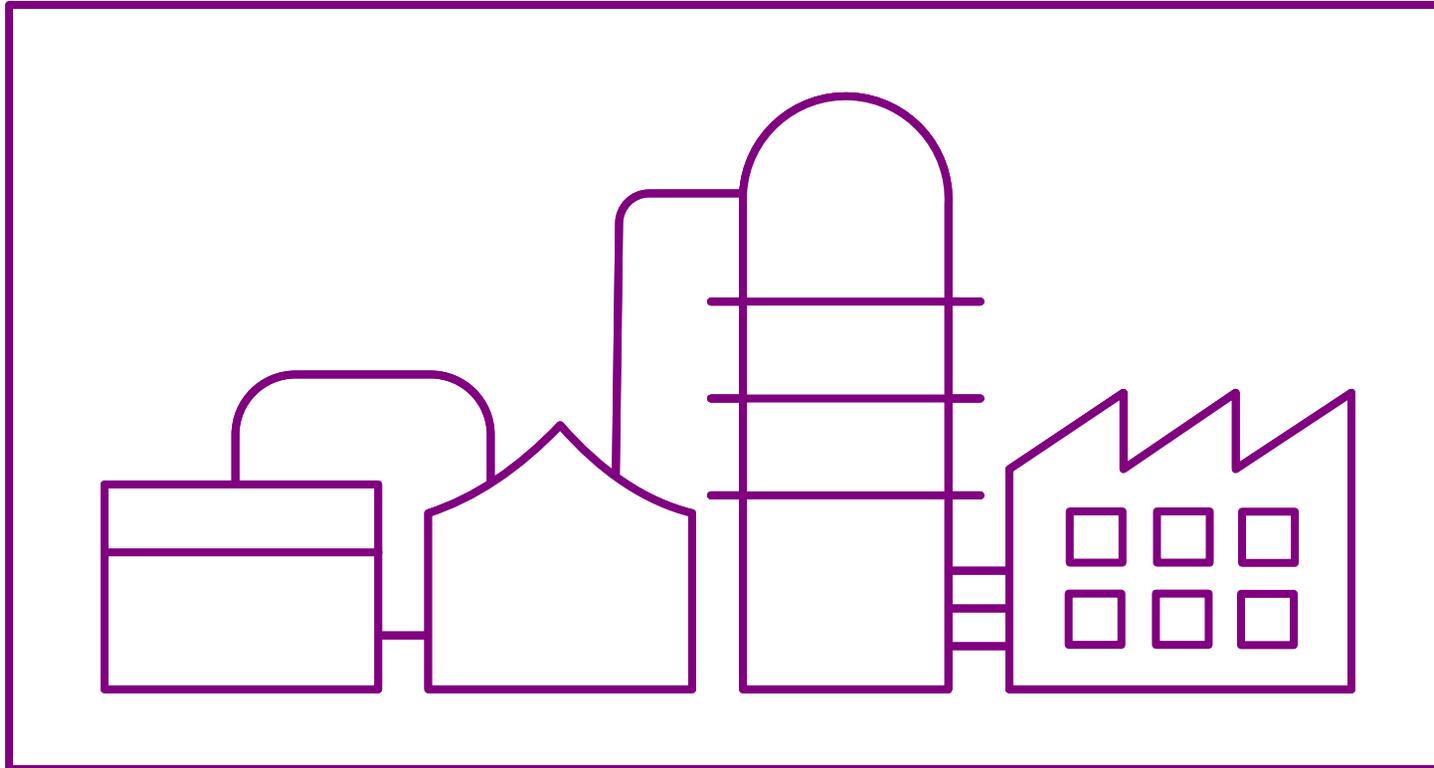


# Mix Processing Maps

Introduction to eVSM Mix Processing concepts and how to use guide.



## How to Use this File

This file contains the reading materials and the exercise pages from the course (title on previous page). While the course can only be taken on a computer, this booklet can be useful for note taking and later for refresher training.

This booklet is designed for on-screen and print use. For on-screen use, we recommend Acrobat Reader with the page display set to "Single Page View".

For hardcopy use, print the file on 8.5x11 or A4, and bind along the long edge.

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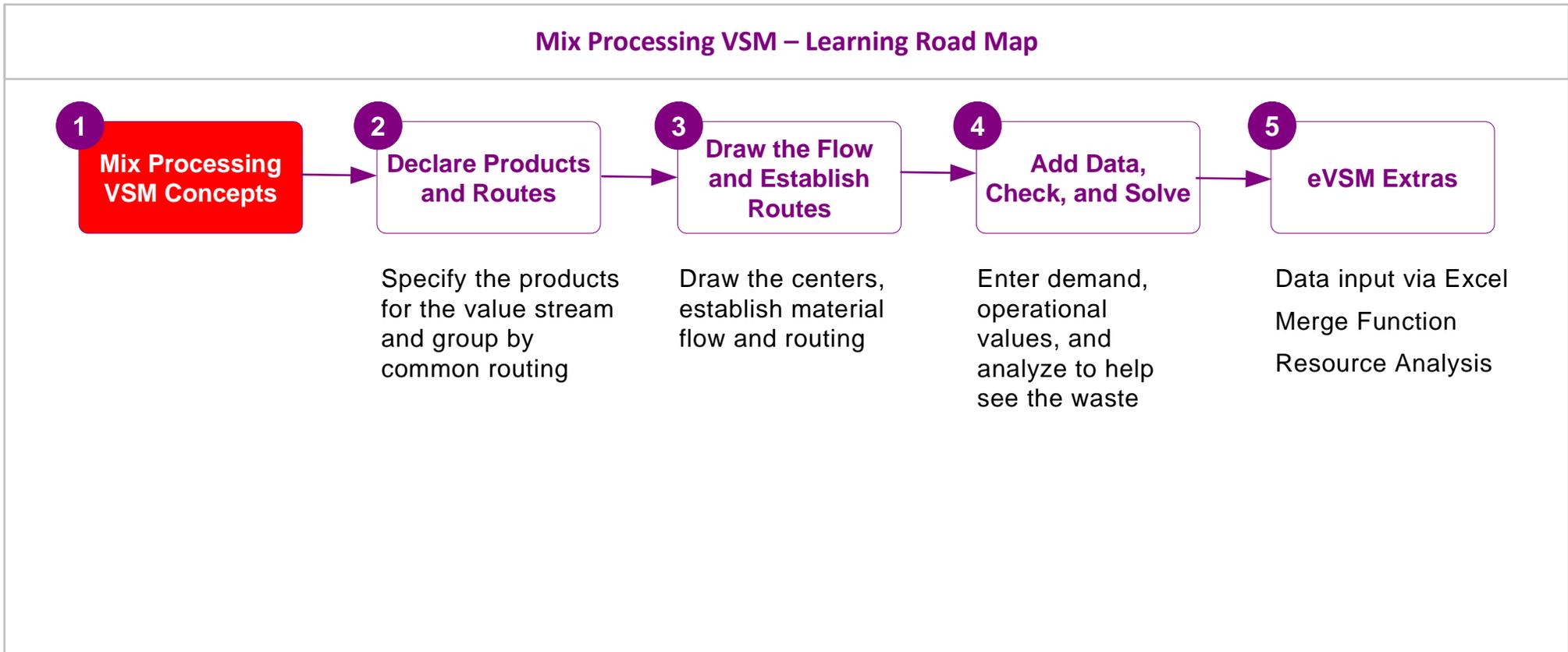
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## Introduction to Mix Processing VSM Concepts

The eVSM Mix Processing application is for plant level value stream mapping of chemicals, pharma, and food processes. The stencil includes visuals to represent the flow of materials and information in multi-product value streams and has built in lean analytics for capacity, lead time, human resource, and cost. The maps can leverage eVSM's improvement management framework.

In this lesson, we will take a look at the concepts supported by eVSM's Mix Processing stencil



**NOTE: You must have eVSM v11.43 or later to run this course. If you have an older version, please contact [support@evsm.com](mailto:support@evsm.com) for information on how to upgrade or to access older course files.**

## Working with the eLearner Control Panel

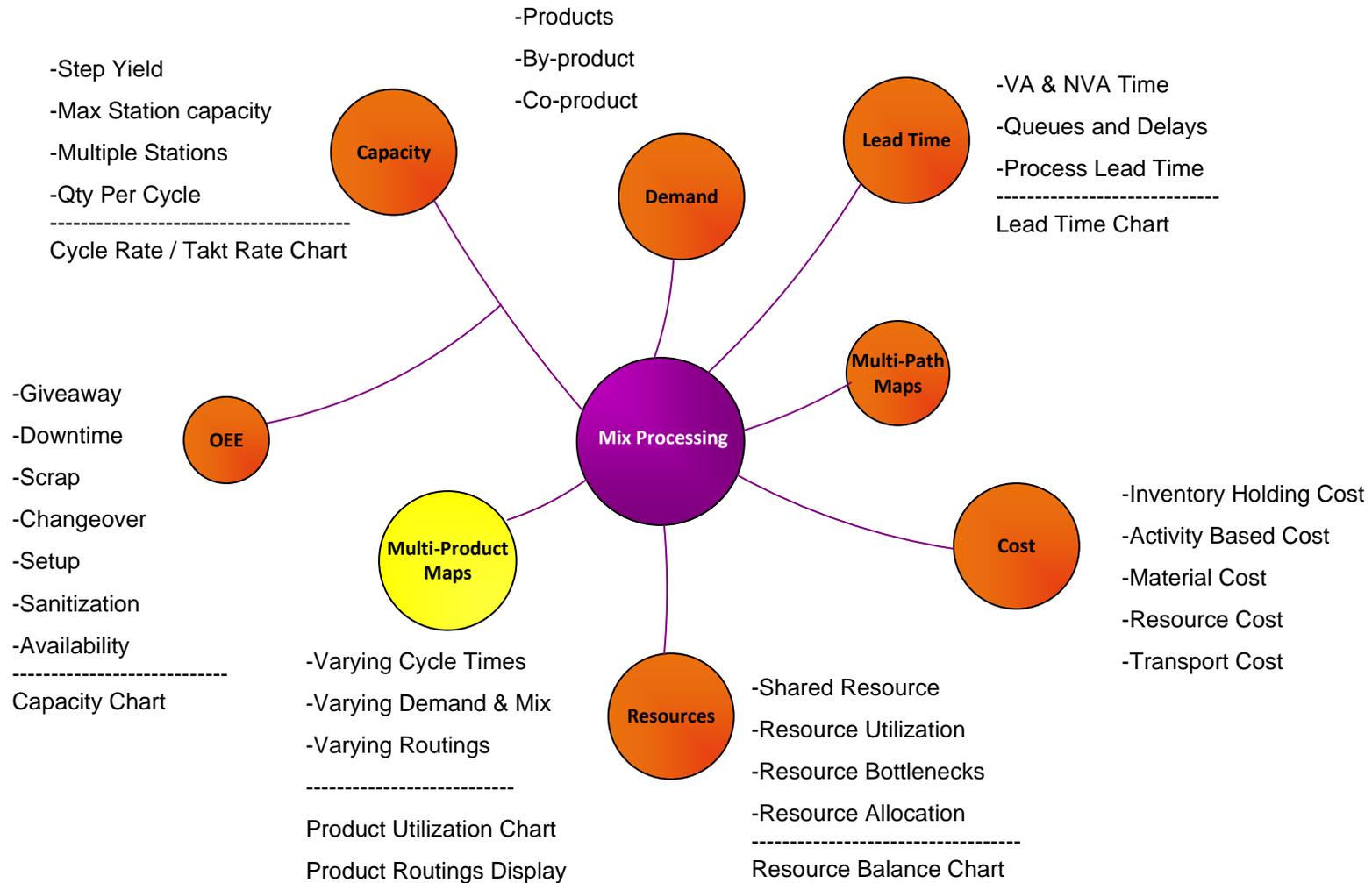
The diagram illustrates the eLearner Control Panel interface. At the top, it shows the course information: "Course: Time Maps: Lesson 1/7: Improvement cycle" and the user's email "hr@evsm.com". A "Sign Out" button is visible next to a user profile picture. The main exercise area is titled "Ex 1 of 2: Configure the Sequence" and contains instructions: "Drag the purple shapes into the white boxes to sequence your improvement steps for the customer fulfillment value stream." Below the exercise area is a purple control panel with several buttons: a question mark, an envelope, a starburst, a speech bubble, a document, a play button, a list icon, a refresh icon, a left arrow, a right arrow, and a "Grade It!" button. Callouts provide the following functions for these buttons:
 

- Question mark: Send feedback and questions to eVSM Support
- Envelope: Check Scorecard
- Starburst: Check Hint if unclear about instructions
- Speech bubble: See reference (when available)
- Document: See video (when available)
- Play button: See table of contents (TOC) for current lesson
- List icon: See reference (when available)
- Refresh icon: Reset exercise page back to original
- Left arrow: Navigate pages
- Right arrow: Navigate pages
- Grade It!: You **MUST** click the Grade It button to check correct completion of each exercise and to record your score

## Important Notes

1. Make sure you have a good eLearner environment: large screen PC, 1280x720 resolution minimum, physical mouse with scroll wheel
2. When you complete an exercise, you **MUST** click the "Grade It" button
3. You **WILL** lose points if you get an exercise wrong the first time
4. If you are stuck on an exercise, check the Hint. If that does not help, go back and review the preceding Readme pages. If you are still unsure, click the Feedback button in the eLearner panel and ask your question.

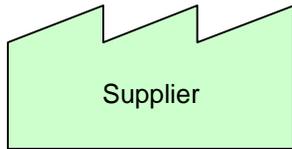
## Mix Processing VSM Analyses



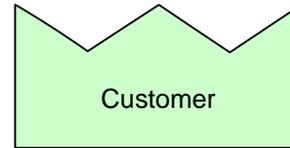
eVSM's Mix Processing VSM application allows capture of food and chemical manufacturing maps with analysis and visualization of capacity, lead time, and cost and to include all the concepts shown above.

Note that eVSM has a separate stencil (Mix Manufacturing) and course to support capture of plant level maps for discrete parts and assemblies.

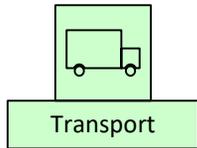
## Mix Processing VSM Primary Mapping Icons



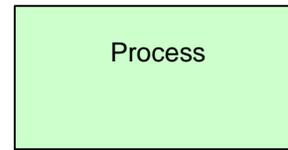
Supplier Center



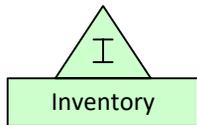
Customer Center



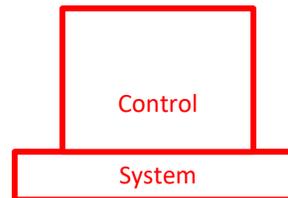
Transport Center



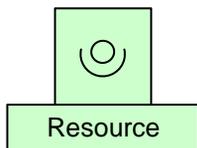
Activity Center



Inventory Center



Control Center



Resource Center

**Q. Which ONE of the following visuals does Mix Processing NOT provide for the value stream?**

- A capacity chart that can show bottlenecks and capacity losses
- A lead time chart
- A resource balance chart to compare staff allocation to availability
- A standard work diagram to show the detailed steps at each station

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## Demand & Net Weight

Processed products have packaging (bottle, case etc..) and ingredients. eVSM's Mix Processing stencil allows depiction of value streams with production of both ingredients and packaging but with an overall demand specified as the weight of the ingredients only. This is called the Net Weight.

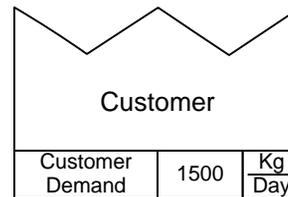
The example below illustrates the customer in the value stream and specifies the customer demand as a Net weight per day

Empty Bottle Weight = 0.5 Kg/Bottle

Contents Weight = 1.5 Kg/Bottle

25 Bottles per Case

Case cardboard Weight = 1Kg



The demand is specified as a NET demand weight over a period. Its important to understand that this is the weight of JUST the contents (the 1.5Kg per bottle) and does NOT include any packaging weight (does not include the empty bottle weight or the case cardboard weight)

In the example above,

Full bottle weight =  $0.5 + 1.5 = 2\text{Kg/Bottle}$

Full Case Weight =  $2 \times 25 + 1 = 51\text{Kg/Case}$

Number of bottles required per day =  $1500 / 1.5 = 1000$  bottles per day

# Activity Capacity Types

Mix Processing is equipped with multiple Activity Capacity addons for the Activity Center. The user chooses the type that best characterizes the station operation (Batch, Roll, Weight etc..).

-  Activity Center
-  Type UnitWt
-  Type BatchVol
-  Type BatchWt
-  Type Roller
-  Type FlowWT
-  Type FlowVol

Underneath the Activity Center will be the different activity capacity addons

Begin by dragging out the Activity Center

 Activity Center

THEN

Add ONE of the Activity Capacity types (Yellow addon)

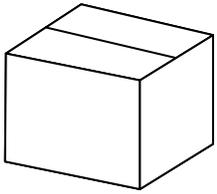
40030		P
Process		
Output Unit = ?		
Process Lead Time	xx	Min
Step Yield	100	%
Stations	1	Stn
Utilization	Auto	%
Batch Weight	x.xx	Kg Btch
Time per Batch	x.xx	Min Btch
Batch CO Time	x.xx	Min Btch
Batches per Campaign	1	Btch Cmpn
Campaign CO Time	x.xx	Min Cmpn
Campaign Mat Loss	0	Kg Cmpn

Ex: The Type BatchWt addon

## Notes:

- An Activity Capacity addon is required for each activity center used
- Only one Activity Capacity addon type may be used at a time
- Time Units may be changed to match the data the user has

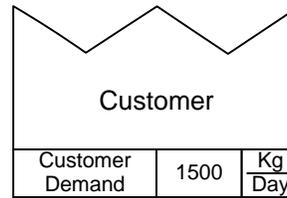
A value stream has a customer demand of 1500 Kg / Day. The product is packed in cases that each weigh 100Kg. There are 24 filled bottles in each case and each filled bottle weighs 4Kg. An empty bottle weighs 1 Kg. An empty case weighs 4 Kg



100 Kg/Case  
24 Bottles/Case



4Kg / Bottle  
1Kg / Empty Bottle



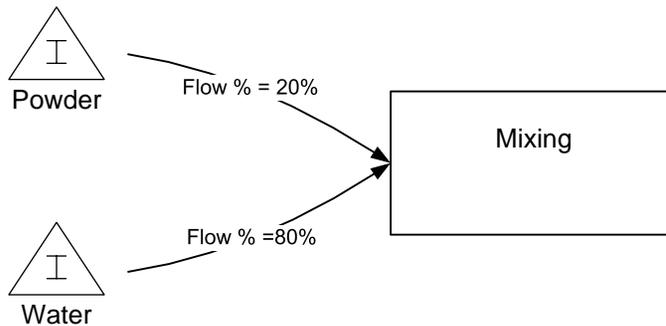
**Q. Approximately how many cases are needed each day ?**

- 21 cases
- 15 cases
- 16 cases

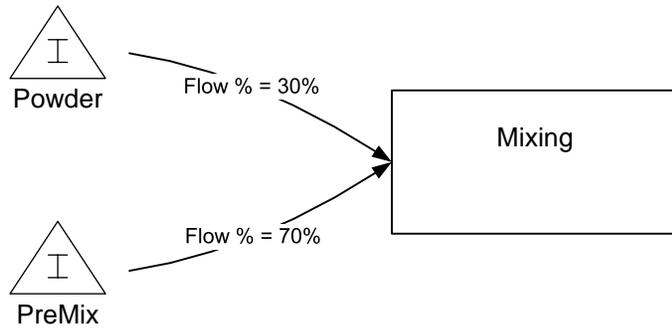
## Multiple Ingredients & Flow %

When several ingredients are needed for a process step, you must specify what percent of the incoming weight is represented by each ingredient; this is called the Flow %.

The example below, for every 100Kg of ingredients coming into the process, you need 20Kg of powder and 80 Kg of water. The Flow % values for ingredients must add up to 100. Note that ingredients can be incoming from an upstream process or from inventory.



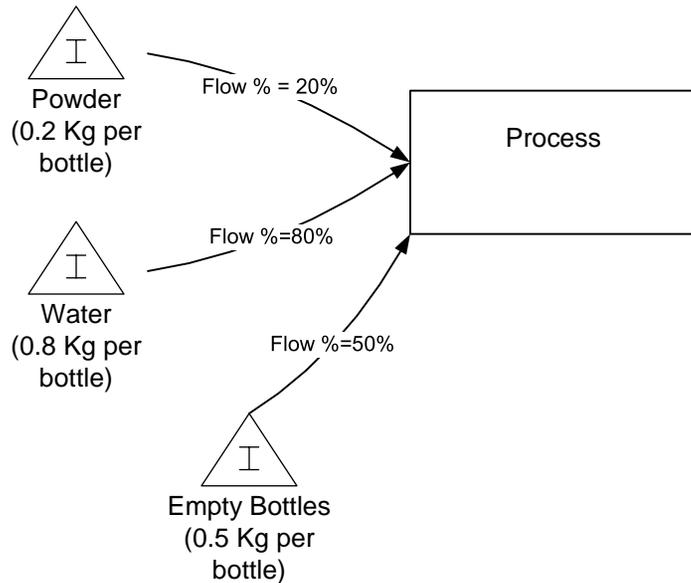
In this example, if we know how much product needs to come out of the mixer to satisfy the demand from the downstream process, we can calculate how much of each ingredient is needed to go into the mixer based on the Flow % values. eVSM calculates the demand at each step in the value stream by starting with a known customer demand and then working back through each upstream activity and using the Flow % values at each step. The demand calculation takes into account related variables like yield and scrap also.



**Q. If 700 Kg of PreMix are needed per day, how much powder is needed?**

- 700 Kg/Day
- 210 Kg/Day
- 300 Kg/Day

## Ingredients and Packaging



In some processes that include packaging, there are both incoming ingredients and packaging materials. In this specific situation

The Flow % numbers for JUST the ingredients need to add up to 100%

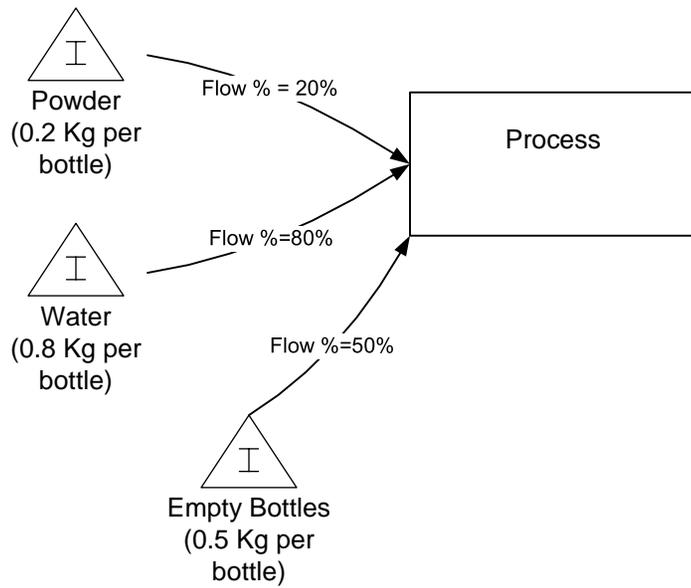
The Flow % number for any packaging is calculated as

$$\frac{100 * \text{Weight of Packaging}}{\text{Total Weight of Ingredients}}$$

For the empty bottles on the left, the Flow % calculation is

$$\frac{100 * 0.5}{(0.2+0.8)} = 50\%$$

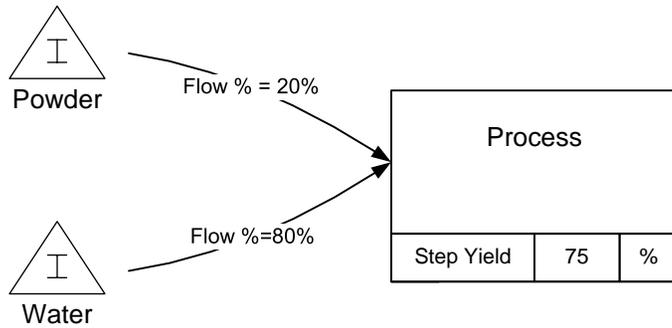
Mix Processing calculates the demand for ingredients at the process and uses the Flow % value to understand the demand for bottles coming into the process.



