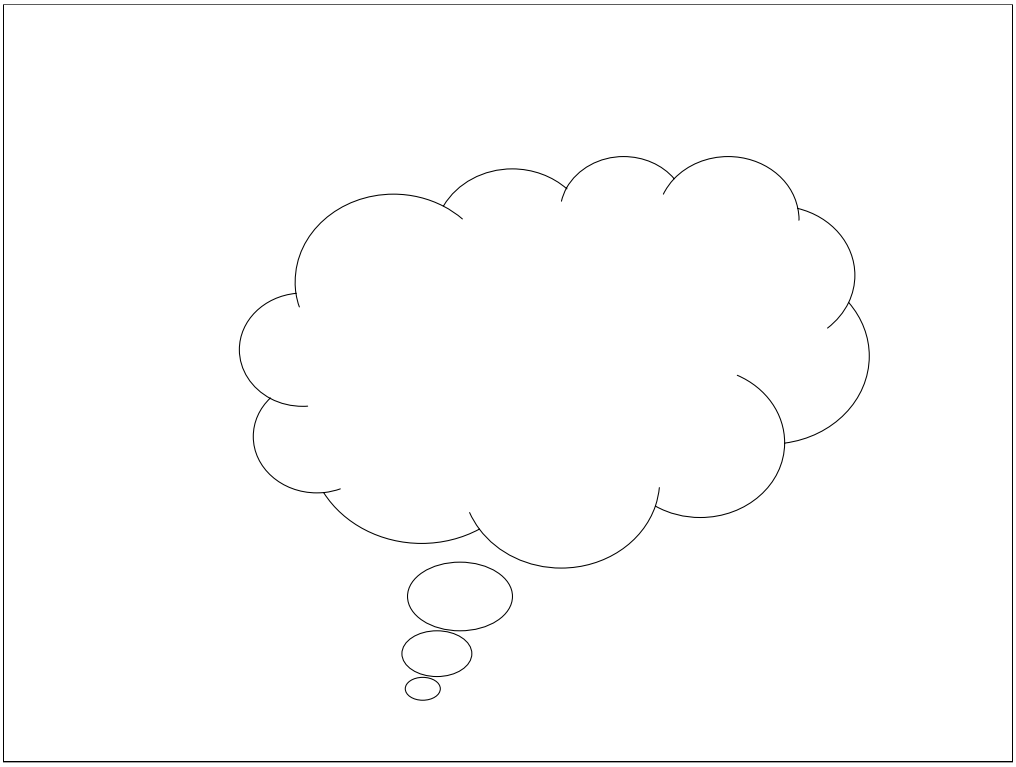
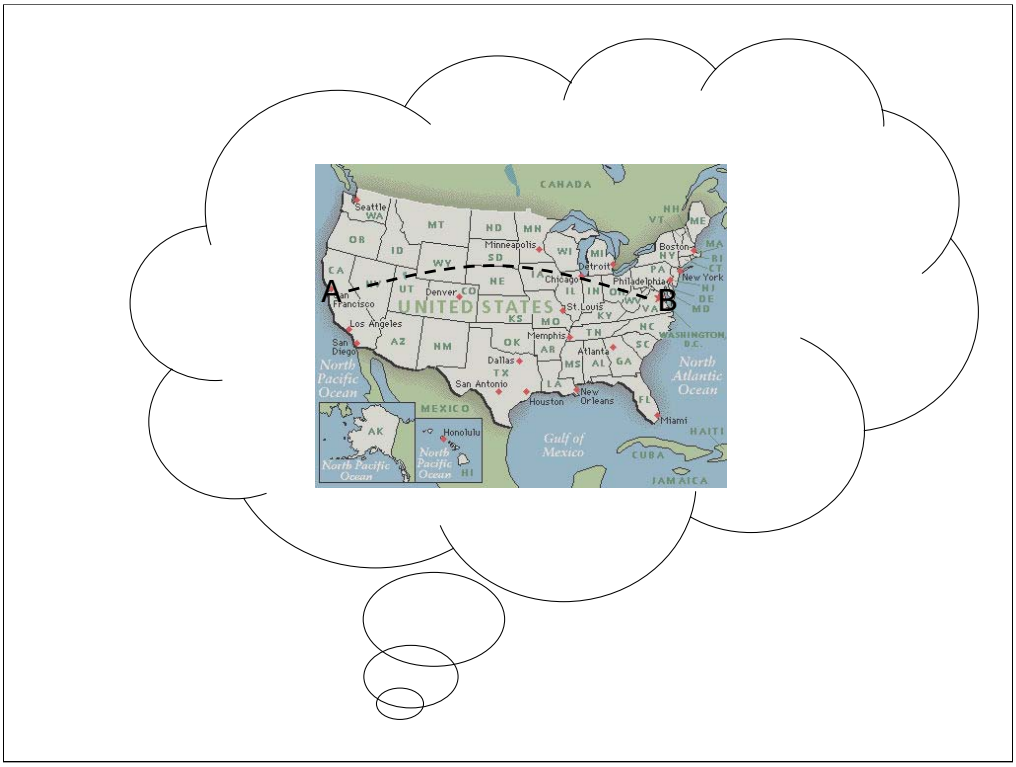


NARRATOR: When we think of the word “map”…

ON-SCREEN ACTION [a mind bubble appears from the bottom up, possibly above a person’s head]



NARRATOR: We might conjure up an image of a place?

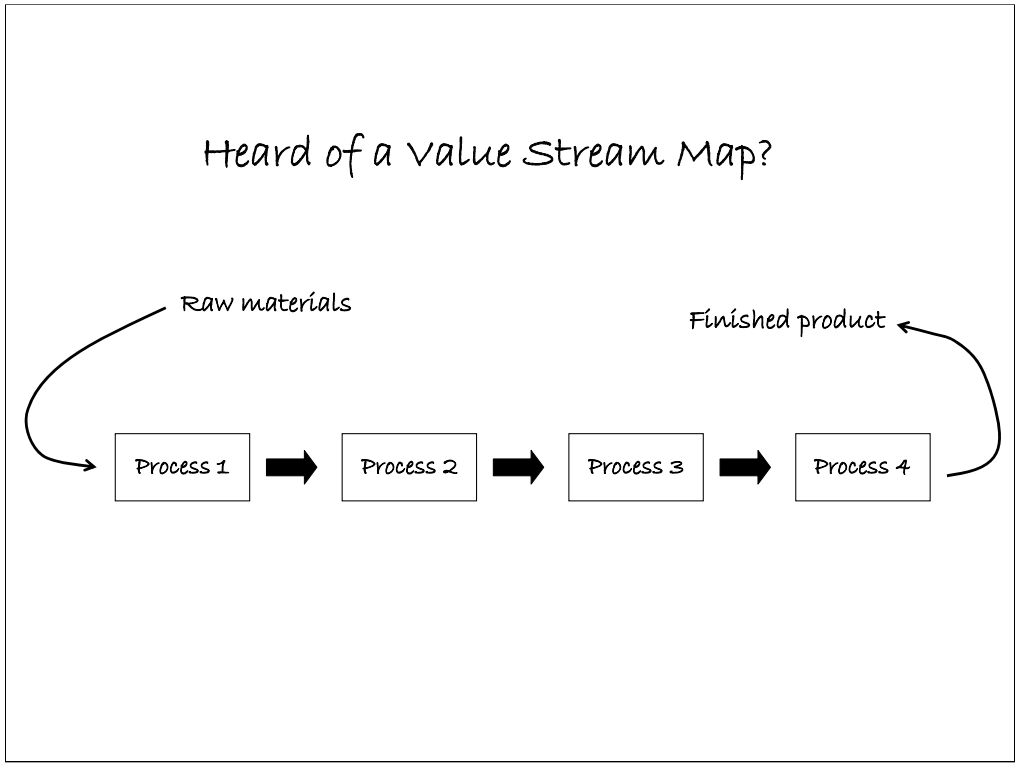
ON-SCREEN ACTION [a simple map of the United States appears in the bubble]

NARRATOR: When we think of a map, we naturally think about how to get from point A to point B.

ON-SCREEN ACTION [A and B appear on the map at different locations with an indirect route represented by a dotted line between them]

NARRATOR: But a map does not immediately convey the most efficient way to get from point A to point B.

ON-SCREEN ACTION [The dotted line fades and is replaced by a direct route between them]



NARRATOR: However, have you ever heard of a Value Stream Map?

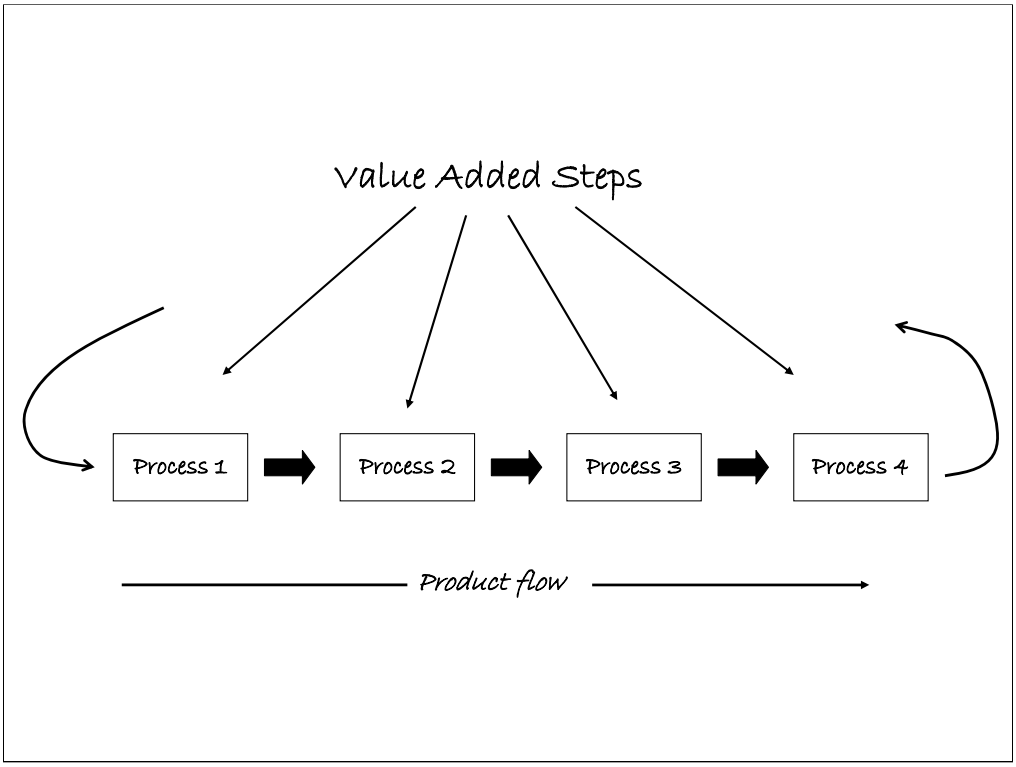
NARRATOR: A Value Stream Map is a map of each step required to deliver a product to a customer.

ON-SCREEN ACTION [four boxes are drawn as the voiceover reads above]

NARRATOR: Any Value Stream Map begins with drawing out the path the product follows along its manufacturing journey from point A to point B just like any other map.

NARRATOR: We begin this journey with raw materials and end with a finished product. Lean and Clean practitioners call this journey the Value Stream. By creating a Value Stream map we can pinpoint opportunities to improve efficiency to get from point A to point B.

ON-SCREEN ACTION [draw arrows and write “Raw materials” and “Finished product”]

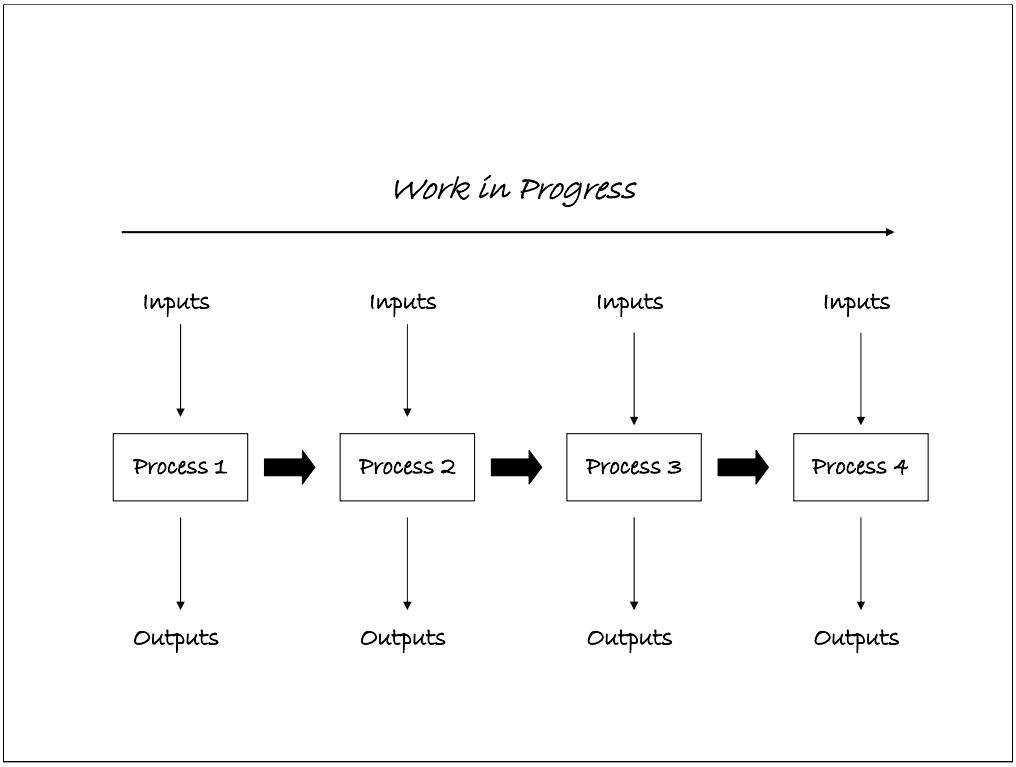


NARRATOR: A product's value stream has a number of steps,…

ON-SCREEN ACTION [A header of "Value Added Steps is written and arrows are drawn to each step.]

NARRATOR: …each adding value to the product as it moves through a facility. Value-added steps are anything the customer will pay for.

ON-SCREEN ACTION [an arrow is drawn below the value stream from left to right to show the product flow]

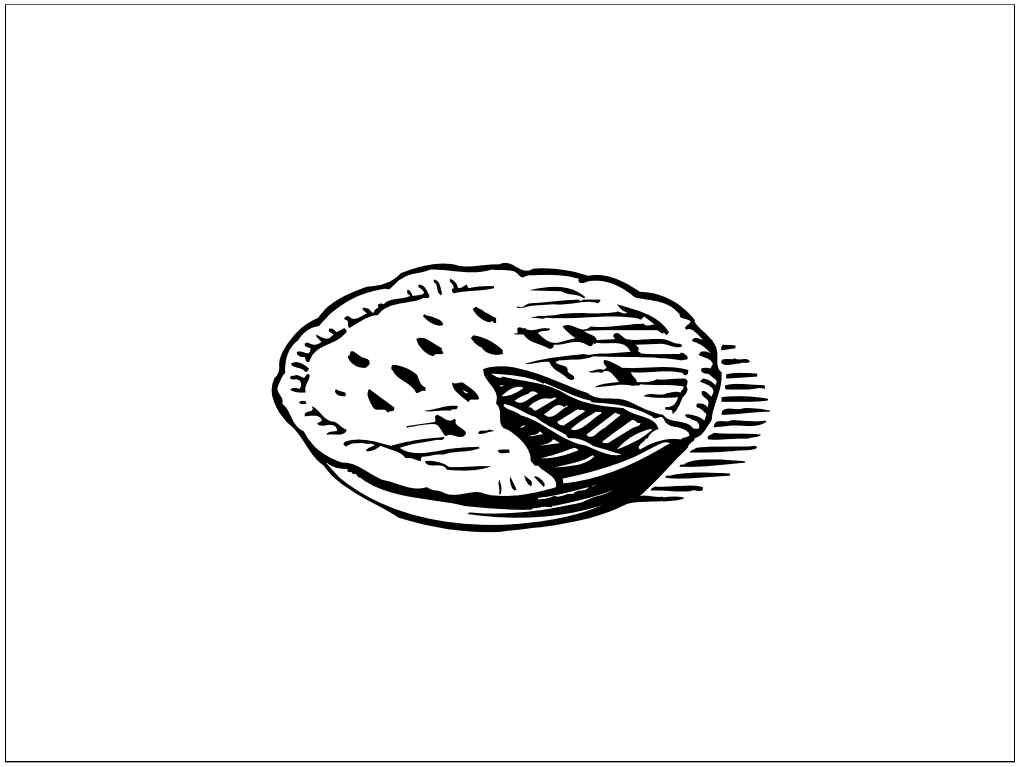


NARRATOR: Each of these steps have different inputs and outputs while the work-in-progress moves along laterally, increasing in value until it's a finished product ready for the customer.

