dialog

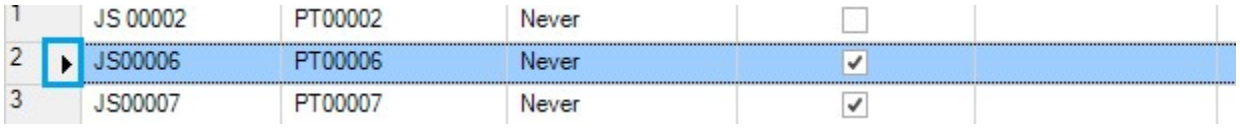
Once the tabs are understood and the columns have been arranged per the user's needs, the next step would be to look into the work orders themselves. Although the information has been imported and resembles exactly the data in the source ERP, occasionally it is helpful to look into the order for routing or BOM information as it exists in PlanetTogether.

Opening Jobs

Each job dialog can be opened by highlighting the work order and clicking "Open", shown below:

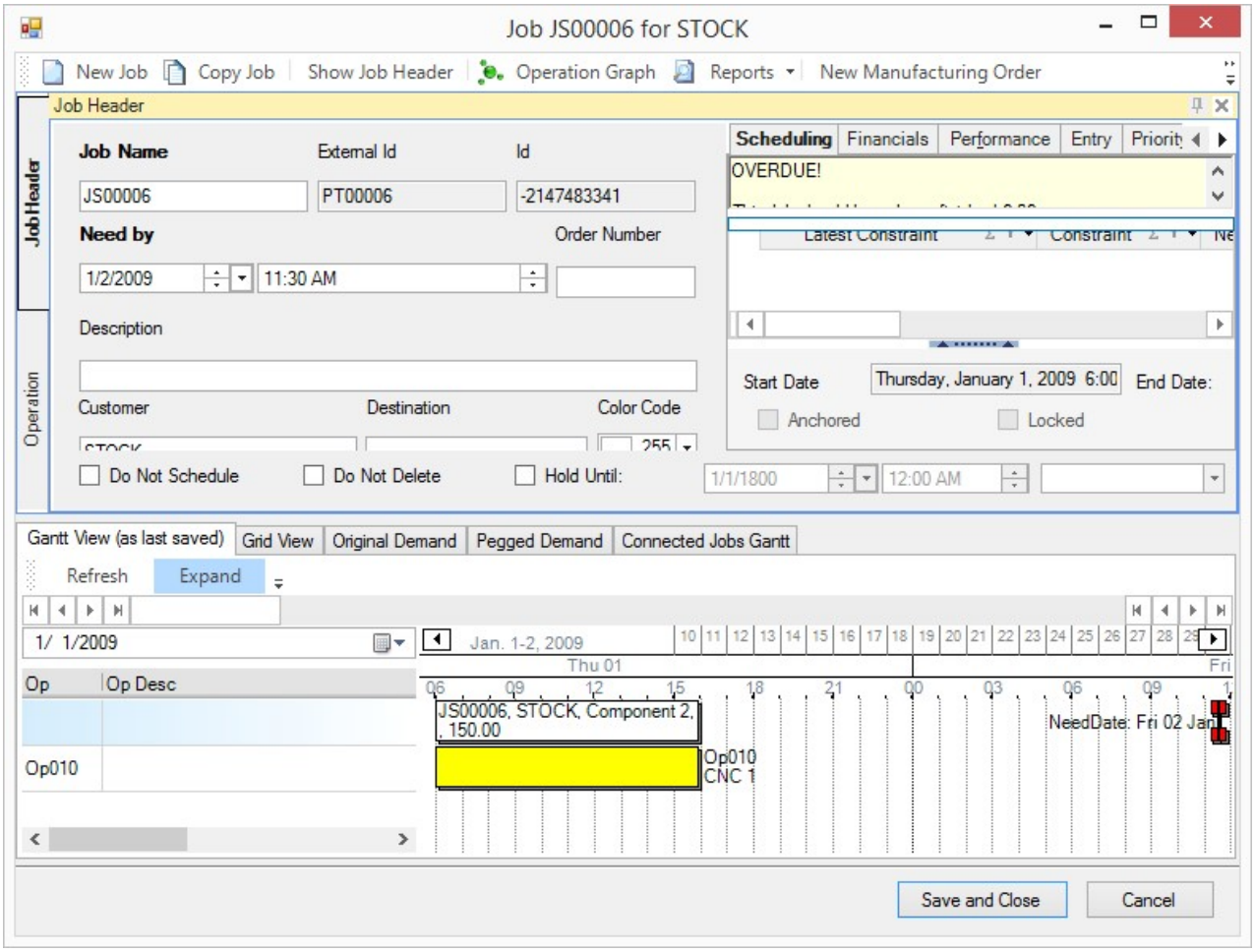


Another way is to double click on the small black triangle on the row shown below:



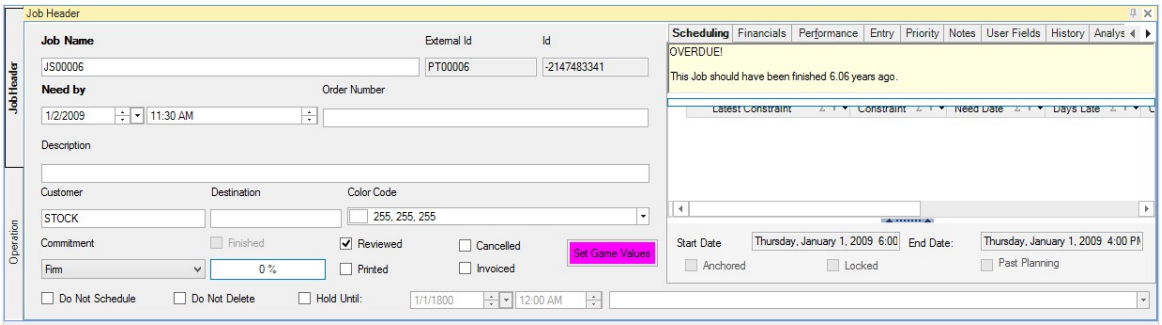
Job Dialog Layout

The now open job dialog will be divided into two sections. The topmost pertains to either the job or operation header depending on which is selected on the left hand side of the dialog.



Job Header

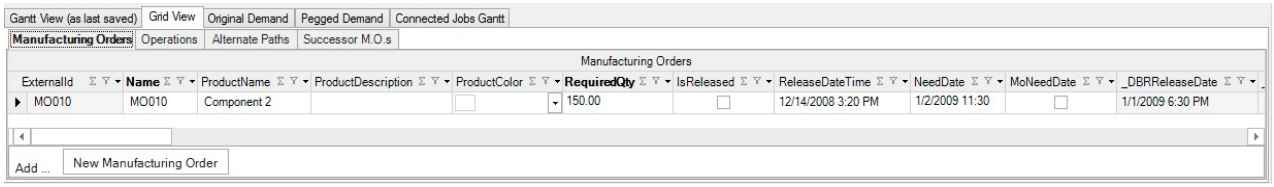
The job header displays information about the job as a whole, such as the customer name and need date of the order. On the upper right-hand corner, there are a number of other fields that maybe populated by the refresh, such as priority or financial fields.



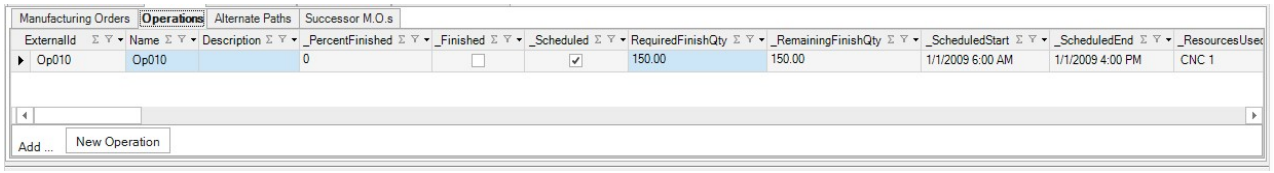
Manufacturing Order Details

The bottom half of the Job dialog shows firstly the list of manufacturing orders, which includes the required quantity for the manufacturing order as well as the product to be produced.

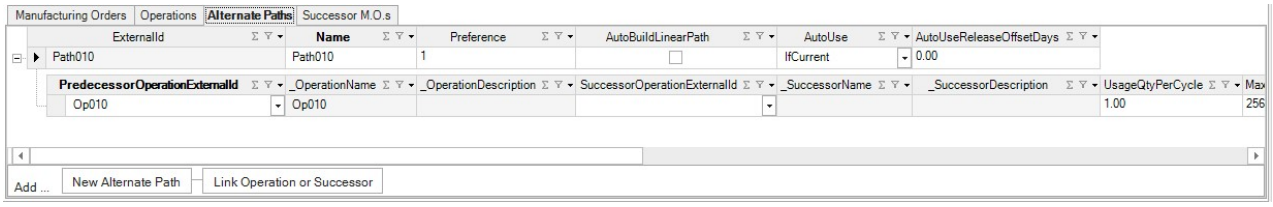
Underneath the list of manufacturing orders is the Manufacturing Order Details which contains a list of all the operations for that manufacturing order.



The Operations tab lists all operations, as well as their scheduled status, required finish quantities, and their scheduled start and end dates. It should be noted that all operations across all alternate paths (alternate routings) are listed in the operations list.

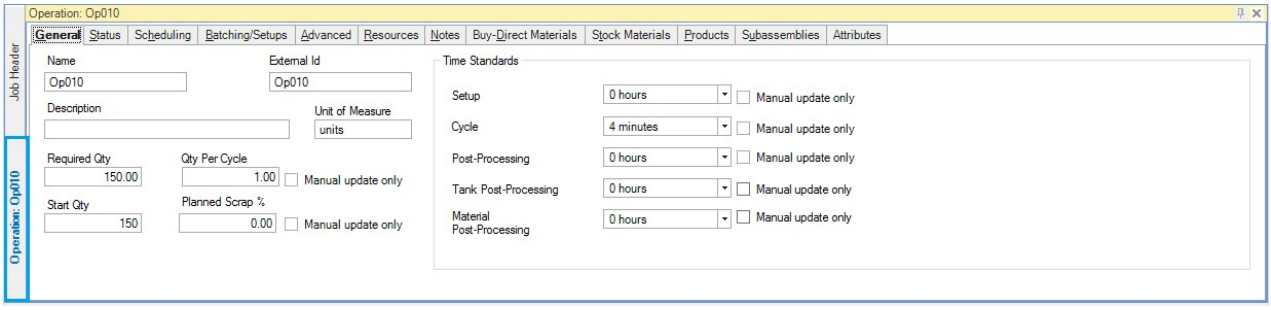


The Alternate Paths tab displays how the operations precede and succeed each other. The Alternate Paths tab also contains information how the different operations can overlap one another.



Operation Header

The operation header contains the information for a single operation in the routing. It is tied directly to the operation selected under the Manufacturing Order Details' Operations tab.



It is separated into the following tabs:

- **General** – contains run rate and setup time information

- **Status** – shows the internal activity and scheduling status and reported good quantities and run rates.
- **Scheduling** – shows scheduling information such as scheduled start and end dates, latest constraint, and number of work hours.
- **Batching/Setups** – contains information regarding batch codes and setup identifiers which will be covered in the next section.
- **Advanced** – contains advanced settings for overlap functionality, successor processing and how the operation deals with scrap, and resizing quantities.
- **Resources** – this contains the resource requirement and required capabilities information.
- **Notes** – this tab allows the user to import or create any notes that he or she would like regarding the operation. For example, it may note a material substitution or special instructions for the operation.
- **Buy-Direct Materials** – This tab is for items that are being purchased specifically for this operation. These purchases are not reflected in the Inventory Objects' Purchase Orders.
- **Stock Materials** – contains a list of the required materials and quantities for the completion of the order. Typically this is the BOM, which is compiled on the first operation. However, if the BOM is split among several operations with WIP or other state changes, the BOM may appear at different levels on different operations.
- **Products** – contains a list of products, byproducts and output quantities for the operation.
- **Subassemblies** – contains a list of subassemblies used in the operation.
- **Attributes** – contains a list of attribute numbers and codes most often used to determine setup times.

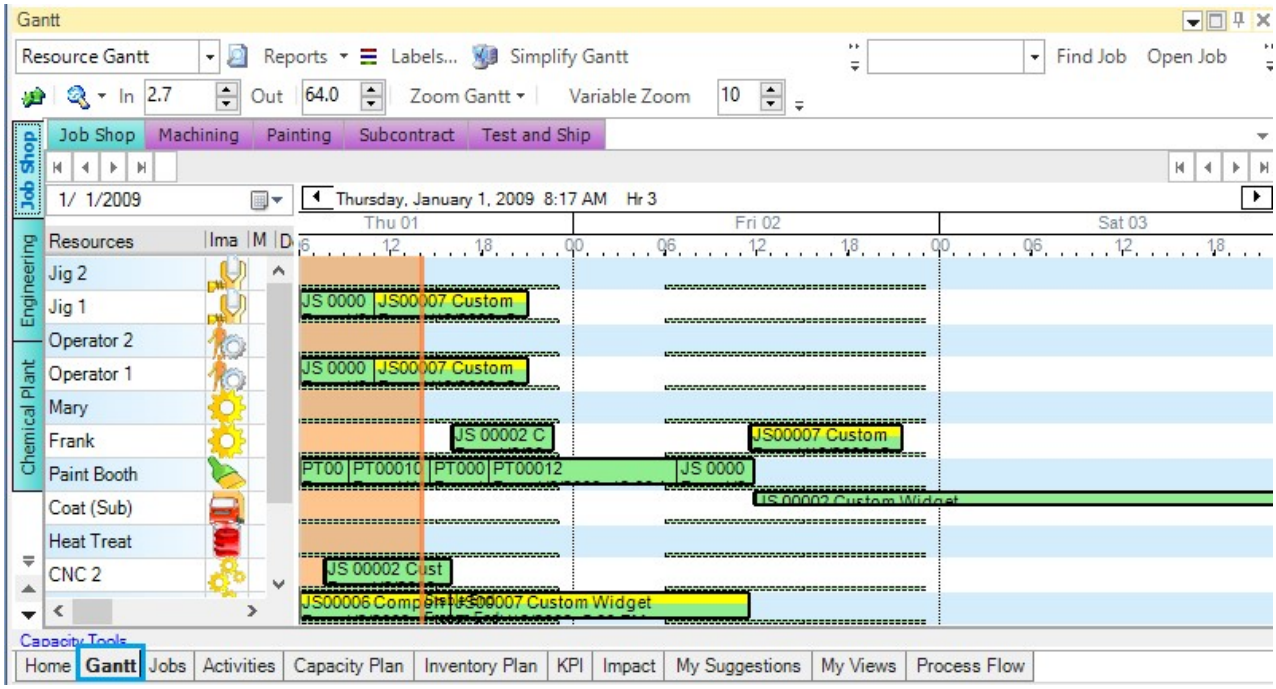
Making Manual Scheduling Changes

At this point, information has been imported into PlanetTogether, the Jobs View has been customized, and we've taken a closer look at things like the job dialog and setup times. The time has come to be able to move the newly imported jobs onto the schedule and manually sequence them to create the schedule.