**Q. How many bottles are needed at the process for each 100 Kg of ingredients (powder + water)?**

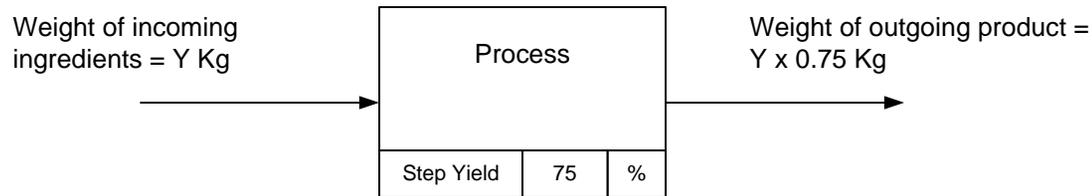
- 50
- 100
- 200
- other

## Step Yield



Production processes sometimes involve steps where the incoming weight is changed through the activity. Could be, for example, because of an evaporation aspect to the activity.

In this example, let's say for every 200 Kg of incoming ingredients weight (40 Kg powder, 160 Kg water) the process only yields 150 Kg of product coming out. The step yield at that process would then be  $100 \times (150/200) = 75\%$



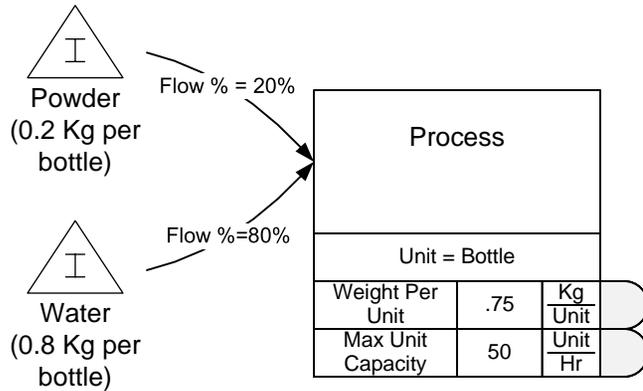
Mixing		
Step Yield	80	%

**Q. If the input net weight is 80Kg/Hr into 'mixing', what is output net weight ?**

- 64 Kg/Hr
- 100 Kg/Hr
- 80 Kg/Hr
- 120 Kg/Hr

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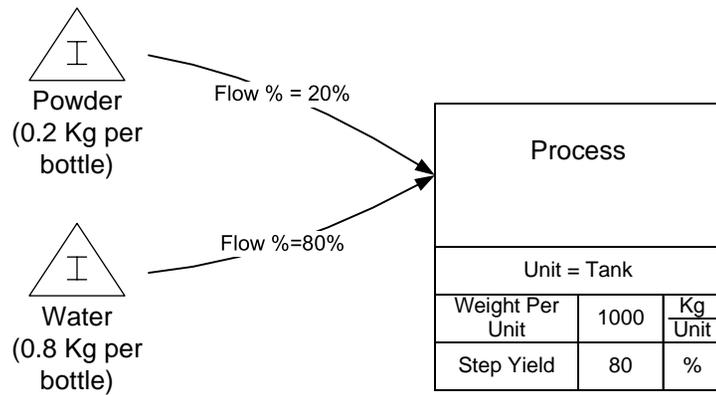
## Local “Unit” to measure Output Quantity



Depending on the process it is sometimes convenient to measure in units other than weight. For this we use the 'Type UnitWt' addon for the activity

In the example on the left perhaps it is convenient to measure output in “bottles”. The Unit (local output quantity) is therefore noted as a “bottle”.

The “Weight Per Unit” is the weight of the ingredient per Unit (bottle) coming OUT of the process step. The capacity is then specified in the new output unit (Bottles/Hr)



**Q. What's the total weight of input ingredients for every tank processed ?**

- 1000 Kg
- 800 Kg
- 1250 Kg
- 1200 Kg

## Max Station capacity

Process		
Unit = Bottle		
Max Station Capacity	200	Unit Hr

The Max Station capacity represents the exit rate of the output from the process.

In this example the local output quantity (Unit) is bottles and the process can produce 200 bottles per Hr.

Note that the Max Station capacity value should be the maximum the station is capable of and not the rate that it is currently running.

## Activity Time

Process		
Activity Time	10	Hr Day

The activity time represents the planned production time for a station after lunch, breaks and planned maintenance times are deducted.

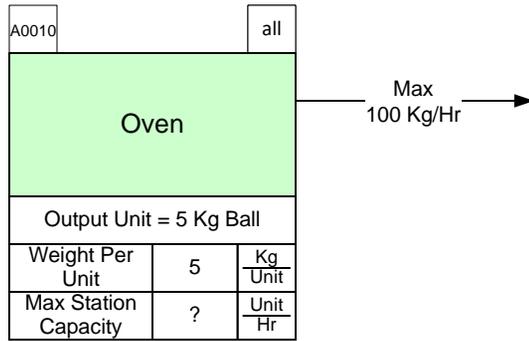
The planned production time DOES include changeovers and setups

## OEE

Process		
Activity Time	10	Hr Day
OEE	90	%

The OEE value represents that percent of planned production time that produces good product after all the station losses due to availability, quality and performance.

So in the example, “good” products are effectively being made for 9 hours per day at the station ( $10 \times 0.9$ )



**Q. What is the Max Station Capacity Value ?**

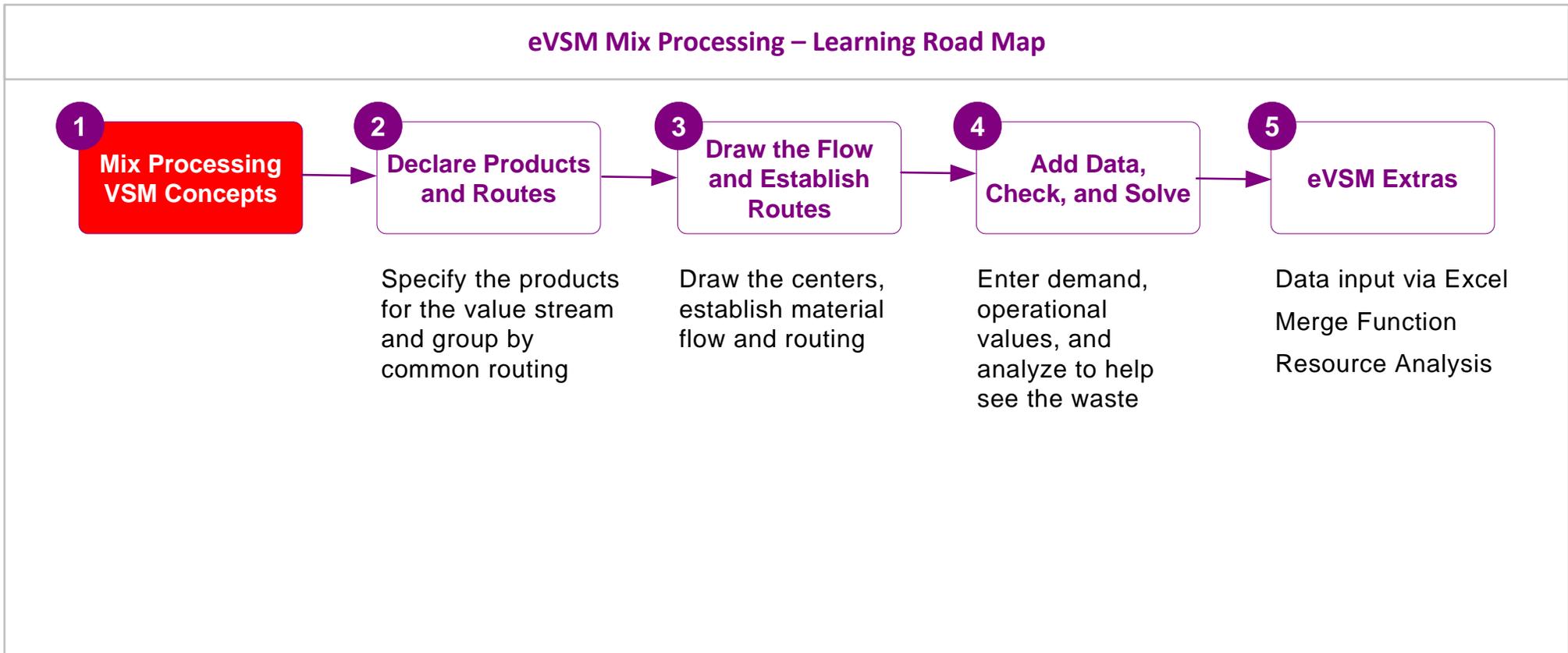
- 200 Unit/Hr
- 100 Unit/Hr
- 20 Unit/Hr
- 40 Unit/Hr

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Units	Week	Year	Week
	5	52	xx
	Day	Week	Hr

## You learned:

- That Mix Processing VSM supports mapping of plant level production value streams for food and chemicals
- Some of the key concepts and data on the map that is used to provide value stream analytics



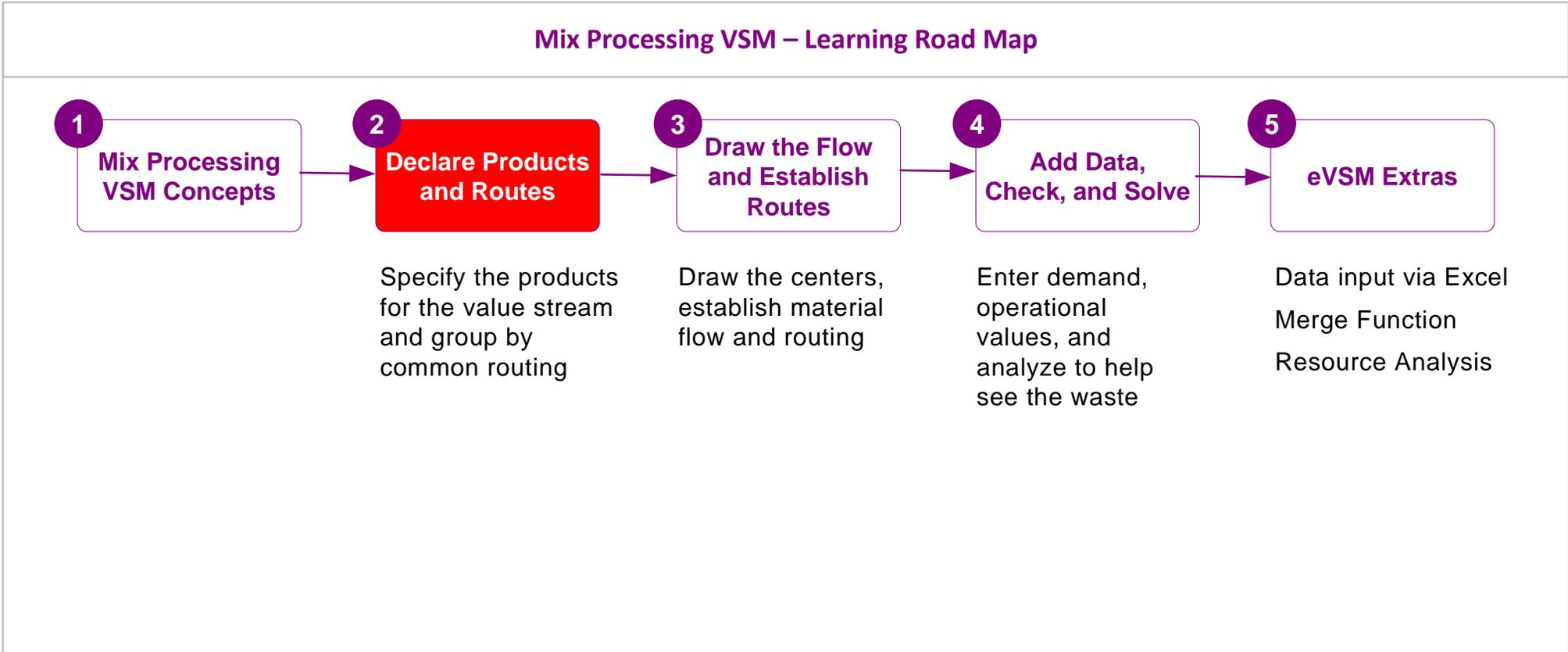
## What's next:

In the next lesson, we will introduce the Mix Manager and use the Product Matrix to begin utilizing the capabilities of Mix.

## Declare Products and Route Sets

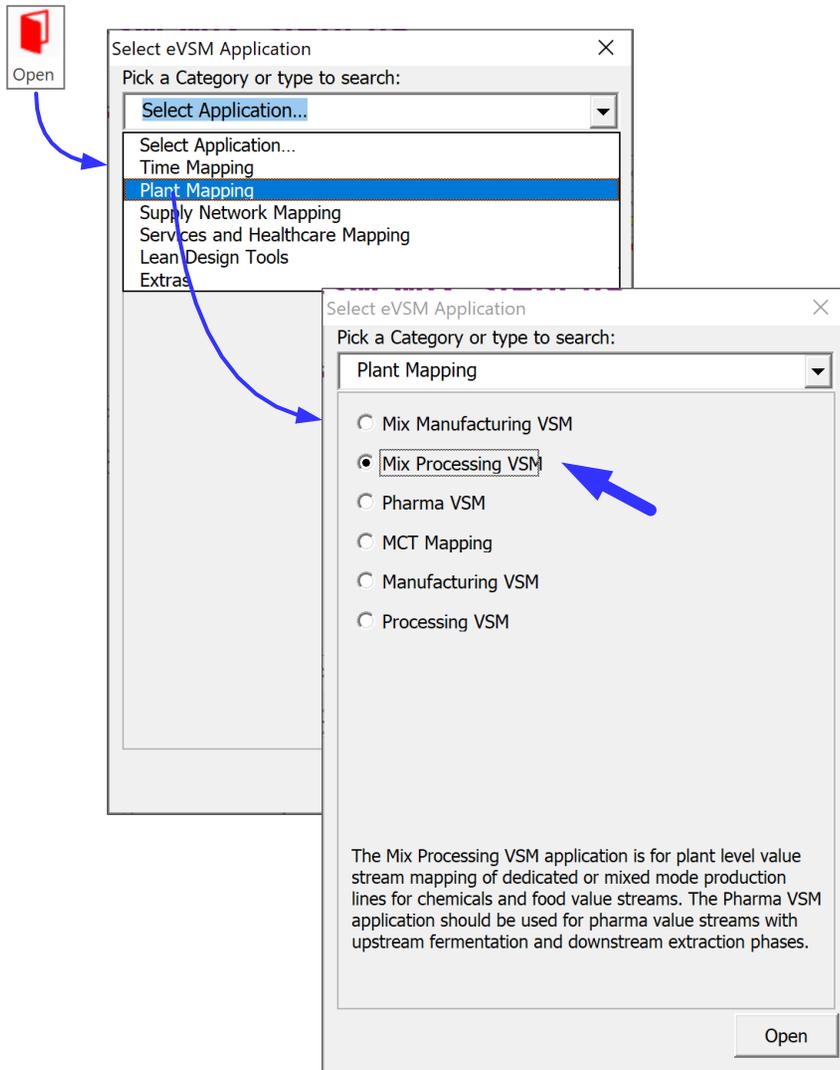
The Mix Processing VSM application in eVSM Mix focuses on plant value stream mapping for mixed model processing of food, and chemicals.

This lesson introduces the mapping process and covers the first step of specifying the products in the value stream and grouping them by common routing

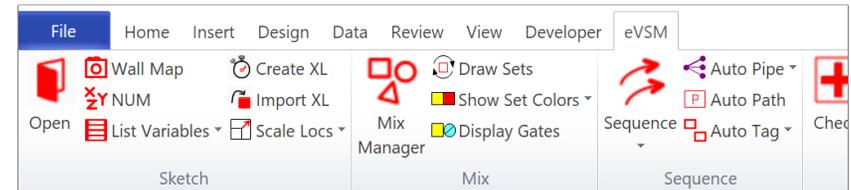


# Start eVSM and Open the Mix Processing VSM Application

## Opening the Mix Processing VSM Stencils



## Quick Mix Toolbar Functions



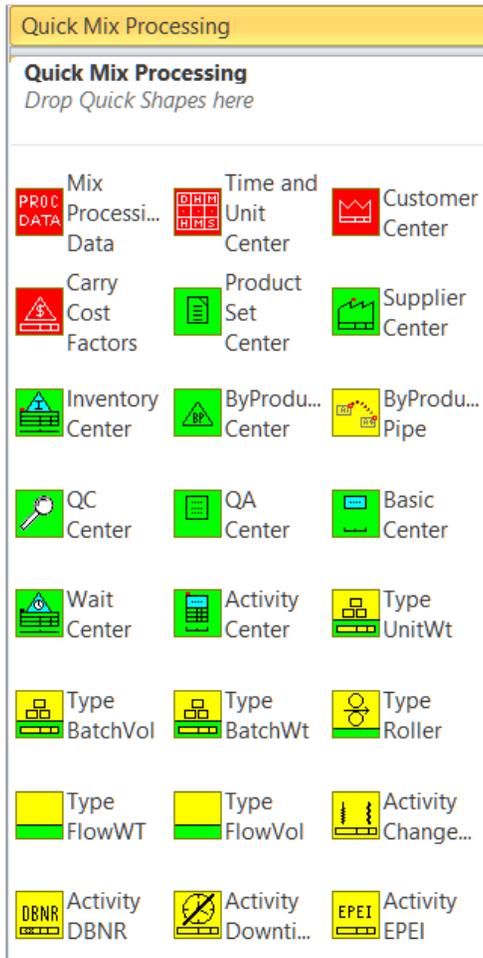
The Quick Mix toolbar functions are only available when Mix stencils are open.

Note: eVSM Mix and eVSM Standard are two different editions of eVSM. eVSM Standard is a sub-set of eVSM Mix. The Mix functionality is only in the eVSM Mix edition.

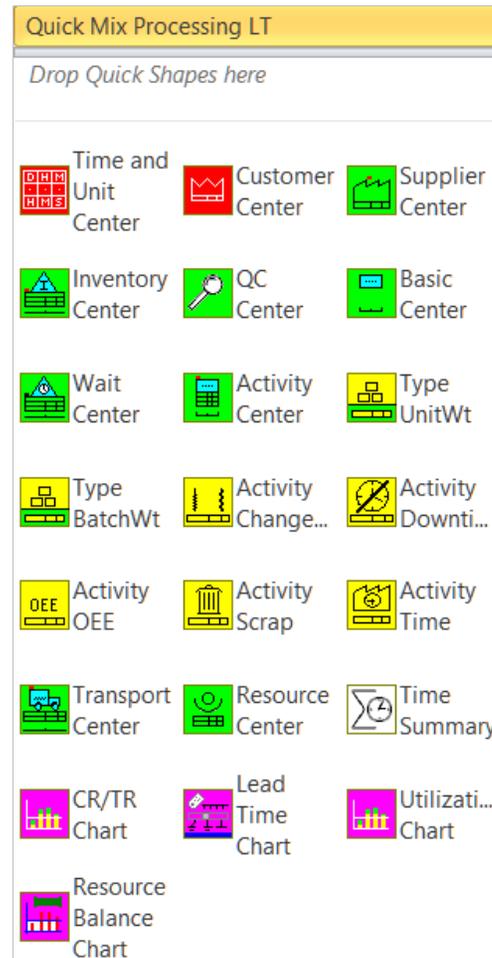
The free 30-Day eVSM trial includes eVSM Mix.

## Mix Processing VSM Stencils

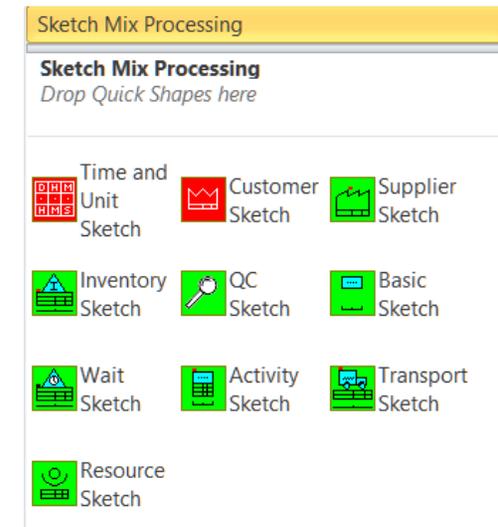
The Quick Mix Processing application is accessed through three stencils. The user can apply icons from any of the three stencils



This is the main stencil and contains all icons for this application

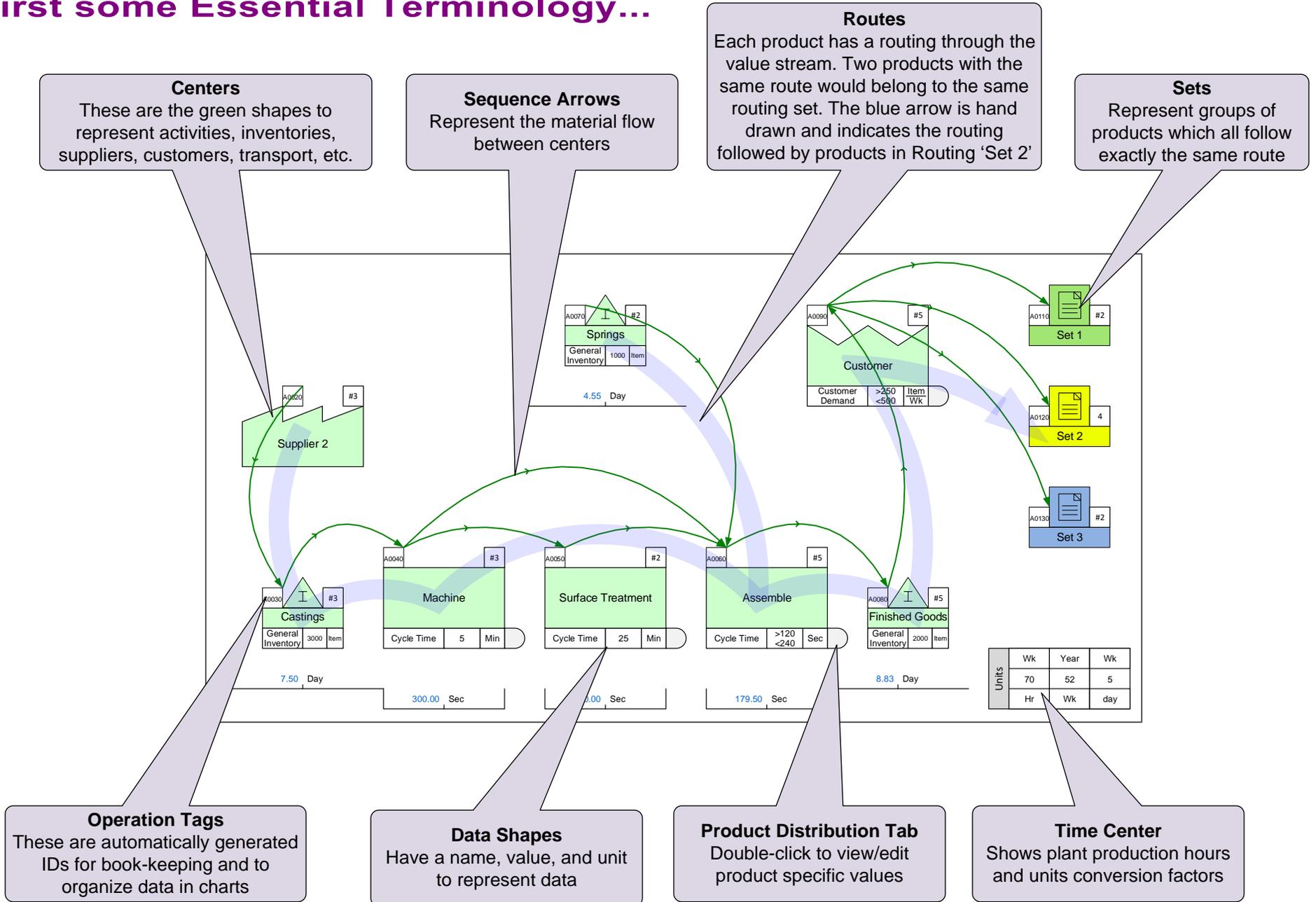


This is a subset of the main stencil. Useful for new users and for quicker access to the icons used most frequently



The sketch stencils contains only the shapes required to create a flowchart of the value stream. Very useful for capturing wall maps. The sketch shapes have a right-mouse click command to add data shapes if/when data needs to be added to the map

# First some Essential Terminology...



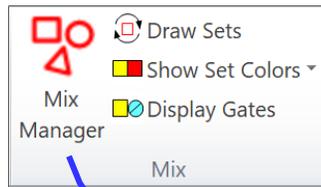
**Q. Which products does a routing “Set” in eVSM group together?**

- All products which have similar cycle times
- All products which go through exactly the same sequence of steps
- All products which are pulled by the customer through similar steps downstream
- All products which get packaged together

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## Define Products and Route Sets

The Mix Manager form allows you to declare your products and group them into Sets.



