

Process Simulator Cost Features Webinar

Cost Modeling and Reporting in Process Simulator



Process
simulator

Professional

Instructor Info:

Bruce Gladwin

SVP, Commercial Products

Office: 801.223.4639

bgladwin@promodel.com

Poll #1

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705 Timpanogos Parkway
Orem, UT 84097
801-223-4600

Course Objectives

During this Webinar you will learn how to:

- 1) Define cost factors for tracking both Variable Costs and Fixed Costs over the course of a simulation run.
- 2) Use the built-in costing functions to quickly and easily track the most common types of Variable Costs.
- 3) Use variables for tracking periodic Fixed Costs.
- 4) Review & interpret cost reports that are provided automatically in Output Viewer.
- 5) Observe cost features in three model examples.

Building a Model with Costing

- When you want to use the costing features you must first define the entities, activities, and resources used in the model.
- Once you define these model objects, you may assign Cost information to each entity, activity, and resource through the Cost fields in their respective Properties dialogs.
- The assigned costs will then be accumulated while the model runs, giving users the ability to track Variable costs associated with entities, activities, and resources.
- Other ways to track costs include using special logic statements as well as using additional model elements like Variables to calculate Fixed or other costs.
- The Output Viewer generates element-specific reports that include the cost statistics which are automatically generated during the model run.

Assigning Cost to Model Elements

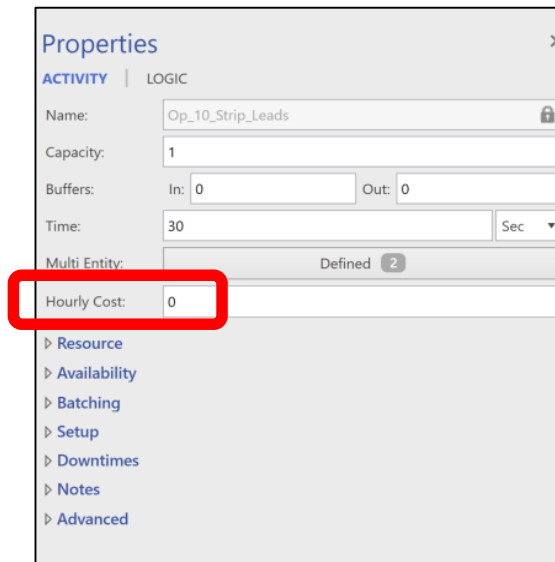
- Cost fields are available in the Properties dialogs for Entities, Activities, and Resources. Fields in the dialogs vary between object types. Process Simulator can evaluate expressions in these fields, but only during translation at run time.

Entity Properties:



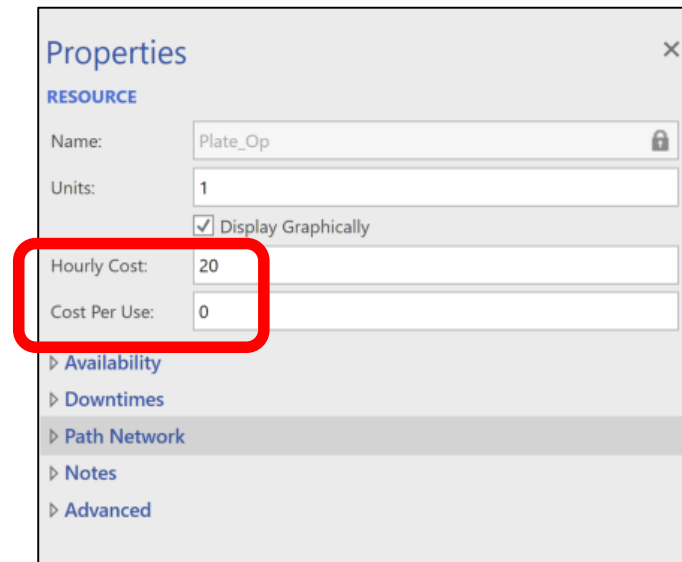
The screenshot shows the 'Properties' dialog for an Entity named 'Kit_B'. The 'Initial Cost' field is highlighted with a red box and contains the value '2'. Other fields include Name, Capacity, Buffers, Time, and Multi Entity.

Activity Properties:



The screenshot shows the 'Properties' dialog for an Activity named 'Op_10_Strip_Leads'. The 'Hourly Cost' field is highlighted with a red box and contains the value '0'. Other fields include Name, Capacity, Buffers, Time, and Multi Entity.

Resource Properties:



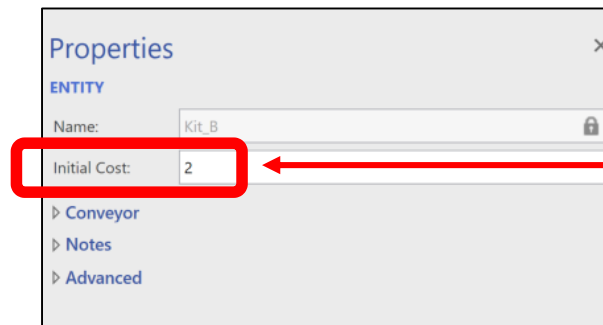
The screenshot shows the 'Properties' dialog for a Resource named 'Plate_Op'. The 'Hourly Cost' field is highlighted with a red box and contains the value '20', and the 'Cost Per Use' field is highlighted with a red box and contains the value '0'. Other fields include Name, Units, and Display Graphically.

Note: You can use user-defined expressions such as Variables or Macros in all of these Cost fields to set the rates.

Entity Cost

- The Initial Cost field allows you to define the initial entity cost for an entity which enters the system through an Arrival, a Create routing, or an Order statement. Process Simulator accepts expressions in this field, but evaluates them at translation only.
- Entities can accumulate additional cost from Resources and Activities as they progress through the process.

Entity Properties:



Properties

ENTITY

Name: Kit_B

Initial Cost: 2

▶ Conveyor

▶ Notes

▶ Advanced

- Number greater than or equal to 0
- Distribution
- Variable
- Macro
- Array
- Subroutine
- User Distribution

Activity Cost

- Activity costs accumulate only while an entity incurs time in the Time field or via a Wait or Use statement in the logic.
- Activity costs are reported separately as Operation cost (from Wait statements) and Resource cost (from Use or Get statements).
- Activity costs are tracked separately in the output statistics even though these costs are accumulated by entities.

Activity Properties:

The screenshot shows the 'Properties' dialog box for an activity named 'Op_10_Strip_Leads'. The 'ACTIVITY' tab is selected. The 'Hourly Cost' field is set to 0 and is highlighted with a red box. A red arrow points from the 'Hourly Cost' field to the list of activity types on the right. The list includes: Resource, Availability, Batching, Setup, Downtimes, Notes, and Advanced.