This section will focus primarily on the different methods of manually making schedule changes. As most manual changes occur on the Gantt, the Gantt is where the section will begin.

Understanding the Gantt

The Gantt view displays a list of all plants, departments and resources, shown below:



Additionally, to the right of the resources is the timeline that can be changed to suit what amount of time the user needs to be able to see at a glance.

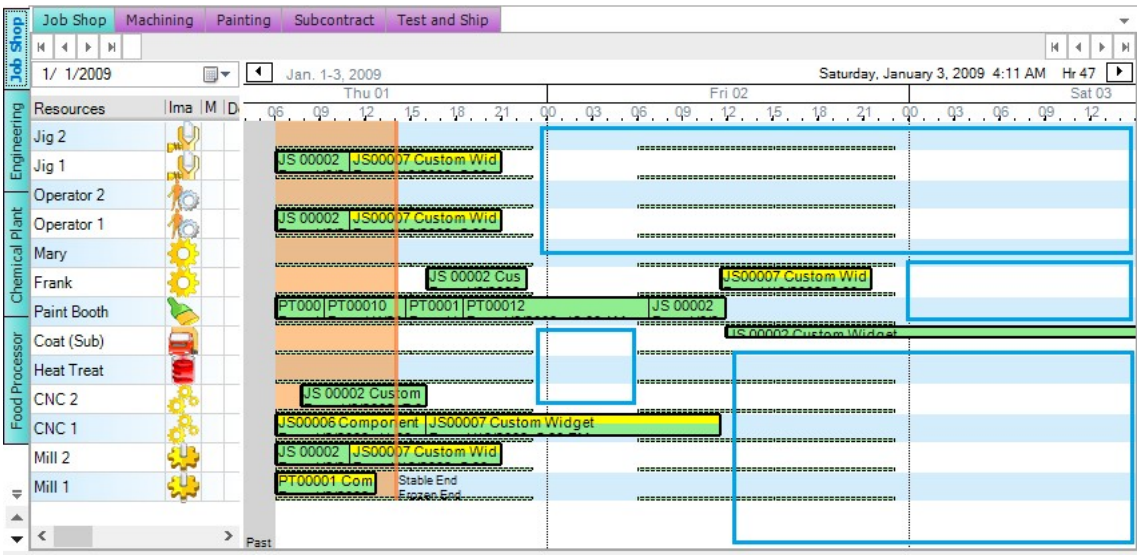
Changing the Time Window

To resize the time window:

1. Left-click and hold on the timeline
2. Drag in either direction
    a. Drag to the right to zoom out and see more time at a glance.
    b. Drag to the left in order to zoom in and see less time at a glance.
3. Release the left-click.

To keep the **amount** of time static and change what days you're looking at:

1. Left-click and hold on blank space on the Gantt



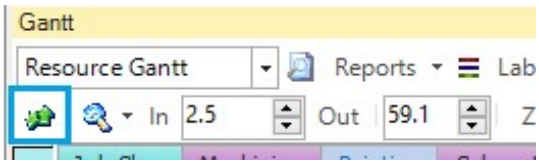
2. Drag in either direction
    a. Drag to the right to see past days and weeks
    b. Drag to the left to see future days and weeks.

Hint: A good way to remember which way to drag would be to imagine flipping pages in a book. Turning the page to the left advances you through the book, turning pages to the right regresses you through the book.

Other Zooming Options

Notice the second line of options below the orange line. These options allow you to further refine the sizing and time span that displays on the screen.

The green icon on the left will adjust the Gantt to fit the screen. This is particularly useful if you are using a large monitor. You can zoom in or out.



The number of days and or hours displayed can be adjusted by selecting the drop down box, or you can display *week (*7 days) or *month* (31 days) from the beginning of the APS clock. The Now and Today options are based on the PC clock, so if the APS clock is set for Thursday Sept 24

8:00am and the current date and time is Friday Sept 25, 10:00am, selecting now will display Friday 10:00am. Selecting *"Today"* will display the beginning of the day for Friday.

Labels

Every block on the Gantt is color coded purposefully. The label option allows you to add multiple layers (segments) to the activity block. For example, you may want to look at set up process, in addition to the

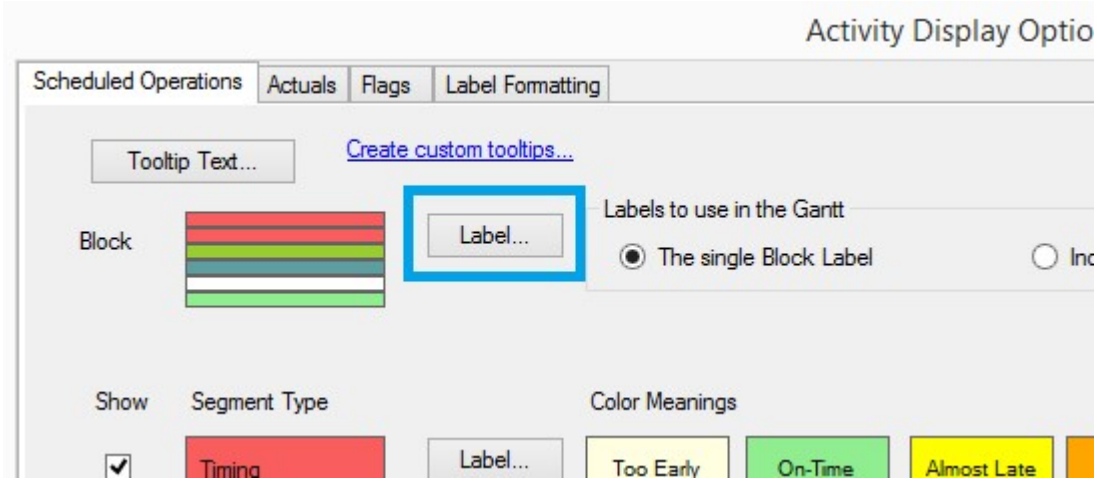
timing segment. By checking **Process**, you will see two bars on the activity block, allowing you to see how schedule changes impact not only the timing of the job, but set-up, run, and post-processing times as well. The colors are not customizable; you can modify the label content (below).

Timing Definitions:

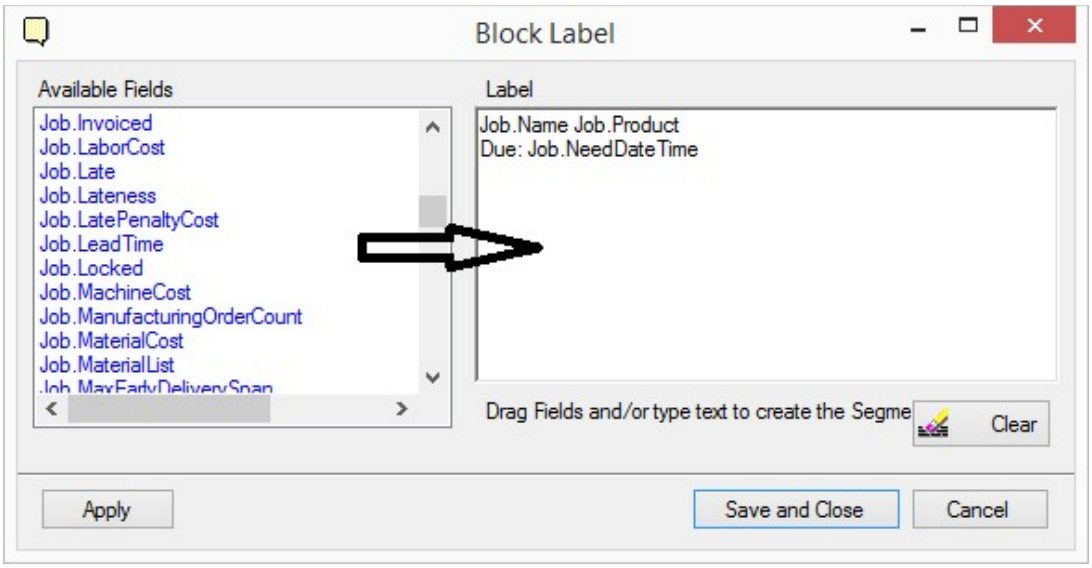
- White: An operation that is too early; it starts too far ahead of its JIT start date.
- Yellow: An operation that is still on time, but is coming closer and closer to its JIT start date. These are operations that are typically more affected when unplanned scheduling changes occur.
- Green: An operation that is comfortably on time.
- Orange: An operation that is late, but is late because of a preceding operation being late.
- Red: An operation that is a capacity bottleneck, signifying that the operation is not starting early enough to complete on time and as a result, is causing all downstream operations to run late.

You can customize the content that appears on the activity blocks and tooltips when you mouse over the activity.

1. Select the label option for the entire block (at the top) and scroll through the data fields.



2. Drag the fields that you want to display to the right-hand side.

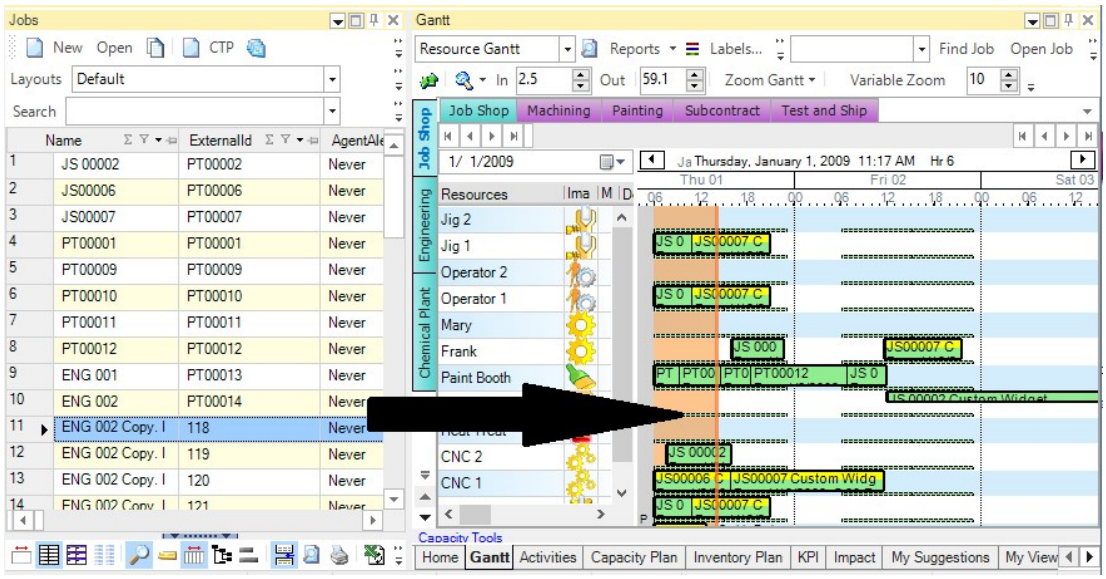


3. Use your mouse to position the fields where you want them.
4. You can type content and then add the variable field information.
5. Apply, save, and close.

Drag-and-Drop

Drag-and-Drop is the simplest, most intuitive way to change the sequence of orders on a given resource.

1. Click on the Jobs View
2. Highlight the row pertaining to all work orders that need to be scheduled
3. Left-click and hold once the necessary rows have been highlighted 4. Drag over the Gantt View

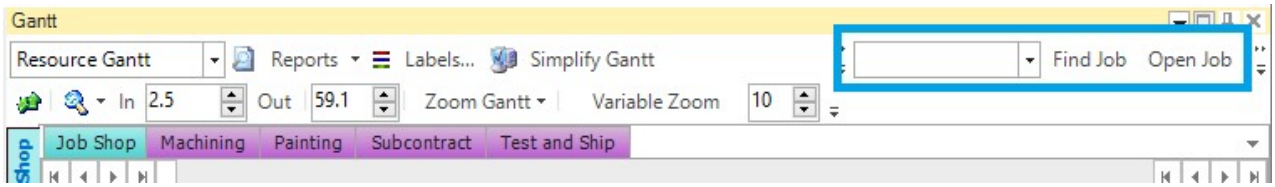


5. Release the left-click in the blank space next to the resource list.

This will schedule the highlighted orders onto the Gantt. Checking the Jobs View again will show that the selected jobs should now have legitimate scheduled start and end days.

Finding Jobs

Once work orders have been scheduled, it can be difficult to locate them at a glance. Fortunately, there is an easy way to look up work orders that are scheduled.



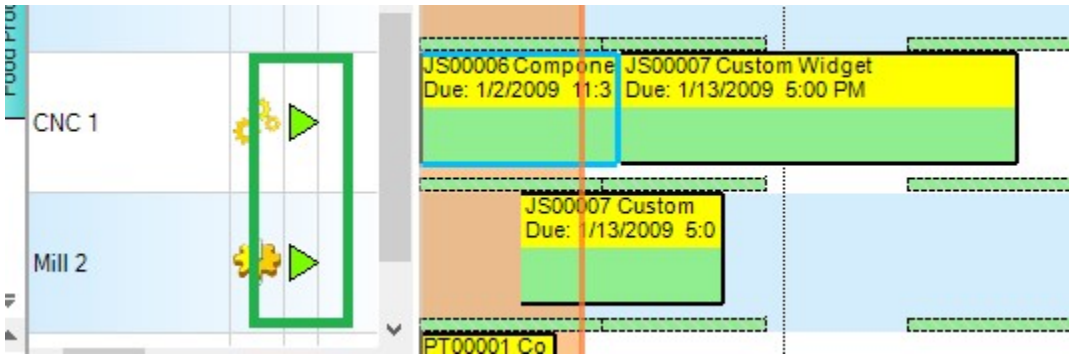
1. Type the name of the work order in the field
2. Left-click “Find” OR
3. Press Enter

The Gantt will automatically move to put the order in question at the very top left-hand corner and will flash yellow to alert the user which activity it is.