Open Mix Manager form

Mix Manager - Define Products and Sets

Products:						
ID	Name	Set	Can Merge?	Must Merge?	Is Merged?	Description
1	Product 1	S1	Y	N	N	
6	Product 6	S1	Y	N	N	
3	Product 3	S2	Y	N	N	
4	Product 4	S2	Y	N	N	
5	Product 5	S2	Y	N	N	
2	Product 2	S3	Y	N	N	

Sets:			
ID	Name	Description	Tag
S1	Set 1		
S2	Set 2		
S3	Set 3		

Add/Edit/Delete Products and Sets interactively

You can move the products up or down product list. This is the sequence in which you will see the products in the input data forms

Import Products and Sets via Excel template

This commands should be used only ONCE per map. After that changes can be made directly in the Mix manager form and the map itself

## What are some of the functions of the Mix Manager Products and Sets dialog? Select **ALL** that are true.

- It shows all the products for the current page
- It allows adding/removing Products from Sets
- It allows you to enter product specific customer demand
- It allows importing of Products and Sets from Excel

Mix Manager - Define Products and Sets

Products:						
ID	Name	Set	Can Merge?	Must Merge?	Is Merged?	Description
1	Product 1	S1	Y	N	N	
6	Product 6	S1	Y	N	N	
3	Product 3	S2	Y	N	N	
4	Product 4	S2	Y	N	N	
5	Product 5	S2	Y	N	N	
2	Product 2	S3	Y	N	N	

Sets:			
ID	Name	Description	Tag
S1	Set 1		
S2	Set 2		
S3	Set 3		

## Product Matrix

eVSM Mix includes a product matrix template (in Excel format) which provides a quick way to enter a large number of products and group them into route Sets. Instructions for using the template are below and also included in the first worksheet of the Excel file. Complete the matrix using steps in the sequence indicated

Note that the matrix is intended for ONE TIME USAGE when starting a map. Subsequent updates/edit are made directly on the map

**1** Assign a short ID (suggest 2 numerals) in column C and a longer product name in column D for each product.

**2** Enter text for icon corresponding to a process step in row 1 and select the icon type in row 2.

**3** **Important:** You must select the Icon Type from the pull-down list in row 2.

	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Pellets	Clean	Mix	Dry	ACME Corp
2	Auto Name		Sort Products		Inventory	Activity	Activity	Activity	Customer
3	S1	Set 1	1	Product 1	X	X	X	X	X
4	S2	Set 2	3	Product 3	X	X	X		X
5	S2	Set 2	4	Product 4	X	X	X		X
6	S2	Set 2	5	Product 5		X	X		X
7	S3	Set 3	2	Product 2	X		X	X	X

**6** Click the "Auto Name" button to do the same, but also to automatically generate a default ID and name for each set.

**5** Click the "Sort Product" button to re-arrange the order of the rows so that the like products are together.

**4** Enter an "X" if the product goes through the process.

When the matrix is imported into Visio, the software will establish the initial Products and route Sets for the map. It will also draw the VSM icons (centers) below the drawing page and the Set icons to the right of the page.

The import will NOT however automatically apply the routing indicated by the "X"s in the matrix. This will be done later using sequence arrows and set gates

## What are the uses of the eVSM Product Matrix?

Select **ALL** of the following that are true.

- Provides easy input of products made by the value stream
- Groups products together which follow exactly the same route
- Automatically draws VSM icons (centers) on the map on Import
- Establish the sequence of operations on the map
- The matrix is intended for one time usage when starting a map

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## Steps to create the Product Matrix



### Watch the Movie

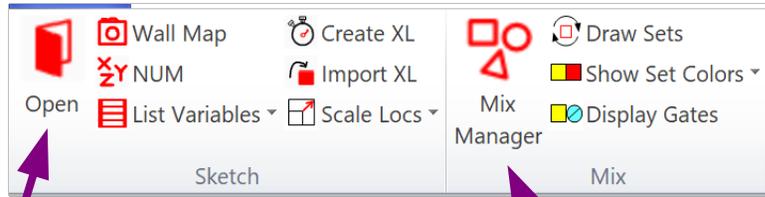
Click the Video button in the eLearner panel to start the video

## Reference Notes

These notes are only a summary of what's in the video. Do not execute these steps on this page.

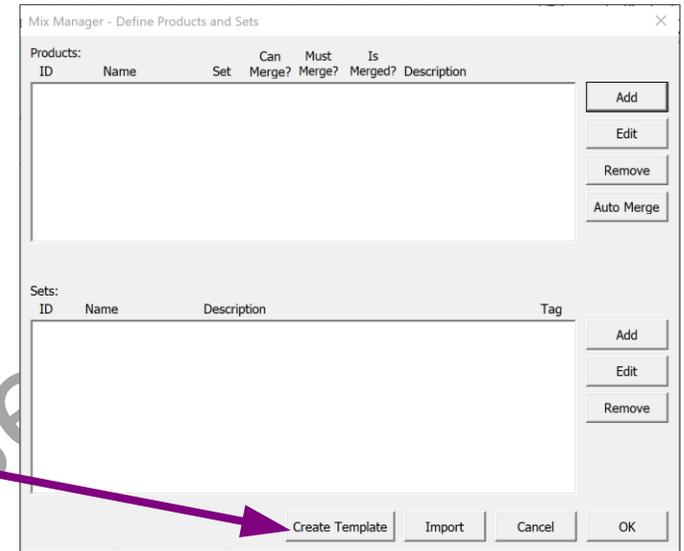
- 1 Select the map type with  **Open**
- 2 Initiate the map by dropping the Time Center from the Quick stencil on the page.
- 3 Open the  **Mix Manager** form. Then click “Create Template” to open the product matrix template in Excel.
- 4 Fill out the Excel template (for help, see the “Instructions” worksheet in Excel).
- 5 Sort products into Route Sets and name the Sets.

## Complete all 6 steps on this page and then click Grade It!



1  
Open the "Mix Processing VSM" stencil

2  
Open the Mix Manager form



3  
Create Template. This will open an Excel template file

4  
Populate the template as shown here

	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Pellets	Clean	Mix	Dry	ACME Corp
2	Auto Name			Sort Products	Inventory	Activity	Activity	Activity	Customer
3			1	Product 1	X	X	X	X	X
4			2	Product 2	X		X	X	X
5			3	Product 3	X	X	X		X
6			4	Product 4	X	X	X		X
7			5	Product 5	X	X	X		X

Row 2 is important

5  
Click the Auto Name button.

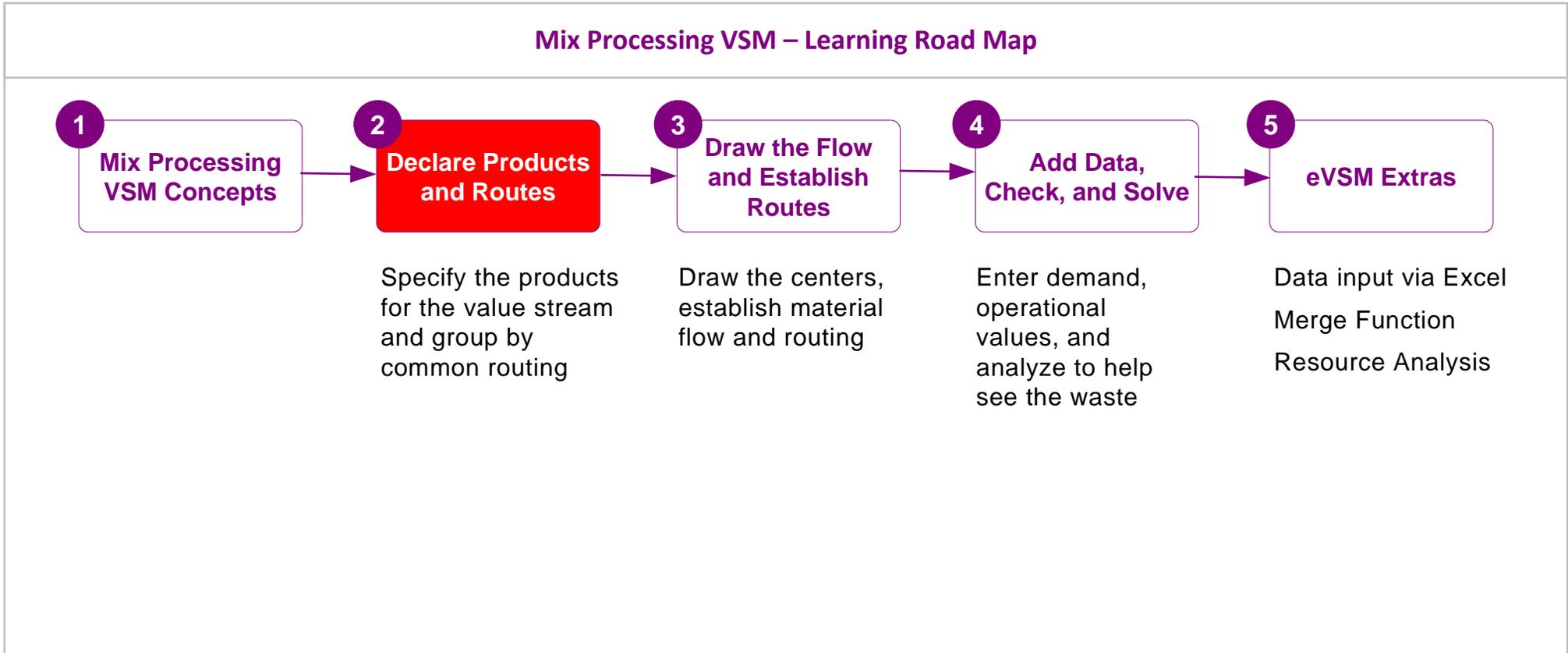
	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Pellets	Clean	Mix	Dry	ACME Corp
2	Auto Name			Sort Products	Inventory	Activity	Activity	Activity	Customer
3	S1	Set 1		1 Product 1	X	X	X	X	X
4	S2	Set 2		3 Product 3	X	X	X		X
5	S2	Set 2		4 Product 4	X	X	X		X
6	S2	Set 2		5 Product 5	X	X	X		X
7	S3	Set 3		2 Product 2	X		X	X	X

Notice how the rows got sorted and colored, and how the sets got named.

6  
Close the Mix Manager form and then click Grade It.

- You learned:**
- How to declare products made by the value stream
  - How to represent processes the products go through in the product matrix
  - How to sort the products into route Sets and name the Sets

## Road Map:



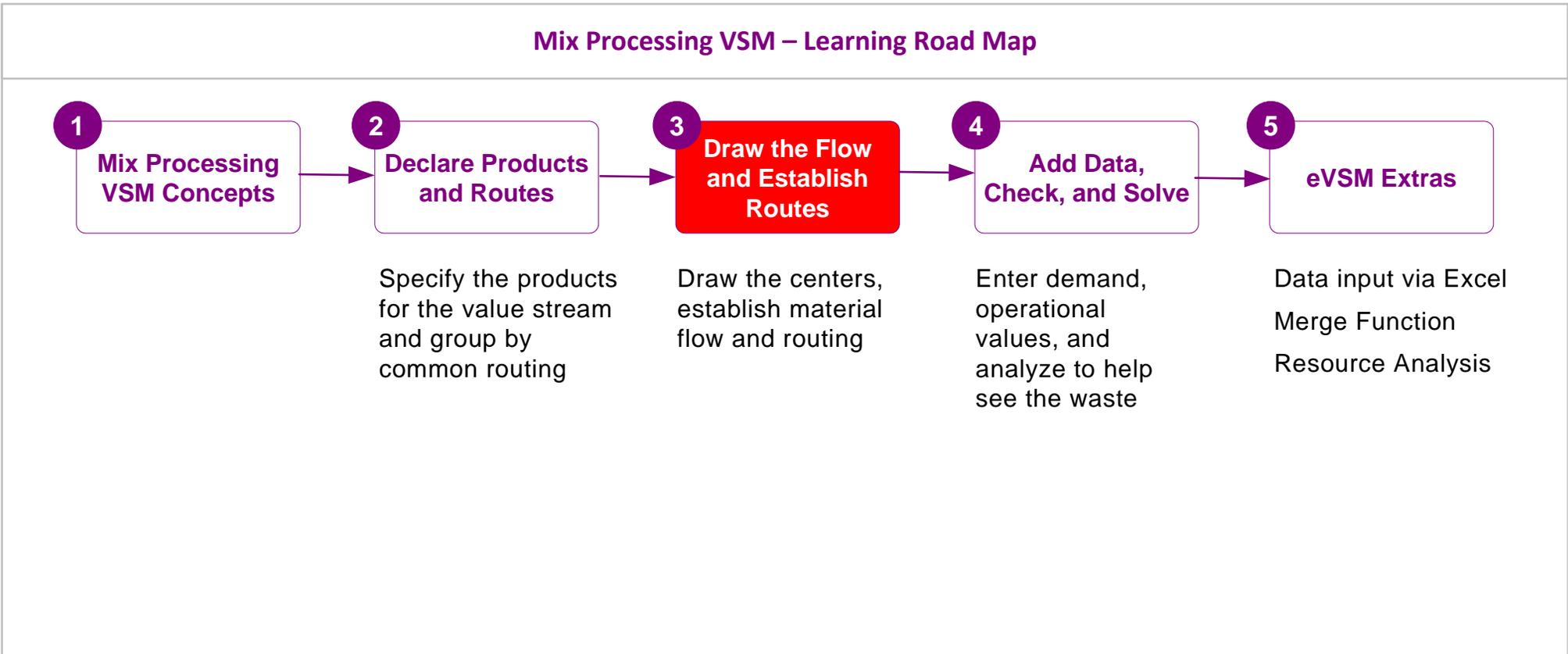
## What's next:

You will learn how to import the product matrix on to your drawing page, specify the material flow, and establish the routes.

## Draw the Flow and Establish Routes

In the previous lesson of this course, you learnt how to specify the products made by the value stream in Excel and how to organize them into routing sets.

In this lesson, you will learn to import the product matrix data into Visio, draw the material flow, and establish the routes.



## Draw the Flow and Establish Routes



## Steps to Draw the Flow and Establish Routes



### Watch the Movie

Click the Video button in the eLearner panel to start the video

### Reference Notes

1. Click “Mix Manager > Import” to import the products/sets from Excel. This will populate the Mix Manager, draw the VSM icons corresponding to each process step at the bottom of the page, and draw Set centers to the right of the page.
2. Arrange centers on the page and add any missing centers from the Quick Mix Processing stencils.
3. Indicate all material flow with  **Sequence** arrows.
4. Click  **Display Gates** to make the gates visible. By default all gates will be open (square).
5. Change the gate status with the “Set Gate Open” command in the right-mouse menu of the color shape indicators (square = open gate, circle = closed gate).
6. Click  **Display Gates** to refresh the Set gates view.
7. Click  **Show set colors** to check the final routings. Edit using steps 4 to 7

## Import the Product Matrix and Draw Sets

1. Initiate the current page for a Mix Processing map then create the product matrix shown here.
2. Sort the products into route sets with "Auto Name" and then **Import** the matrix.
3. Move the process centers onto the page in the space below then submit your work with the **Grade It!** button in the eLearner panel.

If you mess up, click the  Reset button and start again.

	A	B	C	D	F	G	H	I	J	K	L
1	Set ID	Set Name	Product ID	Product Name	Supplier	Raw Materials	Mix	Treat	Pack	Finished Goods	Customer
2	Auto Name		Sort Products		Supplier	Inventory	Activity	Activity	Activity	Inventory	Customer
3			P1	Product 1	X	X	X	X	X	X	X
4			P2	Product 2	X	X	X	X	X	X	X
5			P3	Product 3	X	X		X	X	X	X
6			P4	Product 4	X	X		X	X	X	X
7			P5	Product 5	X	X	X	X	X	X	X
8			P6	Product 6	X	X	X	X	X	X	X

	A	B	C	D	F	G	H	I	J	K	L
1	Set ID	Set Name	Product ID	Product Name	Supplier	Raw Materials	Mix	Treat	Pack	Finished Goods	Customer
2	Auto Name		Sort Products		Supplier	Inventory	Activity	Activity	Activity	Inventory	Customer
3	S1	Set 1	P1	Product 1	X	X	X	X	X	X	X
4	S1	Set 1	P2	Product 2	X	X	X	X	X	X	X
5	S1	Set 1	P5	Product 5	X	X	X	X	X	X	X
6	S1	Set 1	P6	Product 6	X	X	X	X	X	X	X
7	S2	Set 2	P3	Product 3	X	X		X	X	X	X
8	S2	Set 2	P4	Product 4	X	X		X	X	X	X

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## Icon Color Codes in Quick Stencils

The Quick stencils on the left contain VSM icons with data shapes. The icon color coding works as shown here.

Red icons are required and must be the first icons put on a blank map

Green icons are for drawing the flow and are the "parent" shape

Yellow icons following EACH green icon represent optional "add-on" variables that can be glued to the bottom of that green icon. This "child" shape glues to the "parent" shape.

Magenta icons represent automated charts

White icons represent summary centers

 Time and Unit Center	 Customer Center	 Supplier Center
 Inventory Center	 QC Center	 Basic Center
 Wait Center	 Activity Center	 Type UnitWt
 Type BatchWt	 Activity Change...	 Activity Downti...
 Activity OEE	 Activity Scrap	 Activity Time
 Transport Center	 Resource Center	 Time Summary
 CR/TR Chart	 Lead Time Chart	 Utilizati... Chart

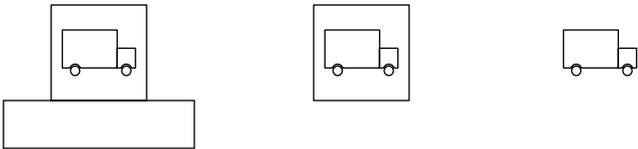
## How are the eVSM Base Stencils Organized?

The eVSM Base Stencils are on the right of the screen and contain individual eVSM drawing shapes. The Quick Stencils on the left of the screen are actually macro combinations of base shapes.

Base stencils have blue and white icons. The blue icons are actually FAMILIES of shapes. To access members of the family, you:

- Drag out the icon
- Right-click the shape on the page
- Use “Change Shape” to select a different member

There are also right-click options to change the framing around the shape.



Base stencils are organized by categories like eVSM Arrows, eVSM Data, etc.

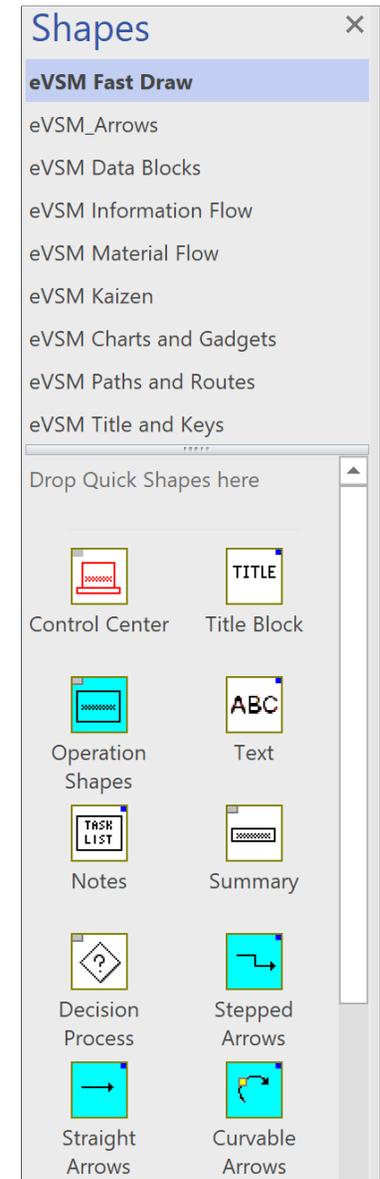
## Getting around the page

A fast way to zoom into an area is CTRL-Shift and then diagonally drag over a region with your left mouse button

Use CTRL-Shift-W to zoom out

## Making pages bigger or smaller

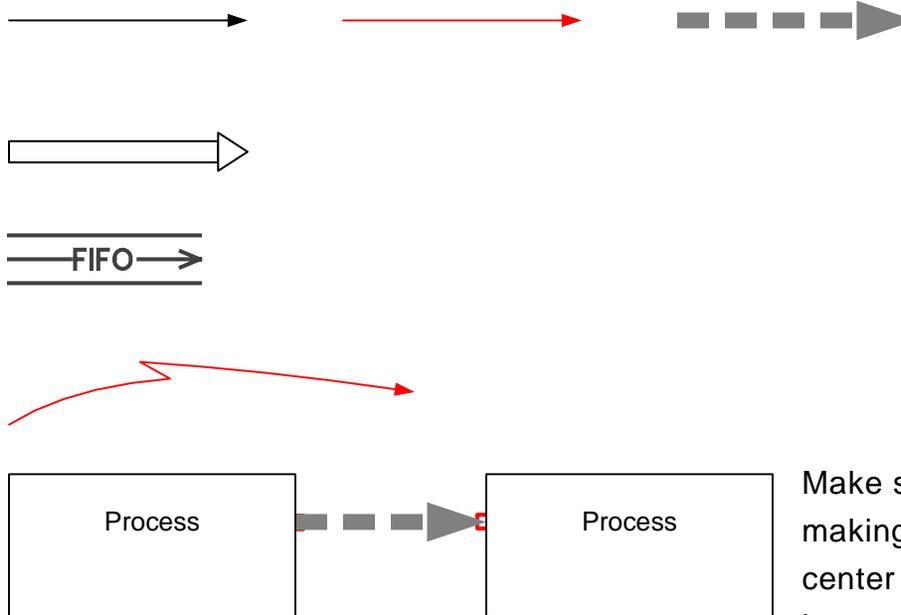
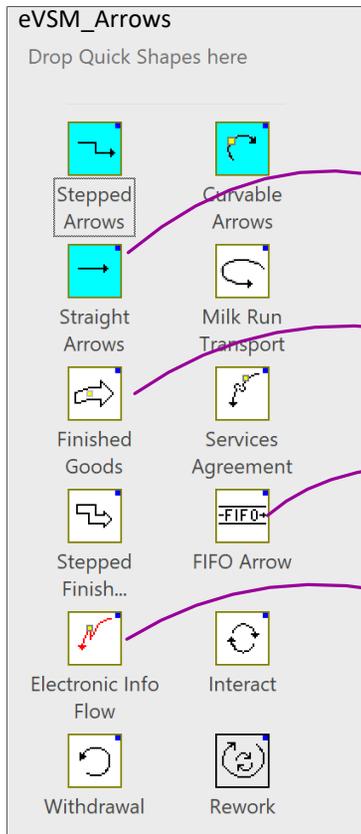
Put your cursor on any of the 4 edges of a page. Now when you hold down the control key, the cursor changes to a line with arrows both ends. You can now drag the edge of the page to make the page bigger or smaller



## Arrows on Value Stream Maps

You remember that the arrows between the VSM shapes have specific meaning on a map. For example, push arrow, information arrow, etc. You review the different arrow types before you add the arrows to the captured model.