- Number greater than or equal to 0
- Distribution
- Variable
- Macro
- Array
- Subroutine
- User Distribution

Resource Cost

- There are two cost options for Resources: Hourly Cost and Cost per Use.
- The Hourly Cost field specifies the cost per hour for a captured resource.
- The Cost per Use field allows you to define a cost that is accumulated each time you use the resource (i.e., the minimum usage cost). The cost per use updates as soon as the resource is captured.
- Resource costs are tracked separately in the output statistics even though they are accumulated by entities.

Resource Properties:

| | |
|----------------|---|
| Name: | Plate_Op |
| Units: | 1 |
| | <input checked="" type="checkbox"/> Display Graphically |
| Hourly Cost: | 20 |
| Cost Per Use: | 0 |
| ▶ Availability | |
| ▶ Downtimes | |
| ▶ Path Network | |
| ▶ Notes | |
| ▶ Advanced | |

- Number greater than or equal to 0
- Distribution
- Variable
- Macro
- Array
- Subroutine
- User Distribution

Other Ways to Incur Cost or Get Cost Values

- Logic statements can also be used to return the accumulated cost on an entity, or add/subtract cost for an Entity, Activity, or Resource.

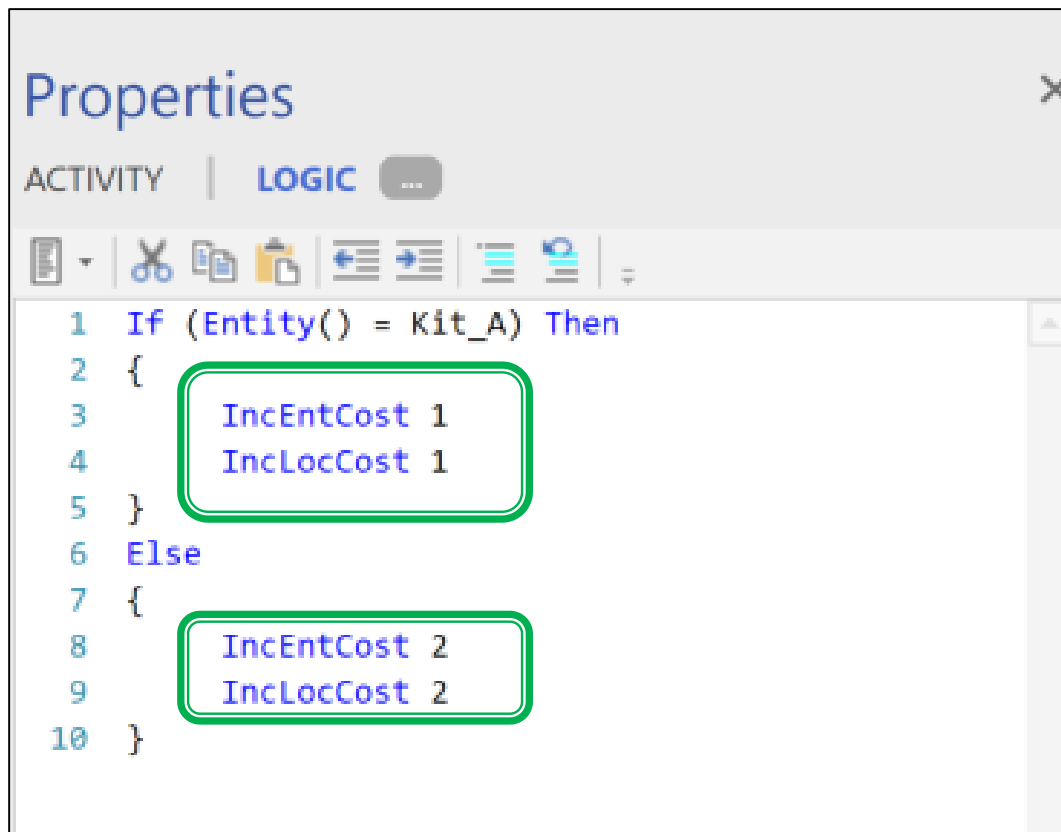
Poll #2

Cost Statements and Functions:

- IncEntCost, IncLocCost, & IncResCost – 3 separate statements to update costs
- GetCost(): Returns the accumulated cost of the current entity executing the logic. Use this function to return the entity's current accumulated cost.
- GetResRate(): Returns the cost rate for the currently captured resource. This cost rate is the current resource cost rate which is entered in the resource's properties dialog.

Using Logic Statements to Update Costs

- Cost statements can be used in the Logic Builder to update (increase or decrease) costs for an Entity, Activity, or Resource.



The screenshot shows the 'Properties' window in ProModel, with the 'LOGIC' tab selected. The logic editor contains the following code:

```
1 If (Entity() = Kit_A) Then
2 {
3     IncEntCost 1
4     IncLocCost 1
5 }
6 Else
7 {
8     IncEntCost 2
9     IncLocCost 2
10 }
```

