

Cannon Factory – Part 1

- This will start the Cannon Factory Model by building the segment that handles the Wheels of the cannon.
- First go into Objects and Containmentment:
 - Create a new object type:
 - 'Wheel'
- Next go into Resources and Shifts:
 - Create a new resource:
 - 'WheelBalancers'
 - Set Available Number – 2
 - Click Add
- Create a new Start Process:
 - 'ReceiveWheelOrder':
 - Go into Define Object Creation Rules:
 - Change Object type to Create:
 - 'Wheel'
- Then create six Generic Processes:
 - 'Router'
 - 'InitialBolts'
 - 'BalanceWheel1'
 - 'BalanceWheel2'
 - 'BalanceWheel3'
 - 'BalanceWheel4'
- Use Connectors to use in-between processes, these will split the connection lines into different segments and makes it easier to control certain behaviors of the objects on these paths.
- Create two more Generic Processes:
 - 'WheelStaging'
 - 'AvailableCannon'
- Using the Interprocess Connection tool complete the layout as shown in the video
- If desired/necessary align processes with one another, this will straighten out connection lines in-between processes/connectors. For the lines that are on a diagonal simply right click and select Add Point, this will allow you to manually move that point and straighten the line out as desired. Multiple points can be added to the same line, this is how you would create a curved line for things such as conveyors.
- Select the connection line leading from the connector into 'InitialBolts':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:
 - Block if next destination is busy
 - Ignore Objects in Transition
- Now select the connection line leading from 'ReceiveWheelOrder':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check Block if next destination is busy
- Select the process - 'Router' and Customize:

- Select Process/Object/Condition Routing:
 - Set up routing for the 'Wheel' Object
 - Next Process set to 'InitialBolts'
- As you can see in this case if the processes do not show up you will need to go to the Flow Properties tab
 - Click Rebuild Connections
- Select 'InitialBolts' and Customize:
 - Go into Least Busy/Randomized Routing
 - Check Select the least busy process
- Use the End Process tool to create:
 - 'Ship(End)'
- Then connect 'AvailableCannon' to 'Ship(End)'
- You can go into the DisplaySetting 2D/3D for any process and change the size of the process, doing this when processes are close together helps for making things clearer. This training model will do this for all 'Staging' processes
- Select all of the connection lines leaving 'InitialBolts':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check Block if next destination is busy
 - Check apply to all
- Select all of the 'BalanceWheel' processes:
 - Go into Timing Properties:
 - Set Default Timing:
 - Min - 60 seconds
 - Max - 80 seconds
 - Check apply to all
 - Customize and go into Resource Constraints:
 - Set Required Number for 'WheelBalancers' to 1
 - Check apply to all
- Switch to the Simulation tab and press Start to run the simulation. As the simulation runs watch as the resources only handle the objects at the process. If it's desired to have the resources handle the objects in this entire section then some changes will need to be made to the Resources Constraints
- Stop the simulation
- Click and drag over the entire Wheel balancing area of the model, from 'InitialBolts' to 'WheelStaging':
 - Be sure to select a connection line:
 - Go into Speed/Distance/Capacity - Here will begin setting up the area for the 'Wheel' object, each area will have different settings:
 - Check Speed based on Units/Sec Set to 2
 - Check Enable Auto Distance calculation
 - Set Line Capacity to 4
 - Check Enable Line Capacity
 - Set distance between objects to 0.5
 - Check apply to all

- Go into Display Setting 2D/3D:
 - Check the following:
 - Rotate Objects based on Direction
 - Rotate Resources based on Direction
 - From Process
 - To Process
 - Check apply to all
 - Lastly Customize and go into Resource Constraints:
 - Set Required Number for 'WheelBalancers' to 1
 - Check Enable
 - Check Hold Resources
 - Check apply to all
- Select the 'BalanceWheel' processes:
 - Go into Resource Constraints:
 - Check Enable
 - Check Hold Resources
 - Check apply to all
- Run the model again, see that only two objects enter the area, this is because there are only two resources to handle the area.
- Stop the simulation and under the Model Build tab
 - Resources and Shifts
 - Set Available Number for 'WheelBalancers' to 4
- Then run the simulation again