The blue stacks of arrows found in the eVSM Arrows stencil (typically open on the right side of the page) have a variety of arrows in the right-mouse menu after dragging out the shape. The “Straight Arrows” stack below has been dragged out and changed to Information and Push arrows.



Make sure to glue each end of the arrow (by making sure a glue connection appears) to the center it is associated with so that if the center is moved, the arrow will move with it.

## Sequence and Pipe Arrows

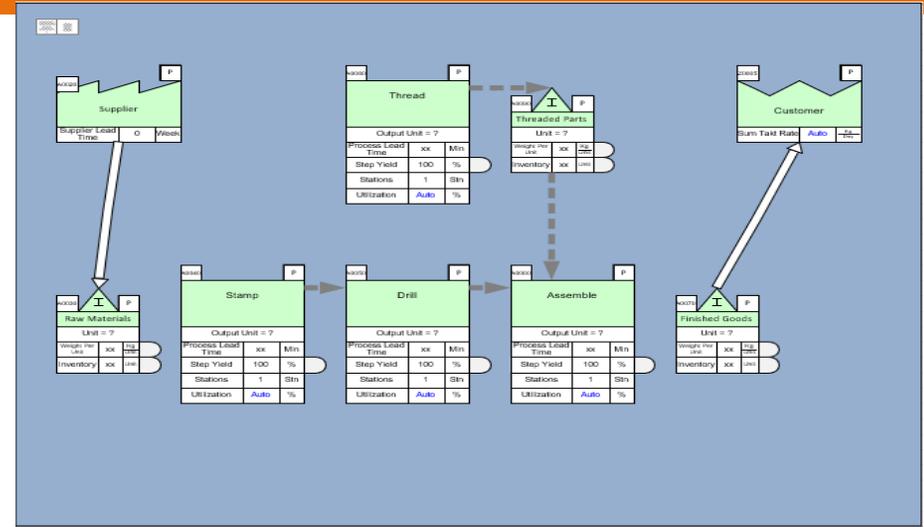
These are not included in the above stencil. Sequence arrows are used to indicate material flow and are automatically generated through buttons in the toolbar. Similarly, Pipe arrows are used to transfer other data (cost, resources, time) and are also automatically created with buttons in the toolbar.

## Arrange the centers as shown in the blue thumbnail image.

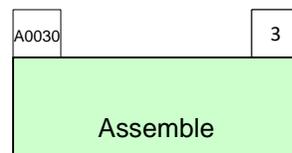
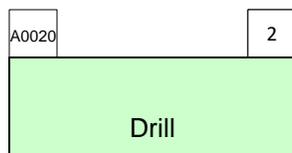
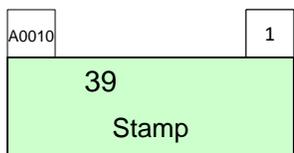
A product matrix was just imported to this page. This added new centers below the bottom of this page.

Arrange the centers as laid out in the thumbnail. There are some missing centers (icons) and they should be added from the Quick Mix Processing stencil. The arrows are available in the eVSM Arrows stencil on the right.

No need to enter data or create sequence arrows.



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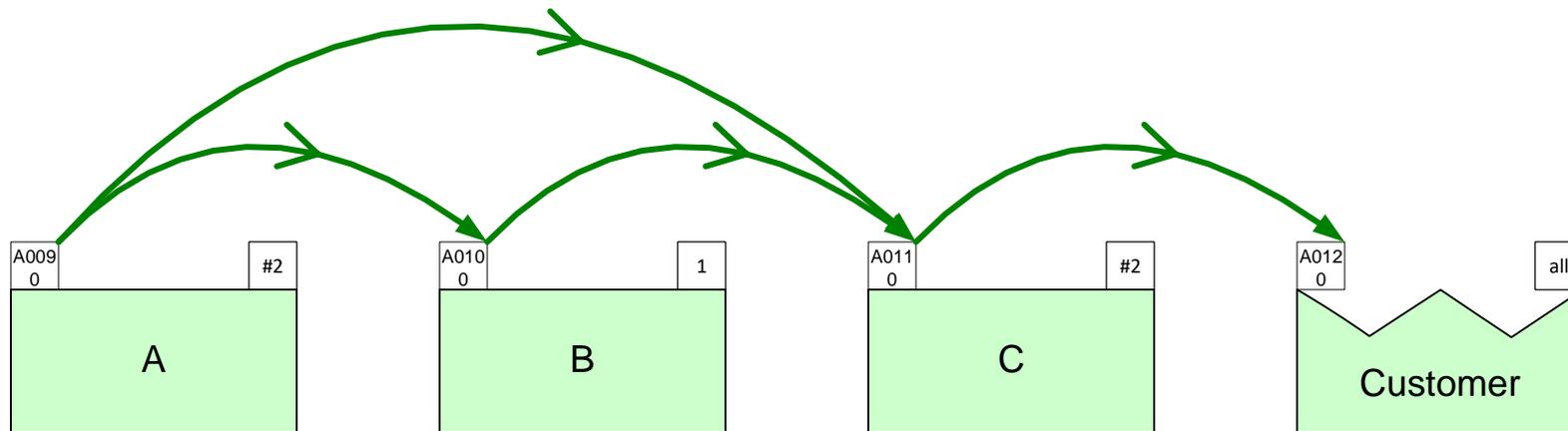
## Specifying material flow sequence on the map

The need to specify material flow sequence using eVSM's Sequence arrows is mandatory. Sequence arrows are used to:

1. Calculate demand at any point working back from customer demand
2. Establish unique product routings
3. Label activities from upstream to downstream (useful for charting)

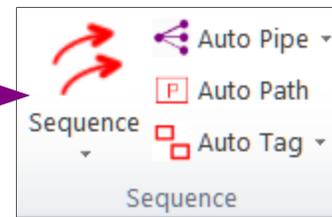
## How do you specify material flow sequence?

Lets say material is moving from stations A to B to C (diagram below). Some material is also moving directly from A to C. We would specify the sequence as shown by the green sequence arrows in the diagram. Note that arrows are directional



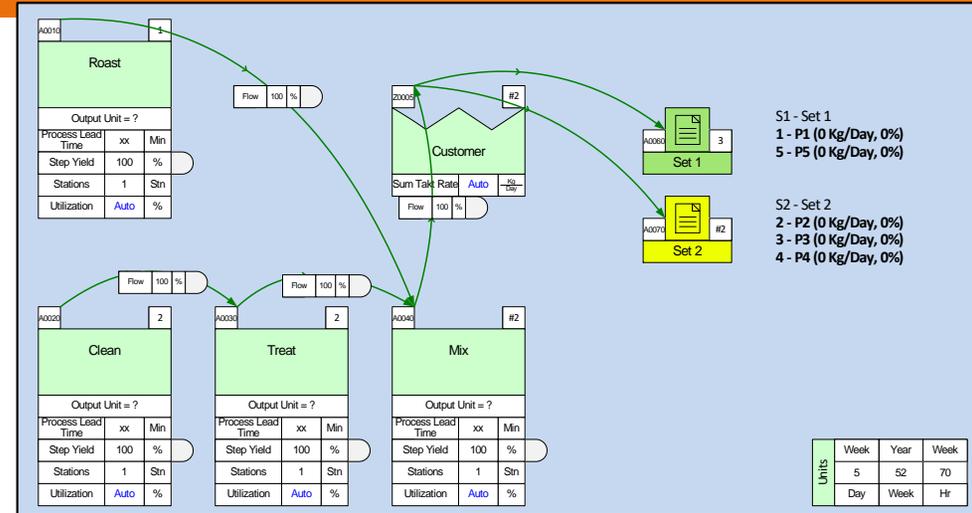
## How do you create the sequence arrows?

Pick two or more centers in the correct sequence (holding down the shift key) in the order of the material flow. Then click the "Sequence" button in the eVSM toolbar



## Sequence the flow as shown in the thumbnail image

No need to enter data values. Zoom in to the thumbnail to check arrow directions.



A0010		1	
Roast			
Output Unit = ?			
Process Lead Time	xx	Min	
Step Yield	100	%	
Stations	1	Stn	
Utilization	Auto	%	

Z0005		4	
Customer			
Sum Takt Rate	Auto	Kg Day	

A0060		6	
Set 1			

S1 - Set 1  
 1 - P1 (0 Kg/Day, 0%)  
 5 - P5 (0 Kg/Day, 0%)

A0070		7	
Set 2			

S2 - Set 2  
 2 - P2 (0 Kg/Day, 0%)  
 3 - P3 (0 Kg/Day, 0%)  
 4 - P4 (0 Kg/Day, 0%)

Units	Week	Year	Week
	5	52	70
	Day	Week	Hr

A0020		2	
Clean			
Output Unit = ?			
Process Lead Time	xx	Min	
Step Yield	100	%	
Stations	1	Stn	
Utilization	Auto	%	

A0030		3	
Treat			
Output Unit = ?			
Process Lead Time	xx	Min	
Step Yield	100	%	
Stations	1	Stn	
Utilization	Auto	%	

A0040		5	
Mix			
Output Unit = ?			
Process Lead Time	xx	Min	
Step Yield	100	%	
Stations	1	Stn	
Utilization	Auto	%	

Units	Year	Week	Week
	52	70	5
	Week	Hr	Day

## Add Sequence arrows to show all three routes

### Route 1:

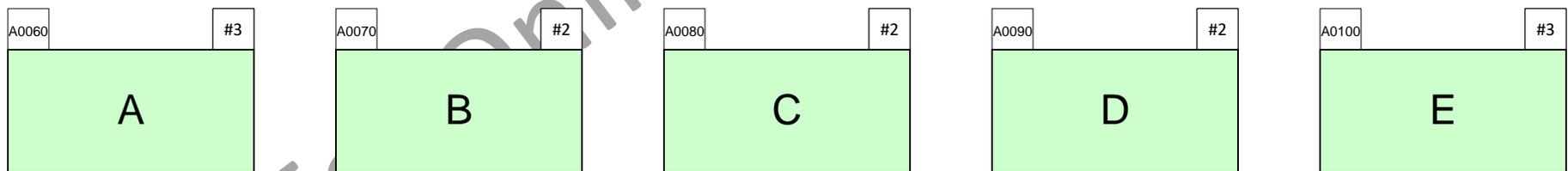
A > B > C > D > E

### Route 2:

A > B > E

### Route 3:

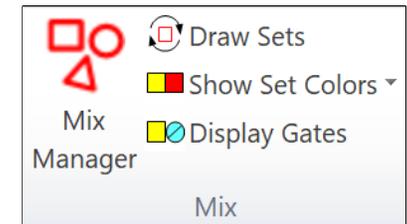
A > C > D > E



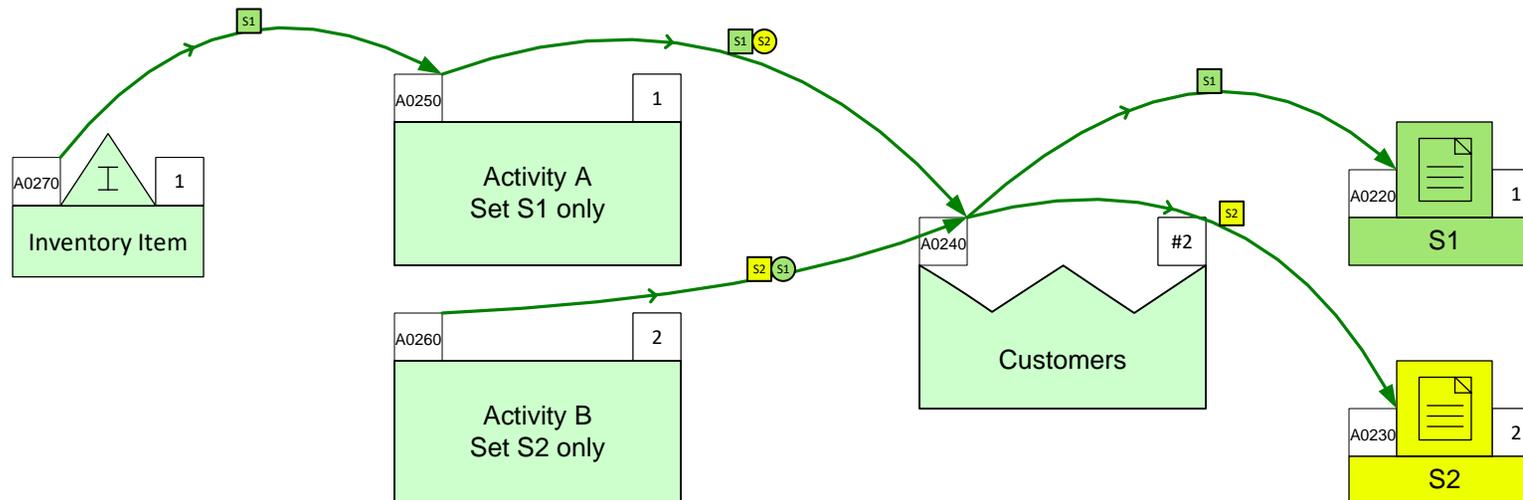
## Using Set gates to establish Set Routes

A simple visual way to establish routes

1. Make sure sequence arrows are created to support each of the routes.
2. Click the  Display Gates button in the eVSM toolbar to show the gates (small squares and circles) on the sequence arrows. These Set Gates can be closed/opened with a right-mouse menu "Set Gate Open" command on gate indicators. Round indicators  represent a closed gates. Square indicators  represent open gate. The indicator color matches the Product Set centers.
3. Once you have adjusted the status of the gates, use the  Show Set Colors button to clearly show which product set goes through which sequence arrow.



Mix section of eVSM Toolbar



### Note:

The gate status rolls to all upstream arrows and activities. In the above example S2 is closed after Activity A so it does not show upstream between the inventory and Activity A.

## Routing Example Problem 1

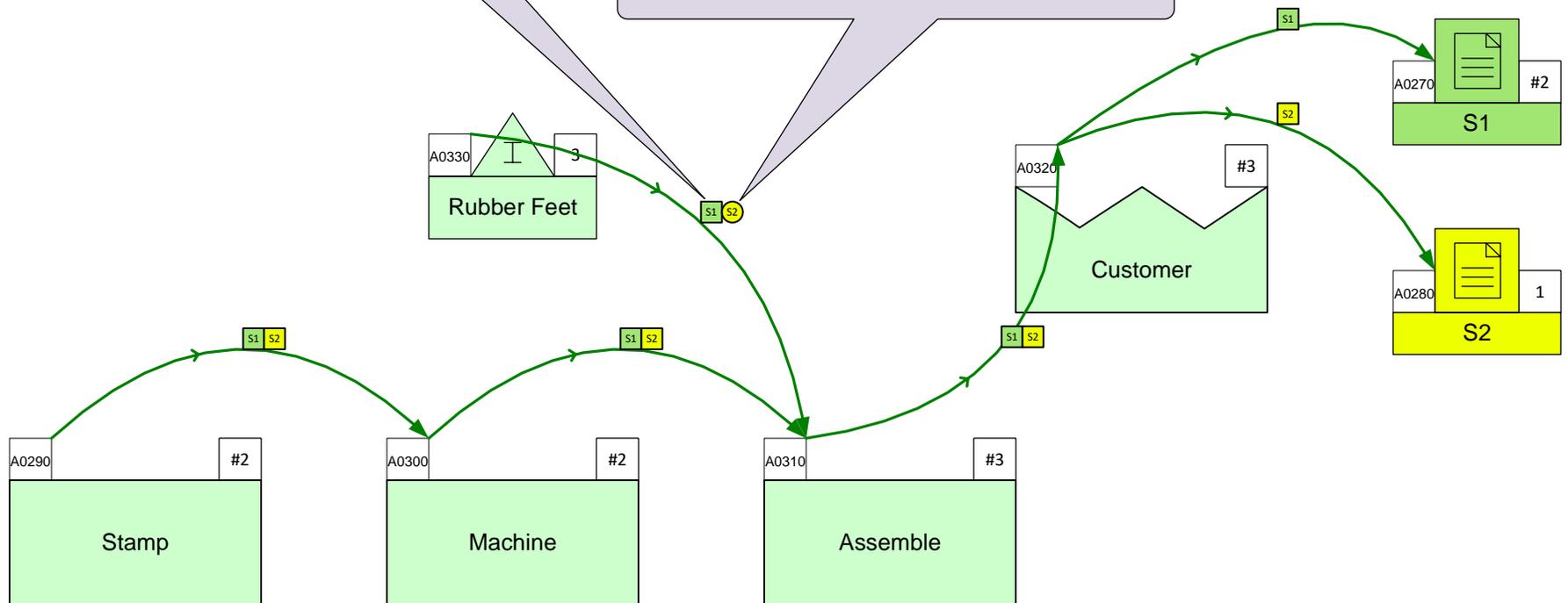
Products in set S1 need rubber feet. Products in set S2 do not.

### Solution:

Close the set gate for S2 here

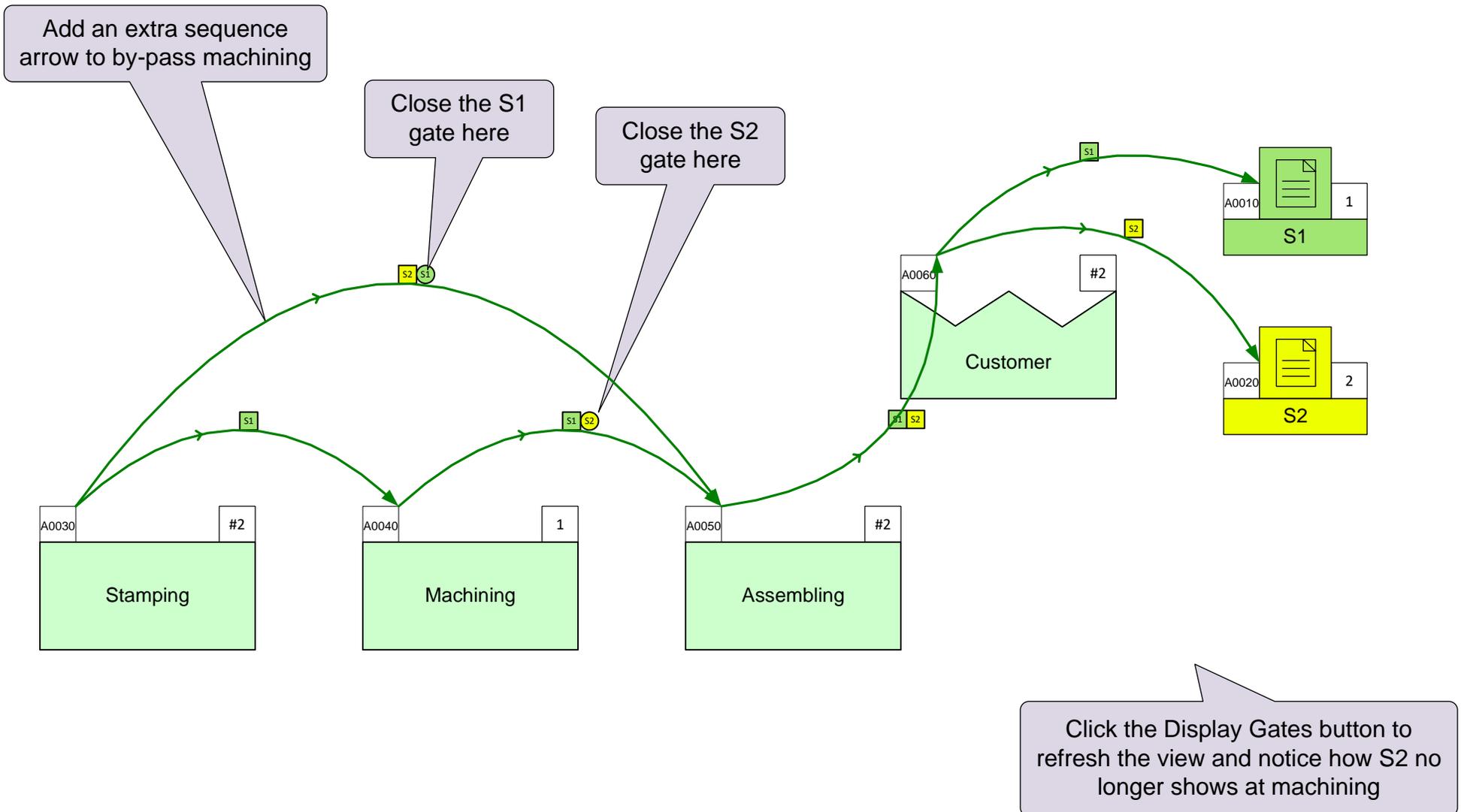
### How?