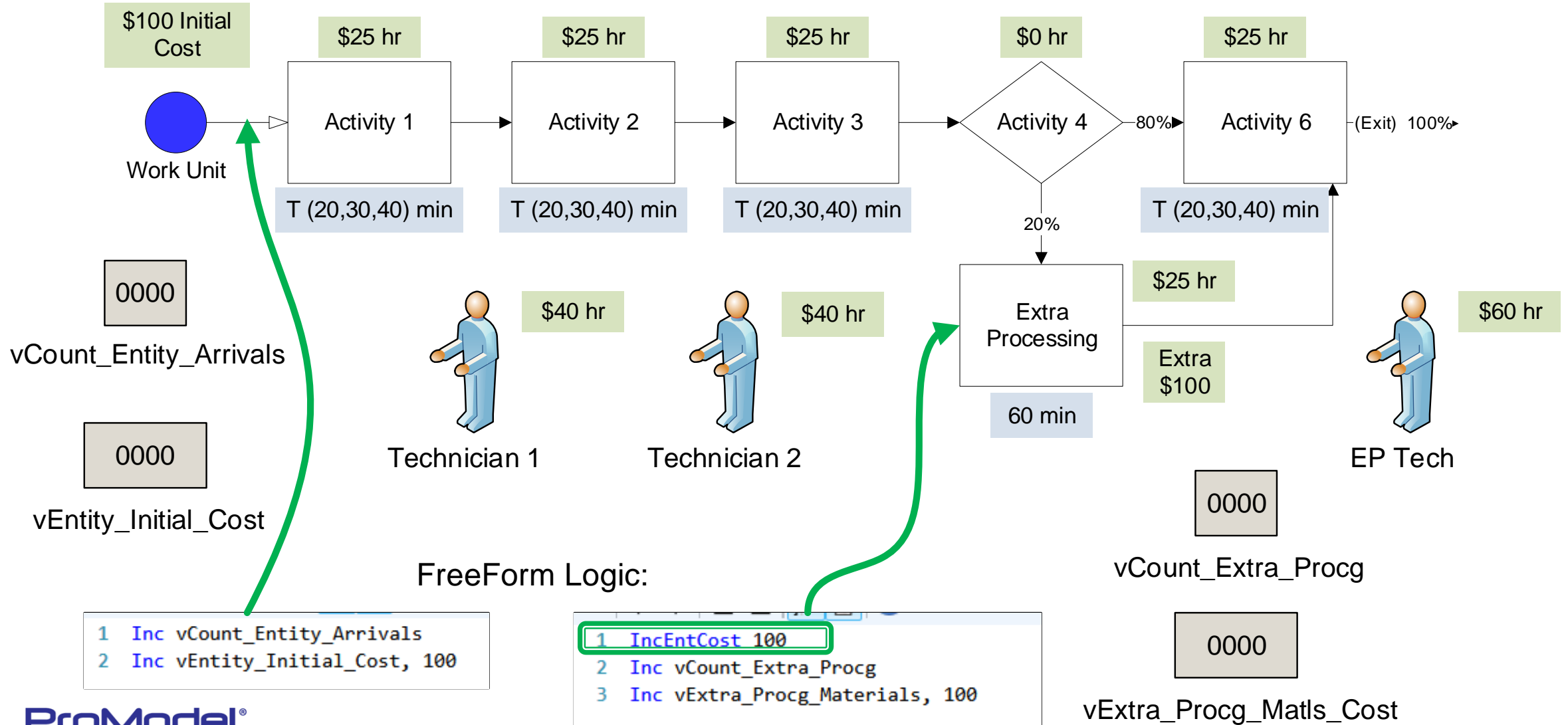
The code is formatted with line numbers on the left. The two code blocks (lines 3-5 and 8-9) are highlighted with green rounded rectangular boxes.

In Operation logic at an Activity, you can increase (or decrease) the accumulated cost of the current Entity, Activity, or any captured Resource(s).

Using Variables to Calculate or Monitor Cost

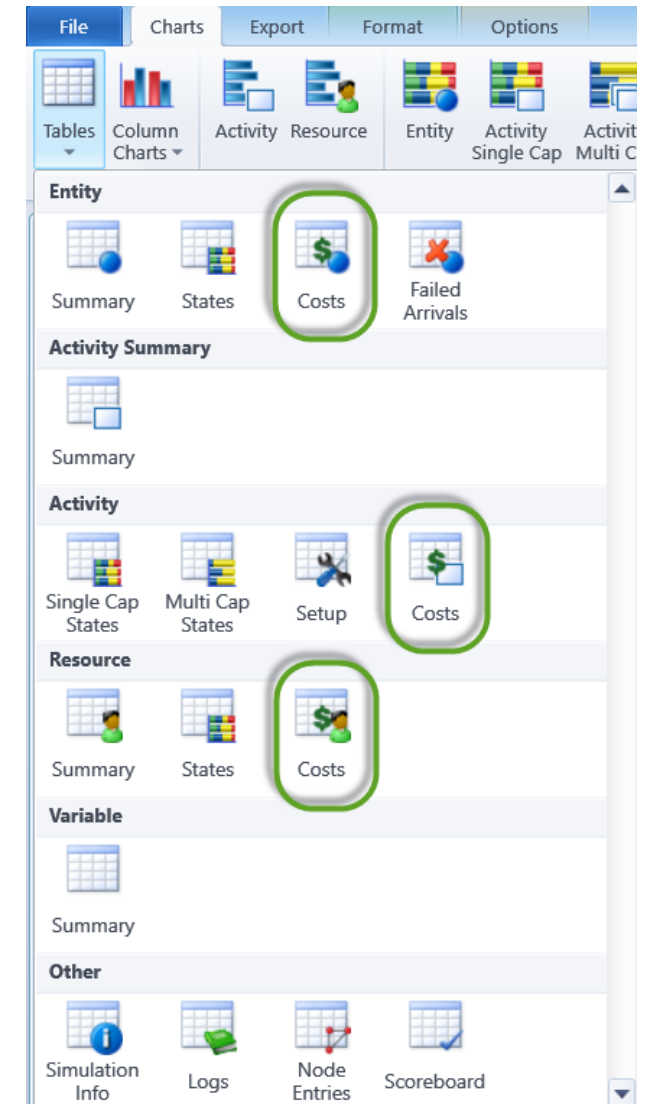
- Variables are another model element that can be used to track accumulated cost or perform calculations among several model elements that are incurring cost.
- Examples:
 - A Variable for Extra Materials (vExtra_Procgs_Materials) required at one step could be incremented whenever an entity enters that Activity. The amount to increment would equal the cost of the additional materials (i.e., \$100).
---- Inc vExtra_Procgs_Materials, 100
 - A Variable for Total Cost of Goods (vTotalCoG) could be incremented whenever an entity exits the model. The amount to increment could be set by using the "GetCost" statement which returns the entity's total accumulated cost. ---- Inc vTotalCoG, GetCost()

Simple Cost Model Demo



Cost Reports in the Output Viewer (OV)

- Cost Reports can be generated from the Tables menu in the OV.
- Separate reports show cost summary data tables for entities, activities, and resources.
- The OV also allows you to generate Cost bar charts under the Column Charts menu.
- You can also use Variables to track costs. For example, you could set a variable equal to GetCost, e.g. $\text{Var1} = \text{GetCost}()$, and then generate a time series graph to track changing entity costs.