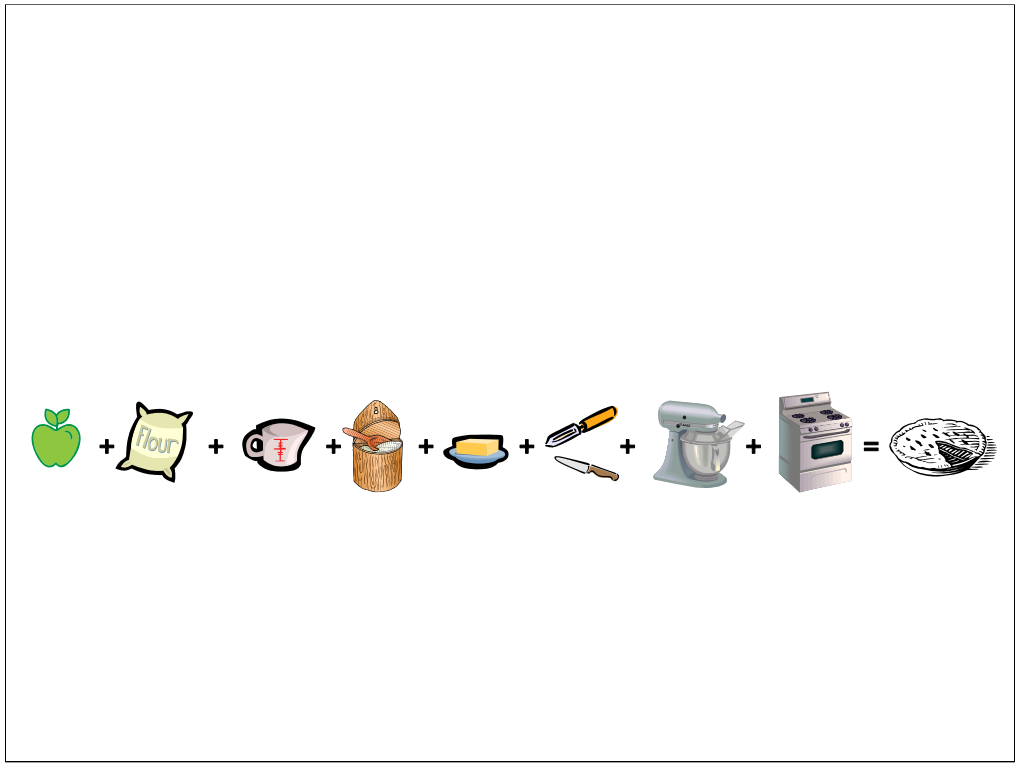
ON-SCREEN ACTION [Arrow is drawn above the process steps]

NARRATOR: Process maps look closely at the inputs and outputs of each step in the value stream to help identify which of these contain opportunities to improve efficiency. Lets work through an example to demonstrate Value Stream Mapping Basics—and a product we can all appreciate: Apple Pies.

ON-SCREEN ACTION [Inputs and Outputs are represented by using arrows]



ON-SCREEN ACTION [Hand drawn apple pie appears]

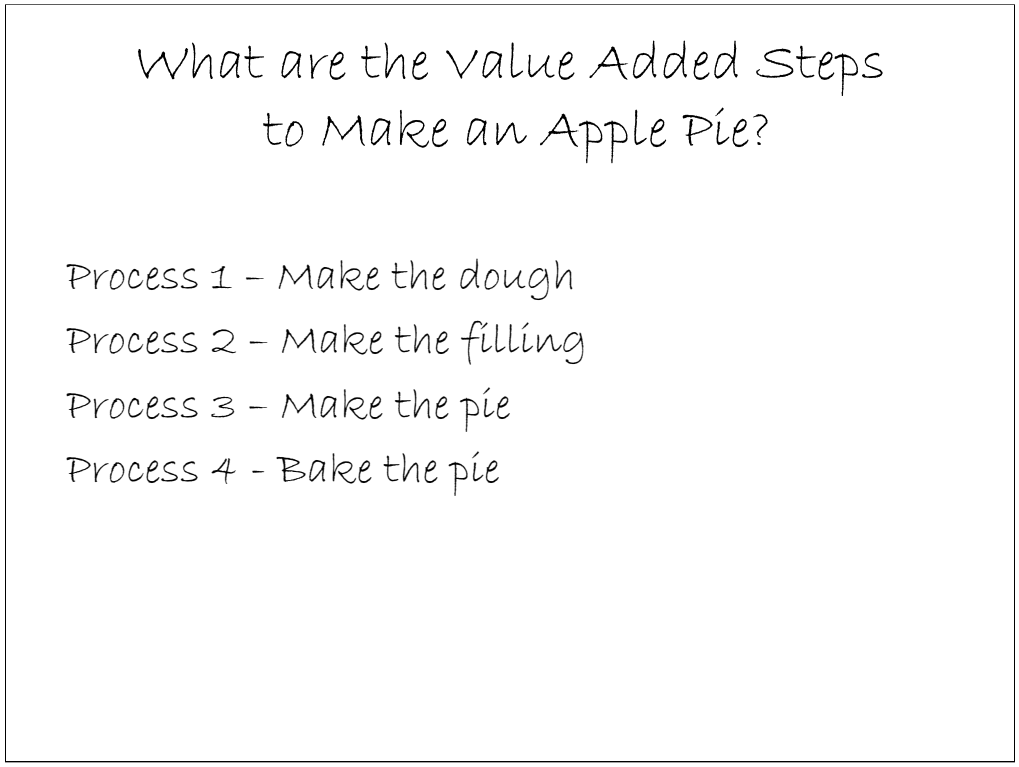


NARRATOR: If you ask someone at random to draw the steps it takes to make an apple pie, they might use pictures to represent each step in the process. Making apple pies requires raw materials and tools such as flour, a measuring cup, bowl, rolling pin, apples, a peeler, a knife, sugar, butter, a mixing bowl, and an oven. ON-SCREEN ACTION [hand drawn pictures appear of each listed input.]

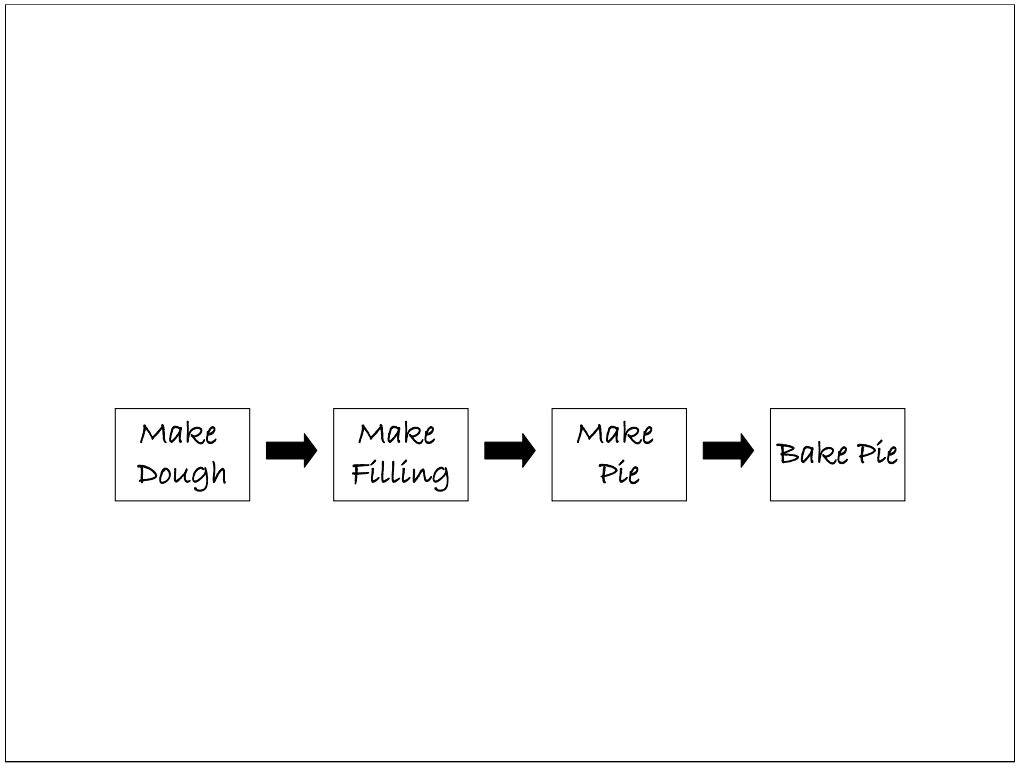
NARRATOR: And of course labor!

NARRATOR: Put them all together and the end result is a hot apple pie. But if you ask someone familiar with value stream mapping you may get a completely different image.

ON-SCREEN ACTION [equals sign and an apple pie complete the “equation”]

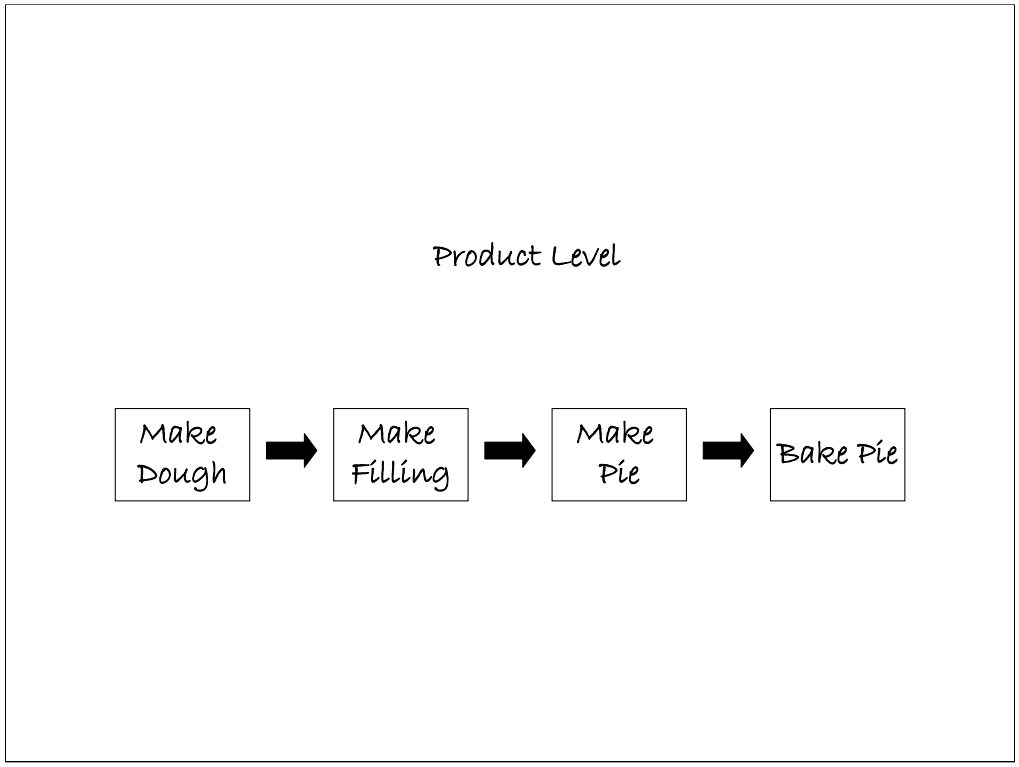


NARRATOR: We first need to identify the process steps to make an apple pie. In simplest terms, what are four steps? You need to make dough, make the filling, combine the two to make a pie, and then you bake the pie. Each one of the steps above involves multiple steps of its own. But we first need to understand the big picture before we can look closer at the small steps that add value to an apple pie.



NARRATOR: So let's draw a box around each step to make a simple value stream map. See that wasn't so hard. Identifying the major steps involved in making a product is how to begin drawing any value stream map.

ON-SCREEN ACTION [The process steps "spill out" of the list and "dump into" each process box]

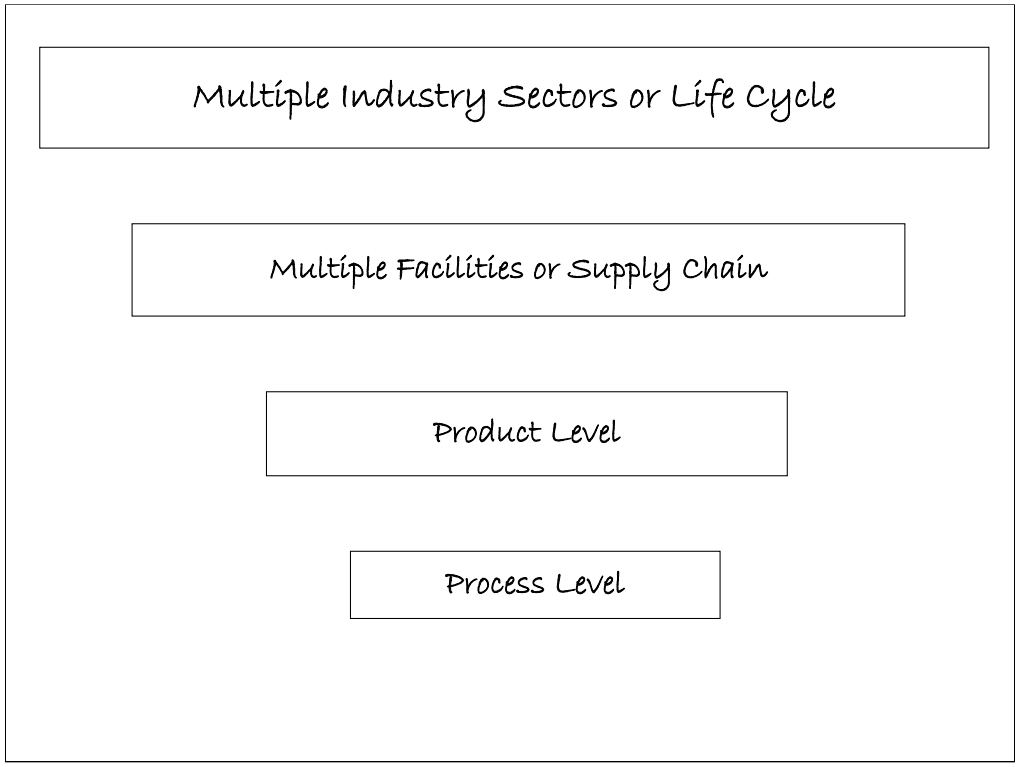


NARRATOR: This map lists out all the steps to create a finished product. We call this a product-level value stream map. ON-SCREEN ACTION [Write out “Product Level”]

NARRATOR: Product-level value stream maps follow the product from door to door of a manufacturing facility, or in this case from mixing bowl to oven.

ON-SCREEN ACTION [Mixing bowl on the left, then an arrow moving towards a mixing bowl]

NARRATOR: Let’s look closer at how we can use this technique to help suppliers see waste.



NARRATOR: While Lean and Clean experts typically begin by mapping at the product level, we can create maps for a product at multiple levels of the whole value stream. If we drill down deeper into the product of apple pies, we can map out each individual process it takes to make an apple pie. This would be the process level.

ON-SCREEN ACTION [animation: draws process box]

NARRATOR: The process level looks at steps necessary to take a raw material and add value to it so that it can be used to make a product. For our example, we can look at the raw material of apples and map out the steps that it takes to get them in shape for using them in our pie.