Cannon Factory Part 2

- Now to add a second area to the model
- First create a new object in Objects and Containment:
 - 'Base'
 - With multiple objects in the model it'll be more difficult to see which is which, if you check Display Object Value this will show the name of each object
 - As well by going into Define Object Dimensions and 3D Control you have the ability to change the color of each object as well
- Create five new Generic Processes that will be the area for the 'Base' object:
 - 'RouteBase'
 - 'MachineBase1'
 - 'MachineBase2'
 - 'PaintBase1'
 - 'PaintBase2'
- Place a connector between 'Router' and 'RouteBase', then another on the bottom to the right of 'AvailableCannon'. Also here place another Generic Process: 'BaseStaging'
- Use the Interprocess Connection Tool to connect the layout as shown in the video
- In Resources and Shifts create a new Resource:
 - 'BaseWorkers'

- Set Available Number to 2
 - Click Add
- Select all of the connection lines between 'RouteBase' and 'BaseStaging':
 - Go into Speed/Distance/Capacity:
 - Check Speed Based on Units/Sec
 - Enable Auto-Distance
 - Set Line Capacity to '2'
 - Check Enable Line Capacity based on Object Dimension
 - Set Distance between to '1'
 - Check apply to all
- Next go into Display Settings 2D/3D:
 - Check the following:
 - Rotate Objects based on Direction
 - Rotate Resources based on Direction
 - From Process
 - To Process
 - Check apply to all
 - Customize and go into Resource Constraints:
 - Set Required Number for 'BaseWorkers' to 1
 - Check Enable
 - Check Hold Resource
 - Check apply to all
- Now select all of the Base processes:
 - Customize and go into Resource Constraints:
 - Set Required Number to 1 for 'BaseWorkers'
 - Check Enable
 - Check Hold Resources
 - Check apply to all
 - Set the Timing Properties:
 - Default Timing for 'MachineBase':
 - Min: 50 seconds
 - Max: 70 seconds
 - Default Timing for 'PaintBase':
 - Min: 20 seconds
 - Max: 30 seconds
 - Check apply to all
- Changes will need to be made to the model in order to use this new area
- Start by changing the Define Object Creation Rules at 'ReceiveCannonOrder':
 - Switch to Create objects Based on Distribution
 - Set 'Wheel' to '66' Percent
 - Set 'Base' to '33' Percent
- Next at the 'Router' process:
 - Go into Process/Object/Conditional Routing:
 - Set up a new routing for the 'Base' object

- Set Next Process to 'RouteBase'
- Again if you run into issues where the desired process doesn't show up in the list then switch to the Flow Properties tab and click Rebuild Connections
- Select 'RouteBase':
 - Set to be a Least Busy/Randomized Routing:
 - Check Select the least busy process
- Now if you run the model you'll see both objects being created and routed to their respective areas, but we need to clean up the flow for the 'Base' object area
- Select the 'MachineBase' and 'PaintBase' on each side and the connection line between them:
 - Right click and select Grouping and Group Items:
 - Name them 'G_BaseStation#'
- Repeat these steps for the other side
- Back at 'RouteBase':
 - Go into Least Busy/Randomized Routing:
 - Check Enable Group Lookup
- Select the two connection lines leaving 'RouteBase':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:
 - Block if next destination is busy
 - Enable Group Polling
 - Check apply to all
- Start the simulation
- The idea to not have objects pile up at any of the processes, polling is needed on the connection line leading into 'RouteBase'
- Select the line leading into 'RouteBase':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check:
 - Block if next destination is busy
 - Ignore Objects in Transition

Cannon Factory Part 3

- To add the final area of the model use the Start Process tool and create:
 - 'ReceiveBarrelOrder',
- We can change the name of the other Start Process as now it will be used to create an order for the entire cannon - 'ReceiveCannonOrder'
- Then create four Generic Processes:
 - 'MachineBarrels'
 - 'PaintBarrels'
 - 'BarrelStaging'
 - 'FinishCannon'
- Use the Interprocess Connection tool to finish the new layout as shown and delete the connection line between 'AvailableCannon' and 'Ship(End)'
- Create an Object Type:

- 'Barrel'
- Create a Resource:
 - 'BarrelWorkers'
 - Available Number of '2'
 - Click Add
- Select all of the connection lines in the 'Barrel' area:
 - Speed/Distance/Capacity check:
 - Check:
 - Speed based on Units/Sec
 - Enable Auto-Distance calculation
 - Check apply to all
 - Display Settings 2D/3D:
 - Check:
 - Rotate Object based on Direction
 - Rotate Resource based on Direction
 - From Process
 - To Process
 - Check apply to all
 - Behavior: Conveyors, Polling, and Carriers:
 - Check - Block if next destination is busy
 - Check apply to all
- Make sure that only the connection lines between 'ReceiveBarrelOrder' and 'BarrelStaging' are selected:
 - Set the Resource Constraints for these connection lines:
 - Set Required Number for 'BarrelWorkers' to '1'
 - Check Enable
 - Check Hold Resources
 - Check apply to all
- Select 'MachineBarrels' and 'PaintBarrels'
 - Go into Resource Constraints:
 - Set Required Number for 'BarrelWorkers' to '1'
 - Check Enable
 - Check Hold Resource
 - Check apply to all
- Set the Timing Properties for 'MachineBarrels':
 - Default Timing:
 - Min of 20 seconds
 - Max of 30 seconds
- Set the Timing Properties for 'PaintBarrels':
 - Default Timing:
 - Min and Max of 30 seconds
- Within 'ReceiveBarrelOrder':
 - Go to Define Object Creation Rules:
 - Set the Object type to Create:

- 'Barrel'
- Start the simulation and watch as all of the objects individually pass to 'Ship(End)'. The plan is to have all of the individual parts assembly into one greater part
- In Objects and Containment create a new object type:
 - 'Cannon':
 - Go into Components:
 - From the Defined Objects list Add:
 - 'Barrel'
 - 'Base'
 - 'Wheel'
 - Set Min/Max for 'Wheel' to '2'
 - With the new objects in place change the colors of them to further distinguish them from one another
- To set up the assembly go to 'AvailableCannon' and Customize:
 - Process Assembly/Disassembly:
 - Check Enable object assembly:
 - From the drop down list select 'Cannon':
 - Click Add Object Definition
 - Check Assemble and Create Object for 'Cannon'
 - Because the 'Barrel' will not be assembled with the 'Cannon' at this process 'Barrel' must also be added to the list
 - For 'Barrel':
 - Check Ignore and be sure to uncheck Active
 - Be sure that 'Cannon' is still checked for both Assemble and Create Object
- The 'Barrel' will be assembled at 'FinishCannon', select 'FinishCannon' and Customize:
 - Go into Process Assembly/Disassembly:
 - Check Enable object assembly:
 - Add Object Definition for 'Cannon':
 - Check Assemble
- Select all of the connection lines leaving from the 'Staging' processes:
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:
 - Block if next destination is busy
 - Ignore Active Objects at Destination
 - Allow Objects Based on Assembly
 - Ignore Objects in Transition
 - Check apply to all
 - Go into Display Settings 2D/3D:
 - Change the Top Color of the lines to a red color
 - Check apply to all
- The connection lines heading into the 'Staging' processes also need to have polling setup on them:
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:

- Block if next destination is busy
 - Ignore Objects in Transition
 - Check apply to all
- Start the simulation