Entity Cost Reports in the Output Viewer



| Name | Explicit Exits | Total Cost | % Total Cost |
|-----------|----------------|------------|--------------|
| Work Unit | 10.00 | 2,854.60 | 100.00 |

- This report shows the Total Cost for each entity by name.
- These are the accumulated costs which include entities' initial cost plus costs from the use of activities and resources.
- This total will also include additional cost from IncEntCost statements.
- % Total Cost column will always add up to 100%

Activity Cost Reports in the Output Viewer

| Activity Costs | | | | | | |
|------------------|----------------|------------------|---------------|-----------------|------------|--------------|
| Name | Operation Cost | % Operation Cost | Resource Cost | % Resource Cost | Total Cost | % Total Cost |
| Activity | 125.90 | 21.90 | 201.43 | 20.56 | 327.33 | 21.06 |
| Activity 2 | 120.42 | 20.95 | 192.67 | 19.67 | 313.09 | 20.14 |
| Activity 3 | 129.57 | 22.54 | 207.32 | 21.16 | 336.89 | 21.67 |
| Activity 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Extra Processing | 75.00 | 13.05 | 180.00 | 18.37 | 255.00 | 16.40 |
| Activity 6 | 123.96 | 21.56 | 198.33 | 20.24 | 322.29 | 20.73 |

- This report shows the Operation, Resource, & Total Cost for each activity.
- These are the accumulated costs from entities in Operation (Wait) and/or using Resources (Use or Get).
- The cost will also include additional cost from IncLocCost statements.
- Note that this report does Not include additional cost from IncResCost statements! However, those costs are shown on the Resource Cost report.
- % columns will always add up to 100%

Resource Cost Reports in the Output Viewer

| Resource Costs | | | | | | | |
|----------------|-------|-------------|---------------|------------|--------------|------------|--------------|
| Name | Units | NonUse Cost | % NonUse Cost | Usage Cost | % Usage Cost | Total Cost | % Total Cost |
| Technician 1 | 1.00 | 176.97 | 17.37 | 394.11 | 40.22 | 571.08 | 28.57 |
| Technician 2 | 1.00 | 165.43 | 16.23 | 405.65 | 41.40 | 571.08 | 28.57 |
| EP Tech | 1.00 | 676.62 | 66.40 | 180.00 | 18.37 | 856.62 | 42.86 |

- This report shows the NonUse, Usage, & Total Cost for each resource.
- These are the accumulated costs from entities using resources (Use or Get).
- Usage cost is based on the rate applied while the resources are utilized. NonUse cost is the cost of the resources for their remaining time.
- Usage total will also include additional cost from IncResCost statements.
- % columns will always add up to 100%

Simple Cost Model Demo – Output Reports

Below is a list of what is included in the Total Cost of the Entities:

- 1) Entities' Total Cost = **\$2,854.60** (1)
- 2) *Initial Cost (10 x \$100) = \$1,000.00
- 3) *Extra Procg (3 x \$100) = 300.00
- 4) Operation Cost = 574.85
- 5) Resource Usage Cost = 979.75
- 1) Entities' Total Cost = **\$2,854.60**

* Not shown separately on OV Report

Below is a list of the Total Cost of this process:

- 1) Entities' Total Cost = \$2,854.60
- 6) Resource NonUse Cost = 1,019.02
- Process Total Cost = \$3,873.62

| Entity Costs | | | |
|--------------|----------------|-----------------|--------------|
| Name | Explicit Exits | Total Cost | % Total Cost |
| Work Unit | 10.00 | 2,854.60 | 100.00 |

(1)

| Variable Summary | | | | |
|-------------------------|---------------|---------------|---------------|-----------------|
| Name | Total Changes | Minimum Value | Maximum Value | Current Value |
| vCount Entity Arrivals | 10.00 | 0.00 | 10.00 | 10.00 |
| vCount Extra Procg | 3.00 | 0.00 | 3.00 | 3.00 |
| vEntity Initial Cost | 10.00 | 100.00 | 1,000.00 | 1,000.00 |
| vExtra Procg Matls Cost | 3.00 | 100.00 | 300.00 | 300.00 |

(2) (3)
(3) Added to Cost via IncEntCost logic

| Activity Costs | | | | | | |
|------------------|----------------|------------------|---------------|-----------------|------------|--------------|
| Name | Operation Cost | % Operation Cost | Resource Cost | % Resource Cost | Total Cost | % Total Cost |
| Activity 1 | 125.90 | 21.90 | 201.43 | 20.56 | 327.33 | 21.06 |
| Activity 2 | 120.42 | 20.95 | 192.67 | 19.67 | 313.09 | 20.14 |
| Activity 3 | 129.57 | 22.54 | 207.32 | 21.16 | 336.89 | 21.67 |
| Activity 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Extra Processing | 75.00 | 13.05 | 180.00 | 18.37 | 255.00 | 16.40 |
| Activity 6 | 123.96 | 21.56 | 198.33 | 20.24 | 322.29 | 20.73 |

Totals = \$ 574.85 (4) \$ 979.75 (5) \$ 1,554.60

| Resource Costs | | | | | | | |
|----------------|-------|-------------|---------------|------------|--------------|------------|--------------|
| Name | Units | NonUse Cost | % NonUse Cost | Usage Cost | % Usage Cost | Total Cost | % Total Cost |
| Technician 1 | 1.00 | 176.97 | 17.37 | 394.11 | 40.22 | 571.08 | 28.57 |
| Technician 2 | 1.00 | 165.43 | 16.23 | 405.65 | 41.40 | 571.08 | 28.57 |
| EP Tech | 1.00 | 676.62 | 66.40 | 180.00 | 18.37 | 856.62 | 42.86 |