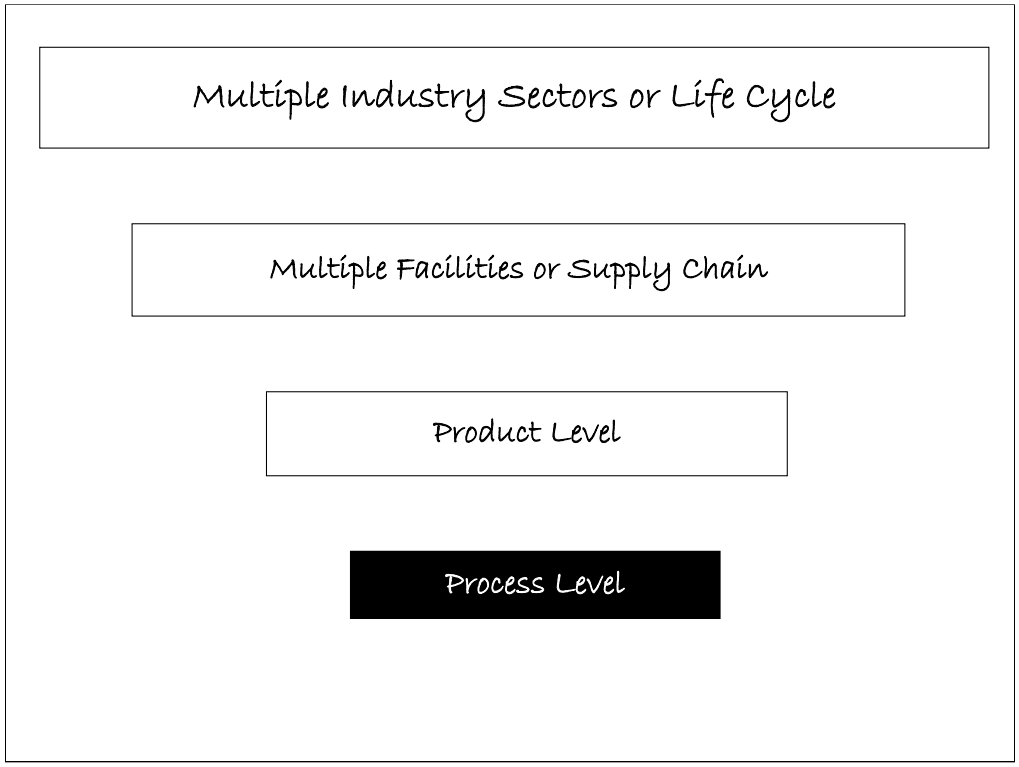
But we can also look at higher levels of the value stream. The level above the product map would be across multiple facilities of the supply chain.

ON-SCREEN ACTION [animation: draws supply chain box]

NARRATOR: The multiple facility level would look at each of the companies involved to make the product of an apple pie. This map could include the apple orchard, the grocery store or even the dairy farm that makes the butter. But we could map out the processes adding value to apple pies even higher.

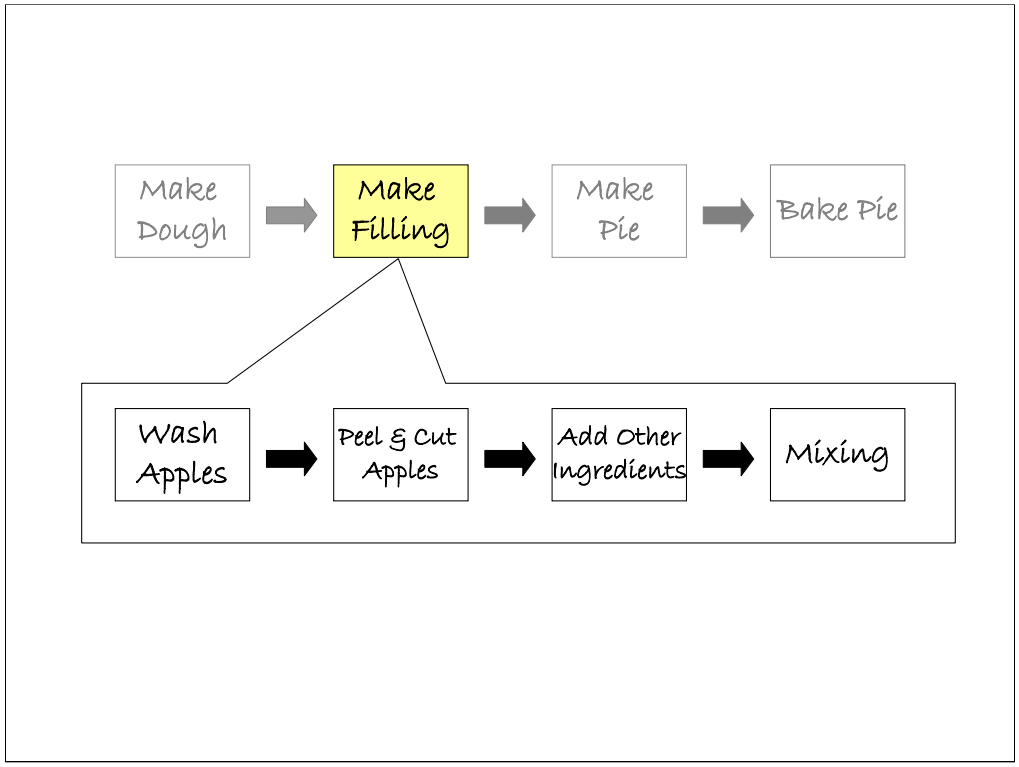
ON-SCREEN ACTION [animation: draw life cycle box]

NARRATOR: We can look at all the industry sectors involved in making an apple



NARRATOR: So lets look at the process level map for the process of making apple pie filling.

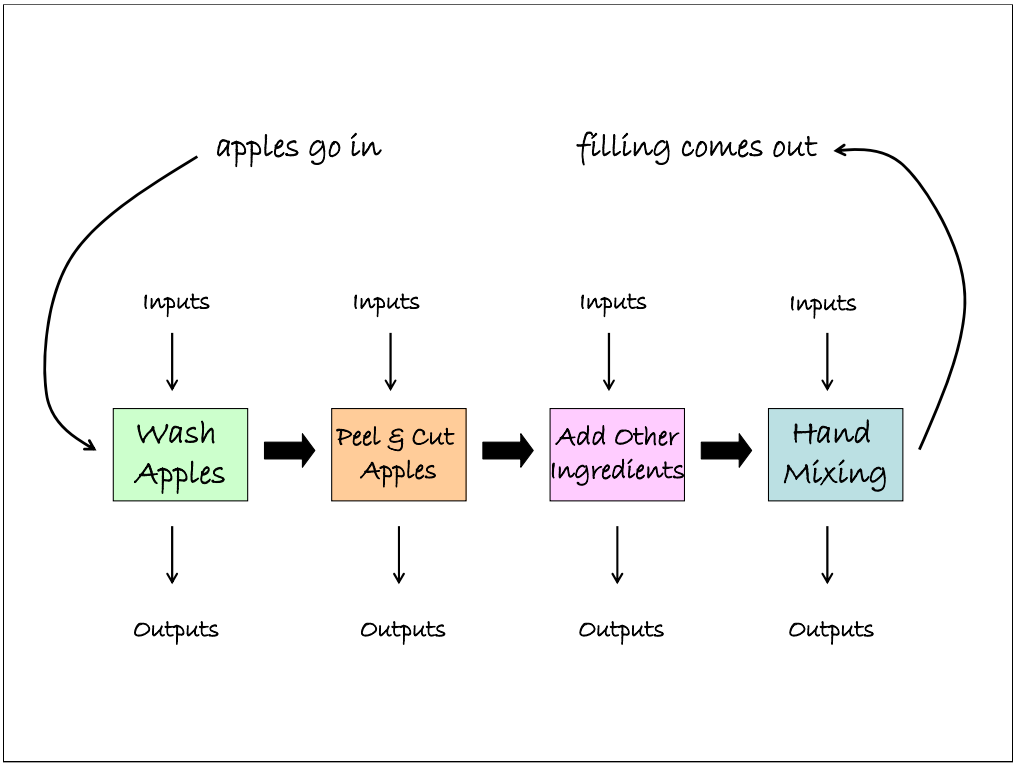
ON-SCREEN ACTION [Highlight “Process Level” box]



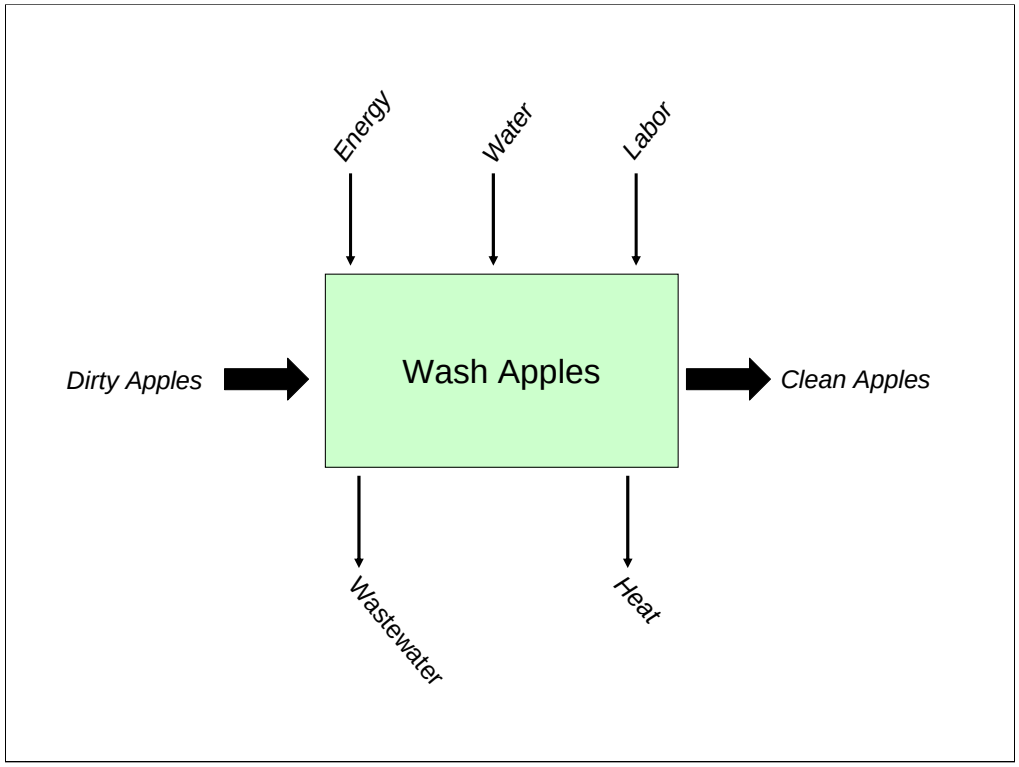
NARRATOR: The process of making filling contains its own value added steps. Let's draw them out.

ON-SCREEN ACTION [Process boxes for "Make Filling" spill out of the Make Filling Box as each process is listed]

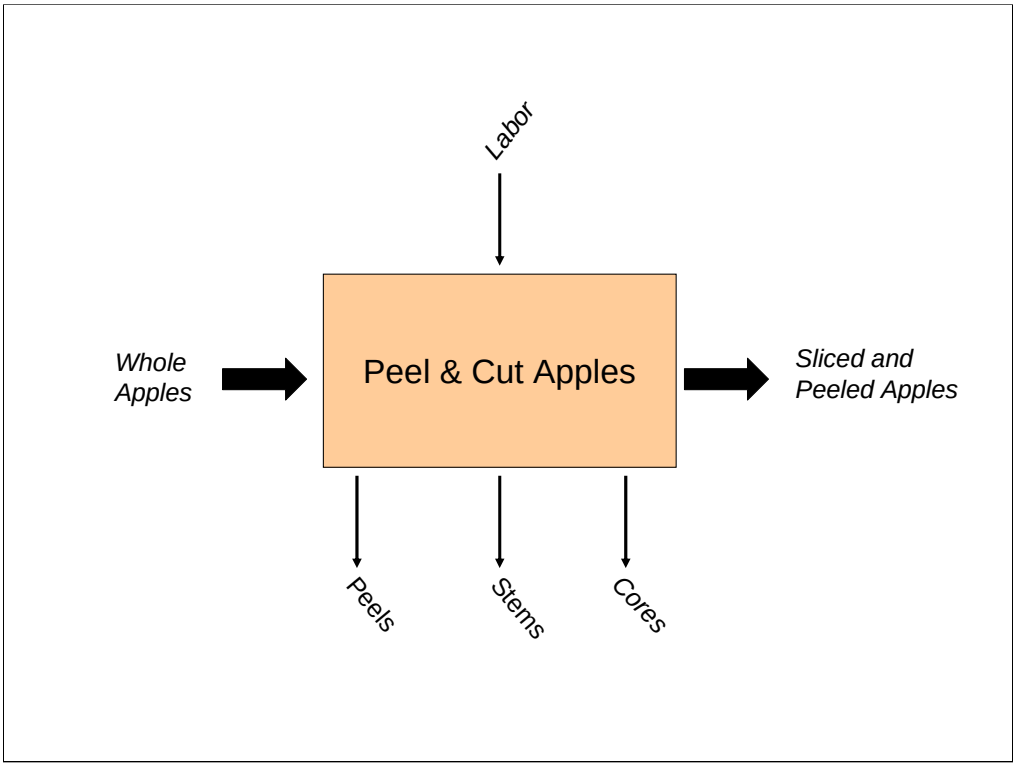
NARRATOR: First we wash the apples, then we peel and cut them. Each step is adding value to the apples for the purpose of putting them into a pie. Next we'll add the other filling ingredients and mix them with apples, ending up with a usable product for making a pie – the filling.



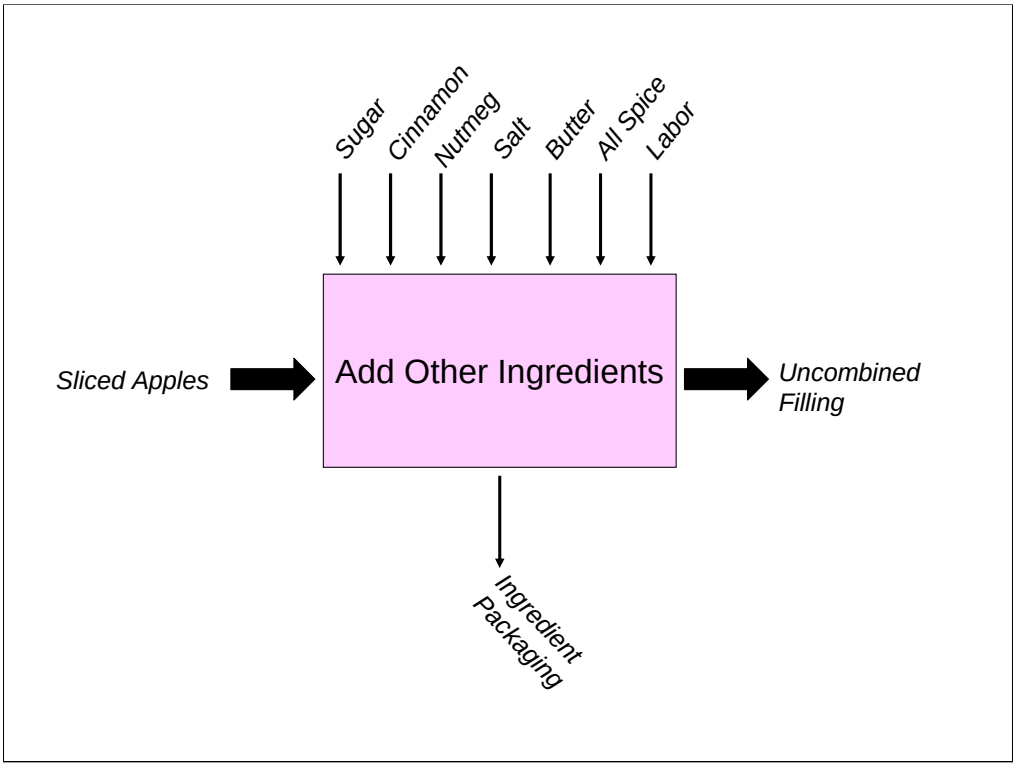
NARRATOR: Each of these process steps has inputs that add value and outputs that include byproducts, wastes, and the work-in-progress part that moves along to the next process. Let's look at the inputs and outputs for each one by drawing process maps.



NARRATOR: A process map takes into account every material and resource entering the process and any byproducts. In our example, we begin with dirty apples and clean apples moving on. To get to that point, it takes the inputs of energy, water, and labor to clean the apples. Wastewater and heat become outputs.