Cannon Factory Part 4

- To finalize this training model create a new Object type:
 - 'OrderComponents':
 - Then click Components for this new object:
 - From the list add the following:
 - 'Barrel' – 1
 - Min/Max – 1
 - 'Base' – 1
 - Min/Max – 1
 - 'Wheel' – 2
 - Min/Max – 2
 - 'Cannon'
 - Min/Max – 1
 - Lastly check Create Object Components when container is created
 - Change the color of this new object type
 - This model will also utilize a Carrier to move parts around, go into Carriers and Robots:
 - Create a carrier:
 - 'Cart'
 - Click Add
 - Also another Resource will need to be created for this model, in Resource Constraints:
 - Create a new Resource:
 - 'Assemblers'
 - Set Available Number to '2'
 - Click Add
 - If a resource happens to travel along a connection line it can be important that the resource has its' own transition speed, in this case we want the resources to manage their speed separately from the objects:
 - Select each Resource from the list and check Add Transition Behavior for each
 - To use the 'Cart' carrier we need to create a new Start Process:
 - 'CreateCart':
 - In Define Object Creation Rules:
 - Select Create Carriers Only:
 - Select 'Cart' from the drop down list
 - Next check:
 - Stop the process after
 - Enter '2' for Objects/Carrier are created
 - Connect 'CreateCart' to 'Router'

- Select 'ReceiveCannonOrder':
 - Go into Define Object Creation Rules:
 - Change to Create Single Object Type:
 - Set the object type to create:
 - 'OrderComponents'
- Select the connection line leaving 'ReceiveCannonOrder':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:
 - Ignore Q size at Destination
 - Ignore Empty Baskets at Destination
 - Ignore Objects in Transition
- Place a Connector above 'AvailableCannon' and connect the model as shown to link 'Router' to 'AvailableCannon' and back
- Select the connection line leading into 'AvailableCannon':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - Check the following:
 - Block if next destination is busy
 - Ignore Objects in Transition
- Select the connection line from 'AvailableCannon' to 'Router':
 - Go into Behavior: Conveyors, Polling, and Carriers:
 - On the left side check Defines Empty Carrier Path, by doing this you will not be required to route the carrier back through the process, it will automatically choose this path when empty
- Switch to the Flow Properties tab and click Rebuild Connections
- Go into 'Router':
 - In Process/Object/Condition Routing:
 - Set up both 'Cannon' and 'Cart' to be sent to 'AvailableCannon'
 - To use the carrier go into Carrier Requirements:
 - Click Insert new Carrier Definition:
 - 'Cannon'
 - 'Cart'
 - Check Carrier Waits
 - Min Load – 1
 - Max load – 1
 - In order to get the 'Cannon' object we need to disassemble the 'OrderComponents' object type
 - Go into Process Assembly/Disassembly and check the following:
 - Split grouped/assembled objects
 - Split After processing
 - Delete Container
- Start the simulation
- Pause the simulation and select 'AvailableCannon' and 'FinishCannon', these need to have the 'Assembler' Resource applied to them:

- Resource Constraints:
 - Set Required Number for 'Assemblers' to '1'
 - Check Enable and Hold Resource
 - Check apply to all
- Select the connection line between them and do the same with the 'Assembler' Resource
- Resume the simulation
- Currently you cannot see the 'Cart' carrier, this is due to the default image being used for it:
 - Stop the simulation and go into Objects and Containment:
 - Define Object Dimensions and 3D Control:
 - Change the color of 'Cart'
- Now that we have the 'Cannon' object coming into the model we no longer need to be creating it at 'AvailableCannon':
 - In Process Assembly/Disassembly:
 - Uncheck Create Object for 'Cannon'
- This next part is just finishing up the connection lines to move objects at desired speeds. These speed are completely random and can be anything, do note that different speeds have different outcomes in terms of efficiency of the model, slow and fast speeds can both be good and bad depending on where they are used
- Different sections of the model can also be color coded to note what a connection line is supposed to be doing, for instance the red here after the 'Staging' processes means polling, but can also be used to mark inbound and outbound connection lines
- Start the simulation again
- Select 'AvailableCannon':
 - Go into Timing Properties:
 - Set the Default Timing:
 - Min/Max of 30 seconds each
- Do the same for 'FinishCannon':
 - Go into Timing Properties:
 - Set the Default Timing:
 - Min/Max of 40 seconds each
- Now that the model is set up use the statistics from each process in the Selected Item Analysis tab to gauge how the model is performing. Or set up Results Processes to track utilization of processes and resources, average processing times for each order, and even track wait times and completed order per hour