Totals = \$ 1,019.02 (6) \$ 979.76 (5) \$ 1,998.78

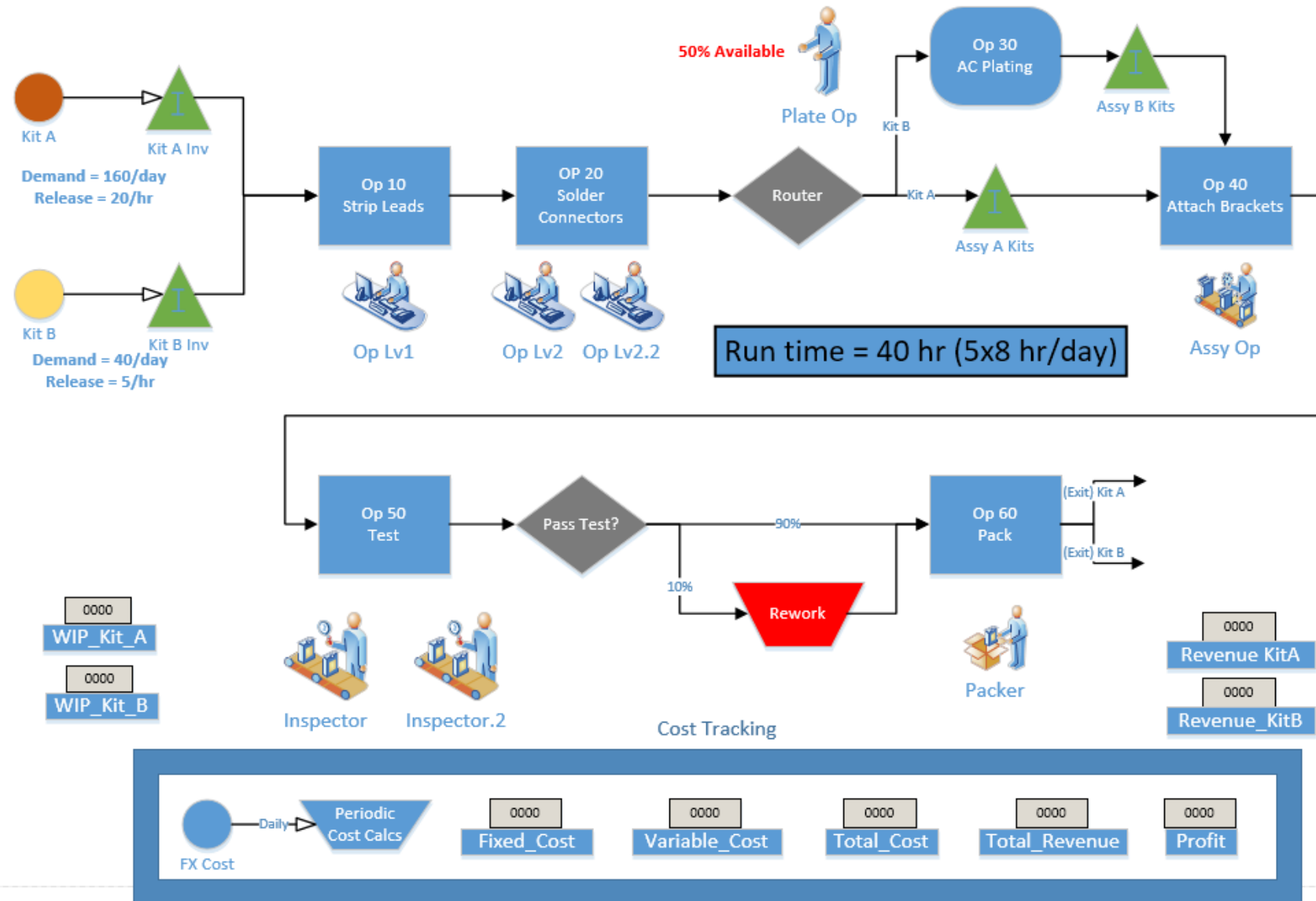
Additional Model Examples with Costing

- Will present two models of wire harness manufacturing operations.
- First model is a traditional “Push” system.
- Second model is a “Pull” system.
- Both models:
 - Utilize costing in their entities, activities, & resources.
 - Utilize logic statements to increase entity cost for rework activities.
 - Utilize Variables to calculate additional cost-related items such as Revenue and Profit.

Wire Harness Manufacturing Demo Push System

Model Example 1: A Push System

This simple mfg process produces 2 Wire Harness products from kitted components. It includes both Variable costs that are tracked internally by Process Simulator, plus Fixed costs that are tracked via manually added variables. Fixed and Variable costs are then summed to calculate Total cost which is then subtracted from Total Revenue to show Profit.



Entity Cost Report – Wire Harness Model

| Entity Costs | | | |
|--------------|----------------|------------|--------------|
| Name | Explicit Exits | Total Cost | % Total Cost |
| Kit A | 797.00 | 4,020.24 | 68.98 |
| Kit B | 195.00 | 1,807.74 | 31.02 |

- All variable costs that are accumulated by the entities as they travel through the system are shown in the table above. This includes
 - Initial costs of the Kits as they enter the system
 - Cost of using resources at each activity (hourly and/or per use)
 - Hourly cost of activities that have this type of cost specified
 - Any additional cost applied through IncCost(entity) statement

Activity Cost Report – Wire Harness Model

- Variable costs that are accumulated at each activity are shown in the table here. This includes costs of using the resources at each activity, plus any activity-specific hourly cost that is specified.

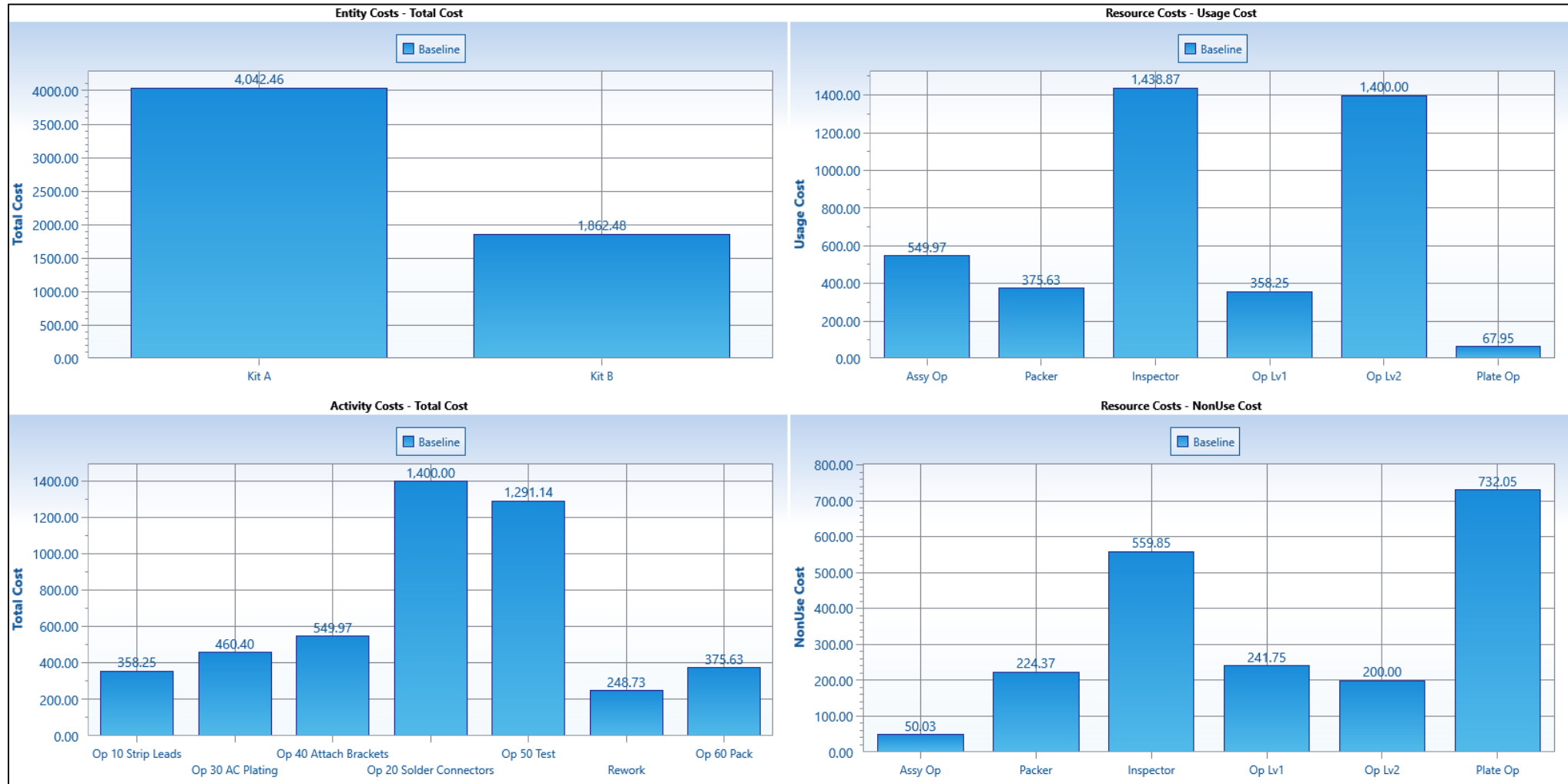
| Name | Activity Costs | | | | | |
|-------------------------|----------------|------------------|---------------|-----------------|------------|--------------|
| | Operation Cost | % Operation Cost | Resource Cost | % Resource Cost | Total Cost | % Total Cost |
| Op 10 Strip Leads | 0.00 | 0.00 | 358.25 | 8.59 | 358.25 | 7.68 |
| Op 20 Solder Connectors | 0.00 | 0.00 | 1,400.00 | 33.56 | 1,400.00 | 30.02 |
| Op 30 AC Plating | 395.55 | 80.47 | 69.95 | 1.68 | 465.50 | 9.98 |
| Op 40 Attach Brackets | 0.00 | 0.00 | 546.25 | 13.09 | 546.25 | 11.71 |
| Op 50 Test | 0.00 | 0.00 | 1,281.88 | 30.73 | 1,281.88 | 27.49 |
| Op 60 Pack | 0.00 | 0.00 | 372.80 | 8.94 | 372.80 | 7.99 |
| Rework | 96.00 | 19.53 | 142.42 | 3.41 | 238.42 | 5.11 |