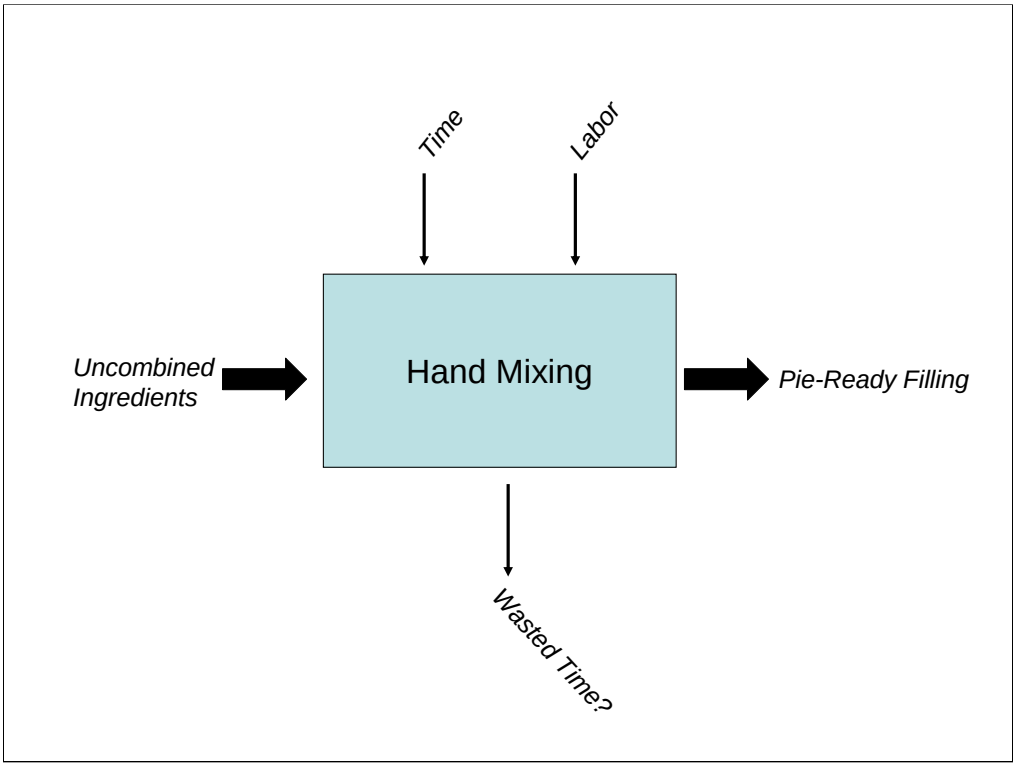


NARRATOR: The process of peeling and cutting the apples begins with whole apples coming in and peeled apple slices moving on. While the process only requires labor as an input, it creates several outputs – apple peels, stems and cores -- that need to be managed. These can be viewed as wastes but some wastes retain more value than others. In this example, the apple byproducts could be sold as animal feed or used to make compost.

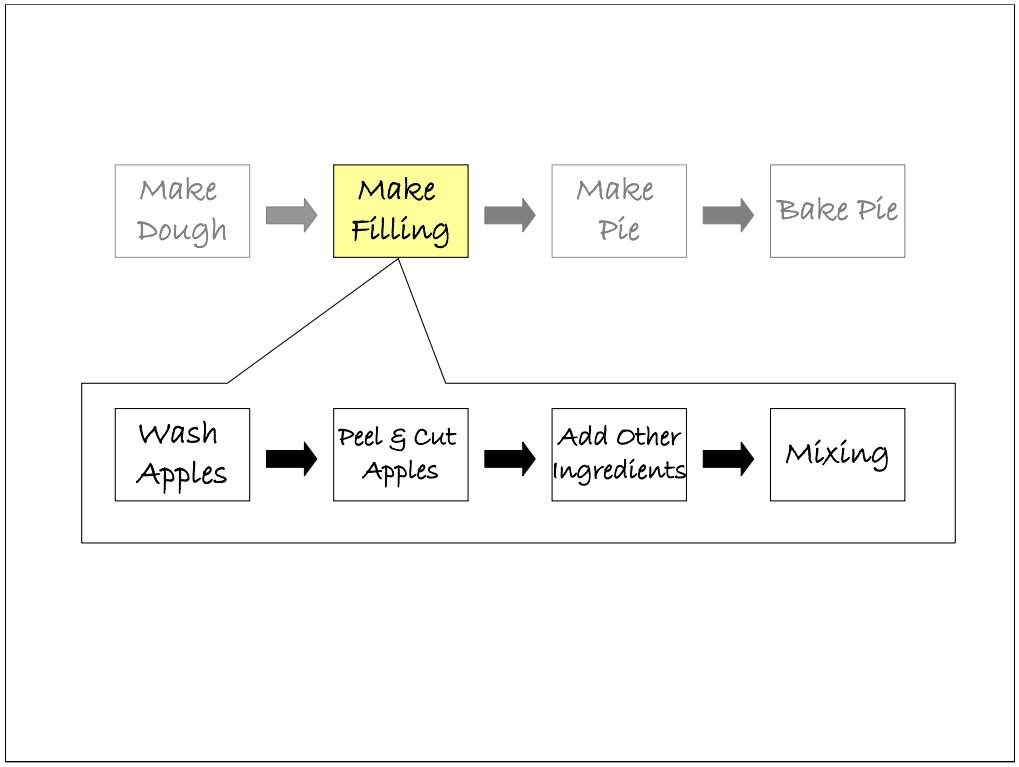


NARRATOR: The process where we add all the other filling ingredients to the sliced apples contains the most inputs because a good apple pie requires a number of ingredients, such as sugar, cinnamon, salt and butter, to create that recognizable taste and smell. While this process requires a lot of inputs, if properly measured, not much of them will be wasted and will be completely consumed by the process leaving behind only the ingredient packaging as the output or waste. Packaging is a common waste focused on during Green Suppliers Network reviews because in many cases it can be reduced or eliminated by working with suppliers and customers to implement reusable shipping containers.

ON-SCREEN ACTION [Process box appearing first then “Sliced apples” in, “Uncombined filling” out, Inputs on top next, and waste output appears last]



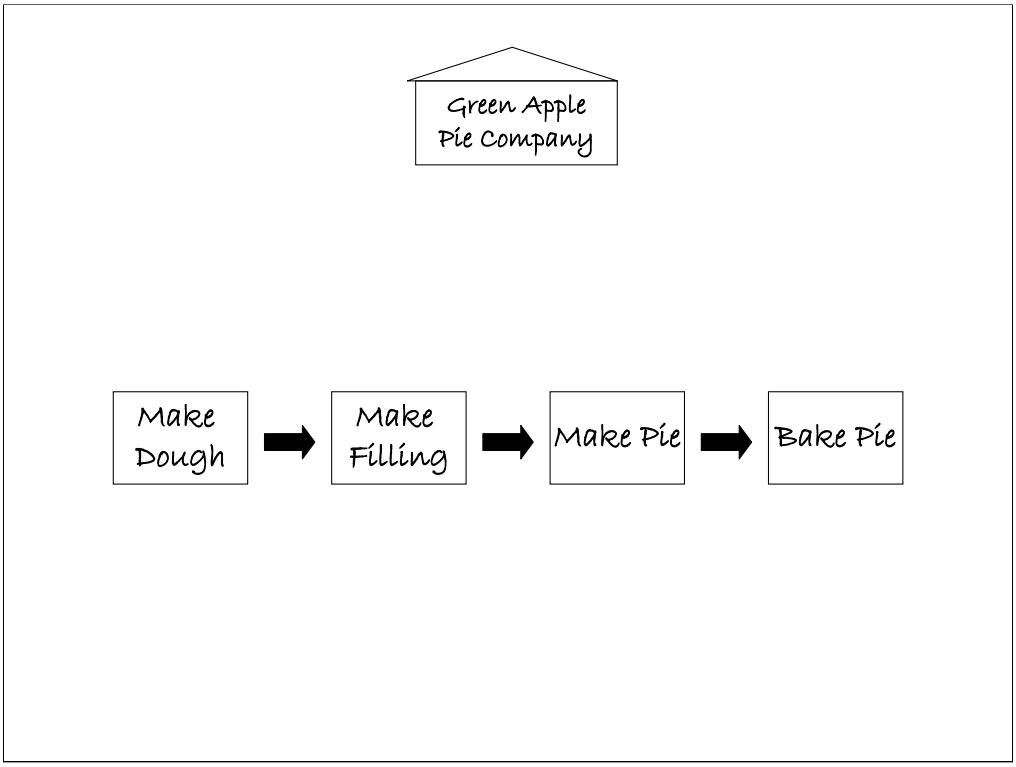
NARRATOR: The process of mixing the filling is relatively simple in that it only requires a little labor and time to turn the pile of unmixed ingredients into pie filling. While this process doesn't have any tangible outputs, time and labor can also be wasted if a process such as mixing is done inefficiently.



ON-SCREEN ACTION [Process boxes for “Make Filling” spill back into the “Make Filling” process box]

NARRATOR: This concludes part 1. We’ve learned basics and the difference between process and product level. Be sure to watch the next segment to learn how to apply these techniques for a facility that mass produces pies.

END PART 1

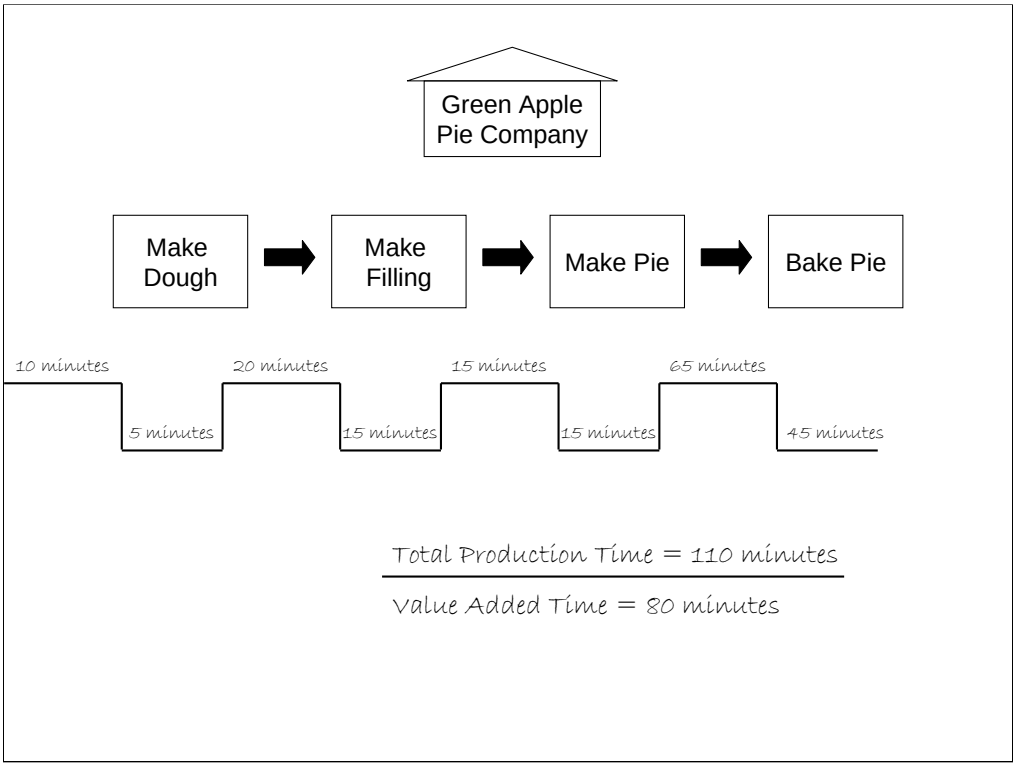


ON-SCREEN ACTION [**Part 2 begins** with same visual map as Chapter 2 began and ended.]

NARRATOR: Now that we've learned how to map out the value stream of making apple pie, let's look at how we can apply these techniques to a company that makes 200 apple pies a day.

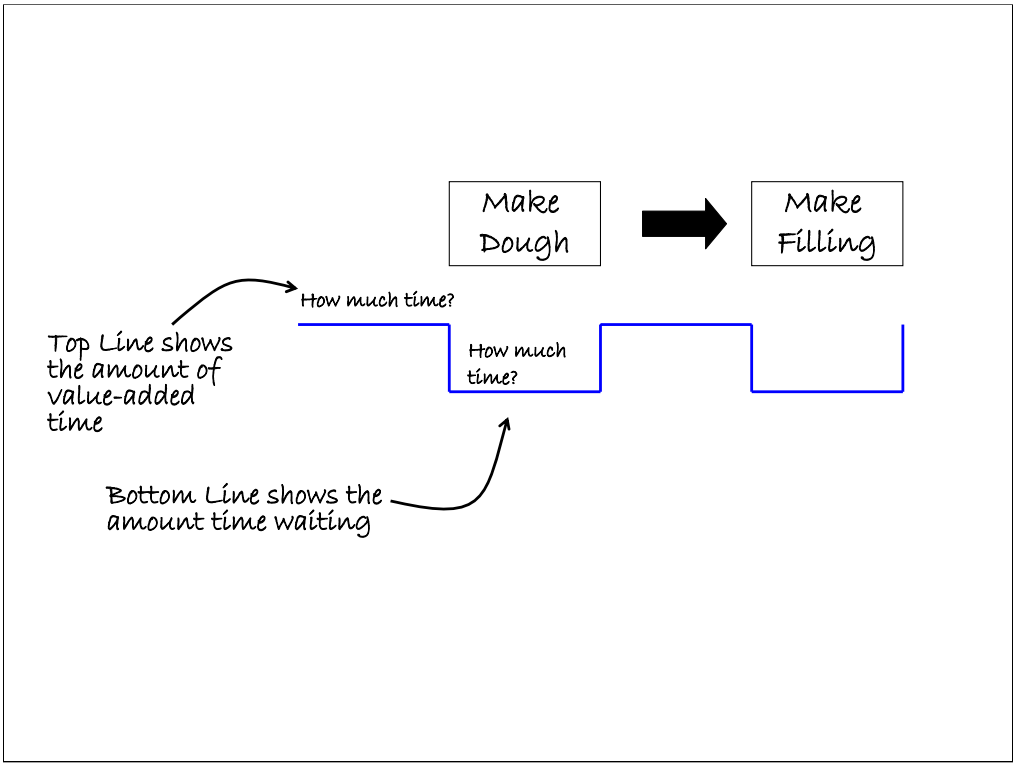
NARRATOR: Using a company that mass produces apple pies as an example allows us to learn other mapping techniques that you can apply when large amounts of resources and materials are being used. A company that mass produces a product is likely using large automated machinery that use high quantities of energy and water.

ON-SCREEN ACTION [Animation: Oven at end (bottom right of screen) glowing heat, with pies on conveyor belt heading towards oven.]

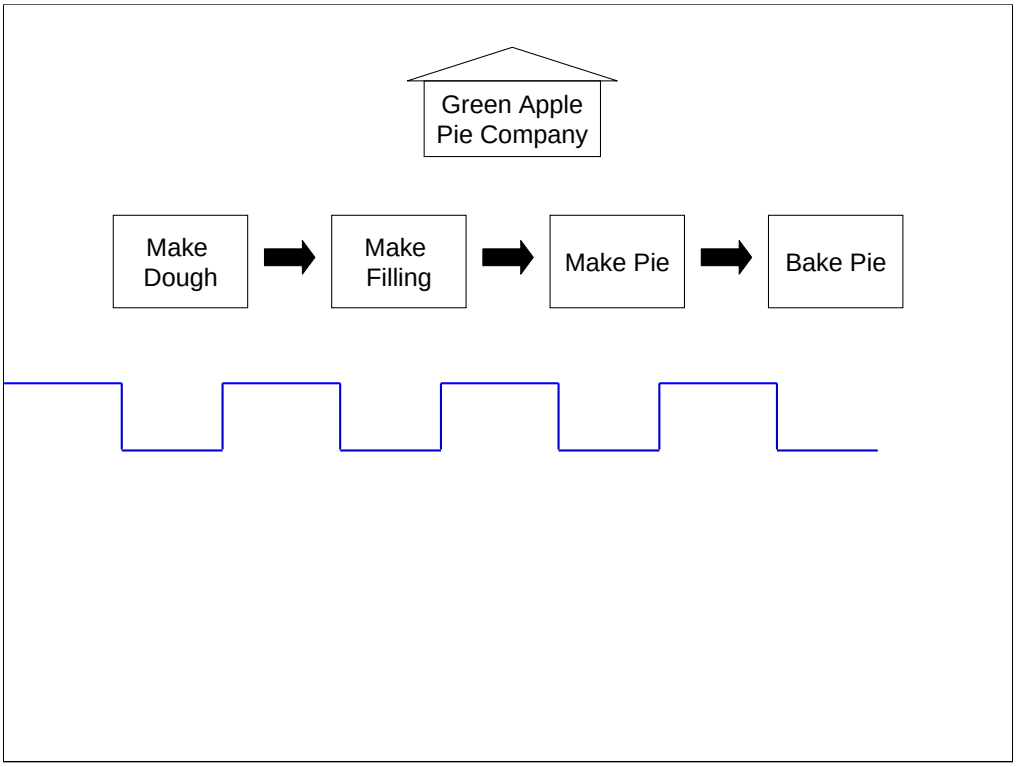


NARRATOR: Traditional Lean Value Stream Mapping includes drawing a timeline. A timeline resembles the top of a castle wall. To complete a timeline, Lean practitioners use a stopwatch to record how long it takes for work to be done on the product at each step, complete the work done to the product at each step in the value stream, and compares that amount of time to the time it takes for the product to move on to the next step. Using our apple pie example, it takes several minutes to make dough and make the filling while it doesn't take much time to move from one process to the next. In a manufacturing facility, its more likely that it only takes a short amount of time – a few seconds – to do the work that adds value, while it might take a day or more for the work-in-progress part to move on to the next process.