Changing the Sequence of Orders

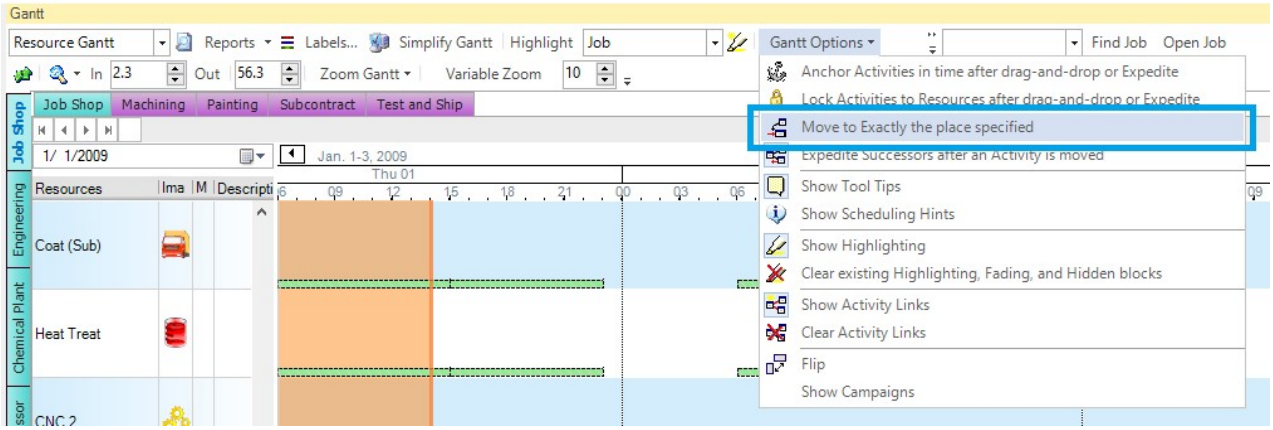
The initial drag-and-drop of orders onto the Gantt will most likely not create a valid schedule. The scheduler will now need to change the sequence of orders or move orders onto different resources.

1. Left-click the activity that you'd like to move.
2. Note that a green triangle will appear next to certain resources. This marks the resources as eligible to perform the work needed on the activity.



3. Left-Click the activity and hold.
4. Drag it to the position and resource where you'd like to run the activity.
5. Release the left-click.

There may be times where the activity moved does not go exactly to the place specified. This is purposeful and controlled by a setting on the Gantt view.

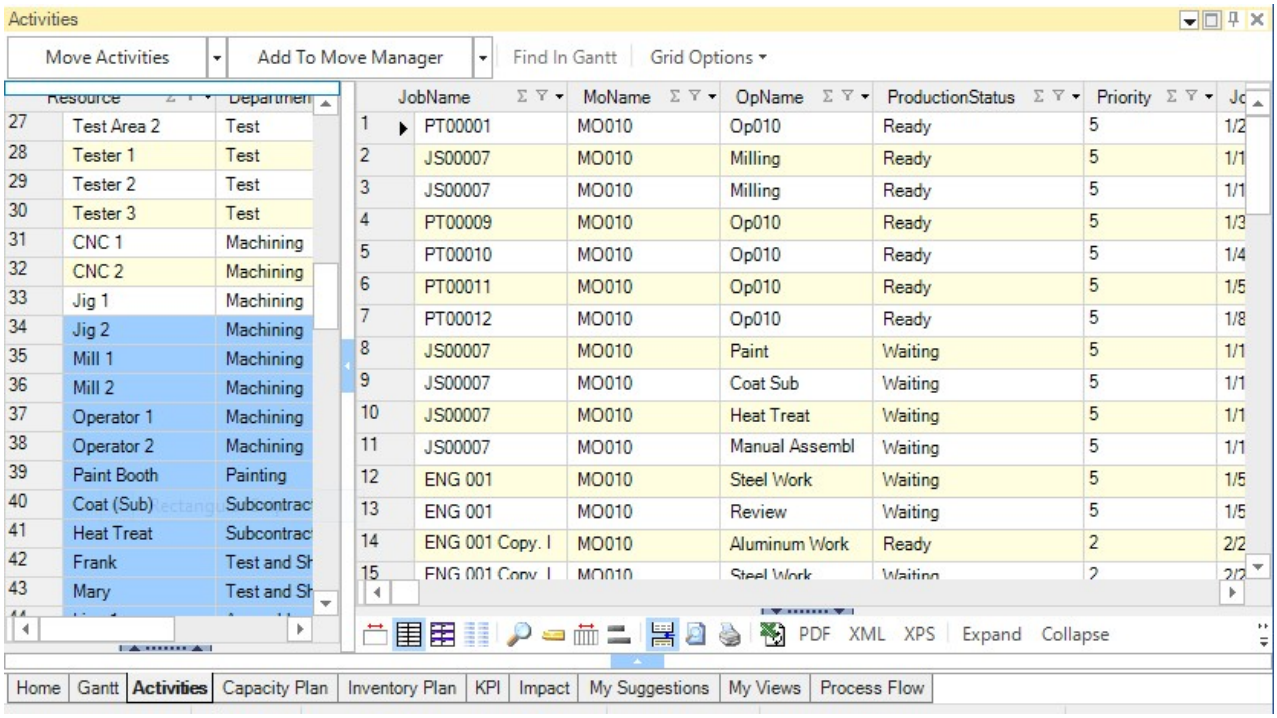


Move Exactly to the Place Specified: Turning this feature on will force every activity moved to settle exactly where the block is dropped, regardless if there is already another activity scheduled at that time. The resulting schedule will place the dropped activity where the cursor sits and push out any existing order to start after the moved activity.

If this not turned on, moving an activity on top of another currently scheduled activity will behave differently. If the start of the moving activity (marked as the front of the block) moves before the start of the already scheduled activity, the moving activity will be placed right in front of the scheduled activity, which will push out to start at the end of the moving activity.

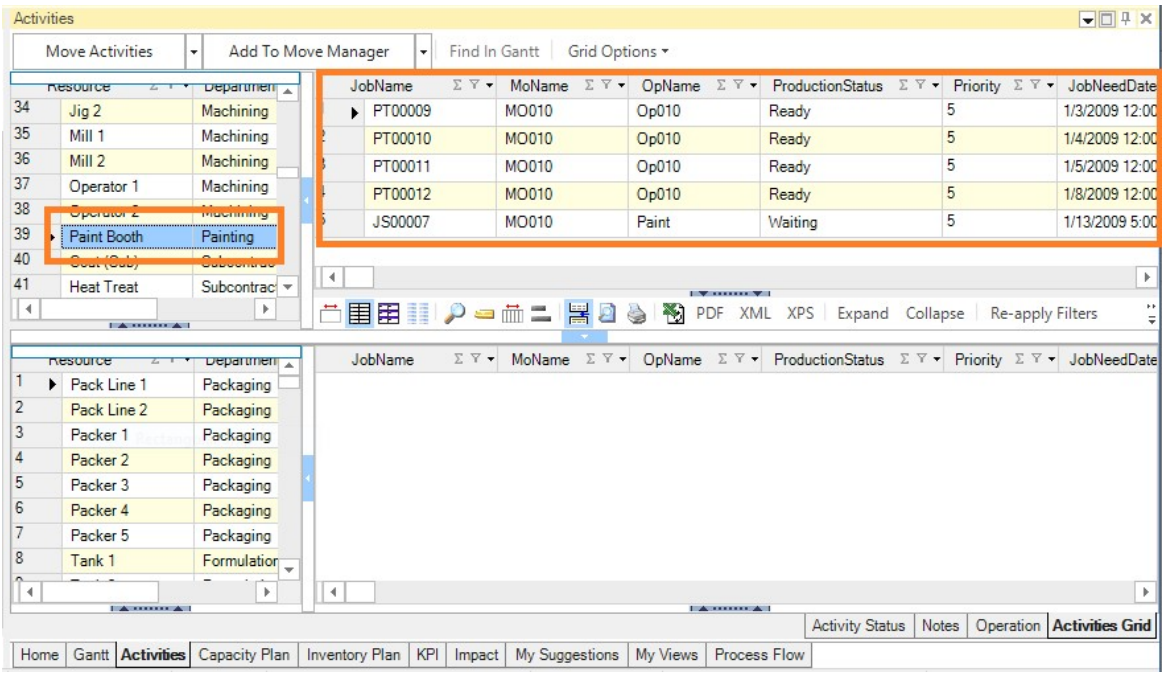
Activity Grid

Another way to move work orders besides via drag-and-drop is with the Activity Grid. This displays the same information on the Gantt, but in a tabular format. This is particularly helpful when expediting a future job earlier in the schedule. Instead of dragging and dropping the work order across months, the Activity Grid will allow us to expedite the order with a few clicks of a button.



1. Left-click on the “Activities” Grid

2. Left-click on a Resource in the upper left-hand of the screen to display the list of activities that are scheduled to run on that resource.



3. (Optional) Left-click on a resource in the bottom left-hand of the screen to display a list of activities scheduled to run on that resource.
4. Move the activity (or multiple activities) with one of the following:
    a. Left-click and hold the work order.
        i. Drop the order on another order to place it just before that order.
    b. Right-click and hold the work order
        i. Drop the order on another order to place it just after that order.

The user can move an order either onto the same resource at a different time, or drag it to the other resource displayed in Step 3.

One of the three following colors will highlight the order once the move has been attempted:

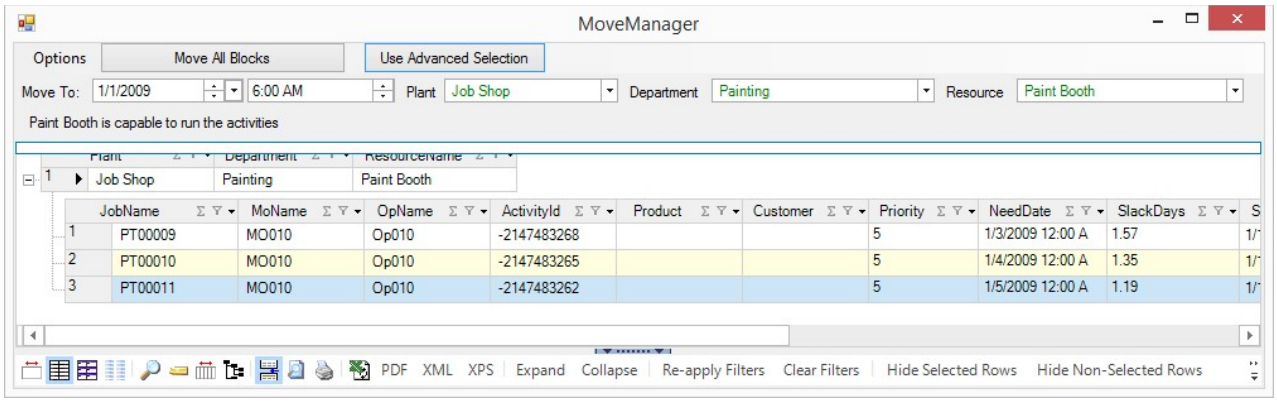
- Green: The activity moved correctly and exactly to the place desired
- Orange: The activity moved but not exactly to the place specified. This could be due to predecessor operation constraints or some other factor. - Red: The activity failed to move at all.

Move Manager

Activities can be added to the Move Manager. This is better used when moving a group of activities that must be moved together.

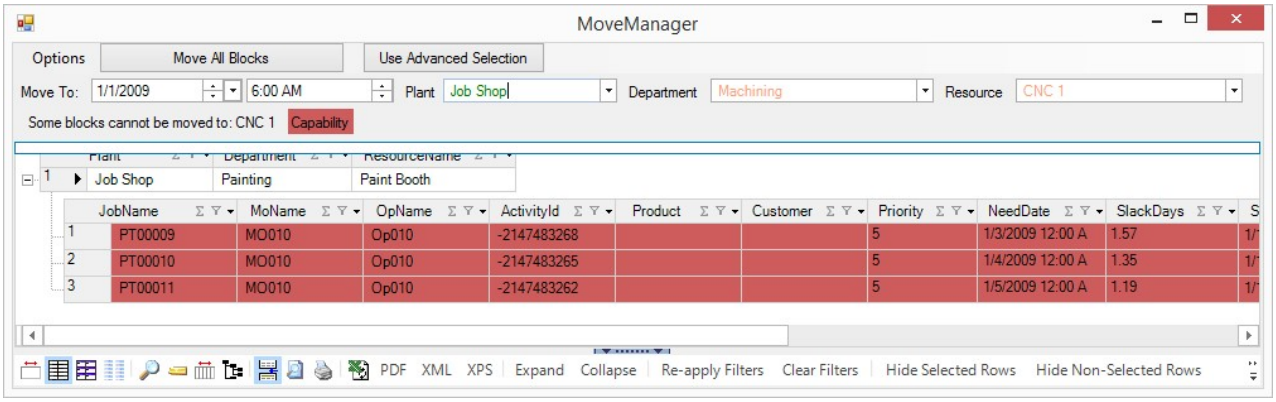
1. Select the activities to add to the Move Manager
2. Left-click “Add to Move Manager”

A popup will be displayed with the orders added to the Move Manager.



3. Specify what day and time to move the block of activities
4. Specify the Plant, Department and Resource to move the block of activities to

Some Resources may appear Red; this means that the resource is not eligible to handle the entire block of activities. It may be that it's not eligible for *any* of the activities, or simply that there exists an activity that it is ineligible for.



The activities themselves will appear with the following colors:

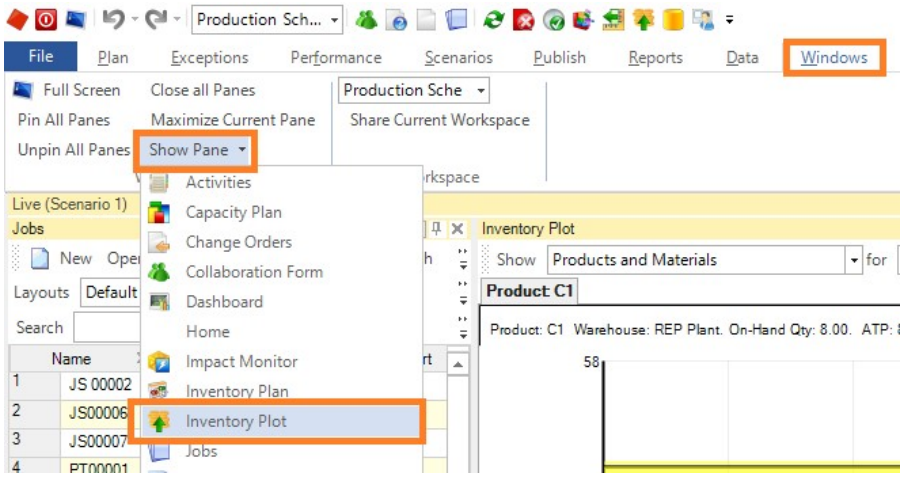
- Green: The activity will move correctly and exactly to the place desired
- Orange: The activity will move but not exactly to the place specified. This could be due to predecessor operation constraints or some other factor.
- Red: The activity will fail to move at all.