Right-click on the S2 gate, switch off the "Set Gate Open" command. Then click "Display Gates" button in the toolbar to refresh the set color indicators

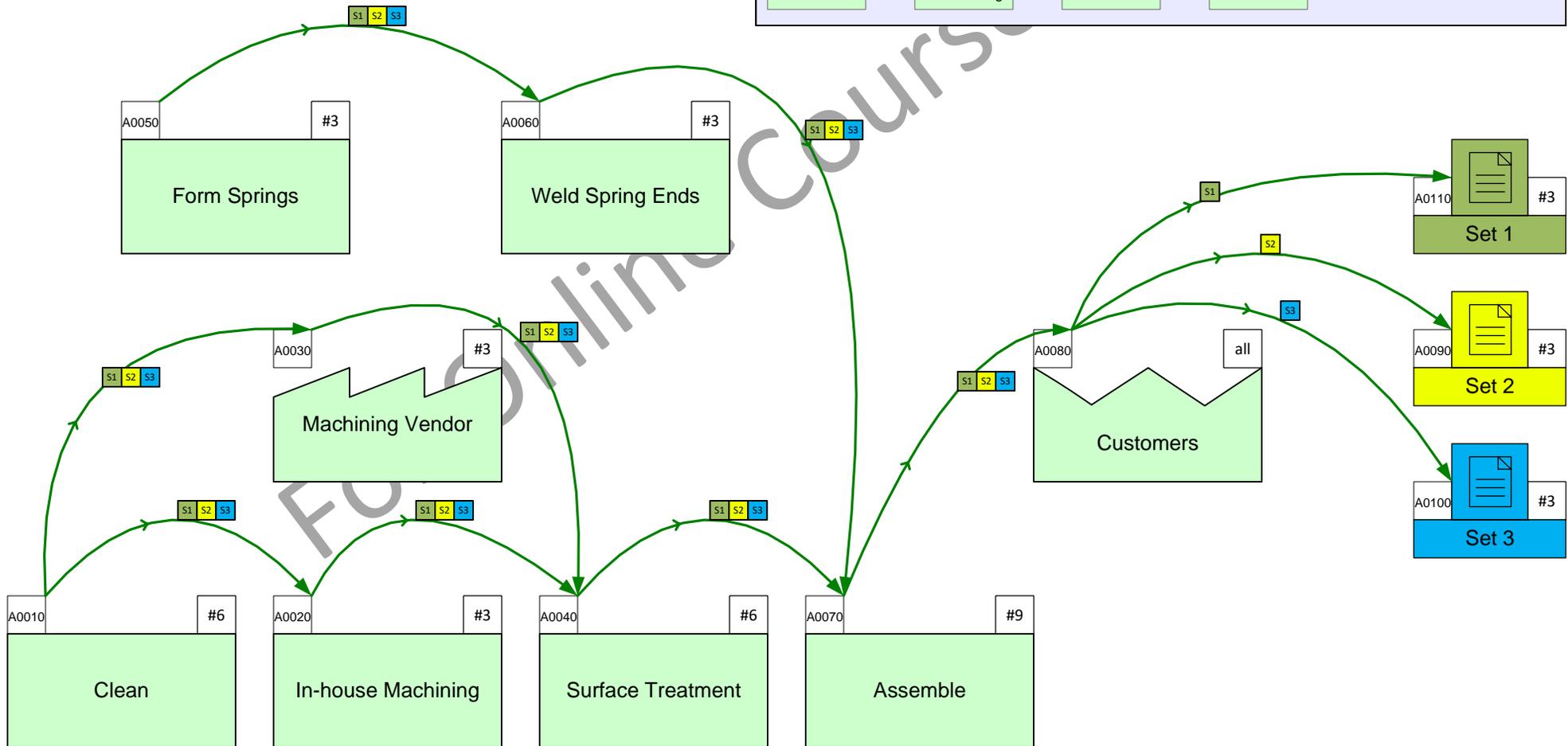
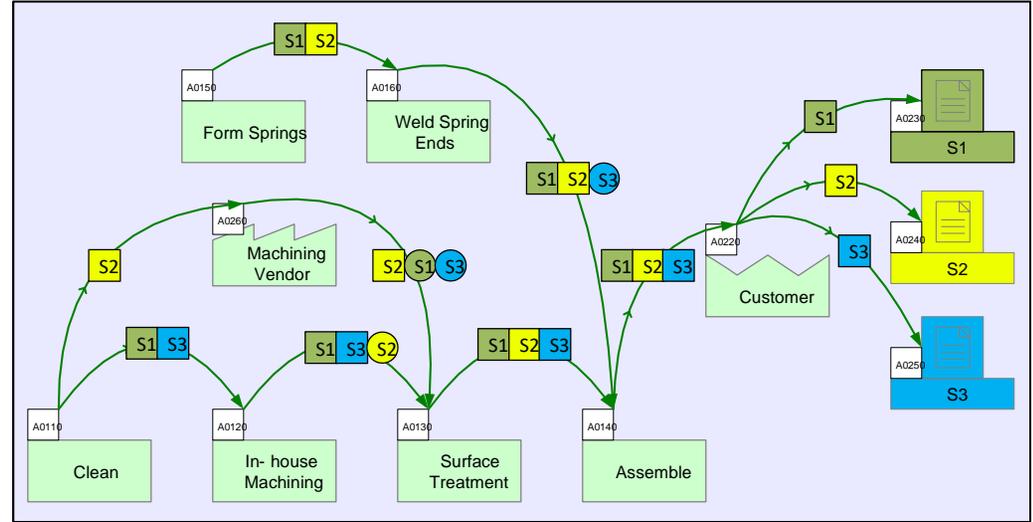


## Routing Example 2

S1 requires machining, S2 does not.

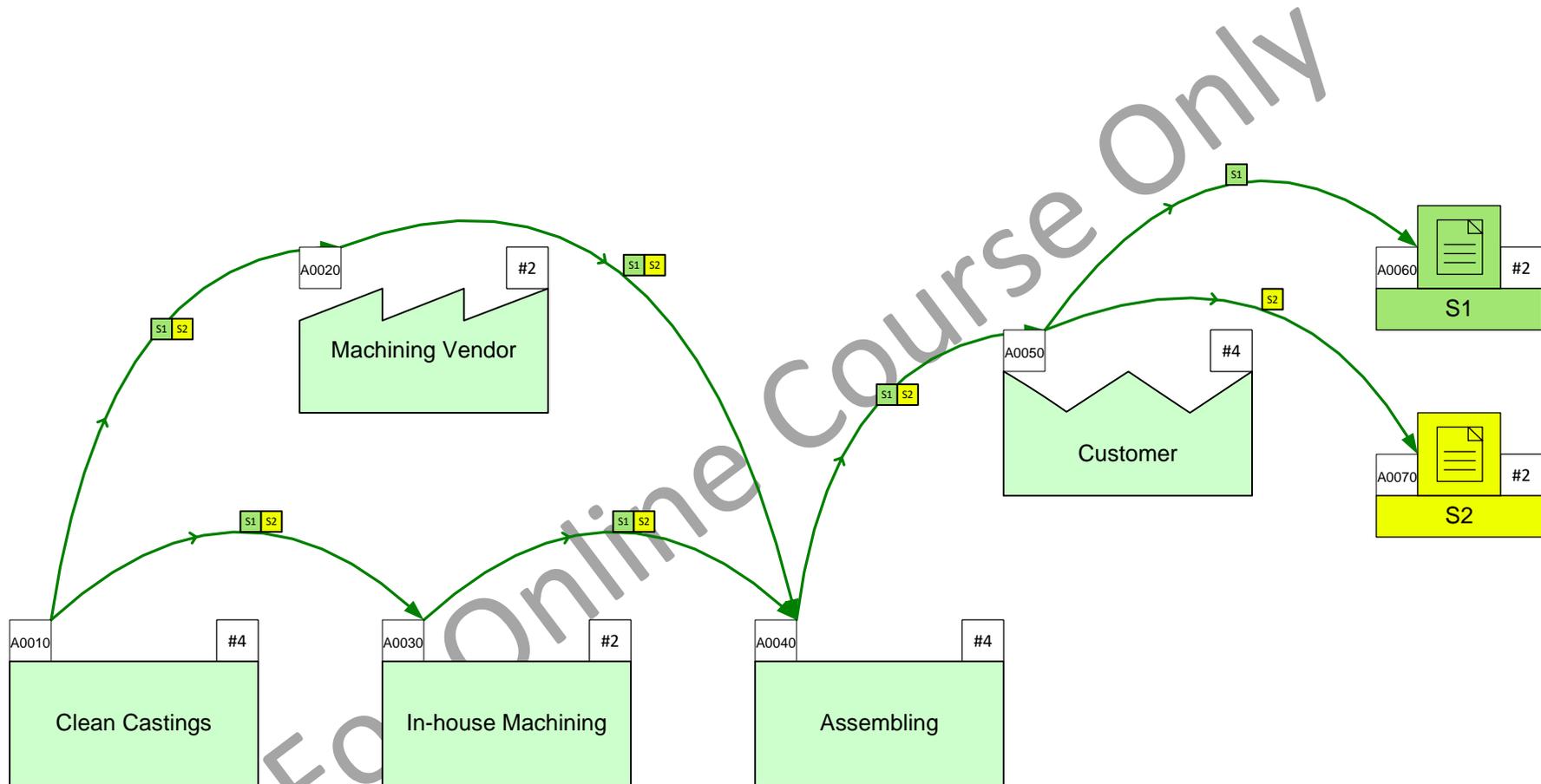


Adjust the Set gates in the map below to match the thumbnail image.



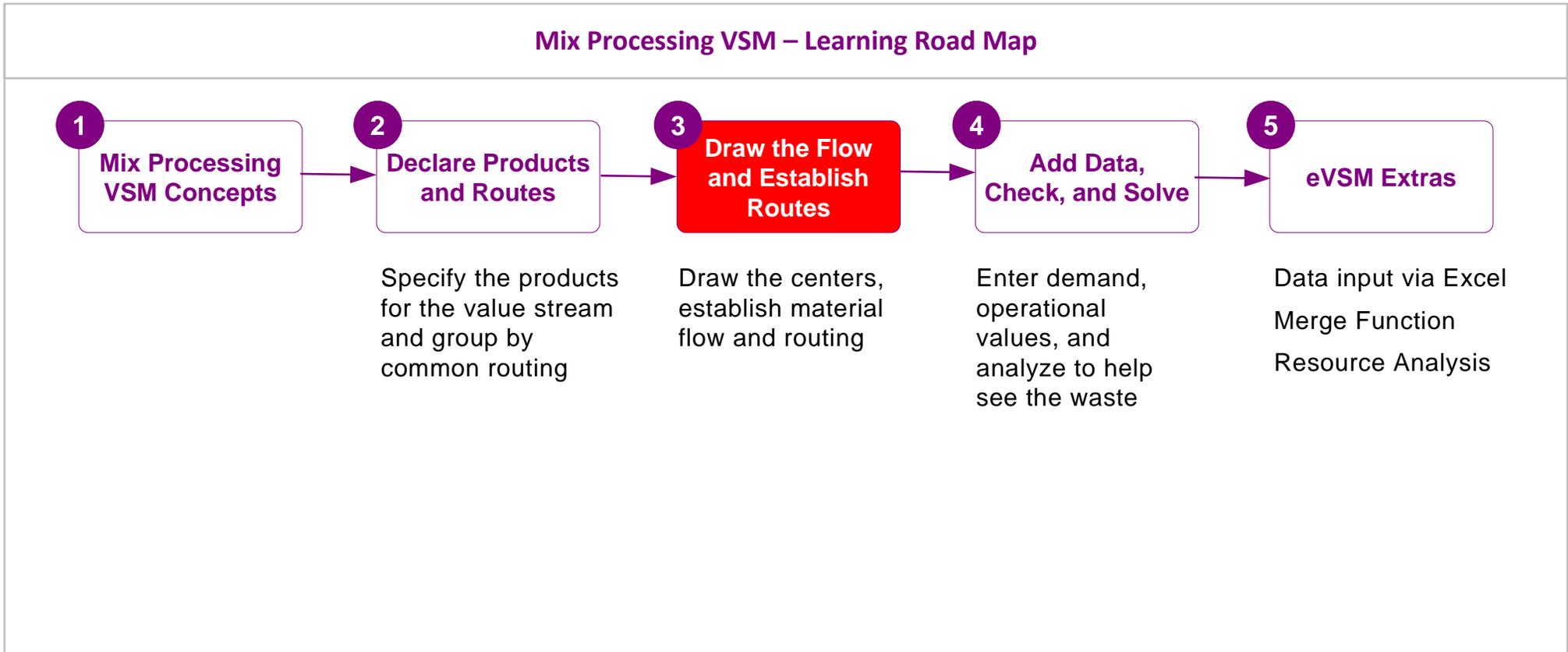
## Adjust the Set Gates to meet the following requirement

S1 will be machined in-house, while S2 has to go through the machining vendor



## You learned:

- How to import products, route sets, and centers from an Excel template
- How to represent material flow with Sequence arrows
- How to establish routes on the map with Set Gates



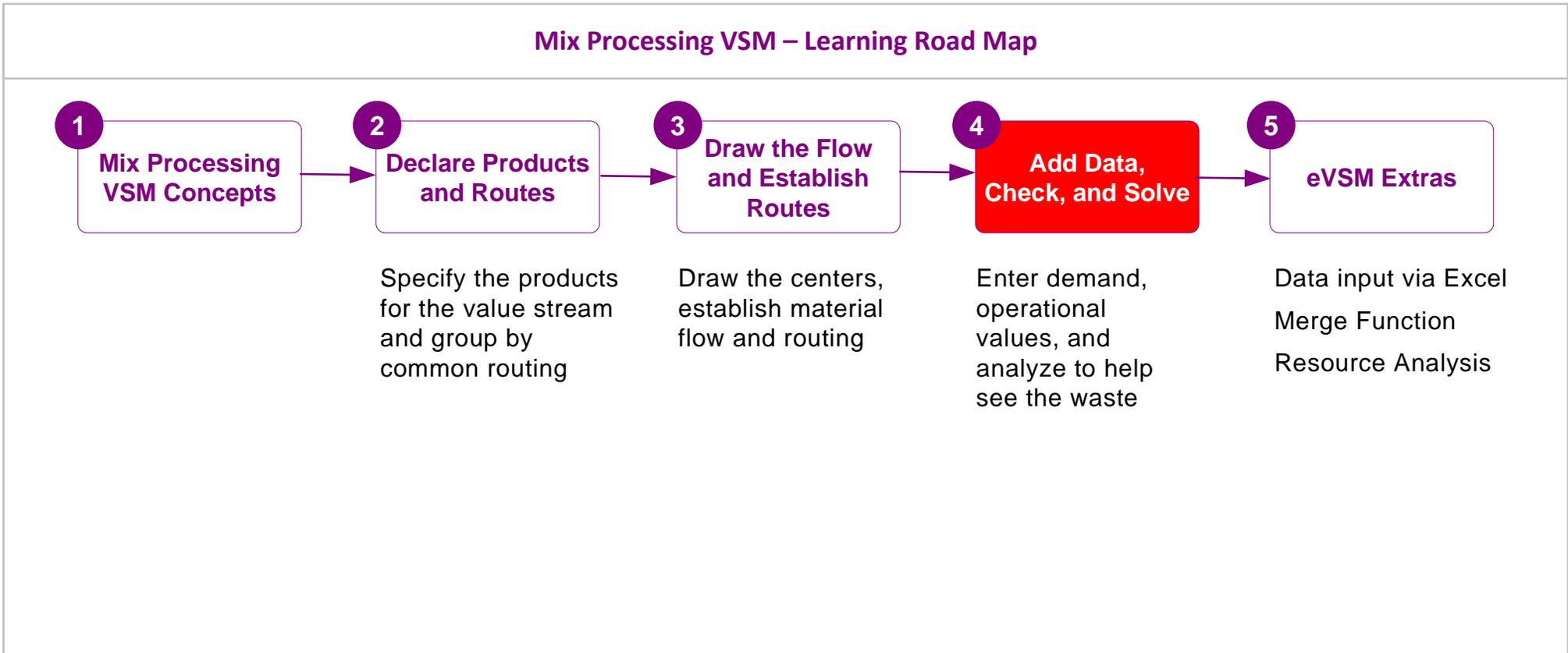
## What's next:

You will see how to enter demand and operational data on the map, and how to set up the map for automatic calculations.

## Add Data, Check, and Solve

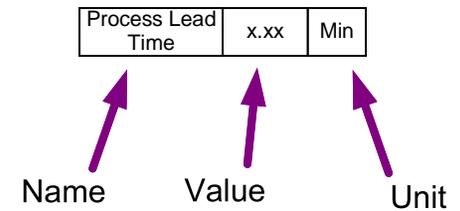
In the previous lessons you learnt how to declare products in Excel, how to import these into Visio, draw the flow, and set up the routes.

In this lesson, you will learn to enter data, check the map, and then solve to perform the automated calculations.



## Working with Data on a Map

- Map data is stored in special data shapes. These data shapes consist of a name, value, and unit.
- To change any field, double-click and then follow the on-screen instructions.
- To move or delete a data shape, you must select the value field.
- Data shapes contain data for the centers (inventory, activity, customer, etc.) they are glued to.
- The Views (accessed with the  Views button) provides a way to hide/show datashapes associated with each center.
- All datashapes, including hidden ones, can be accessed through the  List Variables button. Select the Green center first, then click on the List Variables button.
- eVSM comes with a long list of variable names and units. New names and units can be added through “Name and Unit Manager” form which is accessed with the  NUM button.
- Existing eVSM variable names and units should NOT be modified



A0310	I	1
Inventory		
Unit = ?		
Weight Per Unit	xx	Kg Unit
Inventory	xx	Unit
General Inventory	0	Kg

A0300	2	
Process		
Output Unit = ?		
Process Lead Time	xx	Min
Step Yield	100	%
Stations	1	Stn
Utilization	Auto	%

Z0005	3	
Customer		
Customer Demand	xx	Kg Day

Blue values are automatically calculated by eVSM. Just leave these alone

“xx” represent mandatory values you must provide. eVSM cannot perform calculations without these

## Entering Variable Values for Products

Where eVSM only allows a **single value** for a product, you will see this variable shape. The center value can be changed by double clicking here in the center value field:

Step Yield	x.xx	%
------------	------	---

Where the value is allowed to be **product specific**, you will see a rounded “products tab” on the right side of the variable shape. If the value is a constant just type it in the center field. Otherwise double-click the “products tab”

Weight Per Unit	x.xx	Kg Unit
-----------------	------	---------

The “products tab” opens the product-specific values form.

Product	Value
Default	x.xx
1 - P1	
2 - P2	
3 - P3	
4 - P4	

The Default value (if entered) is used when product specific data is not explicitly specified

Hint: The Enter button will move the cursor to the next field.

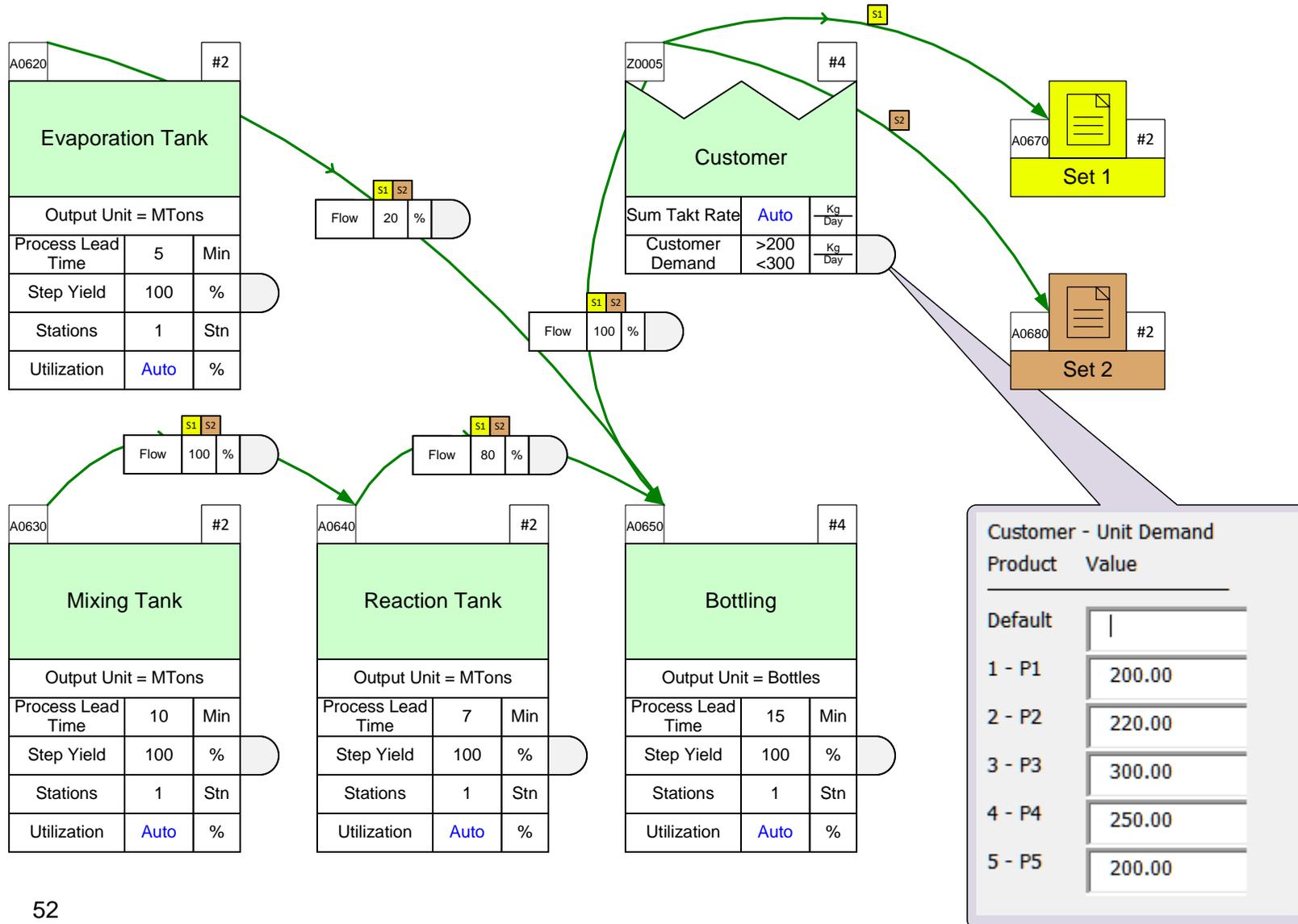
Once you enter the values, the center field will show the range of values as shown below:

Weight Per Unit	>3 <4	Kg Unit
-----------------	-------	---------

## Entering in customer Demand values and demand propagation

The Demand variable at the customer center allows input of demand for each product. In Quick Mix Processing there are multiple demand types which were touched on in a prior lesson, in this example UnitWt is being used. These demands flow upstream and are updated for losses such as scrap along the way.

If demand has to split into multiple paths as it flows upstream, a "Path Demand %" variable is available on all the sequence arrows to control the incoming percentage by weight for each arrow.