ON-SCREEN ACTION [Stopwatch with hand pressing button on top of stopwatch with moving second hands]



ON-SCREEN ACTION: [zooms in on section of the materials line]

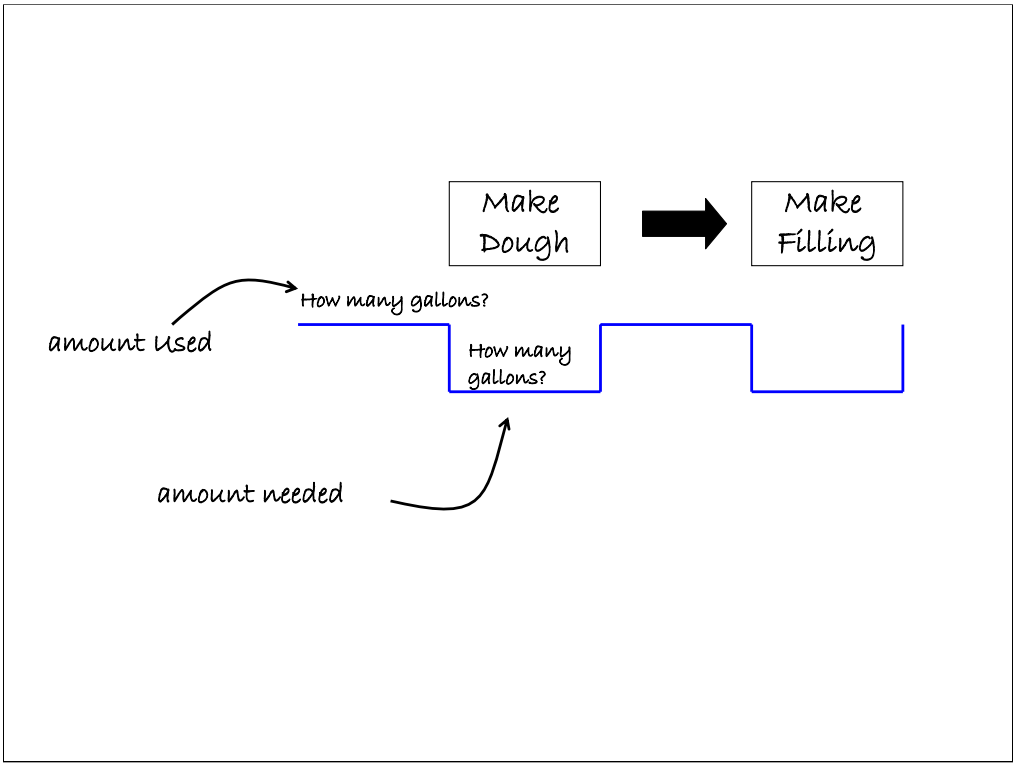


NARRATOR: A facility such as Green Apple Pie Company might want to know how much of one input they use across their whole value stream. To do this, we use a different kind of line –- a materials line.

ON-SCREEN ACTION [erases the times on timeline]

NARRATOR: It shows how much of a raw material is used by each process and compares it to the amount actually needed.

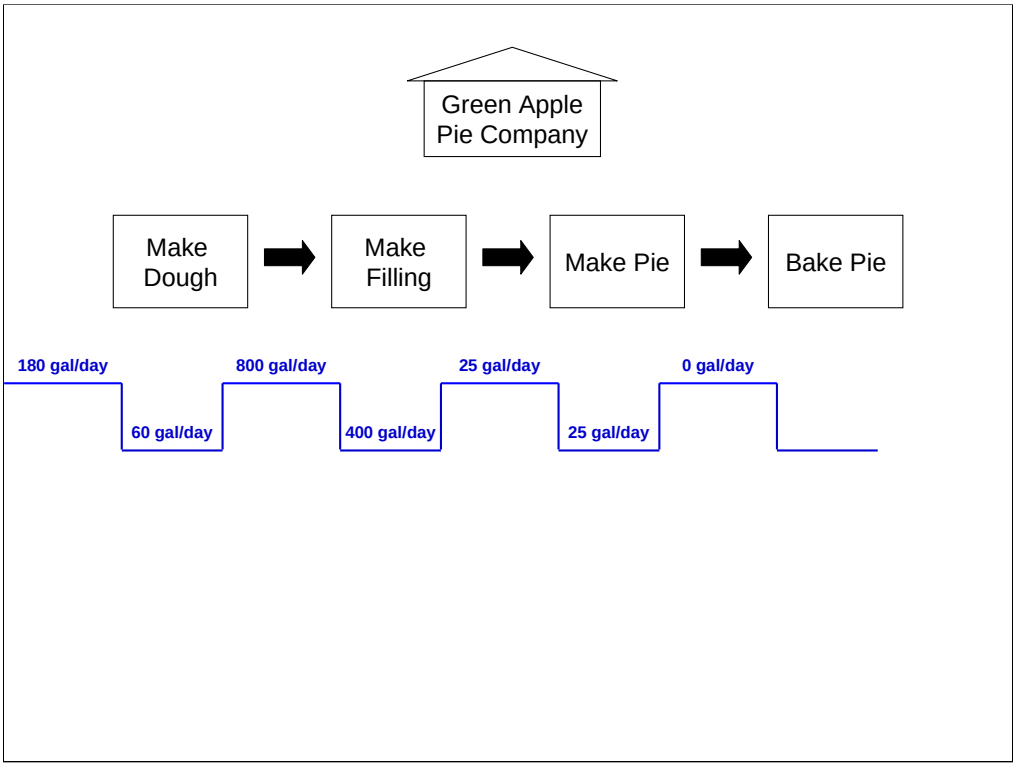
Materials lines are used when an input occurs in multiple or every step in the value stream, such as energy or water. Let's look at a materials line for how much water it takes for the Green Apple Pie company to make pies.



NARRATOR: On the top line, we list out how many gallons of water ON-SCREEN ACTION [write “how many gallons”] are currently used by each process step. The bottom line shows how much water is actually needed to make pies. The amount currently used reflects “current state” of this value stream. The amount actually needed might be an estimate of what an improved future state might look like. Another way to think about the amount used versus what is actually needed is by comparing use to the amount that is incorporated into the finish product.

ON-SCREEN ACTION [write descriptions and draw arrows]

NARRATOR: The difference between the two amounts is not adding value to the product and could be considered waste.



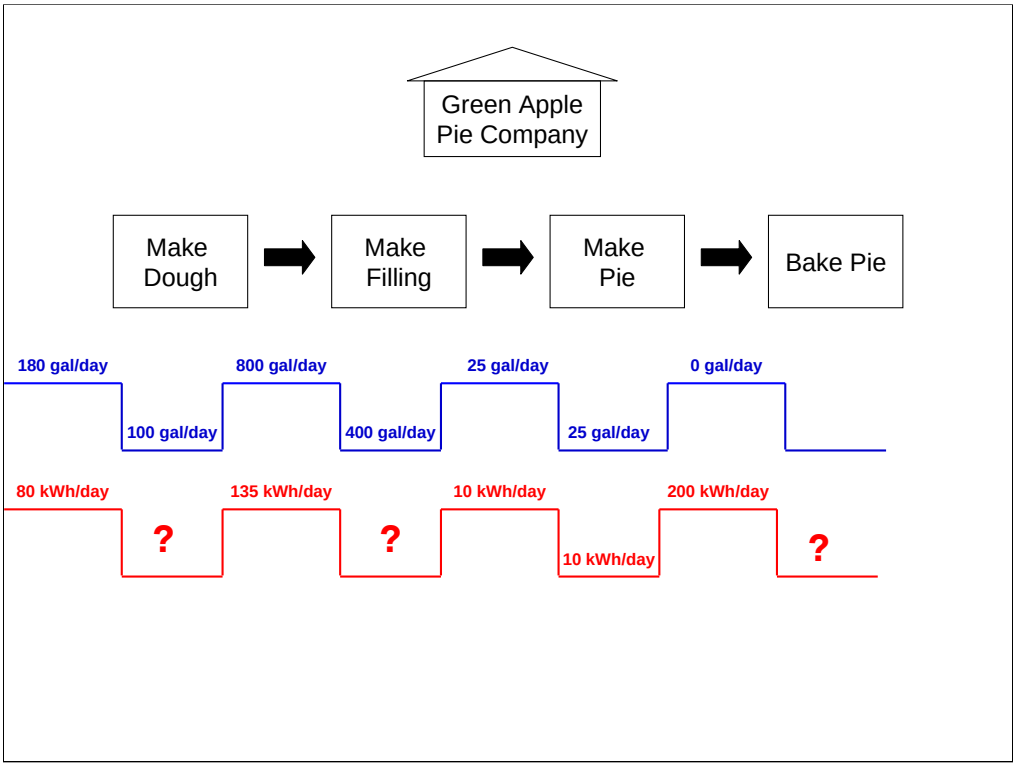
NARRATOR: So what does a completed materials line look like?

ON-SCREEN ACTION [Fill out top of line first then bottom]

NARRATOR: As you can see in our example, the materials line for water use shows that making dough uses 180 gallons a day but it only…

ON-SCREEN ACTION [new text 60 gallons are directly used in making pies]

…requires 60 gallons to actually make the dough while the rest is used for clean up.

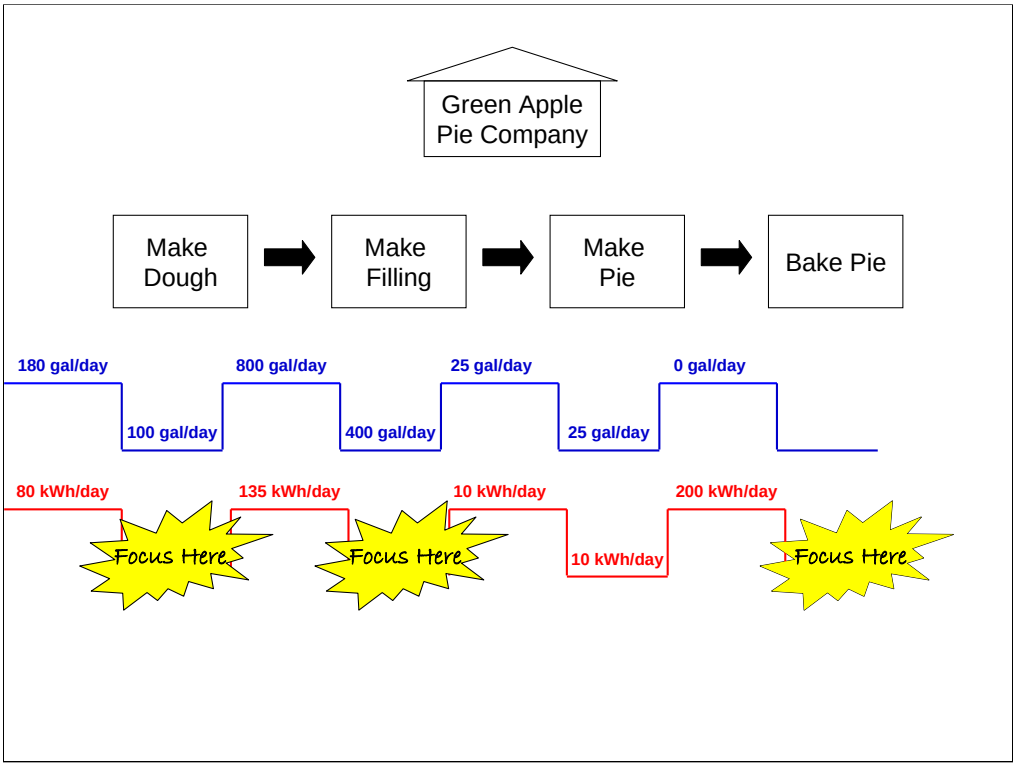


NARRATOR: Materials lines can also be drawn for energy use – lets draw one for Green Apple Pie Company's electricity use. We fill out the top…

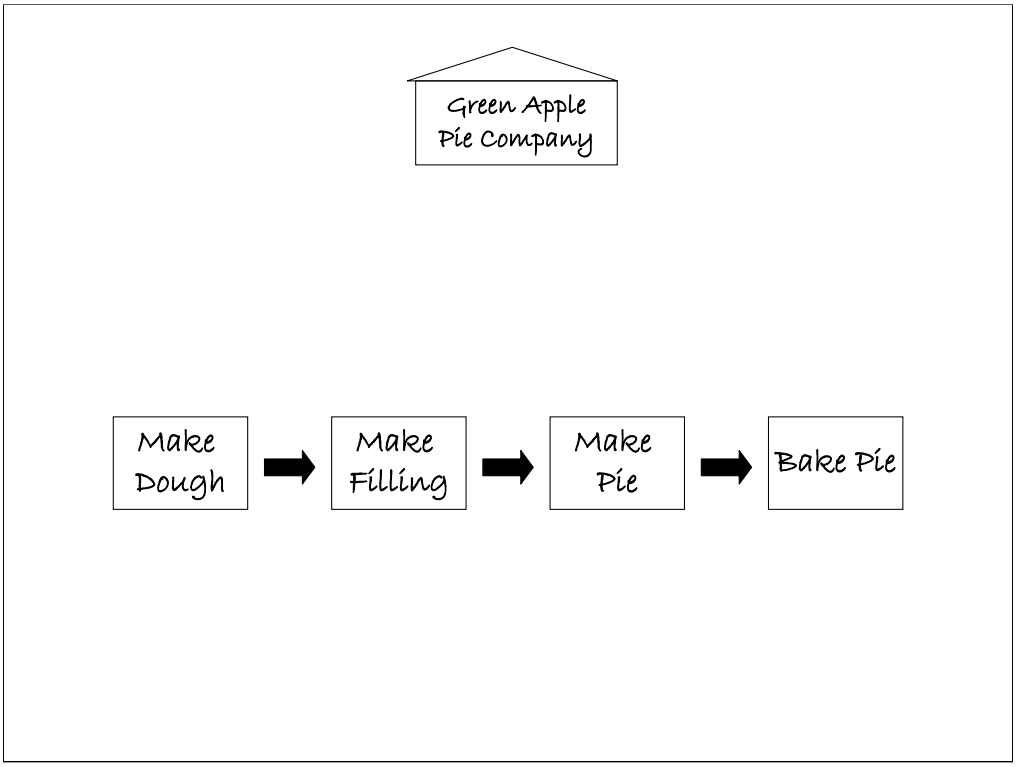
ON-SCREEN ACTION [Fill out only the top]

NARRATOR: …of the materials line using the baseline usage – or current state – for each process. But what if we don't know how much is actually needed to fill out the bottom?

ON-SCREEN ACTION [draw question marks]



NARRATOR: Places where the review team doesn't know how much is actually needed to make the product should be marked with a starburst. These indicate where you might find opportunities to improve efficiency. These starbursts represent a place in the process that the supplier needs to focus more attention – either during the review or after.