Resource Cost Report – Wire Harness Model

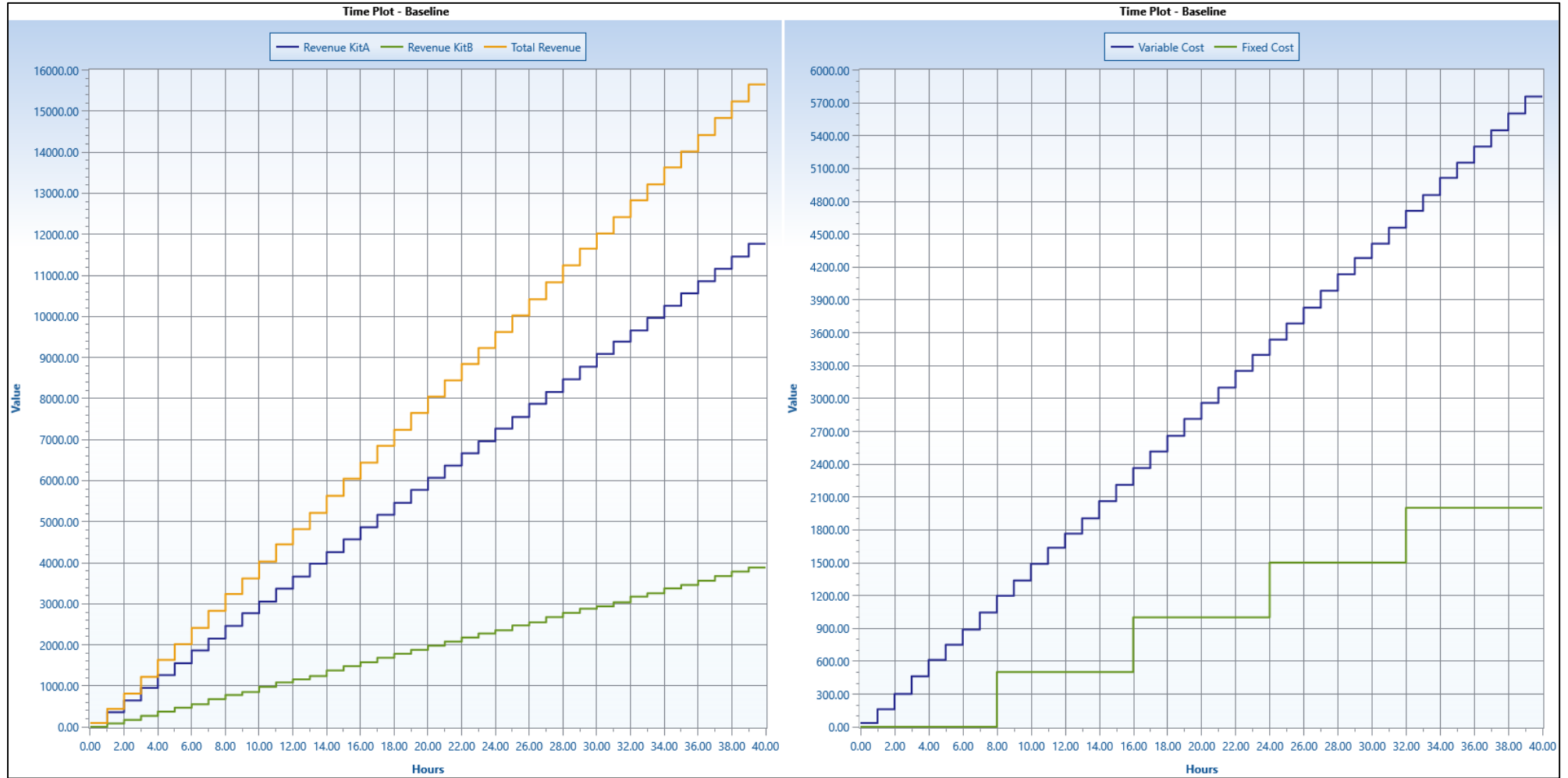
- All costs incurred by the use of each resource type (across all activities in the model) are given in this table.

| Name | Units | Resource Costs | | | | | |
|-----------|-------|----------------|---------------|------------|--------------|------------|--------------|
| | | NonUse Cost | % NonUse Cost | Usage Cost | % Usage Cost | Total Cost | % Total Cost |
| Assy Op | 1.00 | 53.75 | 2.65 | 546.25 | 13.09 | 600.00 | 9.68 |
| Packer | 1.00 | 227.20 | 11.20 | 372.80 | 8.94 | 600.00 | 9.68 |
| Inspector | 2.00 | 575.01 | 28.36 | 1,424.29 | 34.14 | 1,999.30 | 32.25 |
| Op Lv1 | 1.00 | 241.75 | 11.92 | 358.25 | 8.59 | 600.00 | 9.68 |
| Op Lv2 | 2.00 | 200.00 | 9.86 | 1,400.00 | 33.56 | 1,600.00 | 25.81 |
| Plate Op | 1.00 | 730.05 | 36.00 | 69.95 | 1.68 | 800.00 | 12.90 |

Total Cost of Entities, Activities, Resources



Variable & Fixed Costs, Revenue



Logic to Calculate Non-Usage Resource Cost.