Inventory Plot

Other information is also readily available from the Gantt, such as the products and materials that are relevant to the selected work order. This can be seen through using the Inventory Plot, of which there are two ways to access:

Split Screen

1. Click the Inventory Plot button on the Quick-Access Toolbar



2. Left-Click on the work order for which you want to see the material and product information for

This will split the screen in two, typically with the Inventory Plot above the rest of the Gantt chart. This allows the plot to automatically update whenever a new work order is clicked and is very helpful when quickly examining a number of jobs for the inventory information.

Specific Job

1. Right-click the operation
2. Left-click on “Inventory Plot”

This is will create a popup that contains the exact same information as the Inventory Plot option above, but is specific to just the operation that you selected. This is useful when you are concerned with a single work order or a few work orders.

Compressing the Schedule

After all the initial schedule has been created, the last thing to be done is to compress the schedule. This function only removes the gaps between activities that may have resulted from less-than-precise dragging and dropping.

1. Left-Click on “Options”
2. On the dropdown “Compress Activities Currently Start Before”, select “Beginning of the Schedule”
3. Left-Click “Compress, Save and Close”

As you can see, there are quite a number of ways to accomplish many of the same tasks when creating a schedule. Remember that not all ways will be used all the time; the purpose of the above section is to provide insight on how the schedule can be created using PlanetTogether's features and functions.

Updating the Schedule

Once a schedule has been created, it must be updated with new information so that schedulers can react to changes on the shop floor and, if necessary, change the schedule in order to accommodate those changes.

Much of the steps are identical to how the schedule was created to begin with, but this time in a different context.

Refreshing the Planning Data

Triggering the Refresh does more than bring in new work orders and resources (if applicable). The Refresh updates ALL planning data, including production counts for the different work orders, updated inventory information, and changes to the work orders that are flowing down through the ERP.

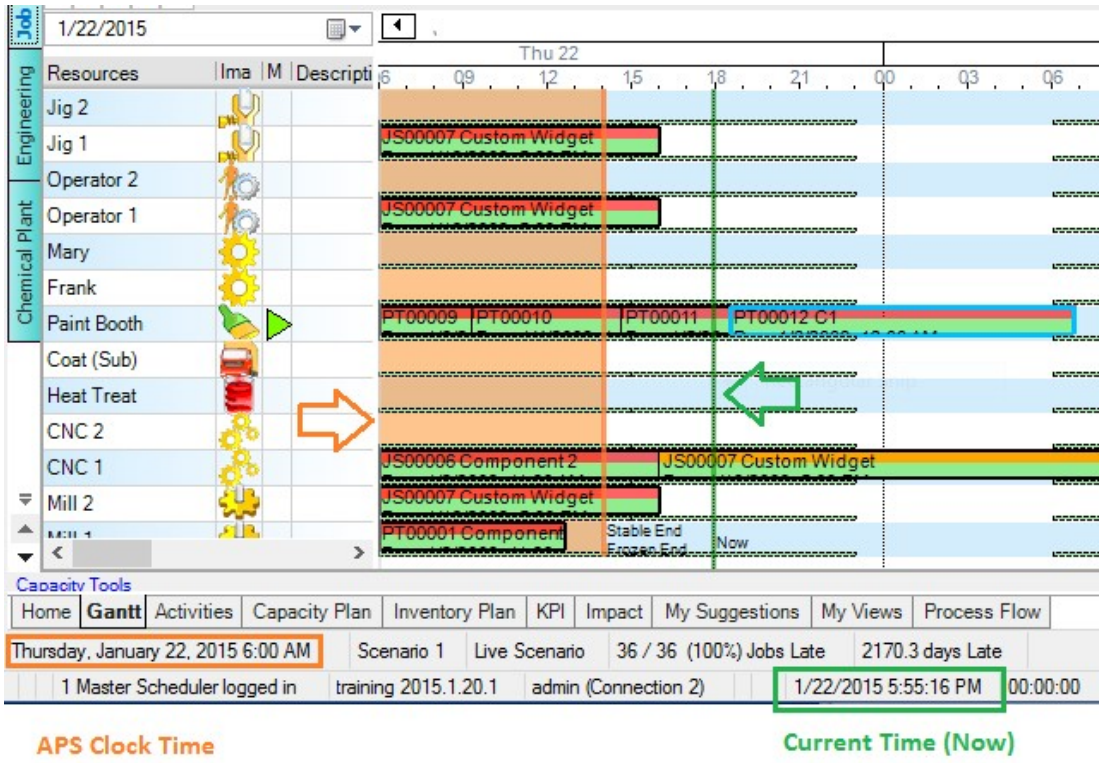
Functionally, using the Refresh is the same in updating the schedule as it is in creating it for the first time.

Advancing the Clock

PlanetTogether functions using *two* clocks. The APS Clock starts at the beginning of the schedule and is stationary unless triggered by a user action or by an automated task. The second clock is the PC clock which reflects the local time and advances in real time. The two clocks are used in order to accommodate situations where job progress is not being recorded and entered into the ERP in real-time.

Functionally, what does this mean for the end user? It means that there can be a gap of time where the clocks are out of sync. For example, if the local time says that it's at 12:00pm PST, but the APS clock has not been advanced, it will still say that the start of the schedule is 8:00am PST, four hours earlier.

The Advance of the Clock is dependent on the Refresh. In the above example, all jobs scheduled to be finished before 12:00pm PST should already be done. If the Refresh does not occur or if the production counts have not been entered into the ERP, advancing the clock will yield errors.



Because the work orders will not have been updated, orders set to be finished by 12:00pm PST will act as if nothing has been done and will push the entire schedule out four hours. The result is that those orders will appear to be late when in fact they are finished. The effect on the downstream operations will also cascade, making the entire schedule appear late when it may in fact be running according to plan.

Two helpful guidelines:

1. Determine when progress gets updated in the ERP
2. ALWAYS refresh before advancing the clock.

Once we are sure that the above has been taken into consideration,

1. Left-click on the Plan tab 2.
   Left-Click one of the following:

Advance the Clock to Today: this option advances the clock to the same APS clock time on the current day. If the clock was set to 8:00am and we advance the clock to today, it will be set to 8:00 am of the current day.

Advance the Clock to Now: this option will advance the clock to match the current PC clock.

Options: This allows the user to define exactly what time and what day to advance the clock to.

Once the schedule has been refreshed and advanced, the schedule as it stands is as up to date as possible. From here, changes to the schedule may need to be made depending on how the new and updated information for the plan affects the schedule.

Capacity Plan

The capacity plan is a graphical interface that can be used for short term and long range capacity planning. It allows you to view work center and resource capacity by different time periods and by different measure such as available capacity, scheduled usage, by product, etc.

It is broken down into a number of dropdowns that will help us determine how we are looking at capacity.

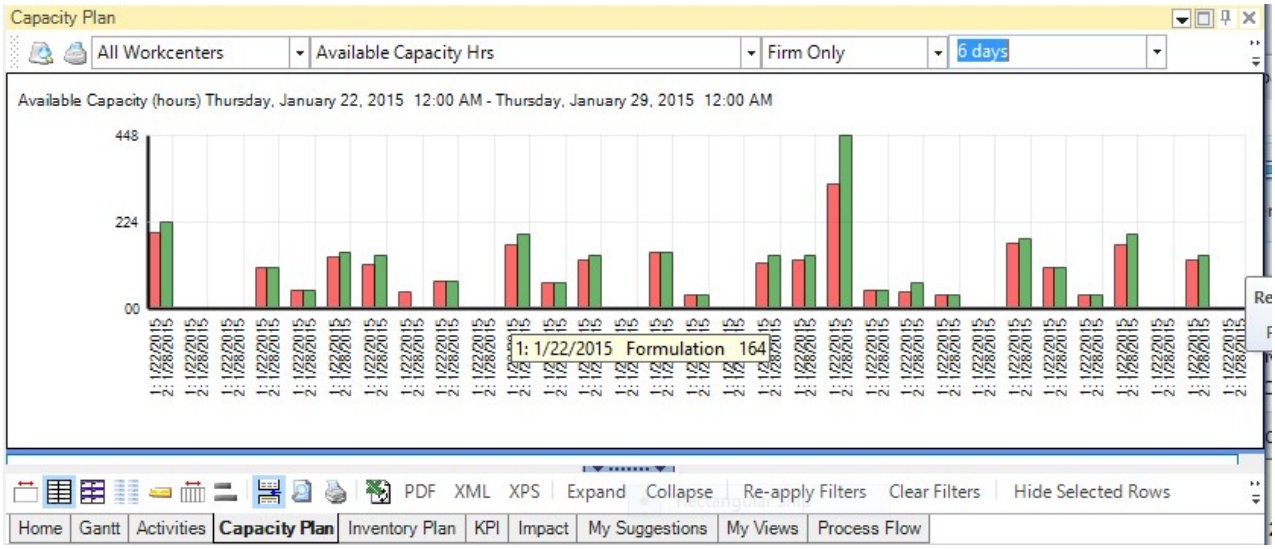
From left to right:

- 1st dropdown: Changes what resources to display for the capacity plan ○ Resources in Gantt – Shows only the resources currently being displayed in the Gantt ○ All Resources – Shows all of the resources across all departments and all plants.
    - Workcenters in Gantt – Shows the department currently being displayed in the Gantt. Information is displayed at the department level.
    - All Workcenters – Shows the capacity for all departments across all plants.
    - All Plants – Shows the capacity at the plant level for all plants.
- 2nd dropdown: This changes how capacity is displayed.
    - Available Capacity Hrs – This is the number of hours available on the resource; availability means the difference between the number of raw hours available versus the amount of work scheduled on the resource or department. ○ Scheduled Usage Hrs – This is the opposite of the above and shows how many hours of work has been scheduled to the resource or department.
    - Available Capacity % -- This displays the amount of available capacity on the resource or department as a percentage. ○ Scheduled Usage % -- This displays the amount of scheduled work on the resource or department as a percentage.

*** Note: There are many more ways to display capacity, but the above four are by far the most commonly selected ways.*

- 3rd dropdown: This determines what work order statuses are being considered as affecting capacity.
    - All Jobs – This shows the capacity information if all jobs are being considered, irrespective of work order status.
    - Released Only – This shows the capacity information if only released orders are being considered. ○ Firm Only – This shows the capacity information if only firmed orders are being considered.

- 4rth dropdown: This determines the bucket length for capacity. For example, weekly capacity versus monthly capacity comparisons. This dropdown has a number of options, but the user can actually type in the bucket length if a custom bucket length is required.
- 5th dropdown: This determines the chart type on the top portion of the screen.



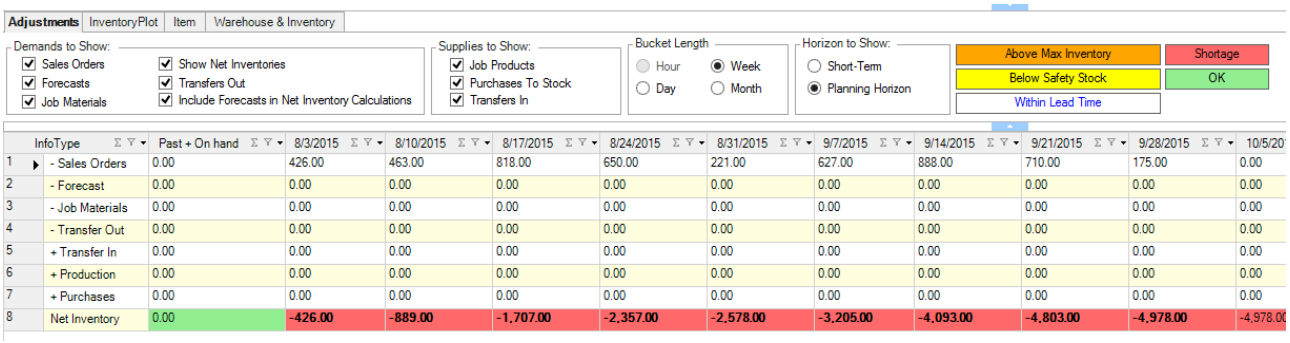
Controlling the Number of Buckets

It is important to know that the number of buckets displayed in the capacity plan is tied to how much time is being displayed on the Gantt. For example, if a month was showing on the Gantt, then there would be four or five weekly buckets for each resource or department. If a week or less than that was displayed, only one week would appear on the Capacity Plan.

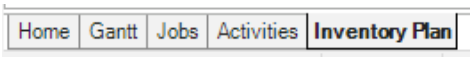
Inventory Plan

Beyond capacity constraints, material and inventory are also important to consider when we are updating or potentially changing the schedule. Select the **Inventory Plan** tab located at the bottom of the screen. If the tab does not appear you can open the view using the navigation ribbon: From the **Plan** tab choose the *Inventory Plan* option located in the View Results Section of the ribbon.

. The information shown below will display.



	InfoType	Past + On hand	8/3/2015	8/10/2015	8/17/2015	8/24/2015	8/31/2015	9/7/2015	9/14/2015	9/21/2015	9/28/2015	10/5/20
1	- Sales Orders	0.00	426.00	463.00	818.00	650.00	221.00	627.00	888.00	710.00	175.00	0.00
2	- Forecast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	- Job Materials	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	- Transfer Out	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	+ Transfer In	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	+ Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	+ Purchases	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Net Inventory	0.00	-426.00	-889.00	-1,707.00	-2,357.00	-2,578.00	-3,205.00	-4,093.00	-4,803.00	-4,978.00	-4,978.0

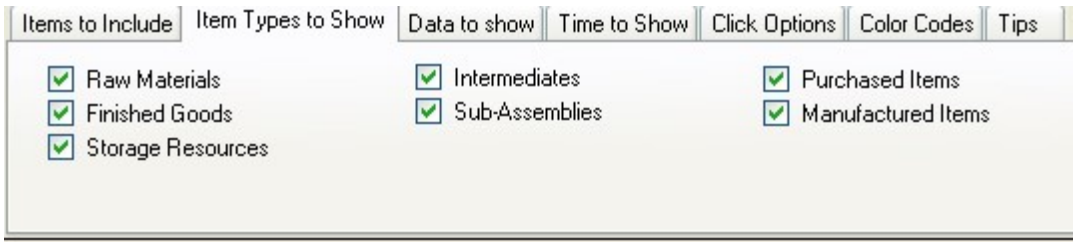


The Inventory Plan displays the supply and demand information for the items you want to manage. This view is useful in determining potential material shortages so that you can take action before it becomes a problem.