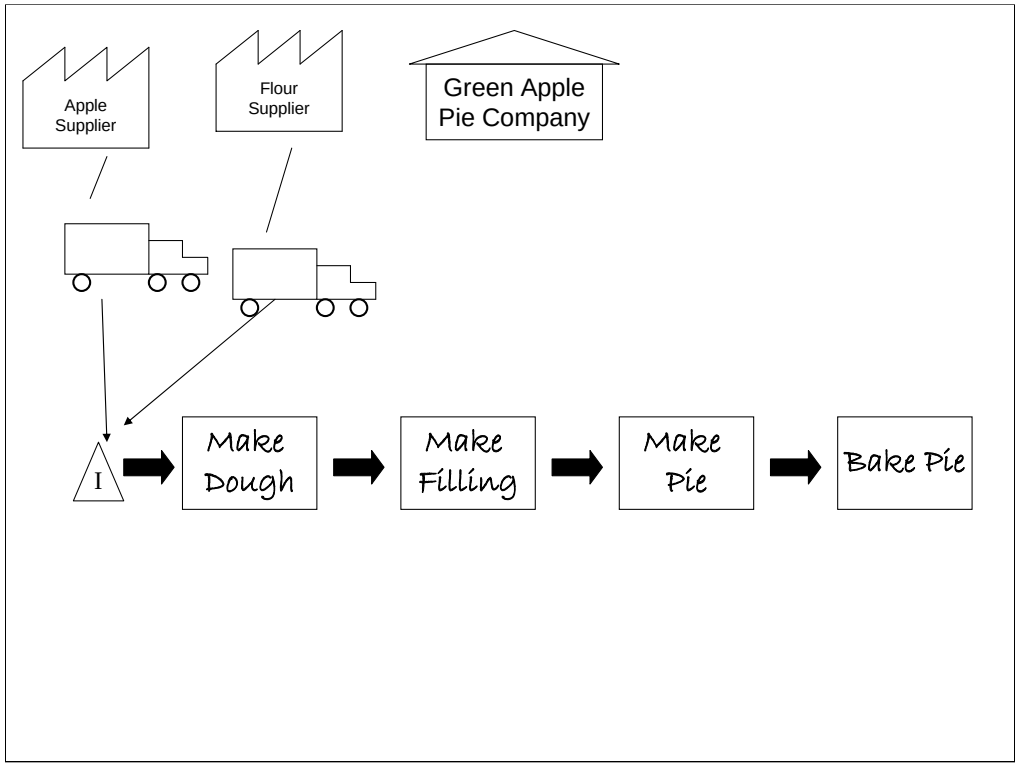


NARRATOR: Now that we have learned about materials lines, let's move on to how we illustrate the external flow of materials and information. It's crucial to understand how the raw materials arrive at the facility and how they are delivered to the customer. Remember that efficient value stream maps receive raw materials and deliver products "just in time"

ON-SCREEN ACTION: ["Just In Time" is written]

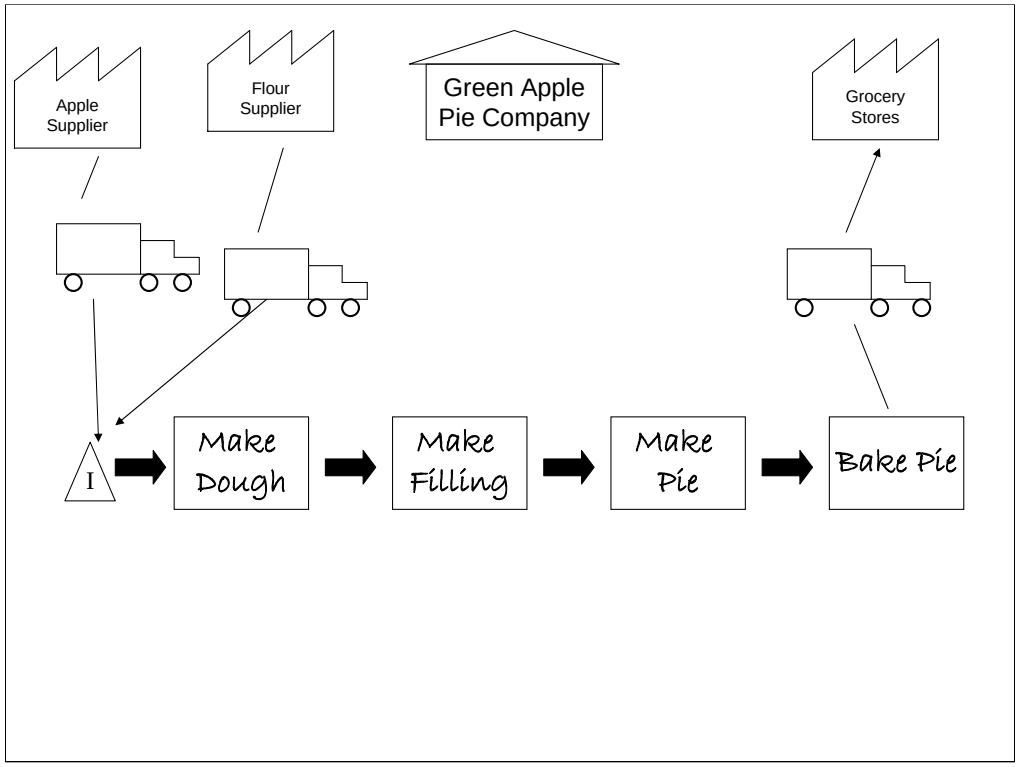
NARRATOR: …in order to limit large inventories and in the case of apple pies, limit spoilage. No one wants bad apples or stale pies.

ON-SCREEN ACTION [Below the process map the conveyor belt continues. The oven is now in the middle of the screen and we see coming pies out of the oven. The pies go a short distance and then hit the floor on the other side and stack up on each other. No one is there to pick up the pies. Cook frowns.]

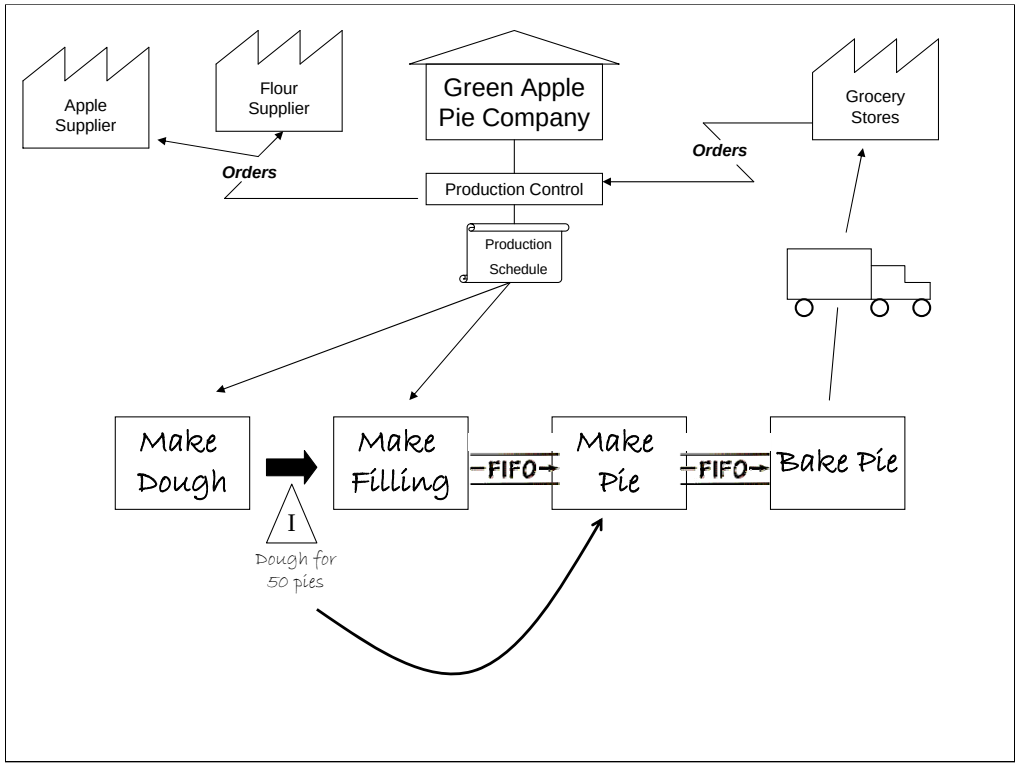


NARRATOR: By drawing a complete map that shows both internal and external movement of raw materials and products can help a supplier see more opportunities for improving efficiency. Lets draw out the movement of raw materials for Green Apple Pie company. It has two major suppliers for their large quantity ingredients – apples and flour. We use a graphic of a truck in this map, but this could also include air or rail transportation. Be creative and draw the type of transportation the supplier uses.

ON-SCREEN ACTION [Draw supplier and truck]



NARRATOR: Draw how the product is delivered to the customer and label who that is. In this case, the apple pies are delivered to local grocery stores. So how does the Green Apple Pie Company know when to start making pies?



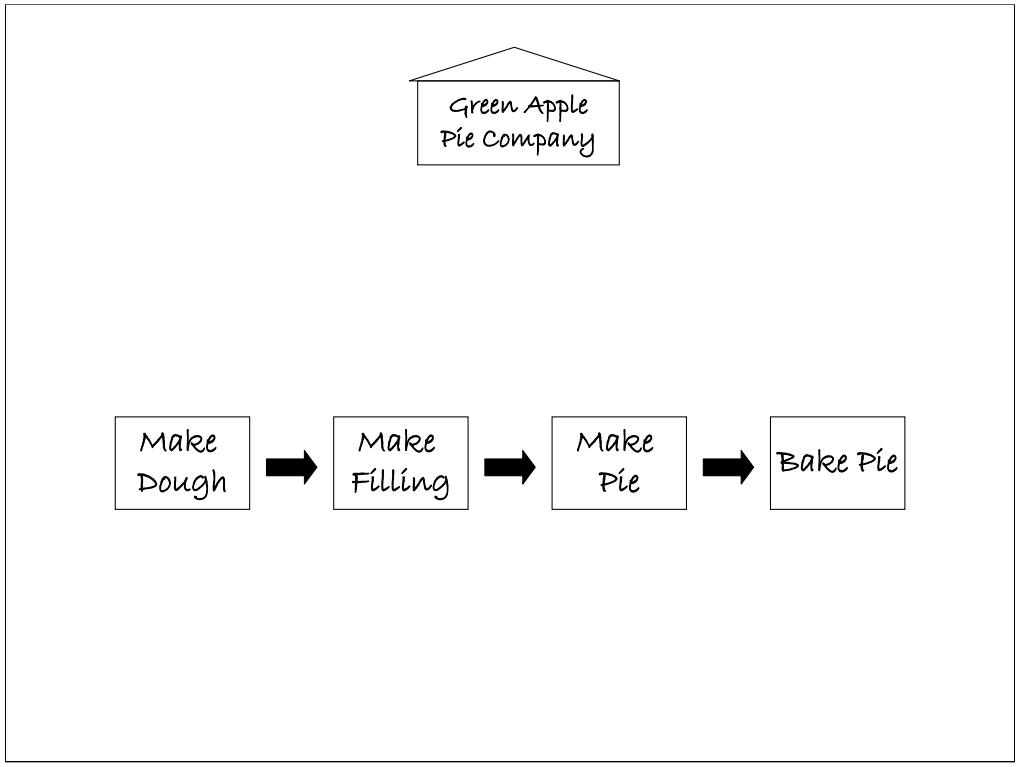
NARRATOR: To answer that question, keep in mind Value Stream Maps should show external information flows. The grocery stores place orders with the Green Apple Pie Company. This signals the company to order more apples and flour, and it tells the value stream when to start making more product.

NARRATOR: A Value Stream Map also needs to graphically represent the pace in which the product flows through value stream. One question you should ask is does each process generate batches or does the product move continuously? Fully efficient value streams move continuously and making batches are avoided, but in the case of Green Apple Pie Company, the "make dough" ON-SCREEN ACTION [draw arrow from prod. schedule to make dough] process uses a large dough machine that generates large batches of dough that are kept as an inventory in refrigerators. We represent this inventory by drawing a triangle with the letter "I" for inventory. ON-SCREEN ACTION [draw triangle] You should also write the amount of inventory held under the triangle ON-SCREEN ACTION [write "Dough for 50 pies"].

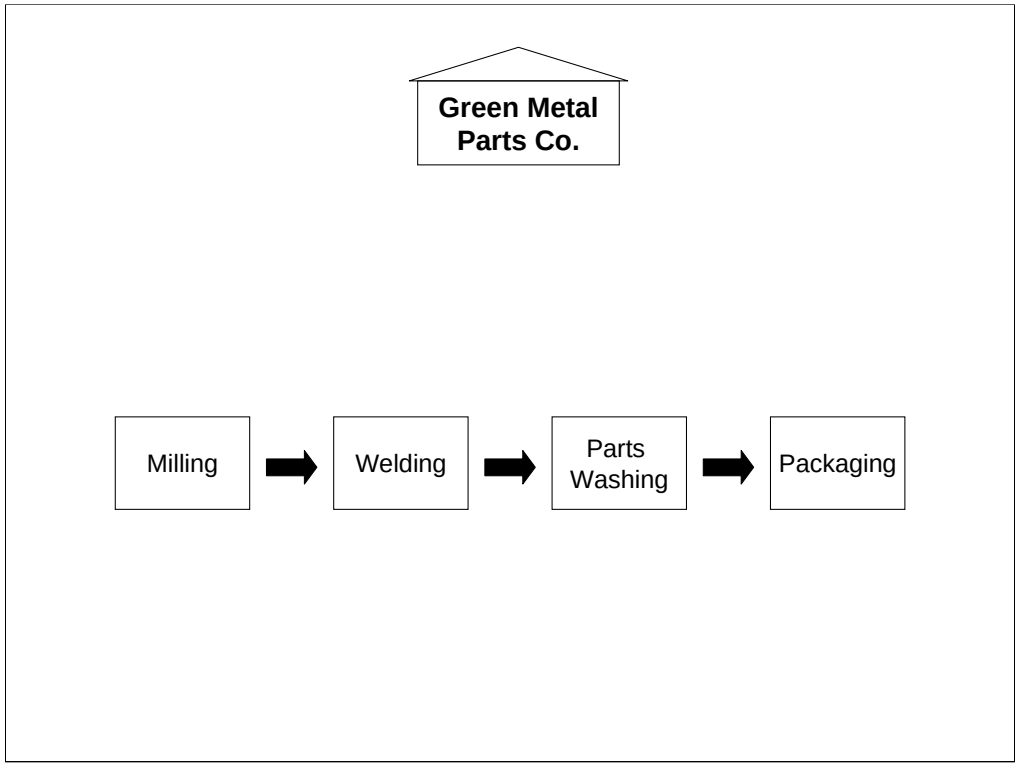
At the same time, production control tells the make filling process to start up, ON-SCREEN ACTION [draw arrow] but its product needs to be used right away -- so as soon as one pie's worth of filling is ready, it moves on to the next process. We call this type of movement "First In First Out" or FIFO ON-SCREEN ACTION [write FIFO]. The "Make Pie" process receives the filling and then pulls enough dough to make the pie from the dough inventory ON-SCREEN ACTION [draw arrow from triangle to "Make Pie"] then puts the pie into a pie plate and pushes the pie onto the baking process. ON-SCREEN ACTION [Write FIFO 2] Once the pie is baked, the value stream is complete and the company has a tasty product to deliver to its customers.

Can you see how the value stream is actually a cycle? An efficient value stream moves only at the pull of the customer and the cycle starts over.

ON-SCREEN ACTION [show cycle in animation]

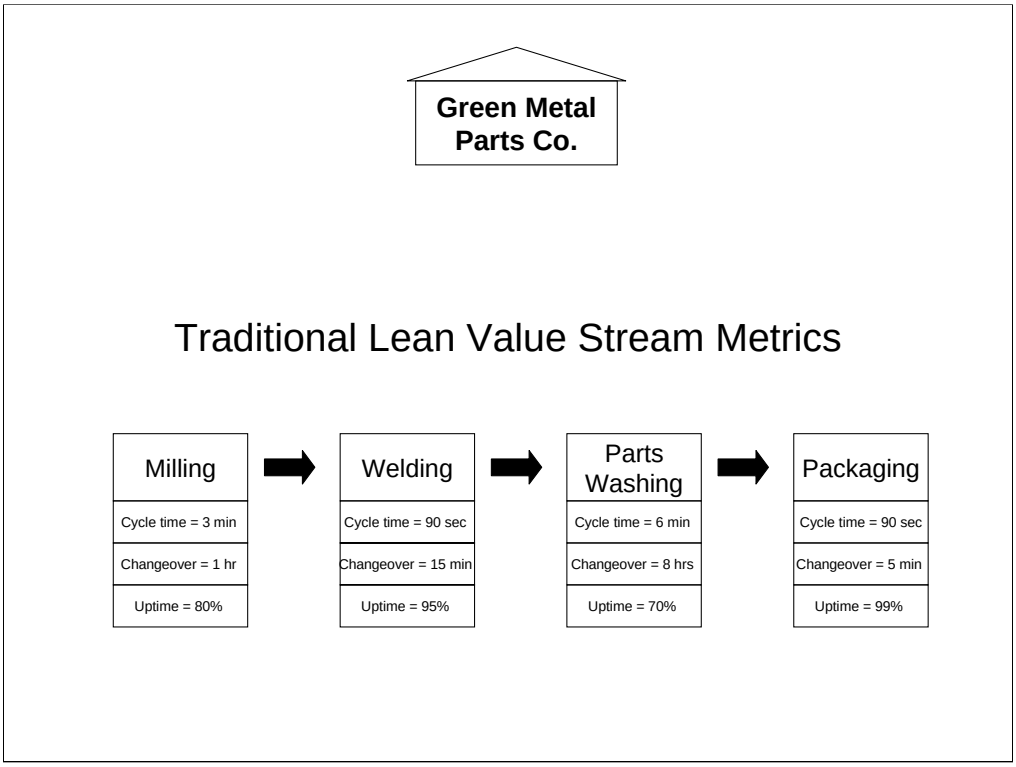


NARRATOR: Now that we have drawn a value stream map for a fictitious company making apple pies, you can feel comfortable making the leap to an example that closer resembles a supplier that you might review.