- ▶ The logic required to calculate non-usage resource cost took a little thought, but can be copied into a subroutine and used in future models.

```
Real rlv_ResNUCost
// Increment the Fixed Overhead costs incurred each period.
Inc Fixed_Cost,m_Daily_OH
// Calculate the cost of non-usage resource time.
If Clock(hr) = 8.0 Then
    s_Reset_Vars()
If Clock(hr) >= 48.0 Then
{
    Get Op_Lv1,999
    Inc rlv_ResNUCost,GetResRate(Op_Lv1)*40*Units(Op_Lv1)*((100-PercentUtil(Op_Lv1))/100)
    Get Op_Lv2,999
    Inc rlv_ResNUCost,GetResRate(Op_Lv2)*40*Units(Op_Lv2)*((100-PercentUtil(Op_Lv2))/100)
    Get Plate_Op,999
    Inc rlv_ResNUCost,GetResRate(Plate_Op)*40*Units(Plate_Op)*((100-PercentUtil(Plate_Op))/100)
    Get Assy_Op,999
    Inc rlv_ResNUCost,GetResRate(Assy_Op)*40*Units(Assy_Op)*((100-PercentUtil(Assy_Op))/100)
    Get Inspector,999
    Inc rlv_ResNUCost,GetResRate(Inspector)*40*Units(Inspector)*((100-PercentUtil(Inspector))/100)
    Get Packer,999
    Inc rlv_ResNUCost,GetResRate(Packer)*40*Units(Packer)*((100-PercentUtil(Packer))/100)
    Free All

    Inc Fixed_Cost,rlv_ResNUCost
    Total_Cost = Fixed_Cost + Variable_Cost
    Profit = Total_Revenue - Total_Cost

    Stop
}
```

Red logic occurs at the end of the 40 hour run.

Total Costs and Profit Calculations

- Due to the non-usage cost of the resources being unknown until the end of the model run, Total Cost and, hence, Profit can only be calculated at the end of the model run.

| Name | Maximum Value | |
|---------------|---------------|--|
| Revenue KitA | 11,955.00 | |
| Revenue KitB | 3,900.00 | |
| Variable Cost | 5,827.97 | |
| Fixed Cost | 4,527.75 | |
| Total Cost | 10,355.73 | |
| Total Revenue | 15,855.00 | |
| Profit | 5,499.27 | |

Comments on Cost Tracking from Model 1

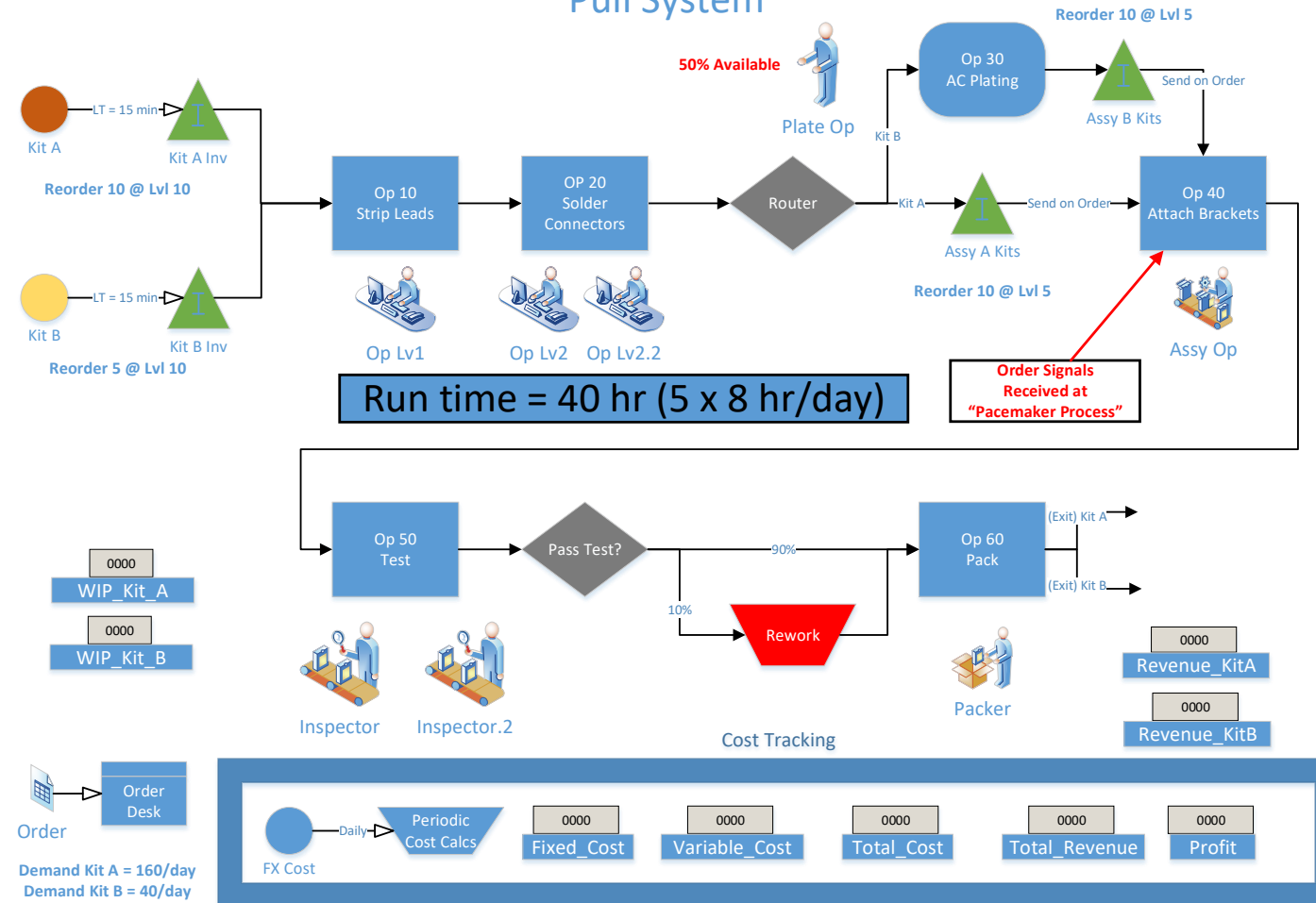
- Tracking Variable costs accumulated over the course of a model run is easy using the built-in costing features of Process Simulator
- Tracking periodic Fixed costs is also easy via the use of a trigger entity, variables and activity logic occurring at the end of each period.
- Calculating the Total costs incurred throughout the process requires an extra step to determine the non-usage times of the resources and multiplying those values by the resource rates.
- Profit calculation is straight forward upon determining the total cost in the step above.