## Steps to Add Data, Check, and Solve



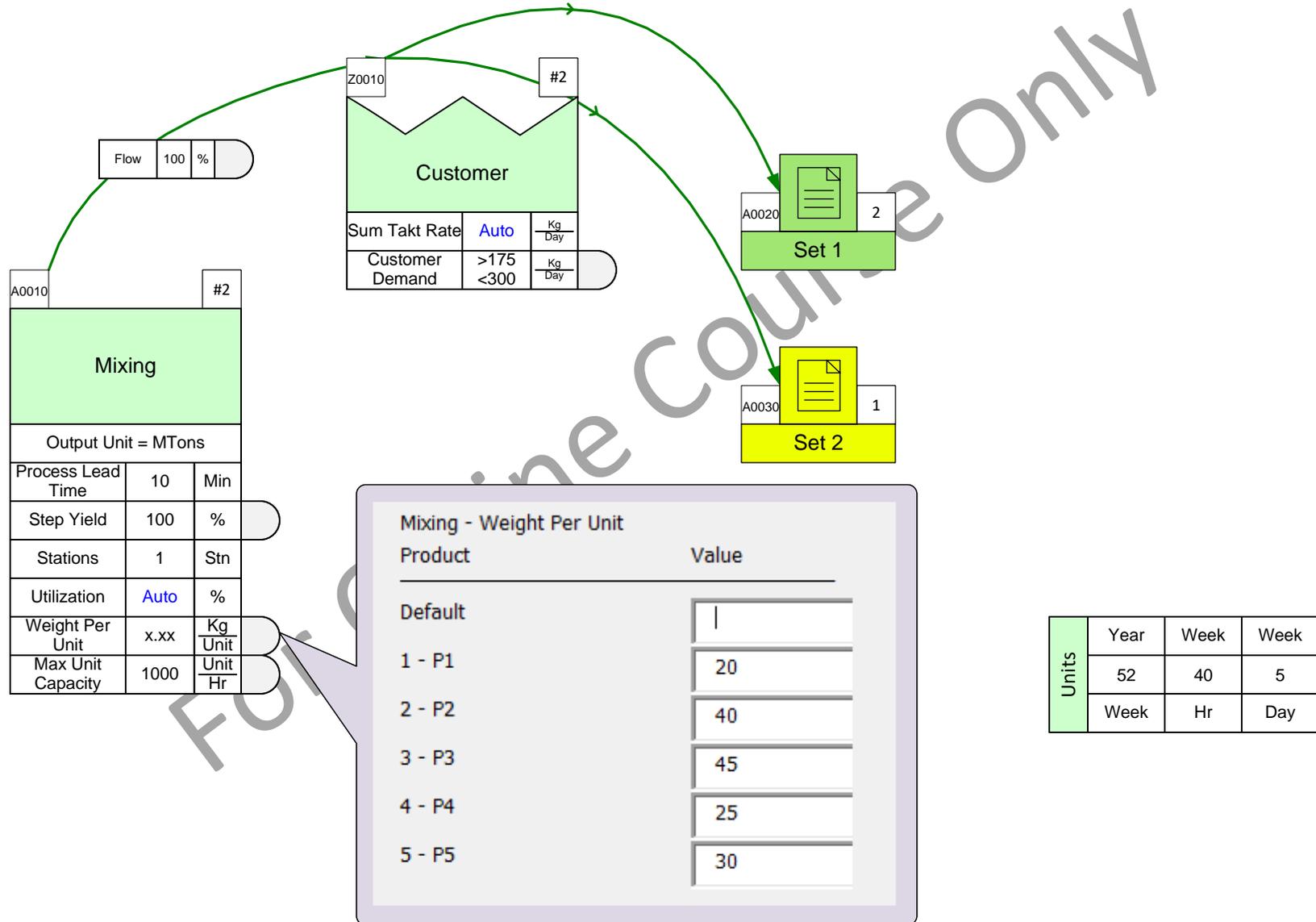
### Watch the Movie

Click the Video button in the eLearner panel to start the video

## Reference Notes

1. Enter plant production hours in the Time center.
2. Enter customer demand at the Customer center in the Demand variable.
3. Enter Process Lead Times and other operational data.
4. Run  **Check** and resolve any problems reported.
5. Run  **Solve** for the automated calculations.

**Set the Weight Per Unit values as shown in the callout.**



## Different ways to specify Activity Capacity

Mix Processing allows input of capacity data in the following formats. At each activity, one (only one) of these add-ons must be used.



### Type UnitWt

Input production rate per unit item.

Weight Per Unit	x.xx	Kg Unit	
Max Unit Capacity	x.xx	Unit Hr	



### Type BatchVol

Input production rate per batch volume

Batch Volume	x.xx	m3 Btch	
Density	997	Kg m3	
Time per Batch	x.xx	Min Btch	
Batch CO Time	x.xx	Min Btch	
Campaign CO Time	x.xx	Min Cmpn	
Batches per Campaign	1	Btch Cmpn	
Campaign Mat Loss	0	Kg Cmpn	



### Type BatchWt

Input production rate per batch weight

Batch Weight	x.xx	Kg Btch	
Time per Batch	x.xx	Min Btch	
Batch CO Time	x.xx	Min Btch	
Batches per Campaign	1	Btch Cmpn	
Campaign CO Time	x.xx	Min Cmpn	
Campaign Mat Loss	0	Kg Cmpn	



### Type Roller

Input production rate for roller based material flow data

Roll Width	x.xx	m	
Roll Length	x.xx	m	
Weight Per Unit Area	x.xx	Kg sqm	
Roll Feed Speed	x.xx	m Sec	
Roll CO Time	x.xx	Min Roll	
Rolls per Campaign	xx	Roll Cmpn	
Campaign CO Time	xx	Min Cmpn	
Campaign Mat Loss	0	Kg Cmpn	
Weight Per Roll	Auto	Kg Roll	



### Type FlowWT

Input production rate for continuous flow in weight per unit time

Weight Flow Rate	x.xx	Kg Hr	
Flow Unit Weight	1	Kg Unit	



### Type FlowVol

Input production rate for continuous flow in volume per unit time

Density	997	Kg m3	
Volume Flow Rate	x.xx	m3 Hr	
Flow Unit Weight	1	Kg Unit	

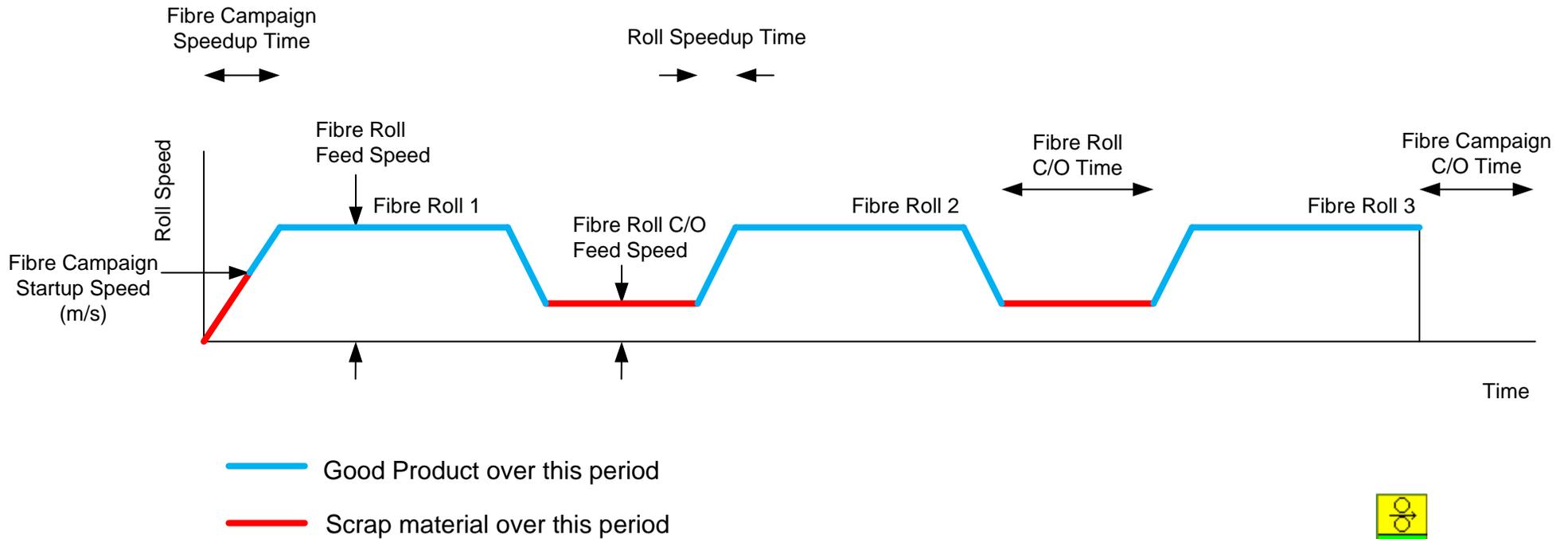


### Type Fibre Spool

Input fibre roll activity to calculate maximum capacity

Fibre Cmpn Length	x.xx	km	
Fibre Cmpn CO Time	x.xx	Sec Cmpn	
Fibre Roll Length	x.xx	m	
Fibre Roll Feed Speed	x.xx	m Sec	
Fibre Roll CO Time	x.xx	Min Roll	
Fibre Roll CO Feed Speed	x.xx	m Sec	
Roll Speedup Time	x.xx	Sec	
Fibre Cmpn Speedup Time	x.xx	Sec	
Fibre Cmpn Startup Speed	x.xx	m Sec	
Weight Per Length	x.xx	Kg km	

# Fibre Spool Capacity Add-on for Activity Center



Type Fibre Spool

Fibre Cmpn Length	x.xx	km	
Fibre Cmpn CO Time	x.xx	Sec	Cmpn
Fibre Roll Length	x.xx	m	
Fibre Roll Feed Speed	x.xx	m	Sec
Fibre Roll CO Time	x.xx	Min	Roll
Fibre Roll CO Feed Speed	x.xx	m	Sec
Roll Speedup Time	x.xx	Sec	
Fibre Cmpn Speedup Time	x.xx	Sec	
Fibre Cmpn Startup Speed	x.xx	m	Sec
Weight Per Length	x.xx	Kg	km

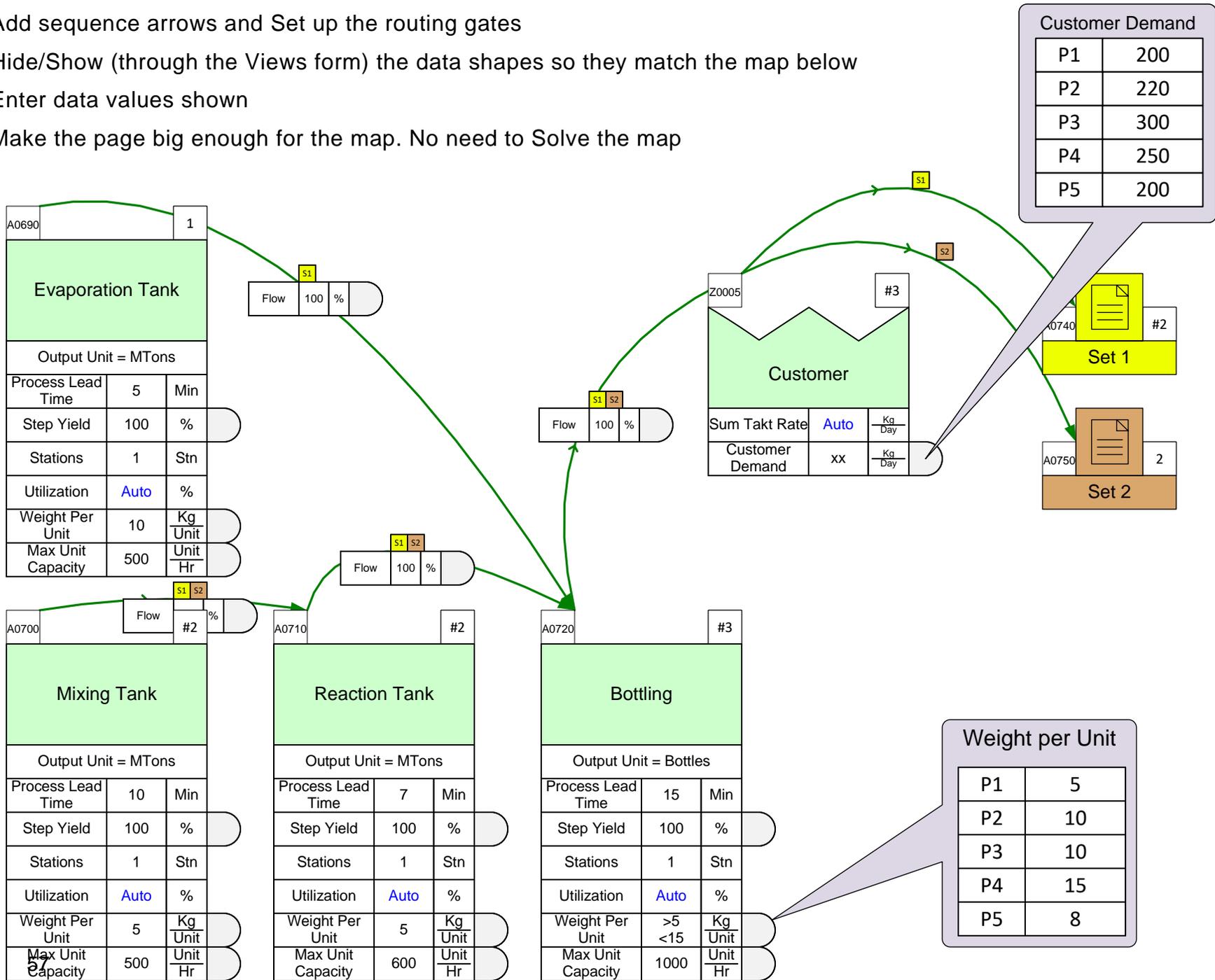
This capacity add-on for an activity supports Fibre manufacturing. The user specifies the Fibre campaign length, roll length, changeover times and key speeds. The last roll length is adjusted to complete the Fibre campaign length. When changing rolls the roll slowdown time is assumed to be equal to the roll speedup time

## Example Map 1

In the exercise on the next page, you will draw the map below from scratch. Follow these steps:

1. Initialize the page for a Quick Mix Processing map
2. Create the product matrix shown, sort, and Auto Name the sets
3. Import to Visio and arrange the centers on the page. Add any missing centers from the stencil
4. Add sequence arrows and Set up the routing gates
5. Hide/Show (through the Views form) the data shapes so they match the map below
6. Enter data values shown
7. Make the page big enough for the map. No need to Solve the map

	A	B	C	D	F	G	H	I	J
1	Set ID	Set Name	Product ID	Product Name	Mixing Tank	Reaction Tank	Evaporation Tank	Bottling	Customer
2	Auto Name			Sort Products	Select..	Select..	Select..	Select..	Select..
3			1	P1	X	X	X	X	X
4			2	P2	X	X	X	X	X
5			3	P3	X	X	X	X	X
6			4	P4	X	X		X	X
7			5	P5	X	X		X	X



**Draw the map shown on the previous page below including sequence arrows, routes, and data values.**

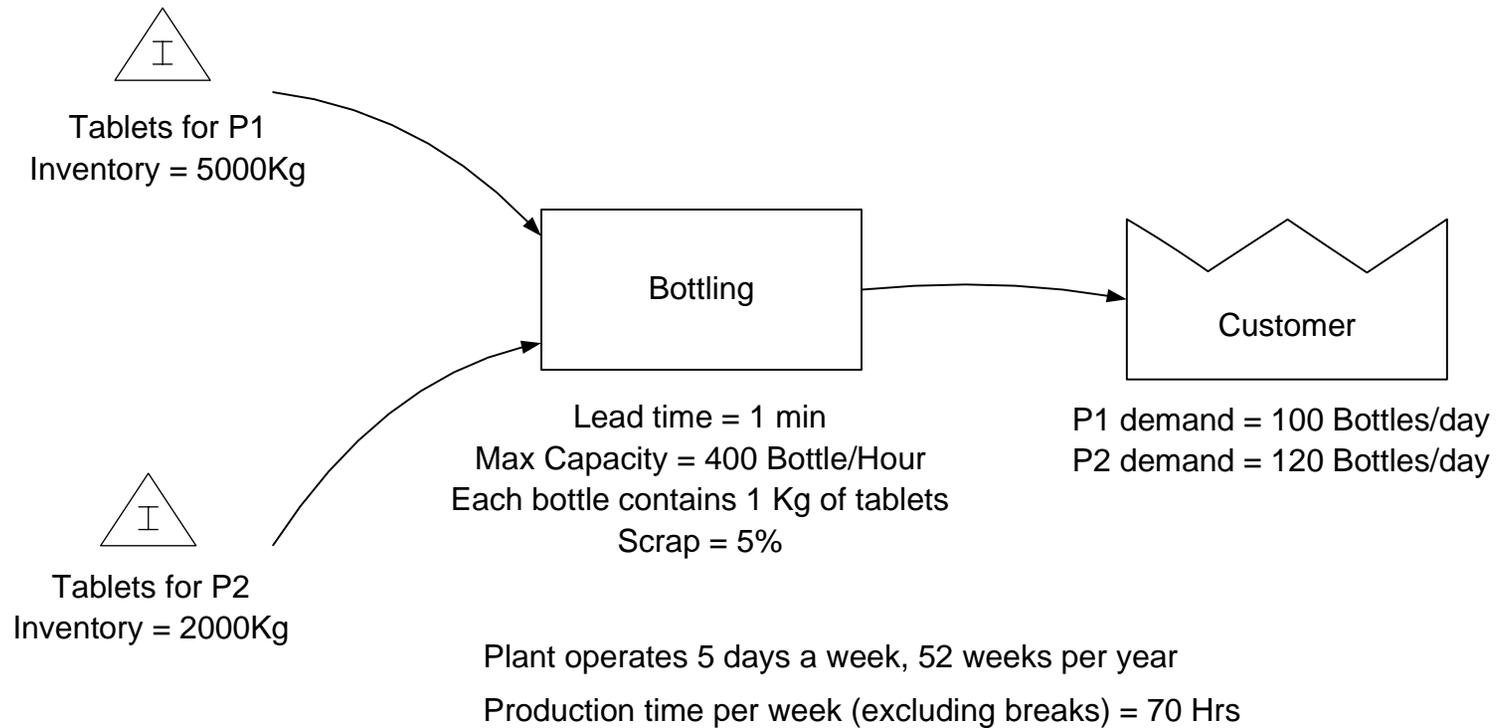
You will need to initialize the page for Quick Mix Processing, create the product matrix, import it, arrange the centers, add sequence arrows, specify routes, and enter data. No need to Solve the map.

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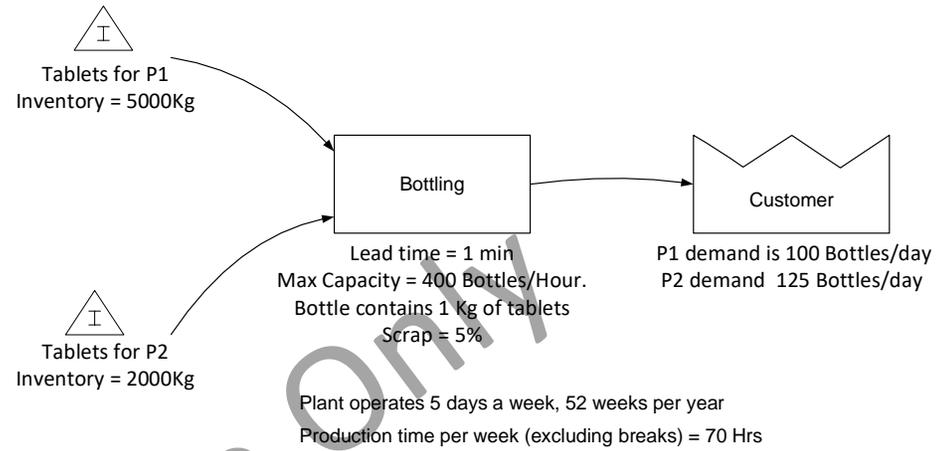
## Example Map 2

This simple example represents the bottling value stream for two products (tablets P1 and P2). The diagram below provides all the data necessary to build a model in eVSM.

In the exercise on the next page, you will draw the map below from scratch. No need to solve



Draw the map shown on the previous page below including sequence arrows, routes, and data values.

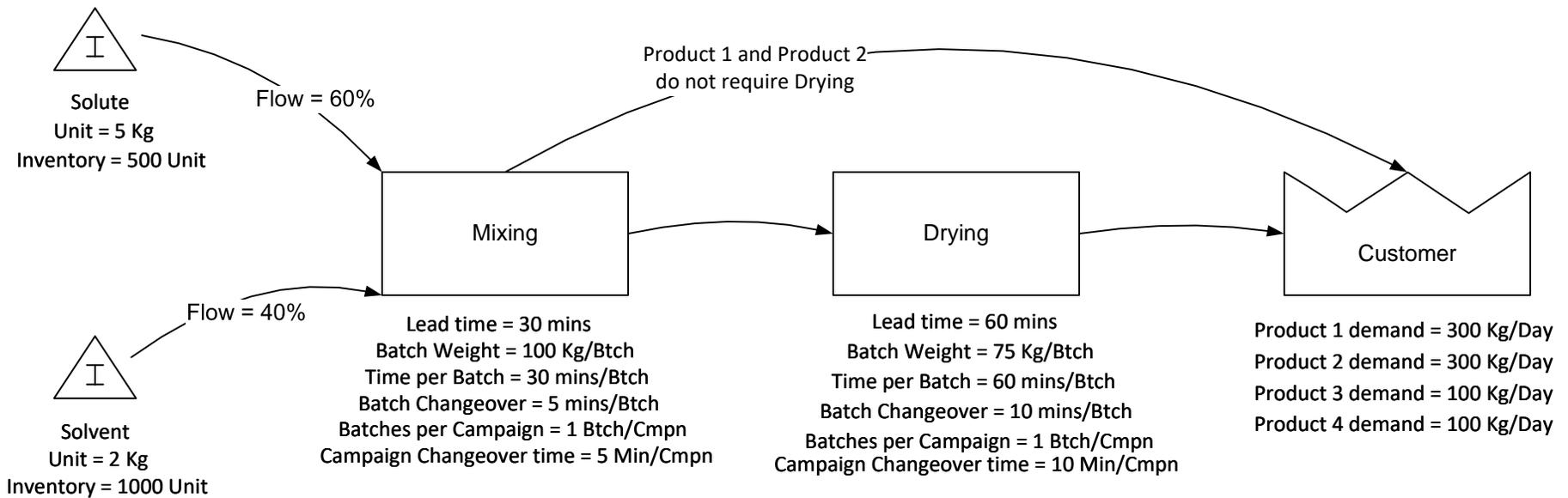


For Online Course Only

## Example Map 3

This example represents the manufacture of 4 products. Product 3 and Product 4 need to go through the Drying process. The other two products do not.

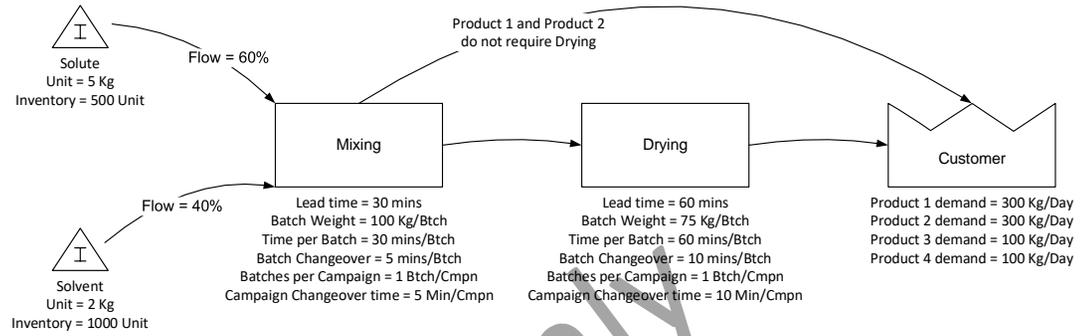
In the exercise on the next page, you will draw the map below from scratch.



Plant operates 5 days a week, 52 weeks per year

Production time per week (excluding breaks) = 70 Hrs

Draw the map shown on the previous page below including sequence arrows and data values.