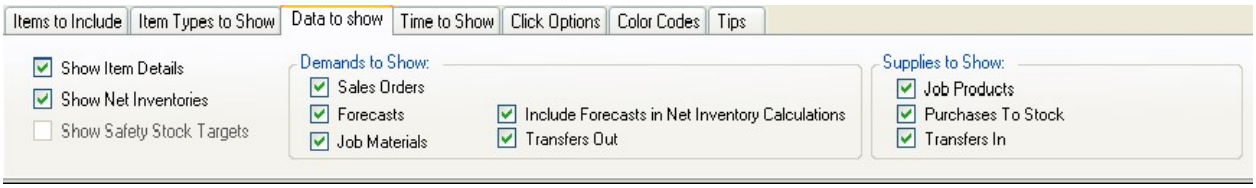
Similar to the Jobs view and Impact view, you can rearrange, sort and filter on the columns of information presented in the view. Click on the + to expand the rows for the selected item. The above example shows the supply and demand information by week for component 2, including Sales Orders, Forecasts, Job Materials, Transfers, Purchases and Net Inventory.

You can choose the types of items, data and time periods by checking the applicable options on the tabs, as shown below:

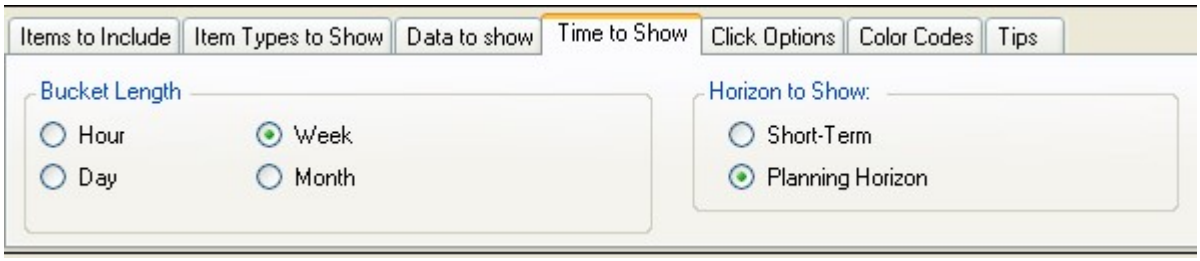
Item Types to Show



Data to Show



Time to Show



Click Options

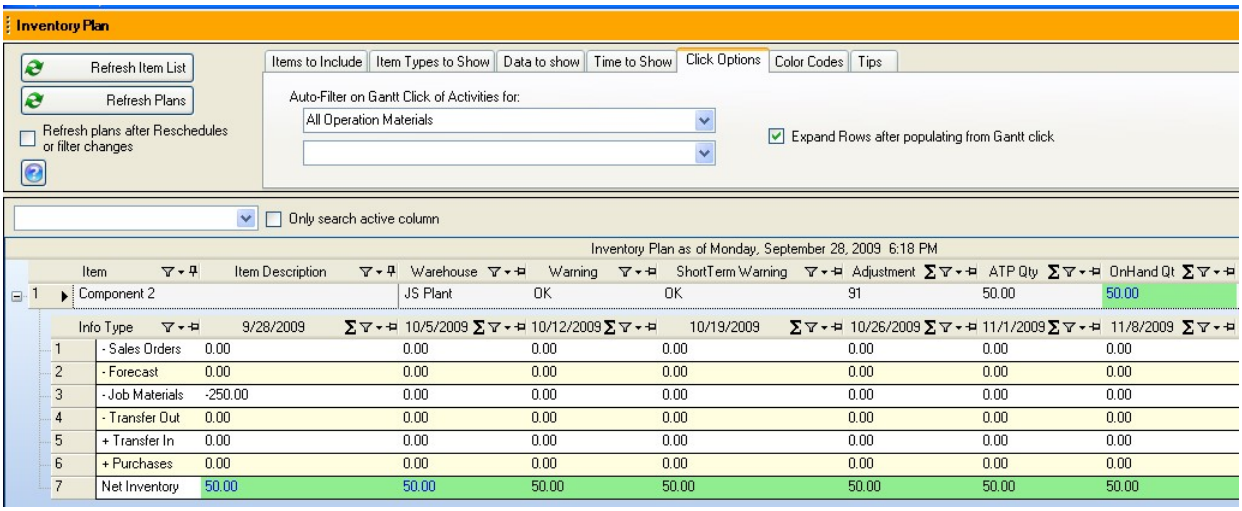
Click options allow you to use the Gantt chart to click on a scheduled activity and then view the corresponding inventory plans. This option is helpful when you want to further analyze a material shortage highlighted on the Gantt by the color purple. (If using a large screen you might find it convenient to rearrange the windows so the Gantt and Inventory Plan are visible simultaneously.)

1. From the inventory plan choose the **Click Options** tab. Select one of the following filter options:

   - **All operation materials** – will display all materials required for the selected operation
   - **All manufacturing order materials** – will display materials needed in all operations for the selected manufacturing order
   - **Operation materials that are not planned** – will display materials with no planned supply for the selected operation (i.e. for material requirements being supplied by standard lead-time).
   - **Manufacturing order materials that are not planned** - will display any materials with no planned supply for the selected manufacturing order

2. Display the Gantt and click on the activity block highlighting the material shortage

3. Display the Inventory Plan, the inventory information will display for the items that correspond to the operation clicked in the Gantt.



In the above example: The operation that was clicked in the Gantt view required 1 material (Component 2). Checking the option '*Expand rows after populating from Gantt click'* automatically displayed the supply and demand information as the operation is clicked in the Gantt to save you from having to expand the row manually.

Rescheduling Jobs

You can reschedule Jobs by dragging and dropping values in the "Production" row of the Inventory Plan (shown for Manufactured Items only). In order to reschedule, you must have rescheduling permissions. To see which Jobs are producing in a given interval, double-click the Production row for that interval.

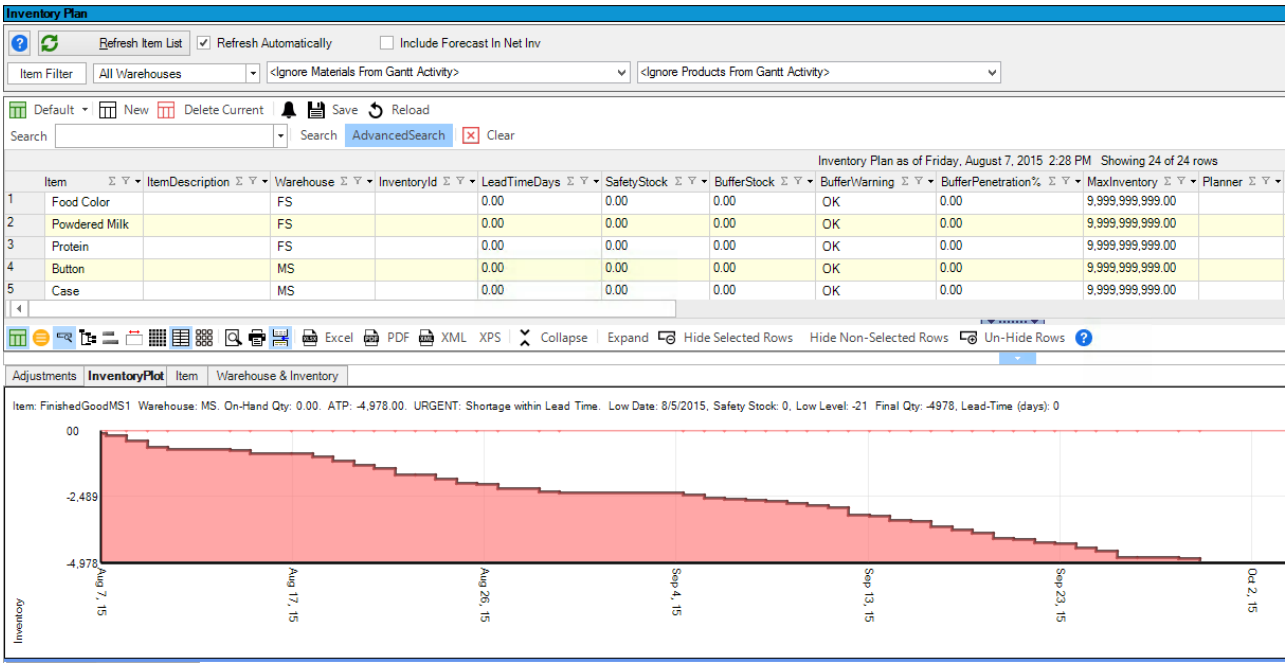
Editing Forecasts

You can also edit your Forecasts by double clicking the Forecast cells. This capability requires User permission to maintain Forecasts. Note that to see the impact on the Net Inventory row after making changes you need to click the **Refresh Plans** button or have the **Refresh Plans after reschedules** checkbox checked.

Inventory Plot

The Inventory Plot is extremely helpful for a planner to see the timing of things like Purchase Order receipts and Sales Order demands in conjunction with the work orders that require the material or supply the finished good, respectively.

While the 'Plotted Values' tab gives summary information for the inventory item as a whole, the 'Inventory Details' provides line by line supply and demand information along with the time those supplies and demands are due.



What-If Scenarios

Once we've checked both the capacity and inventory plans, it's important for us to be able to understand the effects of our schedule changes without potentially risking the live schedule. For this reason, What-If Scenarios can be created to test schedule changes before committing to them.

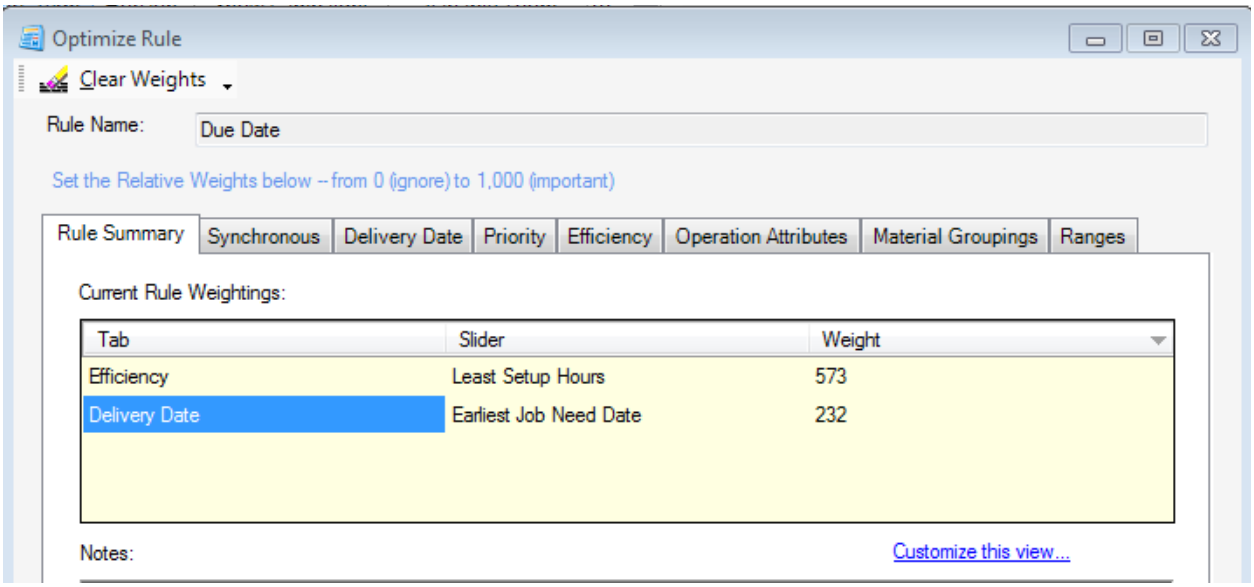
Choose the **What-If** tab on the navigation ribbon and select **New What-If Scenario**. It is easy to tell when you are working in a simulated environment as the Gantt chart is clearly marked. The same options are available in the 'what-if' scenario for manually adjusting the schedule, adding capacity, expediting jobs, moving jobs, placing job on hold, etc.

What-If scenarios provide a safe place for planners to experiment with the schedule without impacting the live schedule. You can have any number of What-If scenarios as your server has RAM to cover the increased memory cost.

Experimenting with Optimization Rules

One advantage of working in a what-if environment is the ability to experiment with different optimization rules to determine how the schedule will be impacted in order to meet certain organizational objectives such as reducing set up time or meeting profit objectives.

Rule Summary



Rules are grouped into one of the seven tabs (shown above). The tabs allow you to place a relative weight on multiple factors within each category. The relative weights are summarized on the *Rule Summary Tab*. In the example above, more weight is placed on efficiency than delivery date.

Note that the weight is *relative* meaning that not only is Efficiency a greater priority than Delivery Date, it is almost 3.5x greater in priority than the delivery date.

Synchronous

This tab is where optimize rules regarding the theory of constraints can be found.

Note: The synchronous manufacturing rules are typically used during a synchronize implementation and not before.

- **Highest Throughput**: Throughput is a value that can be imported. This rule will emphasize the activities with the highest throughput values

- **Highest Throughput per Drum Hour**: Takes an average of throughput her hour required on the drum resource. The activities that have the highest throughput per hour on the drum resource will be weighted more heavily

- **Highest Buffer Penetration**: The activity suffering the greatest penetration into its nearest buffer will be weighted more heavily.

- **Least Drum Hours:** This will cause the activities with the shortest run times required on the

drum resource to be weighted more heavily

Delivery Date

This tab contains the optimize rules that pertain to the various due dates that are tracked in Galaxy.

- **Earliest Job Need Date:** Activities whose Job Need Date are earlier are weighted more heavily
- **Earliest MO Need Date:** Activities whose Manufacturing Order Need dates are earlier are weighted more heavily. The MO Need Date is usually inherited from the Job level but can also be imported separately if need be.
- **Earliest Opn Need Date:** Activities whose Operations Need Dates are earlier are weighted more heavily. The Opn need date is normally calculated relative to the start dates of successor operations, but can also be imported separately if need be.
- **Earliest JIT Start Date**: The activities whose JIT start dates are earlier are weighted more heavily. JIT is calculated as the latest an operation can be scheduled and still be made on time.
- **Highest Late Penalty Cost:** The highest late penalty cost is a value that can be imported at the Job level and signifies the financial penalty incurred by a Job going late.
- **Group by Customer:** At the Job level, this option will increase the chance of orders for the same customer being scheduled together.
- **Critical Ratio:** A comparison between the work content left (hours needed to finish an activity) and the number of days remaining before the activity goes late. Activities with higher critical ratios will be scheduled first.