Model Example 2: Wire Harness Model - Pull System

This is the same simple Wire Harness model as before, but with a Pull System implemented for inventory control.

When using the Storage objects (as in this model) be aware that any "Initial Level" entities will not have accumulated costs from previous activities or resource usage. Therefore, it is important to use a warmup period to "flush" those entities from the system before collecting statistics.

Wire Harness Manufacturing Demo Pull System



Comments on Cost Tracking from Model 2

- No changes were necessary from a cost tracking standpoint when converting the Push system version of the Wire Harness model to a Pull system.

Cost Summary

- Cost information can be assigned to each Entity, Activity, and Resource through the Cost fields in their respective Properties dialogs.
- Costs are tabulated while a model runs which gives users the ability to monitor the various costs associated with entities, activities, and resources.
- Other ways to incur or track costs include using special logic statements such as IncEntCost. You can also create additional model elements like Variables to calculate cost.
- The Output Viewer generates element-specific reports that include the Cost statistics which are automatically generated during the model run.

FINISHED

- Thanks for attending this Process Simulator Cost Features Webinar! We hope it was helpful.
- Remember, help is only an email or phone call away.
- Good luck and happy modeling!

Poll #3

Technical Support
888-776-6633
support@promodel.com
6 am - 6 pm M-F, Mountain Time

Reference Information: Cost Report Definitions & Rules

Entity Cost Report Definitions

- Explicit Exits: The number of entities that have explicitly exited. Whenever an entity exits the system, it is an explicit exit except in the following cases:
 - When an entity JOINS, permanently LOADS, or COMBINES with another entity, it implicitly exits the system, and is reported as an exit in the Entity Activity report. However, for costing purposes, the entity did not explicitly exit, but its costing information was added to the entity it was JOINED, permanently LOADED, or COMBINED with.
 - When an entity temporarily LOADS or GROUPS with another entity, and the entire LOADED or GROUPEd entity exits the system, the original entity implicitly exits the system, and is reported as an exit in the Entity Activity report. Cost information will be lost if entities exit as part of a Group.
- Total Cost Dollars: Total Cost = cumulative entity cost, or the sum of costs incurred on all locations the entity passed through + the sum of all costs incurred by use of resource + initial cost + any IncEntCost
- % Total Cost: %Total Cost refers to the entity's percentage of sum of all entity costs

Activity Cost Report Definitions

- Operational Cost = (Active Operation Time * Rate) + (Any IncLocCost)
- % Operational Cost refers to the activity's percentage of the sum of all operation costs
- Resource Cost = (Utilization * Rate) + (TimesUsed * Cost per use)
- Please Note: For Resource Cost, Utilization and TimesUsed refer to the utilization of a resource while at a location. This applies only to resource use through operation logic.
- % Resource Cost refers to the activity's percentage of the sum of all resource costs
- Total Cost = (Operation Cost + Resource Cost)
- % Total Cost refers to activity's percentage of the sum of all activity costs

Resource Cost Report Definitions

- $\text{NonUse Cost} = (1 - \% \text{Utilization}) * \text{Scheduled Time} * \text{Rate}$
- % NonUse Cost refers to the resource's percentage of the sum of all nonuse costs
- $\text{Usage Cost} = (\% \text{Utilization} * \text{Scheduled Time} * \text{Rate}) + (\text{TimesUsed} * \text{Cost per use})$
- % Usage Cost refers to the resource's percentage of the sum of all resource usage costs
- $\text{Total Cost} = \text{Usage Cost} + \text{NonUse Cost}$
- %Total Cost refers to the resource's percentage of the sum of all resource costs

Cost Rules for Entities – Attach / Detach

- Attached entities do Not add their costs or time statistics to their base entities unless they are Permanently Attached.
- Permanently Attached entities do add their costs to their base entities, but not their time statistics.
- When an Detach occurs, ProModel divides all costs accrued by an Attached entity among the Detached entities. ProModel adds all other entity statistics calculated during the Attached period to each of the Detached entities.
- Entities leaving the system that were temporarily Attached onto other entities do NOT report their individual costs, but do report all other statistics. To get the cost of each entity, you must Detach the entities before they exit or permanently Attach them.

Special Cost Handling

- As soon as you acquire a resource, it begins to accumulate cost.
- Unless obtained in the move logic, Process Simulator charges the “Cost per use” for a resource to the activity that obtained it. Resources obtained in the Routing move logic do not charge a “per use” cost to any activity.
- Process Simulator does not charge any resource time used during Routing move logic to any activity.
- Process Simulator adds initial entity costs defined in the cost module only as entity costs, not activity costs.
- If an activity uses a resource during a downtime, the activity accrues that resource’s cost.
- The Use statement counts as operation and resource cost.
- When you Create a new entity, it begins with new time statistics and an initial cost.
- If you Rename an entity, previous time statistics and costs continue with the entity.
- The Split As statement divides the cost of the original entity between all entities. Each new entity begins with new time statistics.

Cost Rules for Preemption & Downtimes

- If you preempt an entity's resource, an additional cost per use will apply once you re-acquire the resource. While waiting for the resource to return, the entity does not record operation or resource costs.
- If an entity preempts another entity, the preempted entity continues to record operation time during the entire preemption period. While the preempting and preempted entities are simultaneously at an activity, the activity records the cost for both entities. If the preempting entity obtains a resource, the preempted entity will not record the resource costs during the preemption period.
- If an entity is at an activity when a preemptive downtime occurs, the entity records the downtime as part of its operational costs. This applies to all types of activity downtimes, including shifts. The activity records the cost of the preempted entity while it remains at the activity.
- If an entity's resource has a downtime which requires the use of another resource, the entity will not record the second resource's cost. However, the activity will record the extra resource's cost.