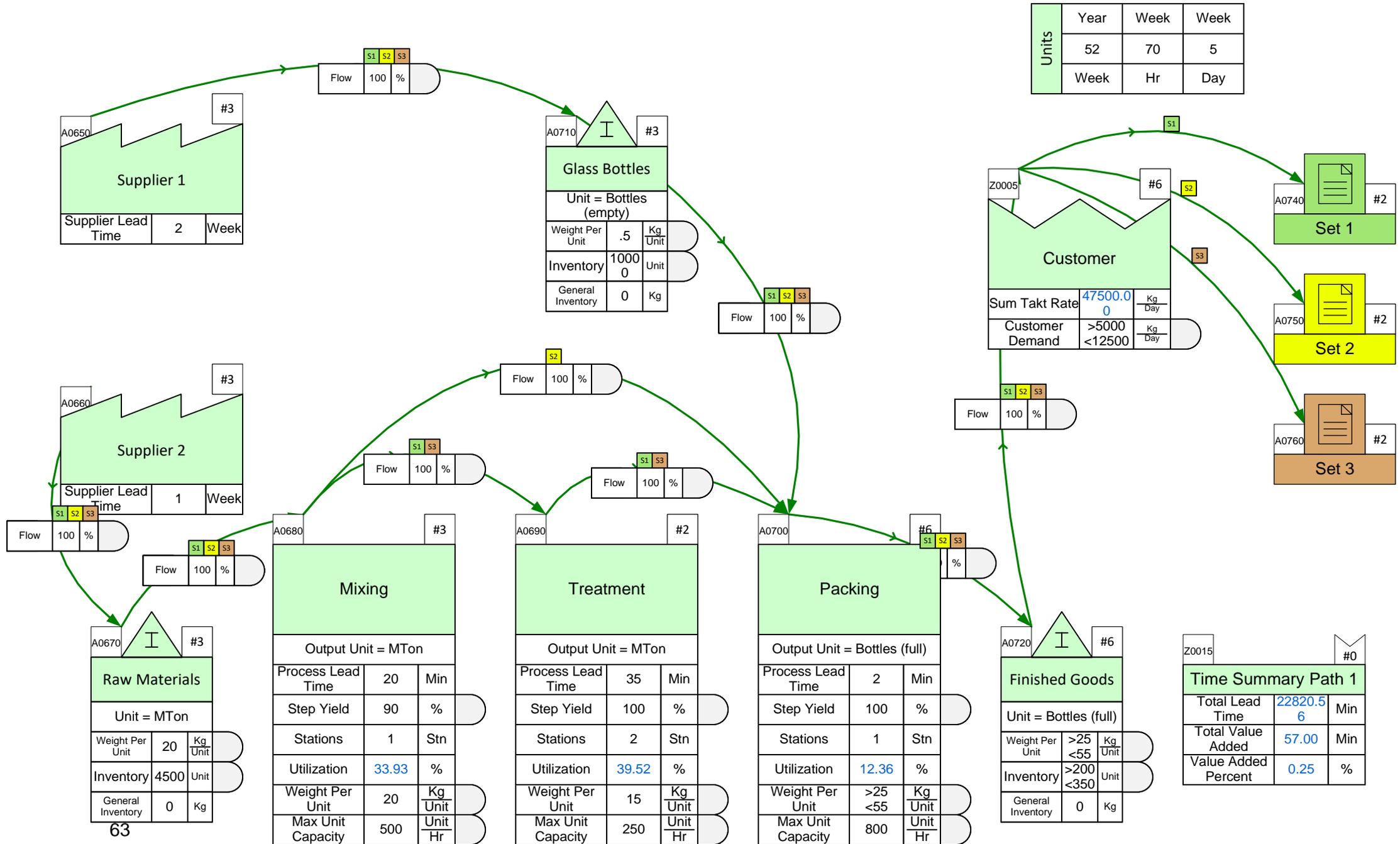


Plant operates 5 days a week, 52 weeks per year  
 Production time per week (excluding breaks) = 70 Hrs

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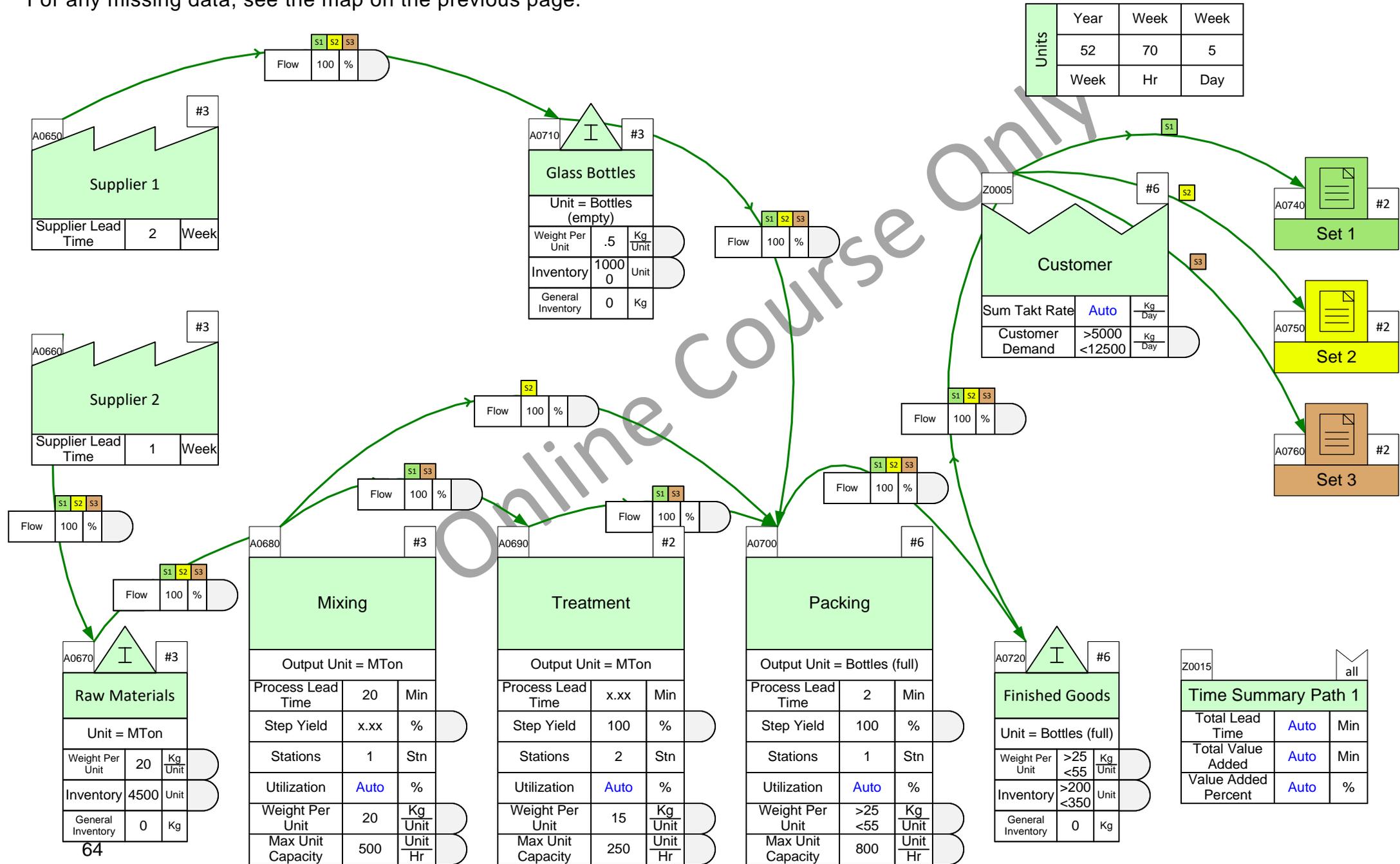
## Example Map 4

This map will be used in the next exercise.

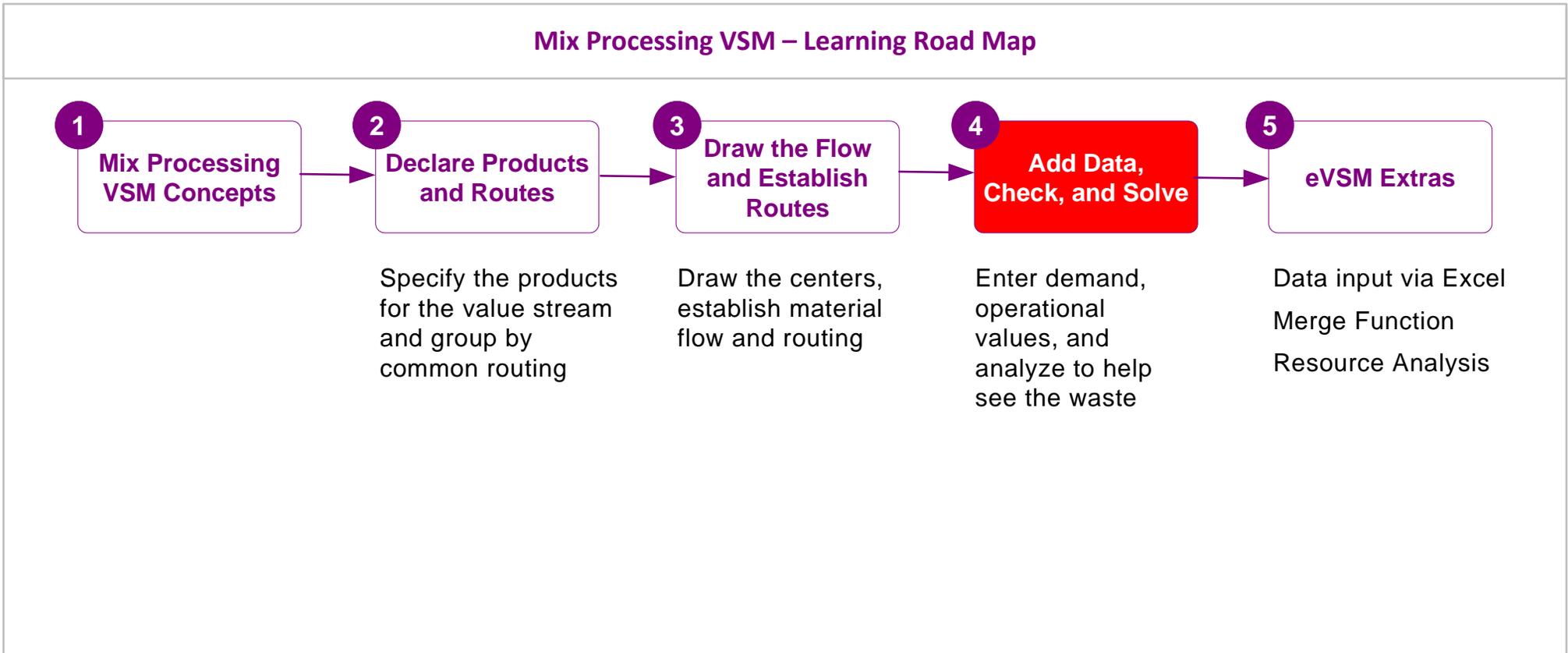


## Fix any problems reported by the Check function, then Solve this map

For any missing data, see the map on the previous page.



- You learned:**
- How to enter product specific demand and operational data on the map
  - How to check the map for completeness
  - How to Solve the model and see the calculation results

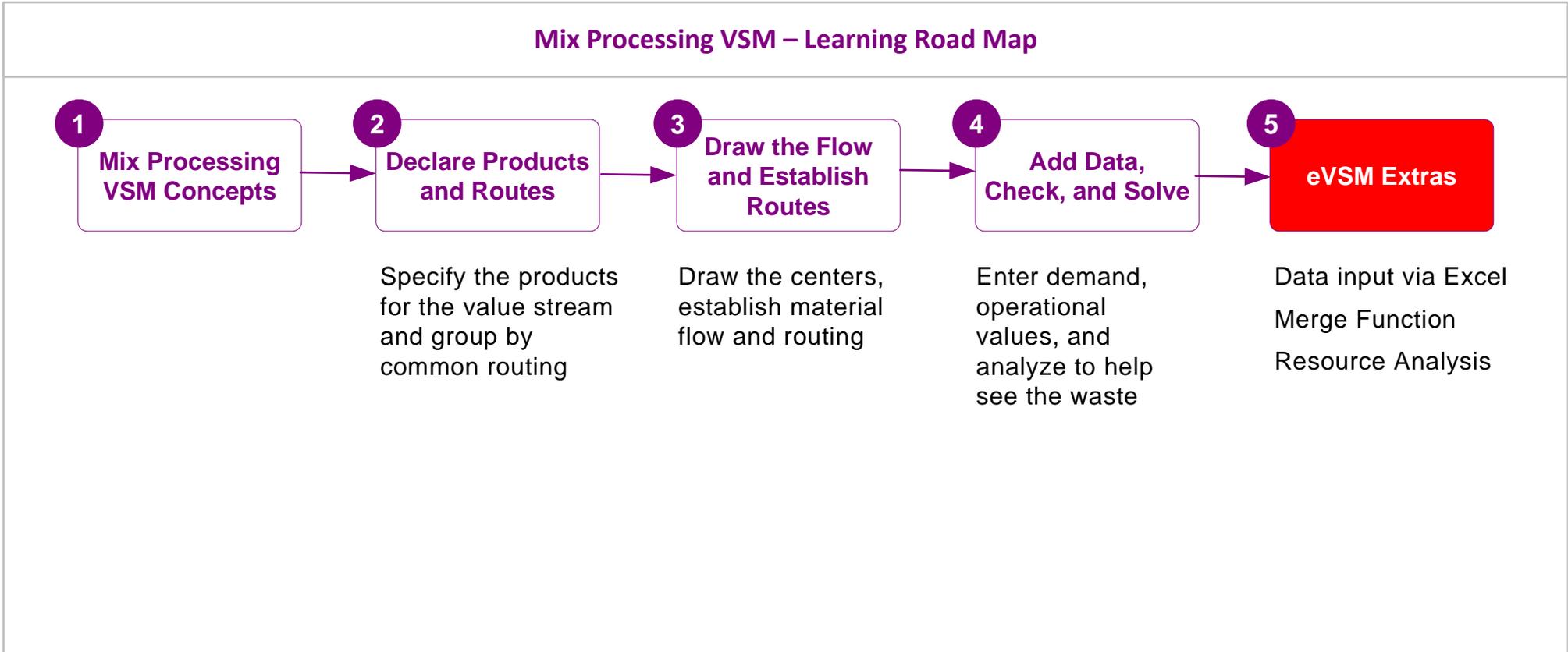


**What's next:**

Once you create the map and solve it, you can use standard charts for utilization, capacity, production interval and lead time to see the waste in the value stream and come up with improvement ideas

### Additional Topics

You have completed the primary training for Mix Processing VSM. This lesson covered some optional topics which allow you to further improve productivity and do more sophisticated calculations with your maps.



## Data Input through Excel

Mix model value streams need require significantly more data. Data input can get tedious, time consuming, and error prone. To address this, eVSM facilitates data input through Excel.

 Create XL - Creates an Excel file which represents all the data input values for the current map.

 Import XL - Import XL pulls the data in from Excel to the map.



### Watch the Movie

Click the Video button in the eLearner panel to start the video

The columns filters have been used to isolate “Activity Center” **Type** and the “Max Unit Capacity” **Variable** for easy input

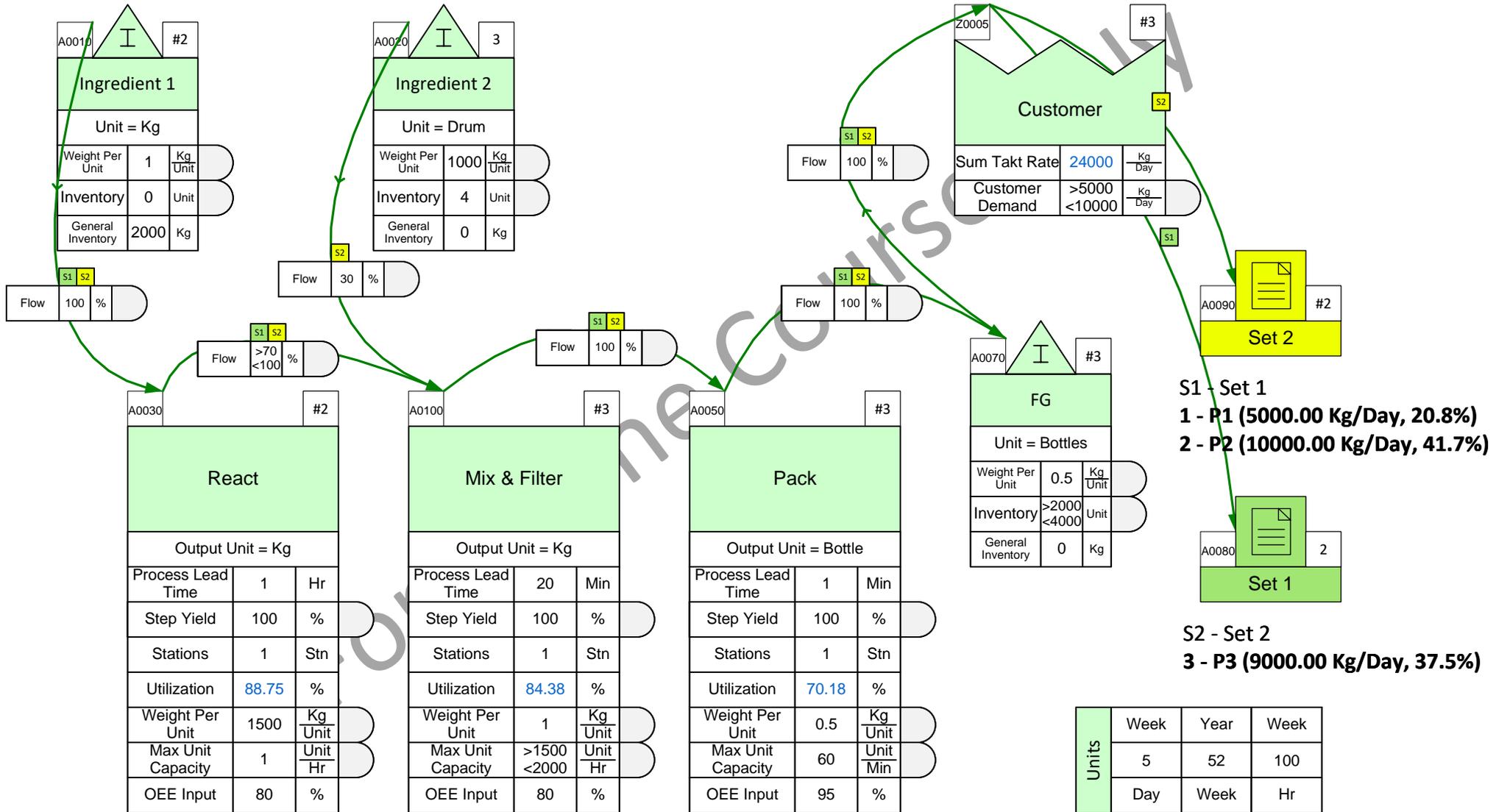
Tag	ID	Type	Product	Variable	Value	Unit
A0030	React	Activity Center	Default	Max Unit Capacity	1	Unit/Hr
A0030	React	Activity Center		1 Max Unit Capacity		Unit/Hr
A0030	React	Activity Center		2 Max Unit Capacity		Unit/Hr
A0030	React	Activity Center		3 Max Unit Capacity		Unit/Hr
A0050	Pack	Activity Center	Default	Max Unit Capacity	60	Unit/Min
A0050	Pack	Activity Center		1 Max Unit Capacity		Unit/Min
A0050	Pack	Activity Center		2 Max Unit Capacity		Unit/Min
A0050	Pack	Activity Center		3 Max Unit Capacity		Unit/Min
A0100	Mix & Filter	Activity Center	Default	Max Unit Capacity	2000	Unit/Hr
A0100	Mix & Filter	Activity Center		1 Max Unit Capacity	2000	Unit/Hr
A0100	Mix & Filter	Activity Center		2 Max Unit Capacity	2000	Unit/Hr
A0100	Mix & Filter	Activity Center		3 Max Unit Capacity	1500	Unit/Hr

Only input values are output to Excel. No calculated values

Product values are requested based on routing so its important to establish routes first

## Enter the product specific data using Create XL and Import XL

Use the Create XL button to export all data items to Excel. In Excel change the customer demand for P3 to 15000. Then use the Import XL button to populate on the map.



## Merging products to reduce solve times

eVSM does multiple solves in support of analytics for mixed model value streams. The solve can take a lot of time and the solve time can be approximated as proportional to

Number of Activities On Map \* (Number of Routing Sets + Number of Products)

One of our maps with 50 products, 4 sets and 10 activities takes 30 mins to solve on our test laptop. If we are able to reduce the number of products from 50 to 10 we find the solve time is about 5 minutes. Hence the idea for merging products. If we can solve the map faster, it becomes more useful to us.

## What is a merged group of products?

Lets say that the value stream is making 10 products and that the top 2 products comprise 80% of the volume. We could consider merging the other 8 products into a effective single product so the map effectively has the top 2 products and a “merged” product. We would expect a 3X reduction in solve times.

## How do we merge products?

We enter in demand and operational values for the Individual products. Via the “Mix Manager” button in the toolbar, we now have an “Auto Merge” function that allows us to specify a cumulative demand % below which products are merged. The software takes product operational values and combines them for merged products using weighted average logic based on customer demand values for each product.