NARRATOR: Lets look at Green Metal Parts Company. The four process steps of the company's value stream are Milling, Welding, Parts Washing, and Packaging.

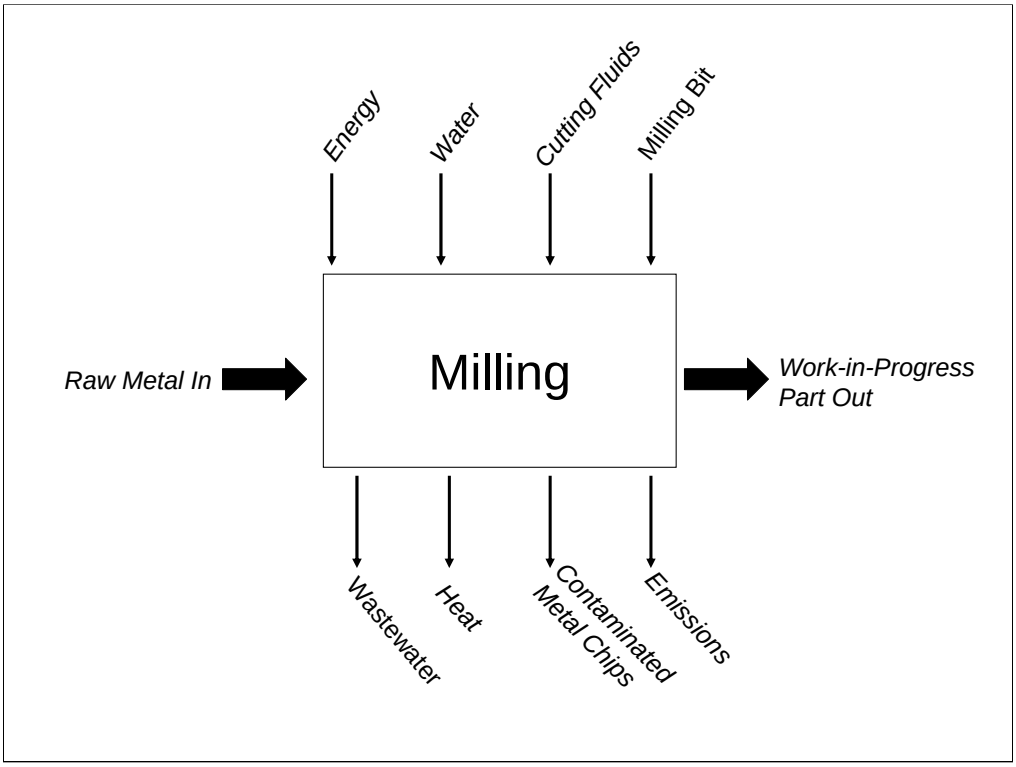
ON-SCREEN ACTION [Map transitions from hand drawn look of apple pie example to a refined look for Metal Parts Co.]



NARRATOR: One question you may be asking is what is the difference between a Lean and Clean Value Stream Map from a traditional value stream map. Well, I'm very glad you asked. A traditional value stream map looks at metrics such as cycle time, Changeovers, Uptime or run time, and other Lean metrics.

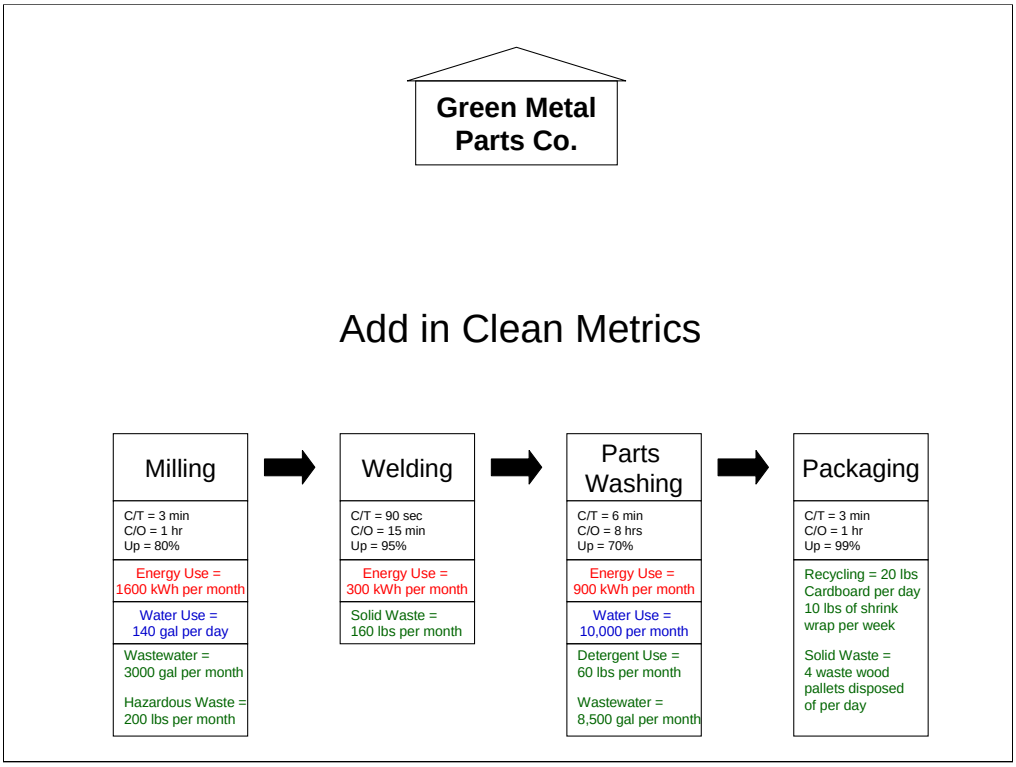
ON-SCREEN ACTION [Lean metric boxes drop down off of the process steps as they are introduced]

NARRATOR: A Lean and Clean value stream map also captures environmental impacts in Clean metrics.



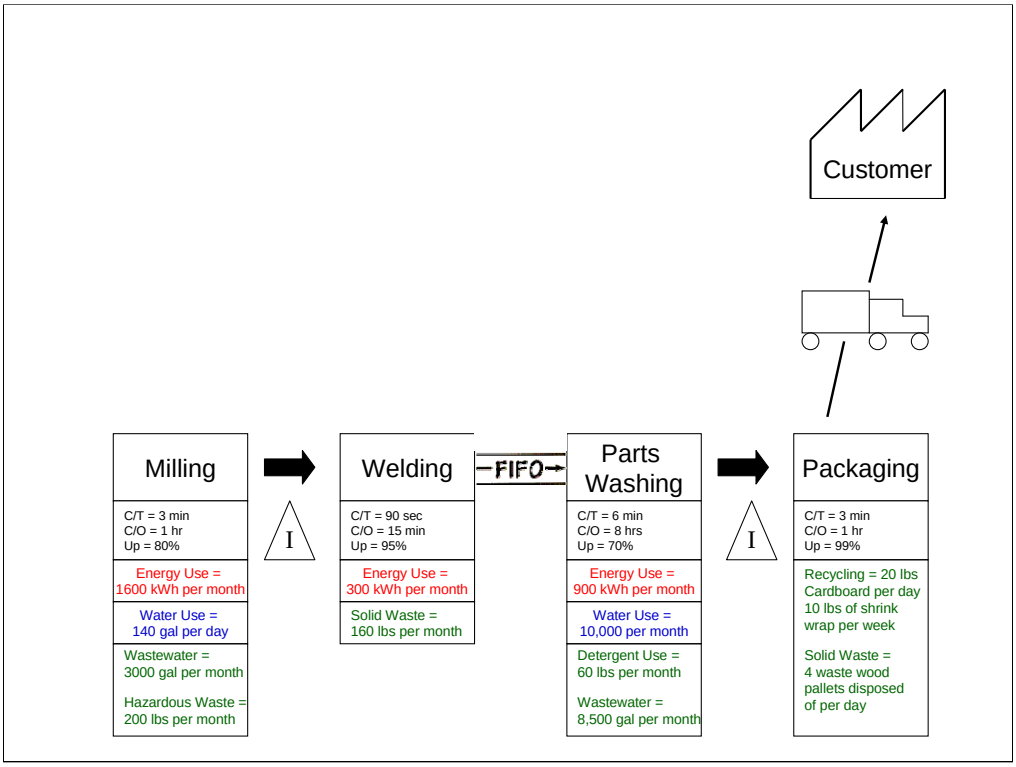
NARRATOR: Recall that each process step has inputs and outputs and we identify these when drawing a process map. During the Milling process for this Value stream, the input is Raw Metal and the output is a milled metal part. To achieve this, the process requires Energy, Water, Cutting Fluids, and a Milling bit as the inputs, and the process generates wastewater, heat, metal chips contaminated with cutting fluid, and air emissions. Drawing process maps helps identify key environmental inputs and outputs and tells what Clean metrics your value stream map should include, but remember that you should also try to quantify these so you can include the usage on the map as well.

NARRATOR: Drawing process maps helps identify key environmental inputs and outputs and tells what Clean metrics your value stream map should include.

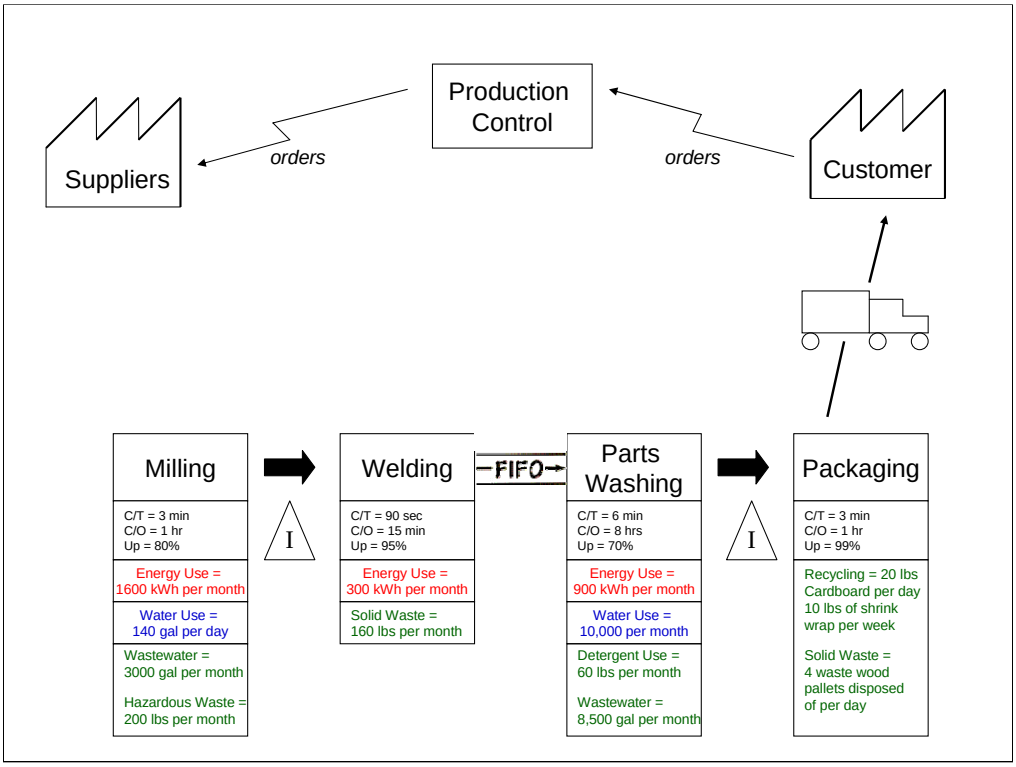


NARRATOR: Adding in Clean Metrics to a value stream map can look like this. This particular value stream tracks energy and water use as well as other identified clean metrics such as solid waste, hazardous waste, and wastewater.

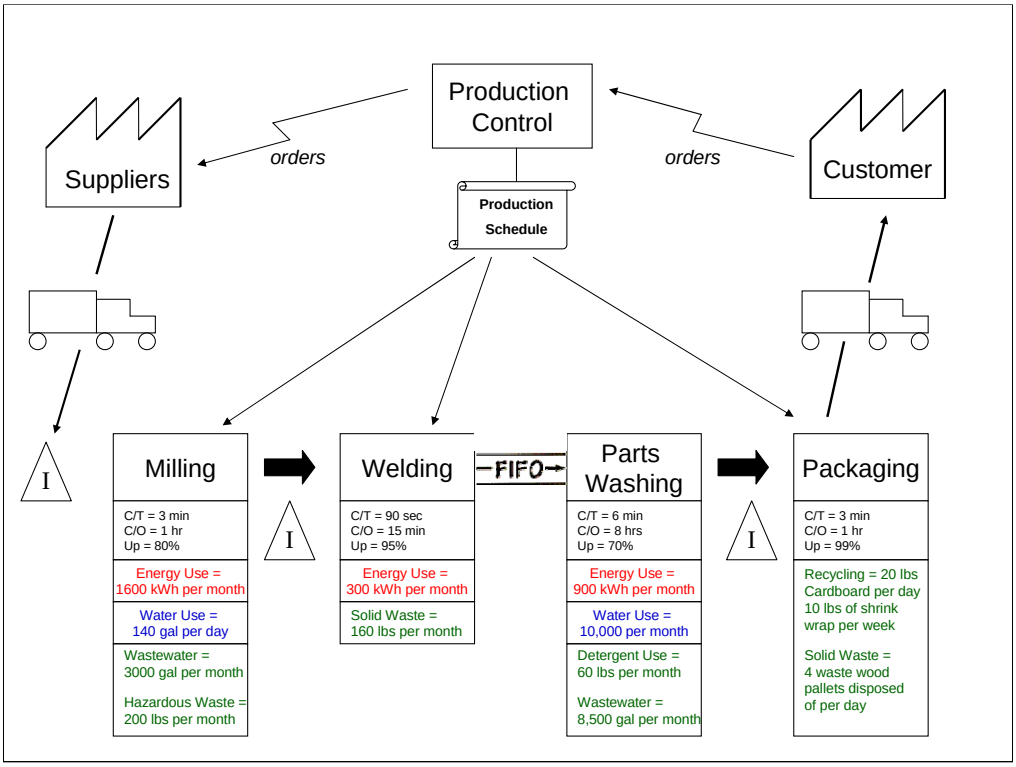
ON-SCREEN ACTION [Add clean metrics boxes]



NARRATOR: The value stream flows at the pull of the customer just like the Green Apple Pie Company and we use the inventory and “first in, first out” symbols to show how the product moves from each process.