Priority

The priority tab contains the rules that can use different measures of priority to optimize the schedule.

- **Lowest Priority Nbr:** The priority number is a value that can be imported at the Job level. Lower priority numbers represent higher priority Jobs.

- **Hot:** The Hot flag is a value at the Job level and will be weighted more heavily if this option is selected.

- **Firm:** Firm orders are weighted more heavily as compared to planned orders or estimated orders.

- **Highest Profit:** The profit value is calculated using the Job revenue versus the operating expenses for this activity. The activities with the highest profit are weighted more heavily during optimization.

- **Highest Revenue:** Revenue is a value that can be imported at the Job level. Jobs with higher revenues are weighted more heavily during optimization.
- **MO In-Process:** Activities belonging to Manufacturing Orders that have already started are weighted more heavily during optimization.
- **Fewest Eligible Resources:** Activities that have the fewest number of eligible resources will be weighted more heavily during the optimization as these represent potential bottleneck operations.

Efficiency

This tab contains optimize rules that are aimed at making the scheduling process more efficient.

- **Least Setup Hours:** This rule will attempt to create a schedule which will minimize setup hours depending on the various ways that setup time is calculated.
- **Group by Setup Code:** If operations have a setup code, optimize will attempt to group together activities where the setup code is the same.
- **Least Run Hours:** This will attempt to maximize throughput on the resource by scheduling the shorter activities first.
- **Most Days in Queue**: This will give higher priority to the operations that have been in the system for longer. This is useful in the case where orders continually get pushed out by other activities that are deemed more important. After enough time passes, these Jobs will be given higher and higher priority in the optimization process.
- **Nearest Setup Nbr:** If an operation has a setup number associated with it, the optimizer will try to schedule an operation behind it with the closest setup number, whether it is higher or lower than its predecessor. This is true even when there are other orders with the same setup number.
- **Nearest Higher Setup Nbr:** Similar to above, this will attempt to sequence orders by increasing setup numbers
- **Nearest Lower Setup Nbr:** Similar to above, this will attempt to sequence orders by decreasing dsetup numbers.
- **Nearest Saw-tooth Setup Nbr:** Unlike the above, it will attempt to schedule in a higher-lower-higher fashion during optimize based again on the setup numbers.
- **Group by MO Product Name:** This optimization rule will attempt to sequence orders together that share the same product name at the Manufacturing Order level.

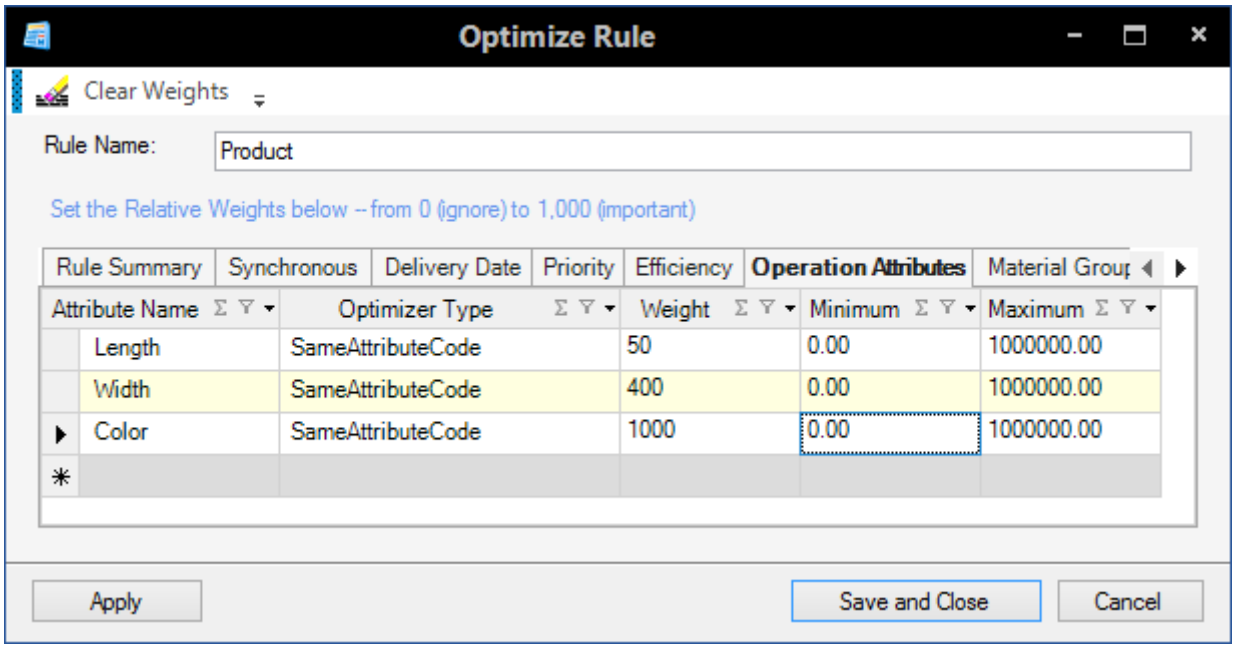
- **Group by MO Product Description:** This optimization rule will attempt to sequence orders together that share the same product description at the Manufacturing Order Level.

Operation Attributes

Operation Attributes are where the implementation of Galaxy can be more specific to individual manufacturers. Attributes can be any characteristic of the products being produced that can affect scheduling. For example:

- Color
- Height
- Width
- Type of Material

Unlike the built-in rules that are common to every installation of Galaxy, the weight value in the Operation Attributes is typed rather than represented as a slider bar. The weighting, however, functions in precisely the same fashion.



Attribute Name: This is a dropdown menu that allows you to select Attribute Names. You can also type in the Attribute Name manually if so desired.
Optimizer Type: There are several different options in this dropdown menu:

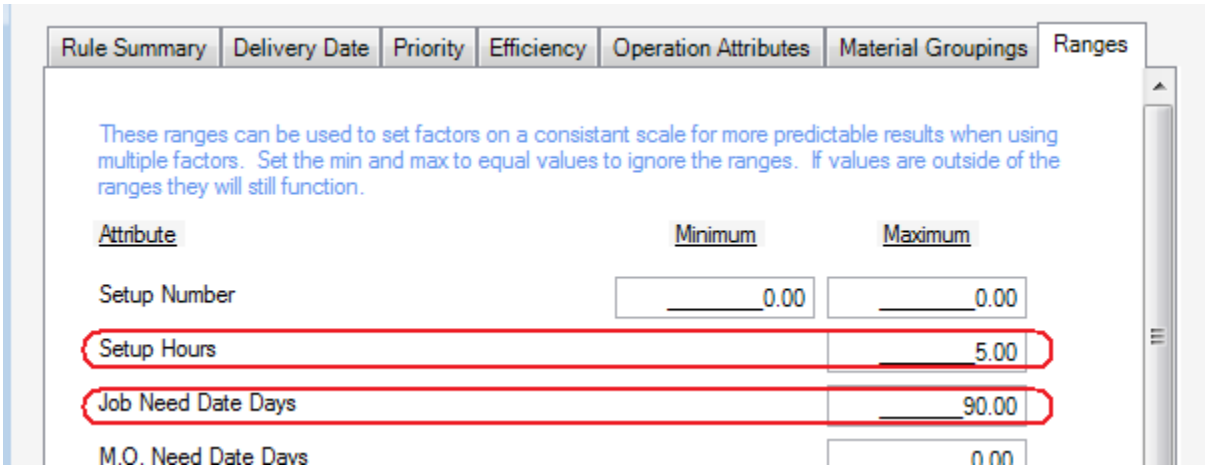
- **Same Attribute** Code: Groups and prioritize Operations that have the same attribute code (i.e. color).

- **Same Attribute Number**: Groups and prioritizes Operations based on having the same Attribute Number (i.e. weight/width)
- **Nearest Attribute Number**: This option will group together Operations with attribute numbers nearest to this attribute number.
- **Nearest Lower Attribute Number**: Prioritizes and Groups together Operations by scheduling the operation with the closest Attribute Number that is lower.
- **Nearest Highest Attribute Number**: The reverse of the above case. Operations closer to the Highest Attribute Number would be prioritized over Jobs requiring a smaller Attribute Number.
- **Sawtooth Attribute Number**: Used when a resource is constantly changing its Attribute Number. Unlike the previous two options, this is dependent also on direction.
    - For example, Op1 handles a width of 3, Op2 a width of 4, and there are two more operations, one with a width of 5 and another with a width of 3, APS will schedule the Operation with the width of 5 first in order to be consistent with the increasing direction.

- **Lowest Attribute Number**: This tells the Optimizer to prioritize operations based on the Lowest Attribute Number.
- **Highest Attribute Number**: This tells the Optimizer to prioritize operations based solely on the Highest Attribute Number.

Ranges

When using multiple types of data in one Optimize rule (such as *dates* in the case of **Earliest Job Need Date** combined with *hours* in the case of **Least Setup Hours**) it can be easier to comprehend their relative weights if you "normalize" their ranges. By doing so, you can more readily see what a slider value on one slider would correspond to on the other slider(s). For example, with the Range values below if you set the Setup Hours slider and the Job Need Date Days slider both to 20% then you would be setting one hour of setup time (20% of 5) as equivalent to 18 days of slack time (20% of 90).



Adjusting the Relative Values

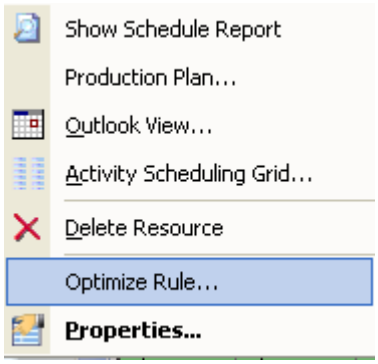
Use the slider bar to weigh each factor on which you want the optimization engine to place a greater importance. The further you slide the bar to the right, the greater the importance. In the example below, Least Setup Hours is set with a moderately high priority

Changing the Rules

The system has been preconfigured with a default rule that applies to all resources. During implementation additional rules can be set up and applied to specific resources. Each resource can have a normal resource rule and an experimental rule. During optimization you can specify which rule you want to apply. There are several ways you can experiment with optimization rules.

1. Change the optimization rule from the Gantt
2. Apply a specific rule using the optimize options

To Change Optimization Rules from the Gantt

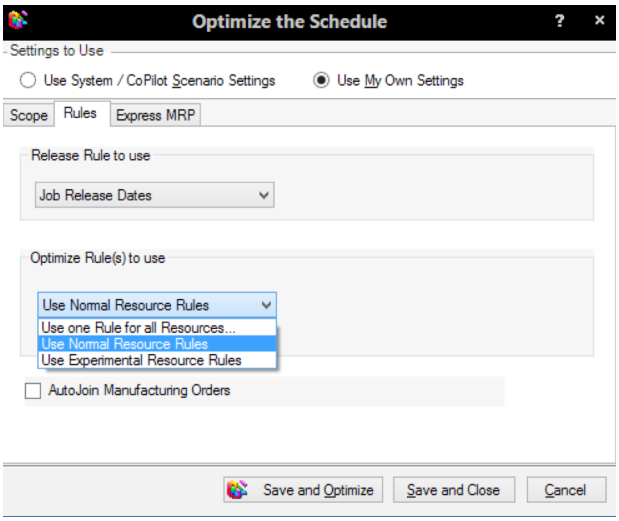


1. Right-click on the resource in the Gantt view, and select *Optimize Rule.*

2. The optimize rule window (pictured above) will display showing the normal rule for the Resource. You can make your changes here. (Note that multiple Resources may be sharing the same Rule.)

3. In order to apply the rule to the schedule, you must
    a. Optimize the schedule. As long as you are working in the 'what-if' scenario, the live schedule will not be affected.

To Apply a Specific Rule Using the Optimize Options



1. From the **Plan Tab** on the navigation ribbon, select Options located in the optimize section of the ribbon. The dialogue box pictured on the left will display.
2. From the **Rules Tab**, select the rule you want to apply to the optimization.
    - Use one rule for all resources (specify rule)
    - Normal resource rule
    - Experimental resource rule
3. Optimize the schedule.

Setup Times

Setup time is frequently cited as a major scheduling consideration when creating a schedule. Setup time can be fixed or sequence-dependent or even somewhere in between. There may be a single factor that determines setup or there might be a dozen different factors that determine setup time. Setup can be consecutive or parallel.

This section will cover the basic concepts of setup time and how they relate to PlanetTogether. For most initial projects, setup is typically left in a basic state until ERP data can be refined to support more sophisticated methods of handling setup time.

Factors of Setup

Setup can be triggered by the change of what's called a setup number or a setup code. A setup number may pertain to some quantifiable characteristic of the resource which determines its setup time. For example, the size of a saw blade may be a modeled as a setup number.

A setup code is similar, but is used for a qualitative factor that determines setup time. This would be used in the case of a color change, for example, from white paint to black paint.

Setup codes and setup numbers are limited in that they only take into consideration a single factor that determines setup. This isn't a workable solution for the times where multiple factors are being considered in setup, for example: color, size, width, height, and mold type. If all five factors can potentially contribute to setup time, **attribute** codes and numbers would be appropriate.

An attribute is defined as any qualitative or quantitative characteristic of the product being made for that operation. Like setup numbers and codes, attribute codes and numbers exist to support quantitative and qualitative characteristics.

Types of Setup

The two first two major categories of setup are whether setup is static or sequence-dependent.

Static Setup: A static setup would be defined as a setup interval that is always a fixed amount of time. For example, changing a mold on a particular machine might be set as a fixed setup if, for example, it always takes three hours to change, regardless of the size or type of mold.

Sequence-Dependent: A sequence-dependent setup is a setup time that depends on the setup of the previous operation running on the resource. For example, a painting resource may have shorter setup times if the machine has to changing from white to black than changing from black to white.

Consecutive vs Parallel Setup

Within static and sequence-dependent setup is another category determining whether a setup is done consecutively or in parallel. This comes into play when there is more than a single factor influencing setup. As such, this is used in conjunction with attributes.