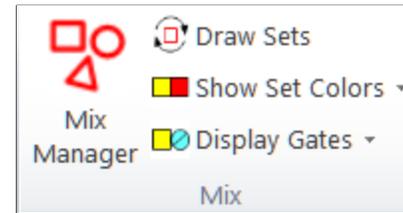
The user can return to the Mix manager and change the cumulative demand % value at any time ahead of the next solve

## Will the software merge products with different routings?

No, the software will create a merged product as needed for products with common routings but will NOT merge products across routings. So for each routing set we may have zero or 1 merged product. The merged product name is always the routing set name\_merge. So for example “Set1\_Merge”

## Merging products step by step

- 1 Define products, sets and routes
- 2 Enter demand and operational values for products
- 3 Enter the “Mix Manager” via the eVSM toolbar
- 4 Click on the “Auto Merge” button
- 5 Select a cumulative demand % below which products are merged and click the “try” button to see merge statistics
- 6 Selecting “OK” on the form will merge the products. You can edit the form again later.
- 7 In the Set keys to the right of the routing sets on the map, merged products will be indicated in Italics



Mix Manager - Define Products and Sets

ID	Name	Set	Can Merge?	Must Merge?	Is Merged?
1	P1	S1	Y	N	Y
10	P10	S1	Y	N	Y
11	P11	S2	Y	N	Y
12	P12	S2	Y	N	Y
13	P13	S2	Y	N	Y
14	P14	S2	Y	N	Y
15	P15	S2	Y	N	Y
16	P16	S2	Y	N	Y
17	P17	S2	Y	N	Y
18	P18	S2	Y	N	Y

Buttons: Add, Edit, Remove, **4** Auto Merge

Merge Products

ID	Name	Can Merge?	Must Merge?	Is Merged?	Demand %	Cumulative Demand %
41	P41	Y	N	N	12.5	100.0
35	P35	Y	N	N	12.4	87.5
34	P34	Y	N	N	11.3	75.0
42	P42	Y	N	N	11.3	63.7
20	P20	Y	N	N	11.3	52.4
8	P8	Y	N	N	11.3	41.1
7	P7	Y	N	N	11.3	29.8
40	P40	Y	N	Y	1.2	18.5
39	P39	Y	N	Y	1.2	17.3

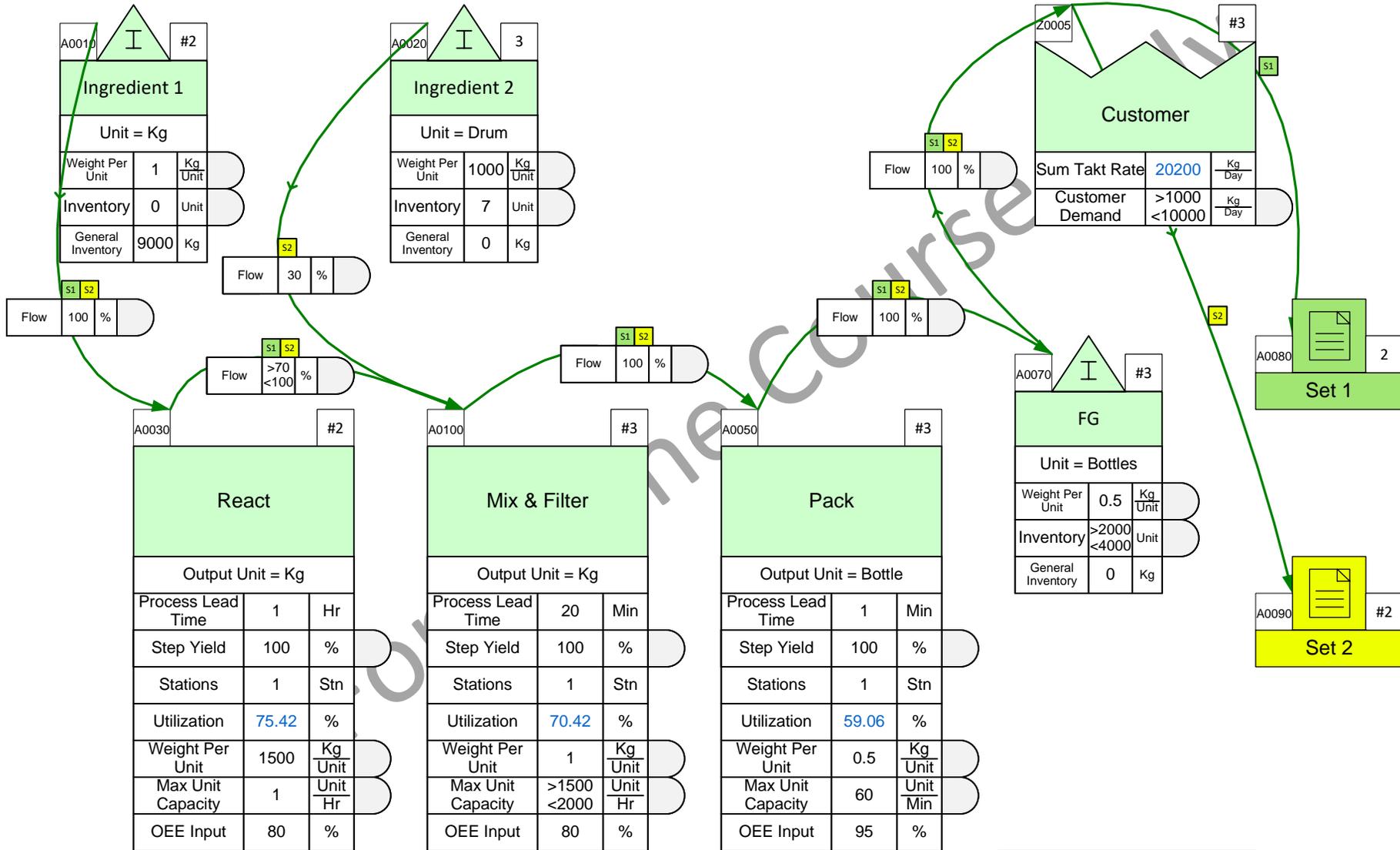
% of demand to merge:  **5**

Total # of products: 50

# of products after merge: 7

## Merge the low demand products to reduce Solve time

Open the Mix Manager and click on the Auto Merge button. Set the merge percentage to 20% and merge. Solve the map.



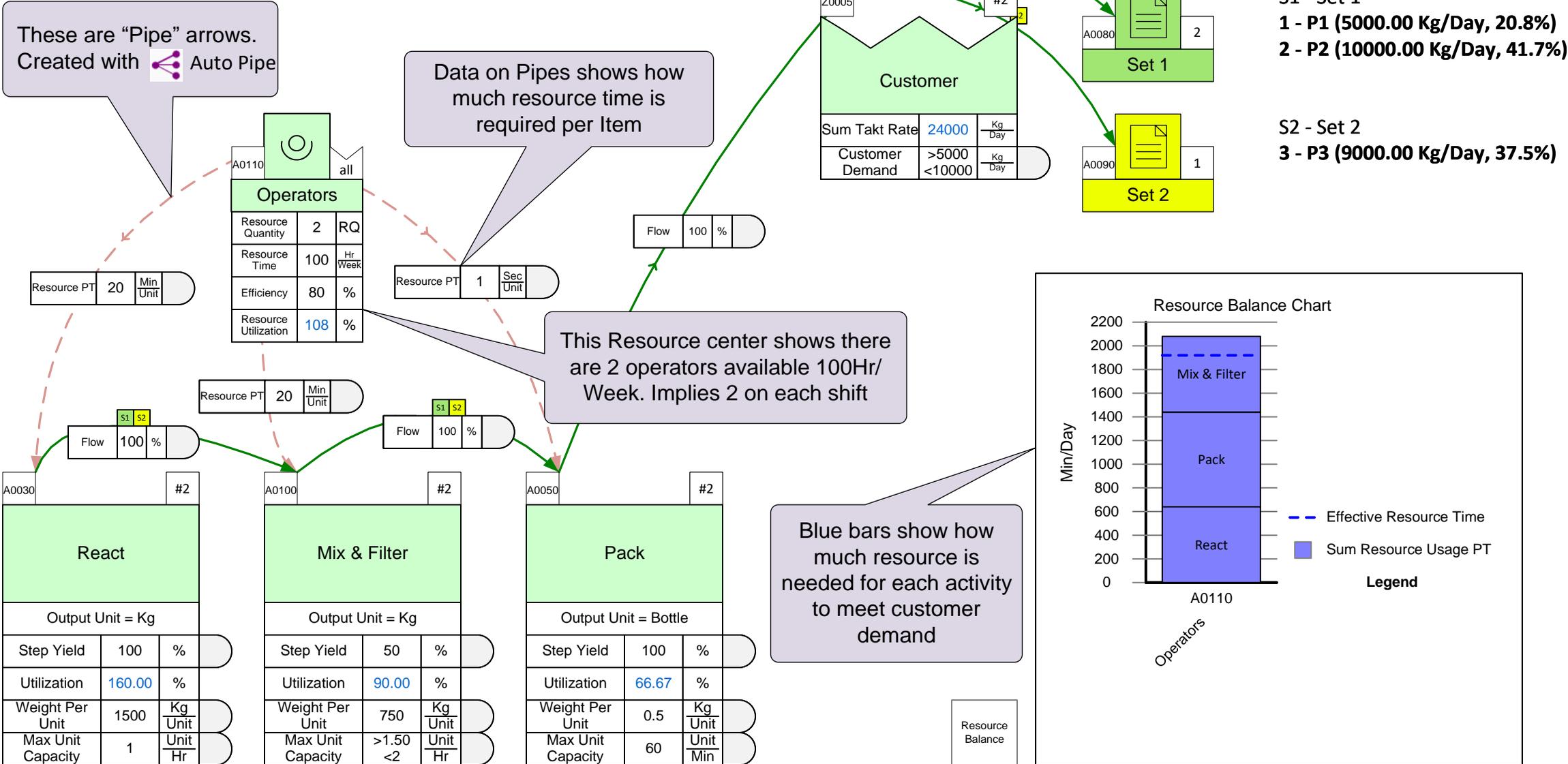
S1 - Set 1  
 1 - P1 (1000)  
 2 - P2 (1000)  
 4 - P4 (1000)  
 5 - P5 (1200)

S2 - Set 2  
 3 - P3 (7000)

Units	Week	Year	Week
	5	52	100
	Day	Week	Hr

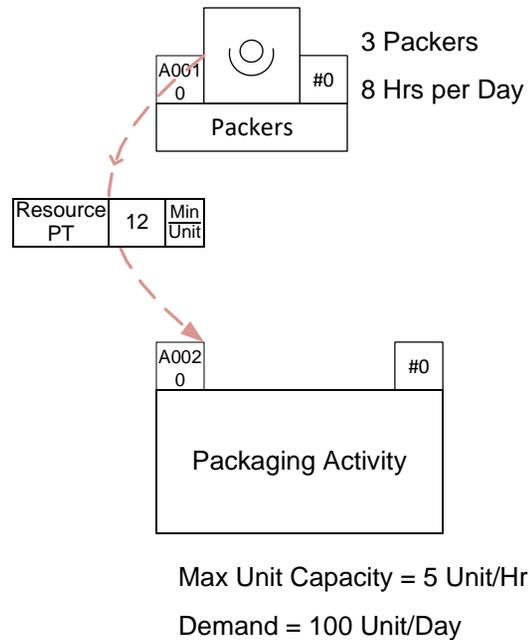
# eVSM Resource Analyses

The resource analysis function allows you to represent the different types of resources serving the value stream. It calculates utilization and plots a resource balance chart.



## Resource Calculations

### Example 1

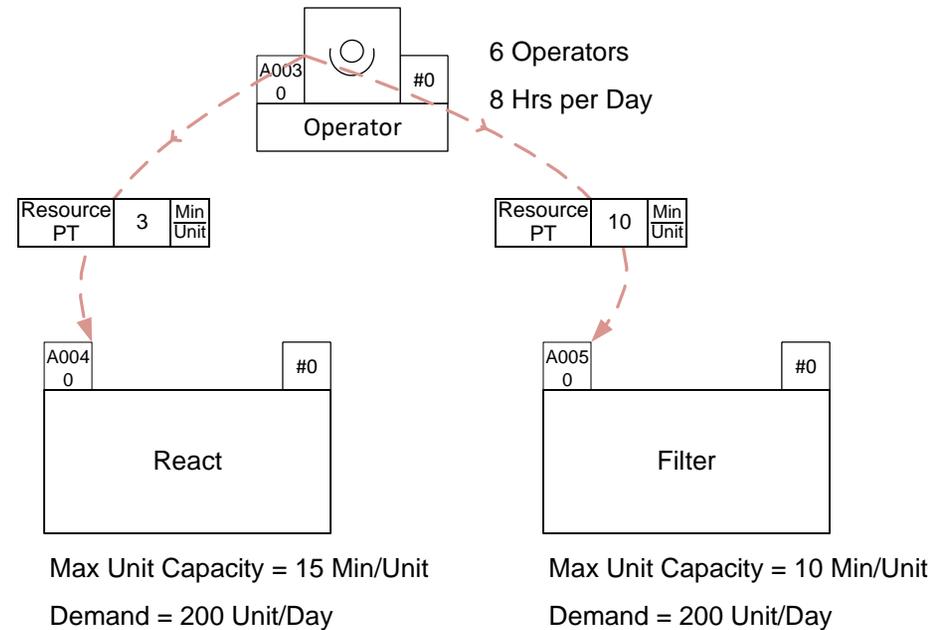


Available Resource Time =  $3 \times 8 \times 60 = 1440$  Min/Day

Resource Used =  $12 \times 100 = 1200$  Min/Day

Resource Utilization =  $1200/1440 = 86\%$

### Example 2

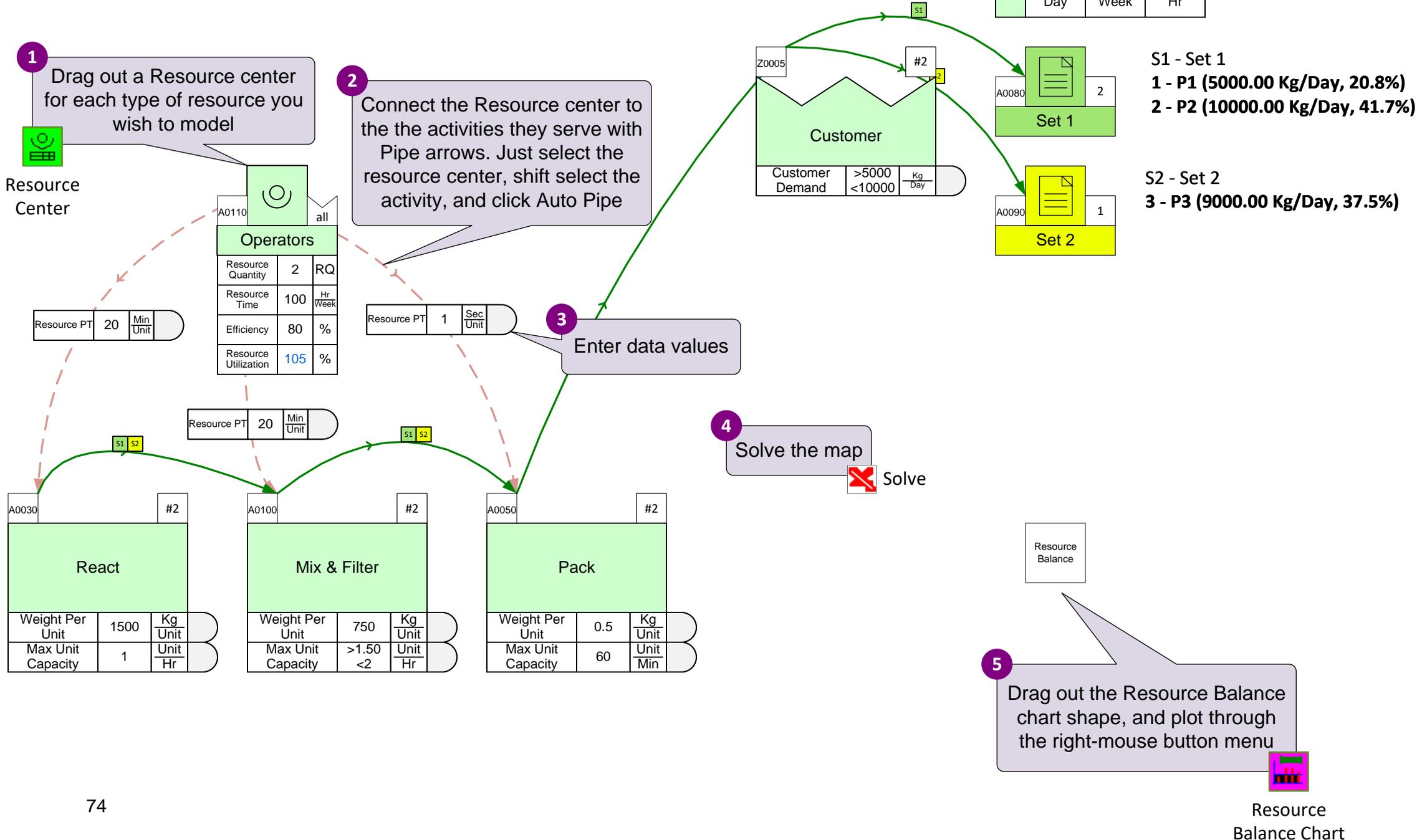


Available Resource Time =  $6 \times 8 \times 60 = 2880$  Min/Day

Resource Used =  $(3 \times 200) + (10 \times 200) = 2600$  Min/Day

Resource Utilization =  $2600/2880 = 90\%$

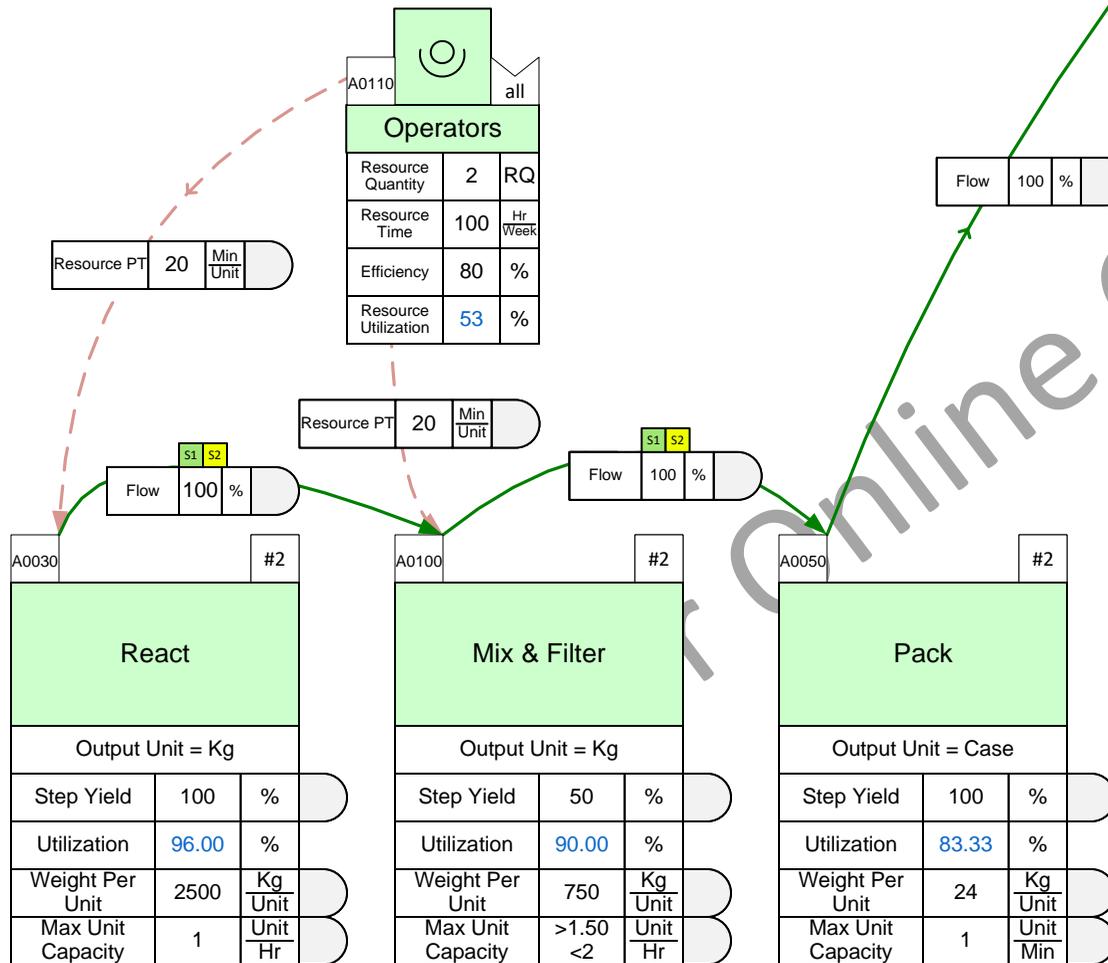
# Resource Analyses Steps



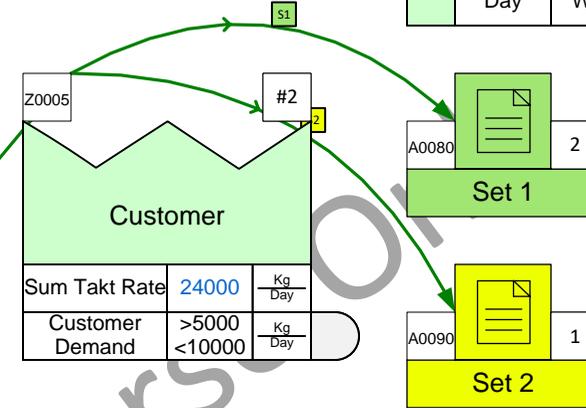
## Resource Analysis Exercise

Create a new resource called “Packers” with the data below and pipe it into the “Package” activity. Solve the model and plot a resource balance chart

- Resource Quantity = 1 Packer
- Resource Time = 100 Hrs/Week
- Resource PT = 1 Min/Unit (Note : Unit = 1 Case at packing)



Units	Week	Year	Week
	5	52	100
	Day	Week	Hr

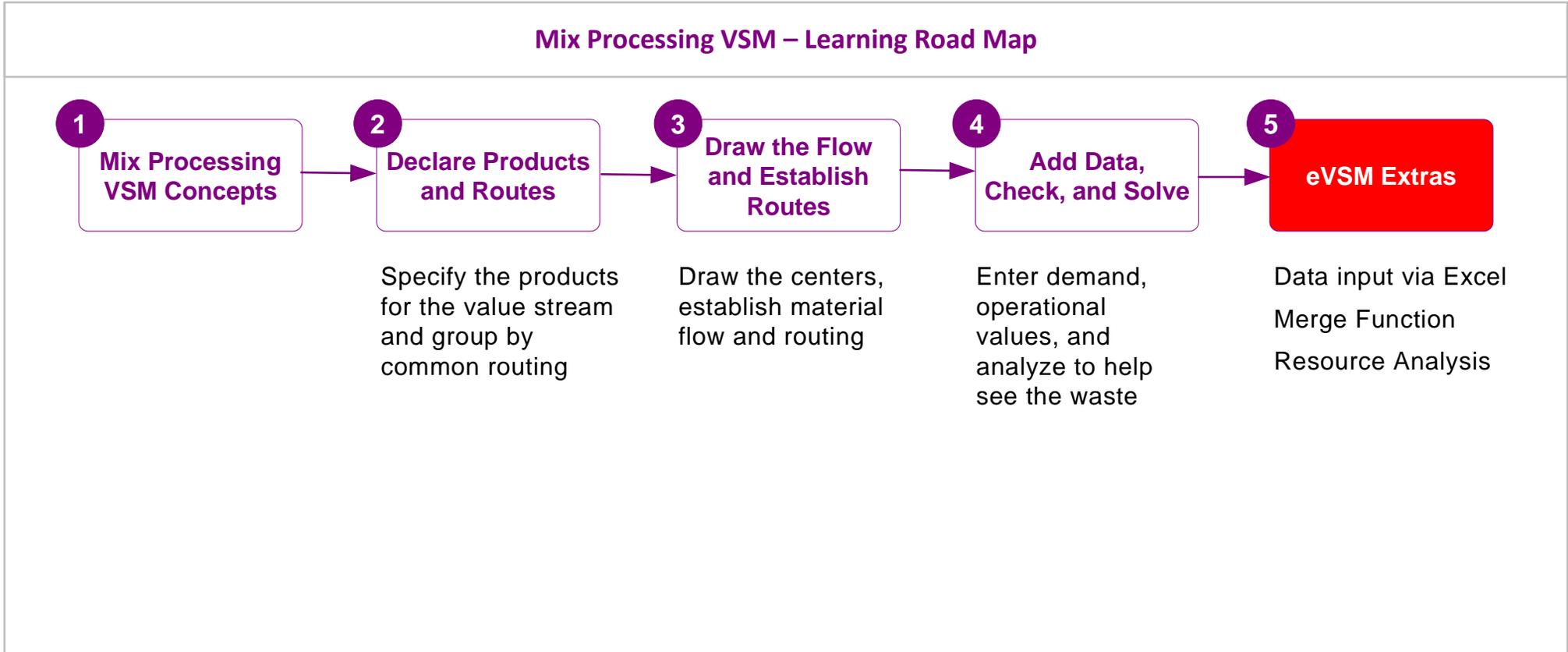


S1 - Set 1  
 1 - P1 (5000.00 Kg/Day, 20.8%)  
 2 - P2 (10000.00 Kg/Day, 41.7%)

S2 - Set 2  
 3 - P3 (9000.00 Kg/Day, 37.5%)

- You learned:**
- How to enter data through Excel
  - How to simplify the mix model by merging low demand products
  - How to use Add-on calculations for more sophisticated analyses

**Summary:**



**What's next:**

Capture your value stream in eVSM and request a review from [support@evsm.com](mailto:support@evsm.com)

## —Useful Links—

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eVSM Toolbar Guide

[evsm.com/toolbarguide](https://evsm.com/toolbarguide)

Map Examples

[evsm.com/examples](https://evsm.com/examples)

eVSM Blogs

[evsm.com/blog](https://evsm.com/blog)

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