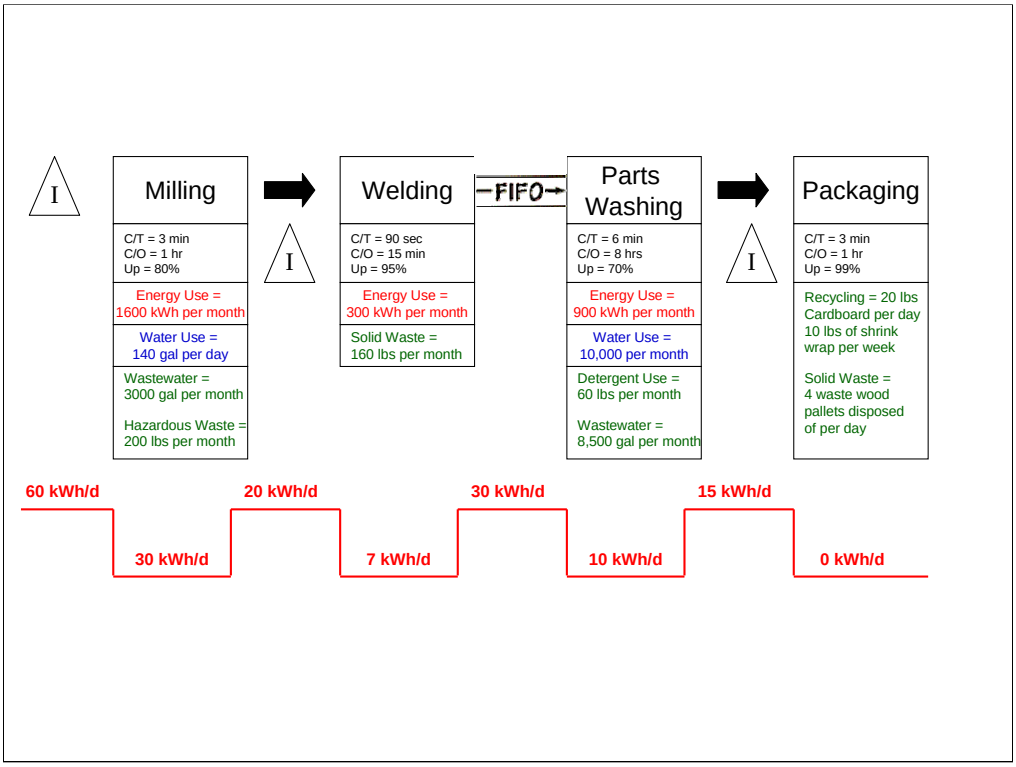


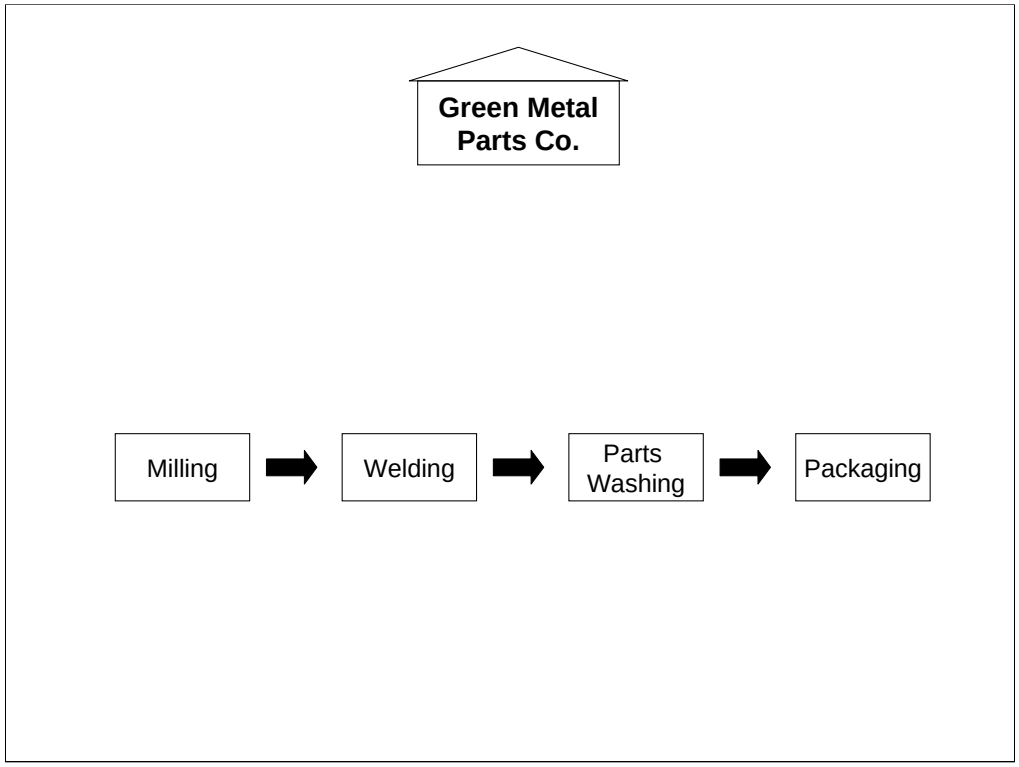
NARRATOR: Just like in our example of making apple pies, we use lightning bolt arrows to represent information flows from customers and to suppliers.



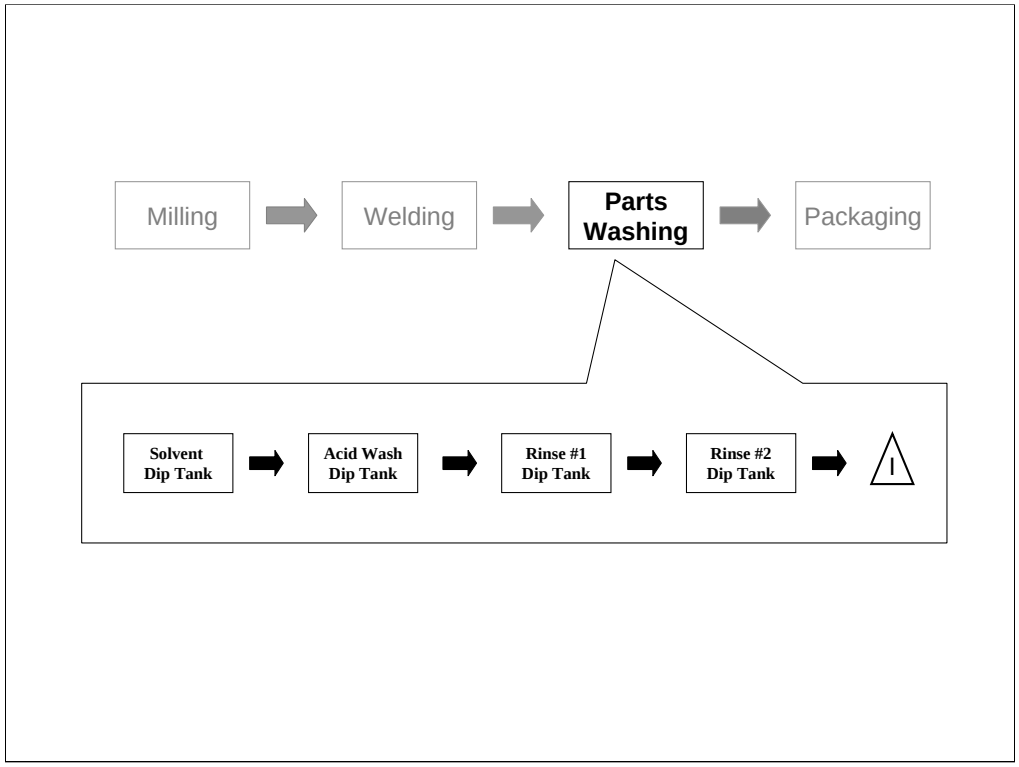
NARRATOR: Just like we learned before, the value stream is a cycle being driven by orders and controlled by a production schedule. And materials lines can show the difference between use versus need. These are key elements in all value stream maps.

ON-SCREEN ACTION: [con't on slide 40]


I
Milling
C/T = 3 min
C/O = 1 hr
Up = 80%
Energy Use = 1600 kWh per month
Water Use = 140 gal per day
Wastewater = 3000 gal per month
Hazardous Waste = 200 lbs per month
I
Welding
C/T = 90 sec
C/O = 15 min
Up = 95%
Energy Use = 300 kWh per month
Solid Waste = 160 lbs per month
FIFO
Parts Washing
C/T = 6 min
C/O = 8 hrs
Up = 70%
Energy Use = 900 kWh per month
Water Use = 10,000 per month
Detergent Use = 60 lbs per month
Wastewater = 8,500 gal per month
I
Packaging
C/T = 3 min
C/O = 1 hr
Up = 99%
Recycling = 20 lbs Cardboard per day
10 lbs of shrink wrap per week
Solid Waste = 4 waste wood pallets disposed of per day
60 kWh/d
30 kWh/d
20 kWh/d
7 kWh/d
30 kWh/d
10 kWh/d
15 kWh/d
0 kWh/d

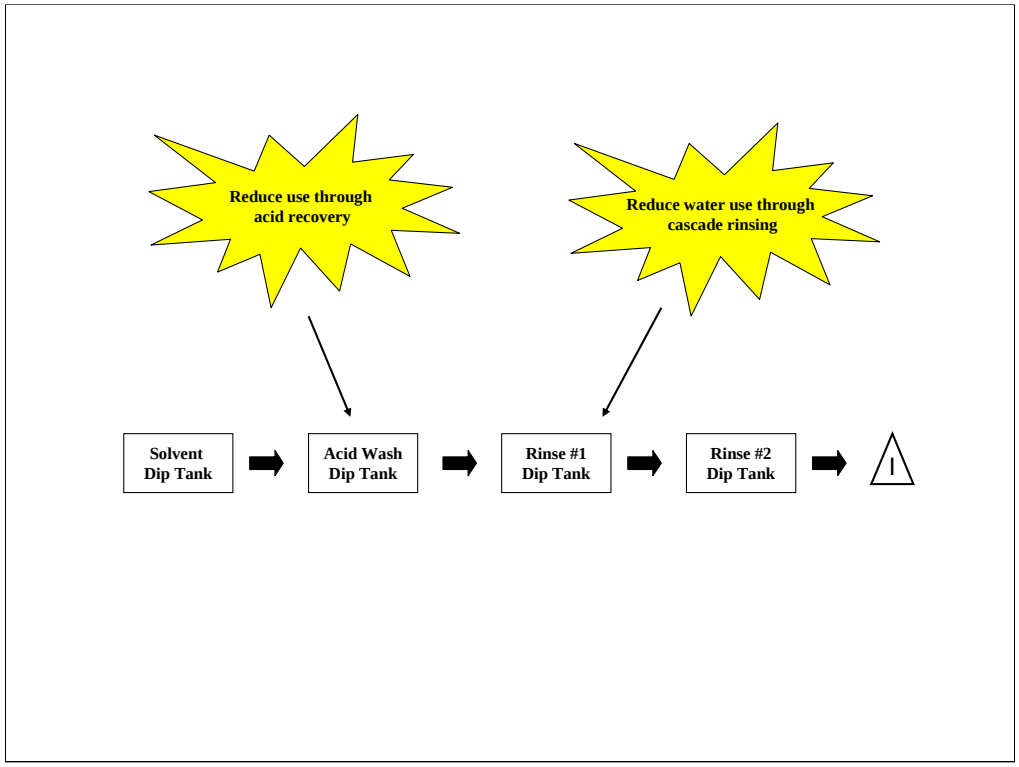


NARRATOR: Another key element when drawing effective value stream maps is envisioning a more efficient “future state”.

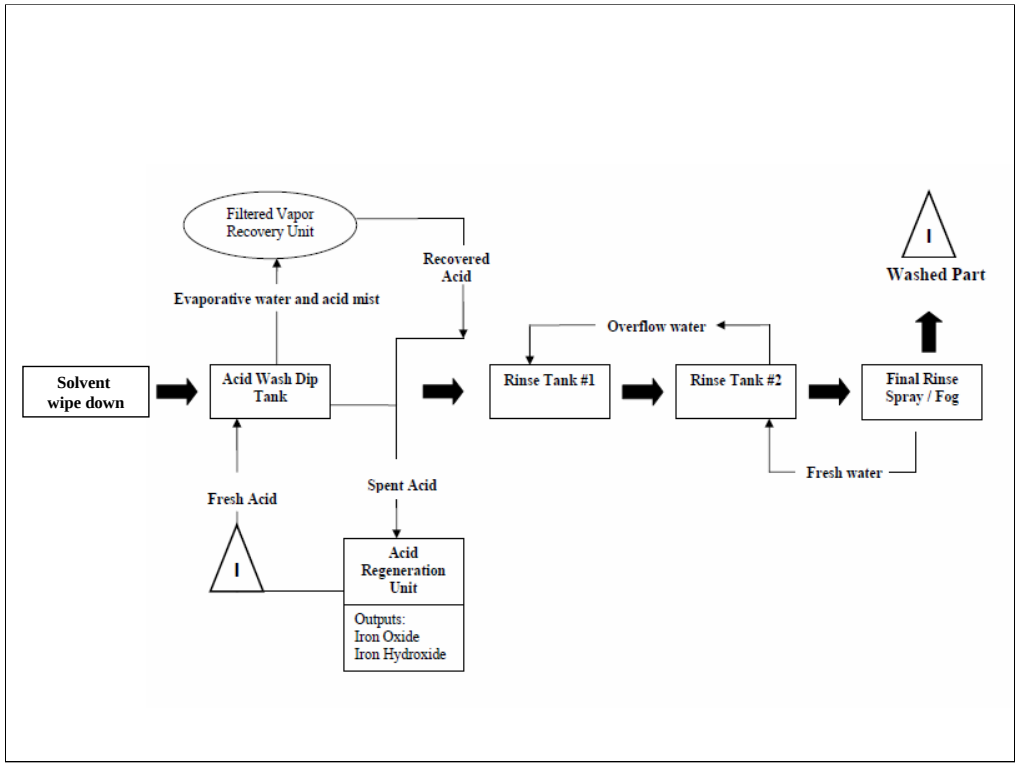


NARRATOR: The current state of the parts washing process looks like this. ON-SCREEN ACTION [the parts washing process steps spill out]

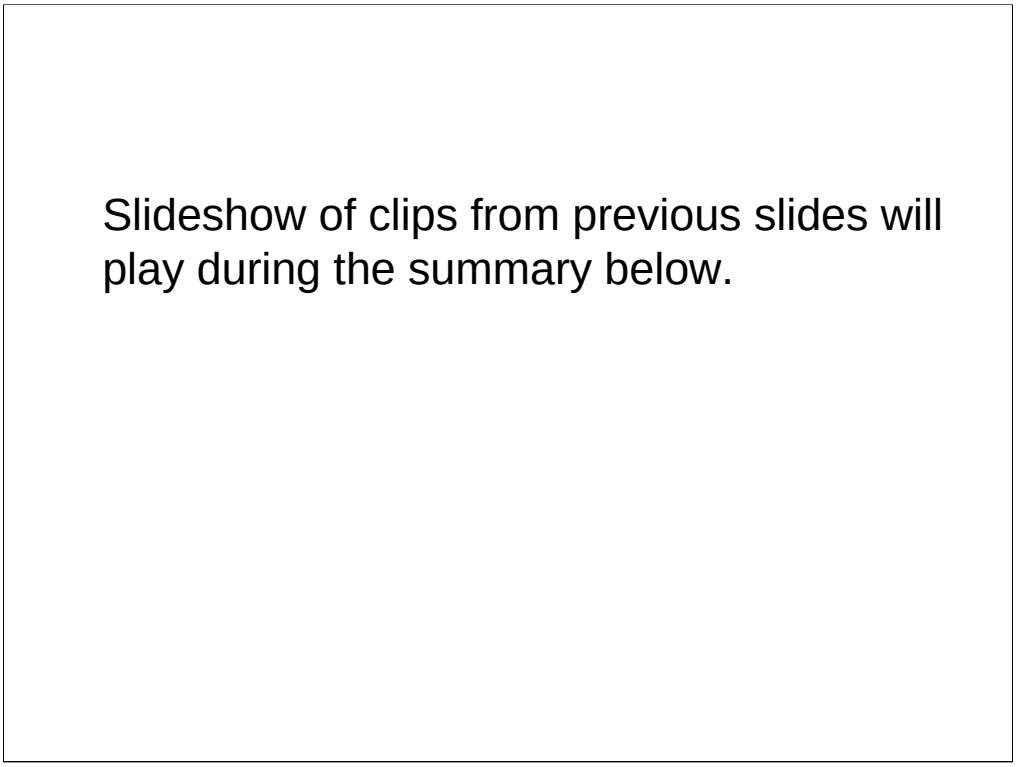
NARRATOR: Now, Let's try to visualize what an improved future state could look like. Remember that before drawing out a future state map, you would have already drawn process maps for each step in the washing process. By doing so, you would have seen the opportunities to improve the future state.



NARRATOR: . For this example, creating process maps for each step allowed the review team to see opportunities to reduce acid and water use by implementing new technologies. Remember that starbursts show where opportunities for improvement occur in the process. If Green Metal parts Company would implement these opportunities to the parts washing process, the future state could look like this….



NARRATOR: The future state would include changing the Solvent Dip Tank to the Solvent Wipe Down. Acid would be reduced by adding a recovery unit. Water use would be reduced by using overflow water." And the part would then get a final rinse.



NARRATOR: Hopefully this training will help you assist suppliers develop useful Lean and Clean Value Stream Maps that capture the baseline or current state of the value stream,

list out Lean and Clean metrics for each process step,

describe the flow of the product through the value stream,

use materials lines to identify the difference between use versus need,

and envision a more efficient future state.

ON-SCREEN ACTION: [Repeats slides 33, 36, 38, 40, 43 and 44 while NARRATOR speaks]