Consecutive Setup: Consecutive setup means that each factor must be setup in sequence. The corresponding setup times for each factor are therefore cumulative. See the example below:

Attribute Name	Attribute Code	Setup Time
Color	Blue	30
Size	Large	15

In the above example, a consecutive setup time would reflect the case where either the color or size must be setup first, and then the other. In this case, the total setup time would be 45 minutes (30 minutes from color and 15 from size).

Parallel Setup: A parallel setup means that both factors influencing setup are being setup at the same time. Therefore, the longest setup factor will be used as the total setup time. In the above example, a parallel setup would mean that because changing the color for the next run takes the longest, the total setup time would be 30 minutes (as opposed to 45 in a consecutive setup).

Setup Tables

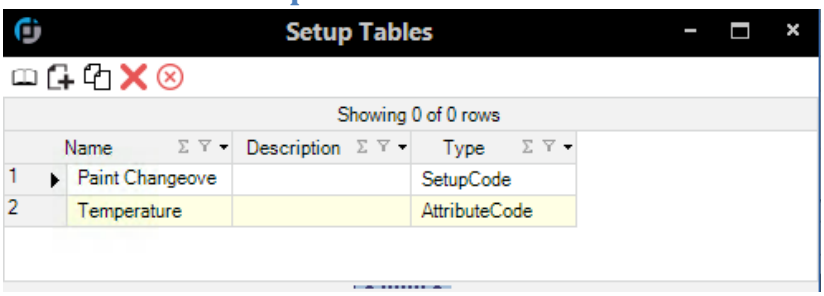
Setup tables are used by PlanetTogether to determine the setup time associated with a specific operation. For example a paint booth might require different set up times depending upon the paint color changeover. The schedule can be optimized to minimize the set up time by grouping together similar operations that require less setup between them.

Three different types of tables are available:

1. **Setup Code Table** – if these tables are used, the scheduling engine will match the setup code values (e.g. color) of each operation to the values in this table to calculate the operation setup time. Note: the resource property must be set to "UseSetupCodeTable".
2. **Attribute Code Table -** Attribute code tables provide more control and additional options. The information in the "Attributes" column of the operation header is compared to the values in this table to decide how much setup time is required.
3. **Attribute number range table** – Provides a way to specify setup times based on a range of values (e.g oven temperatures).

Note: When using Attribute Code Tables and Attribute Number Range Tables, the resource property must specify when to include the setup. Refer to Lesson 5 - Advanced Topics for resource properties.

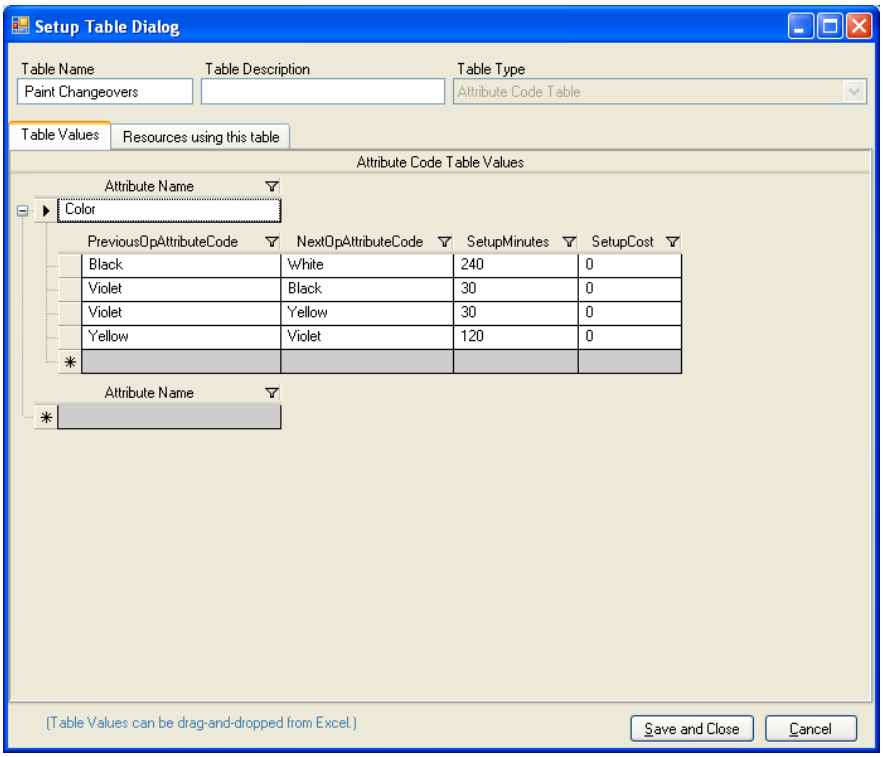
Create a New Setup Table



To create a setup table:

1. Click Setup Tables . The screen (shown above) is displayed.
2. Click on the icon to create a new table
3. The setup dialog will display
4. Enter a Table Name and Description
5. Select the Table Type from the drop down selection box
6. The table values will depend upon the table type (see samples below)

Attribute Codes



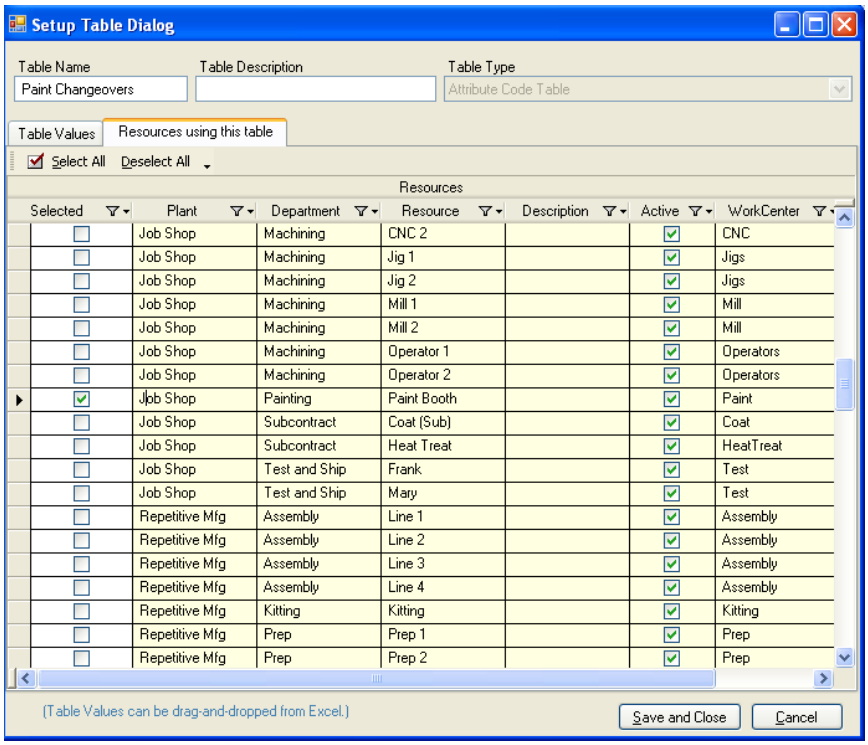
Create Attribute Table

To create an attribute table:

1. Specify a table name and select Attribute Code Table as the Table Type
2. Enter an attribute name
3. Click on the + to expand the rows
4. Enter the attribute codes for the previous and next operation and the corresponding setup hours and setup cost (optional)

Assign to Resource

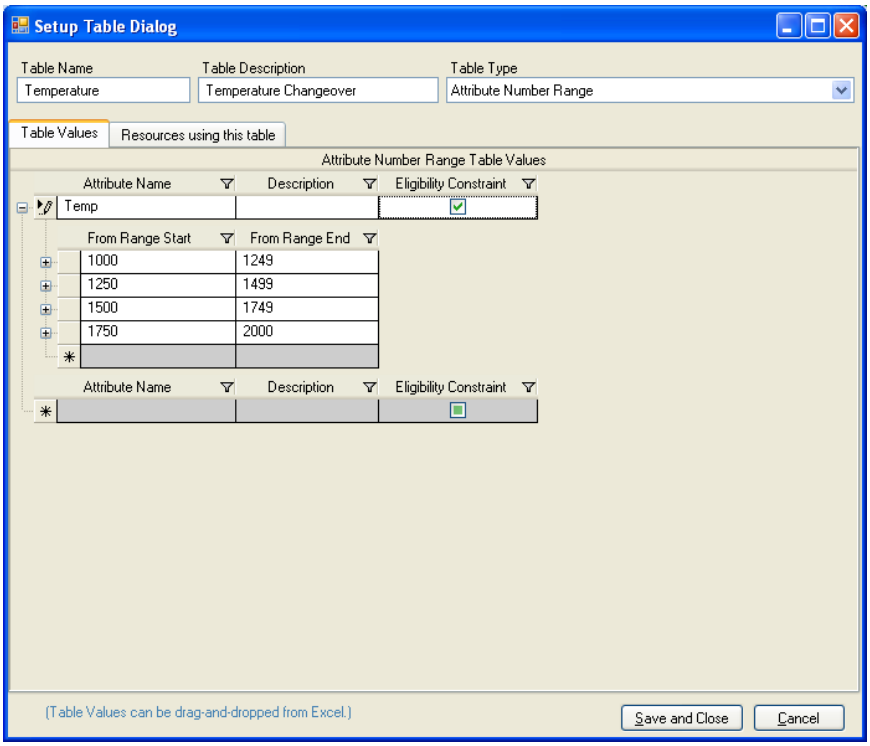
1. Click on the tab Resources using this Table
2. Check the appropriate resources (shown below)
3. Save and Close the Setup Table Dialog



Example:

In the above example the Color attribute is assigned to the Paint Booth Resource.

Attributes and Ranges



Example:

Setup Times: Operations with a "Temp" Attribute with a Number value of 1000 to 1249 will have a setup time based on the rows that can be shown below that attribute range by clicking the '+' expander.

Eligibility: Due to the "Eligibility Constraint" being checked in the setup above, the system will only allow Operations with a "Temp" Attribute to schedule on the Resources linked to this Table if the Operation's Setup Number is in one of the Ranges shown. Ovens will be able to process operations that fit into the valid ranges only.

Making Scheduling Changes

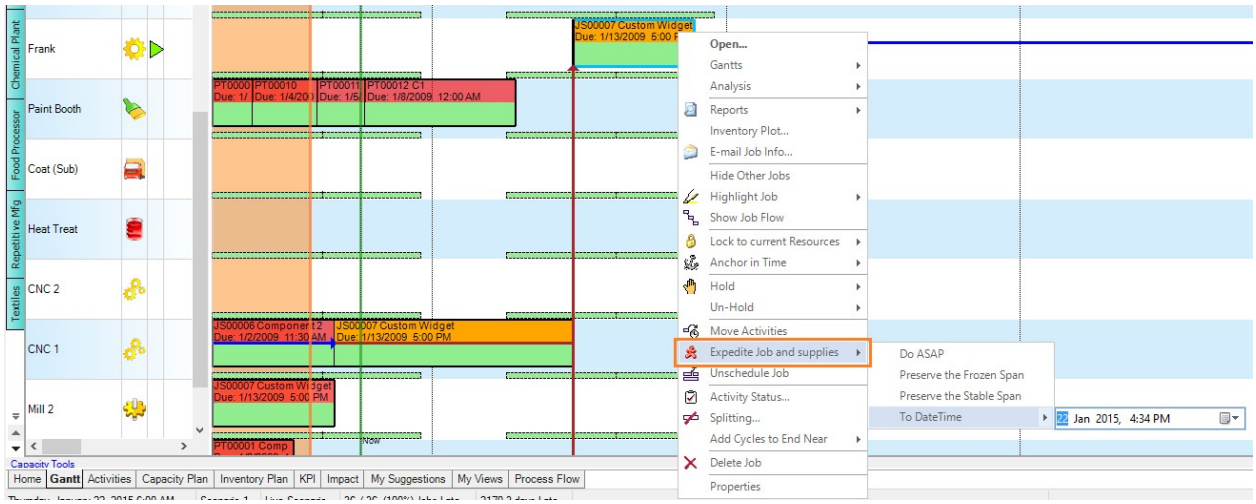
Making scheduling changes is much the same as creating the schedule for the first time. Drag-and-drop and the EasyMove grid are both as valid to use when changing the schedule as when creating one. Additionally, there are a few things that we may want to do when updating the schedule which perhaps were not necessary when we were creating the schedule.

Expediting Orders and Putting Orders on Hold

Once we examine the schedule, it may make sense to expedite certain orders while placing others on hold. Expediting an order is a quick way to move an order and all of its supplying orders earlier in the schedule. Placing an order on hold is a quick way to ensure that an operation doesn't start setting up until the hold criteria has been cleared.

Expediting Orders:

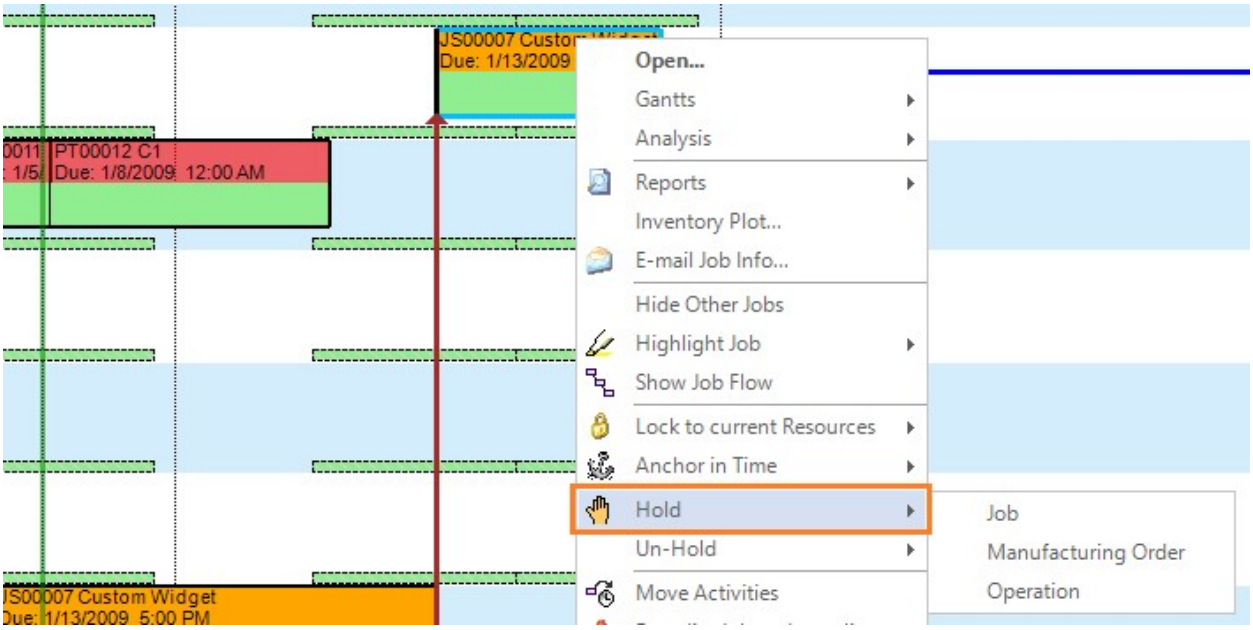
1. Right-click on the Operation
2. Select at what level you want to expedite the order
3. Determine when you want to expedite it
    a. ASAP – This will move it to the front of the schedule
    b. End of the Frozen Span – This will move the job to the very end of the frozen span.
    c. To a specific date and time – This allows the user to choose a specific date time to expedite the order.



Holding Orders: You may place a single operation or the entire job on hold.

1. Right-click and select Hold.
2. Specify the "hold until date" and reason for placing the job on hold.

The operations will be pushed out after that date. The operations will show up in the status segment of the color block as yellow in the Gantt. Once that day is reached, the order will come off as hold unless it is un-held by a user.

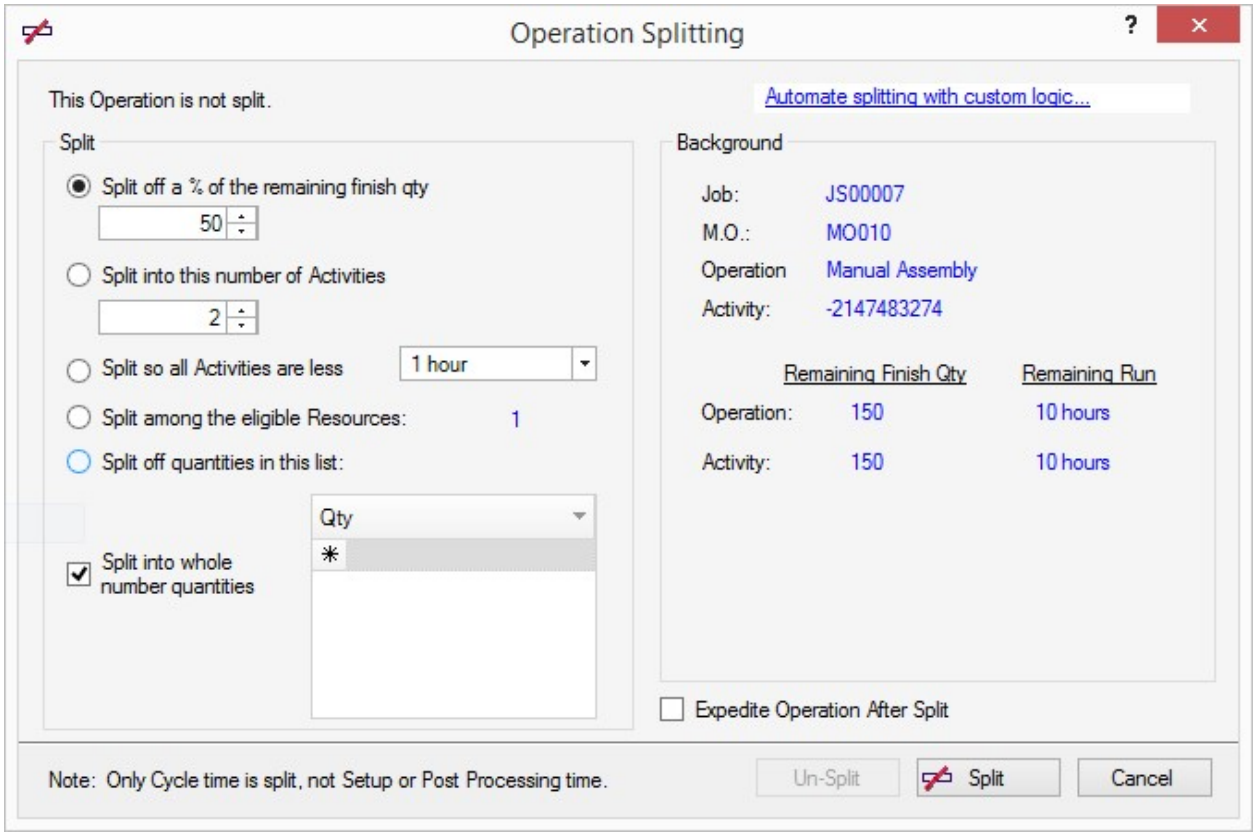


Splitting

Another common way of changing the schedule is split long runs into smaller runs. Splitting the activity allows for product variation for long runs, or the division of larger, bulk orders.

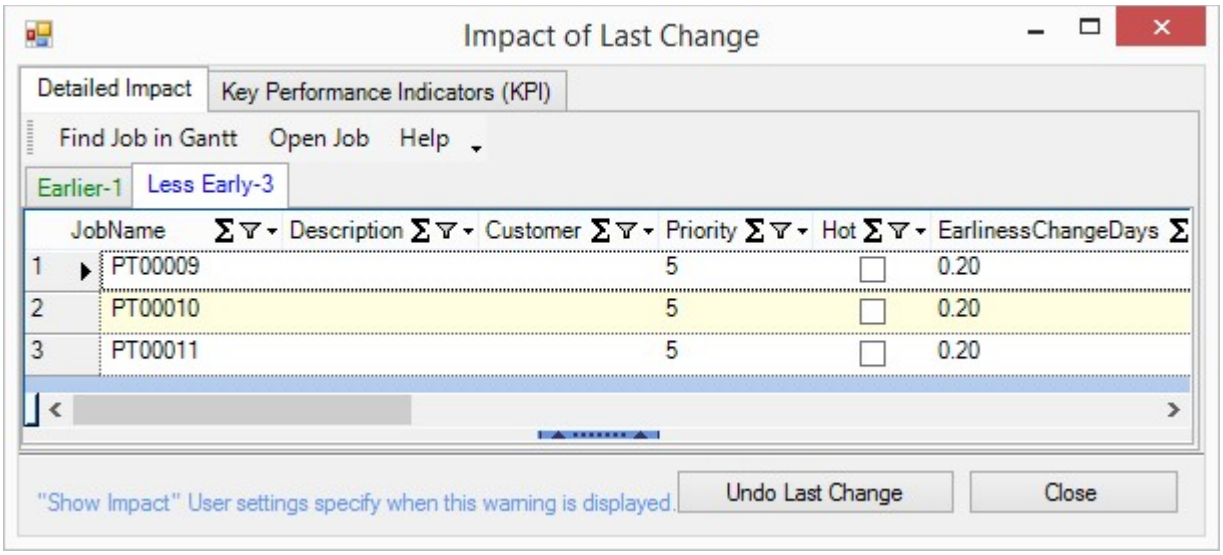
To split the activity right-click on the activity to display the options for splitting the operation, then choose how you would like to split the operation.

- You can split based on percent, units, activities, time or the number of available resources.
- Select *Split* and your operation will now appear as 2 or more activities in the Gantt.
- To un-split, go back to the splitting dialog and select *Un-split*



Impact Analysis

We've perhaps made changes to the schedule. How do we determine if the changes are beneficial? When there are many orders and operations on the Gantt, it's impossible to visually determine if the change was quantifiably "good." The impact view provides a quick way to see which jobs are impacted by scheduling changes and can give us insight into the validity of the changes made.



The tabs underneath the orange bar organize the jobs by how they are impacted

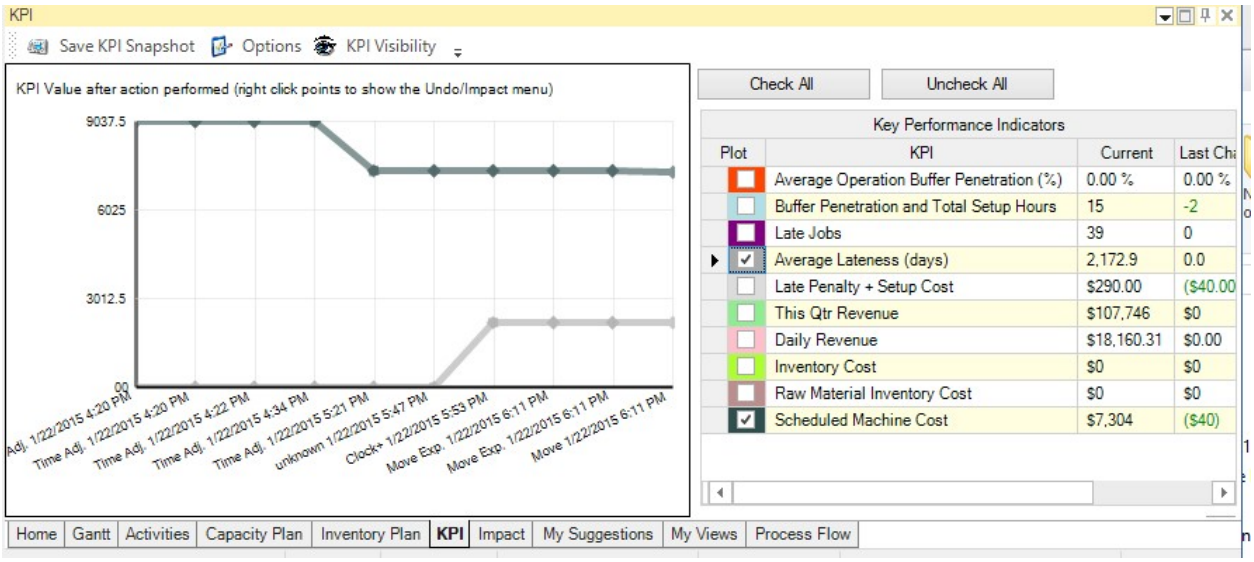
- Late – the orders have moved into a late status
- Later –the orders were already late but is now even later
- On Time – the orders were slow or late and is now on time
- Earlier – the orders were already early, but now is even earlier
- Less early – the orders were early, but is now less early

The columns can be re-arranged, sorted, and filtered just as you were able to do with the job view.

The caveat to the Impact Analysis is that it provides the changes to the schedule *per every change*. This means that after 20 consecutive changes in the Gantt, the Impact Tab will only show the changes to the schedule *as created by the 19th change*. In order to get an idea of the net change after a number of changes, refer to the next lesson under the **KPI** section.

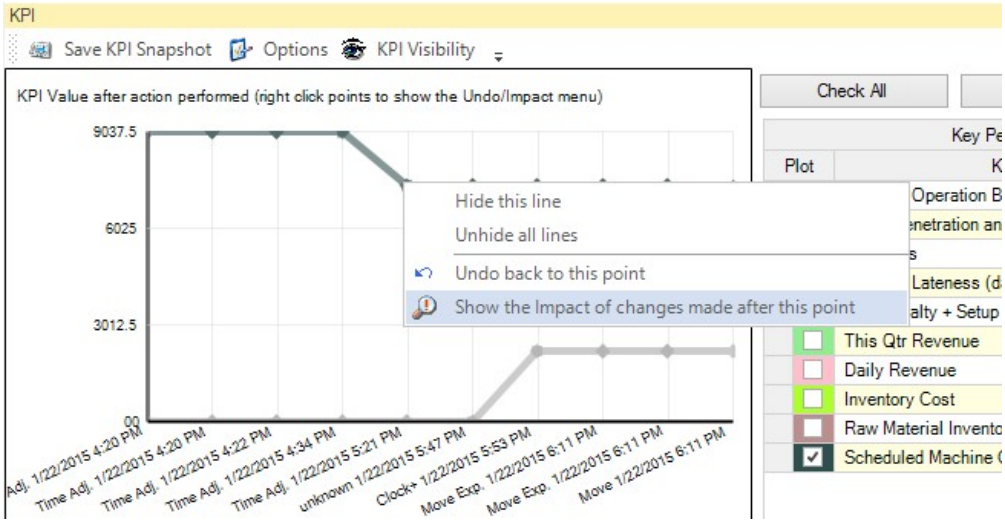
KPI

Key Performance Indicators can be helpful in determining the impact of scheduling changes not only on the schedule, but on business objectives and goals. Its purpose is to help schedulers make decisions that are not only good on paper, but good for the business as a whole. More will be discussed in later modules when KPI's are better supported by highly accurate data. For our purposes, the KPI allows us to accomplish impact analysis over a period of time, which the Impact tab cannot do.



Whereas the Impact Analysis tab only shows you the impact of the very last change, the KPI tab can show you the impact of changes made after a certain point.

1. Left-Click on any plotted point



2. Select “Show Impact of changes made after this point”

This will open up the Impact Analysis tab with the net changes from the point selected.

Undo & Redo

If the impact has produced undesirable results you can *undo* the scheduling changes by clicking on the undo icon in the upper left corner of the screen. You can undo and redo back to a specific scheduling operation.

Running Reports

Using the navigation ribbon, select the *Reports* tab to view and/or print the following standard reports:

- Changeover Schedule
- Production Schedule
- Jobs Running Slower Than Standard
- Late Job Report
- Material Pick List for Today

Right-Click on a specific job to view and print the following reports:

- Job Status
- Where Used
- Job Traveler

Right-Click on a specific resource to view and print the schedule for that resource.

From the Gantt, there are several other reports that can be accessed, listed below:

Department Schedule: Similar to the Resource Schedule Report, this option shows the schedule for an entire Department.

Plant Schedule: Shows the schedule for the current plant in Gantt Screen.

All Plants Schedule: Shows the schedule for all plants, resources and departments

Material Requirements: Shows all material requirements and relevant information (Qty, Scheduled Use, etc) across all plants.

Inventories: Shows inventory information from Plants, Warehouses, Items, Purchase to Stock and Adjustment information.

Performance: Displays a report of the performance of all resources across all plants. A performance of 100% means that, on average, activities took 100% of the expected time to complete. Lower values are better.

Resource Gantt: Takes a screenshot of the resources in the Plant being displayed in the Gantt View which can be emailed or printed for a graphical report.

Job Watch Gantt: Takes a screenshot of Jobs in the Job-Watch Gantt which can be emailed or printed for a graphical report. *Requires Jobs being “watched.”

Publishing the Schedule

In order for the production orders (work orders) to be updated with the actual schedule dates, the schedule must be published. This should be done after all manual changes have been made to the schedule and you are ready to issue the schedule to the shop floor.

To publish the schedule, select the database icon from the Quick Access Toolbar, or navigate to the *Publish* tab on the navigation ribbon and select *Publish to SQL Database*.