LEAN AND CLEAN VALUE STREAM MAPPING

Value stream mapping is a Lean process-mapping method for understanding the sequence of activities used to produce a product. During the Green Suppliers Network technical review, you will use value stream mapping to identify sources of non-value added time or materials; identify opportunities to increase efficiency; and develop a plan for implementing improvements. Value stream maps serve as a critical tool during the review process and can reveal substantial opportunities to reduce costs, improve production flow, save time, reduce inventory, and improve environmental performance.

Conventional value stream mapping can overlook environmental wastes, such as:

- Energy, water, or raw materials used in excess of what is needed to meet consumer needs
- Pollutants and material wastes released into the environment, such as air emissions, wastewater discharges, hazardous wastes, and solid wastes (trash or discarded scrap)
- Hazardous substances that adversely affect human health or the environment during their use in production or presence in products.

The Green Suppliers Network incorporates both "lean and clean" elements into its mapping techniques to help you:

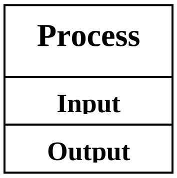
- Recognize where environmental impacts occur in a product line.
- Quantify raw materials used by processes and compare it to materials actually needed to produce the product.
- Identify pollution and wastes generated by the production activities.
- Identify root causes of wastes and inefficiencies.

VALUE STREAM MAPPING TECHNIQUES

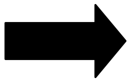
Use Icons

There are a number of common icons used in value stream maps, but icons can also be customized to best serve a value stream map. Icons help distinguish different elements of a product line from another. For example, different arrows should be used to distinguish between product and information movement. The figure below contains commonly used icons in value stream mapping.

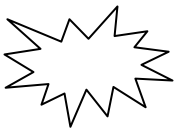
COMMON ICONS FOR VALUE STREAM MAPPING



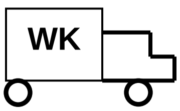
Process Leg Frames



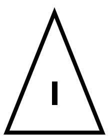
Product Movement



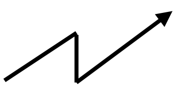
Starburst (identifies improvement opportunity)



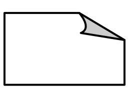
Truck Shipment



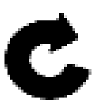
Inventory



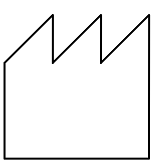
External Movement (information or materials)



Signal Kanban[1]



Withdrawal (pull of materials from stock)



External Source (suppliers and customers)

[1] The Japanese refer to Kanban as a simple parts-movement system that depends on cards and boxes to take parts from one work station to another on a production line. Kanban stands for Kan- card, Ban- signal. The essence of the Kanban concept is that a supplier or the warehouse should only deliver components to the production line as and when they are needed, so that there is no storage in the production area. Work stations located along production lines only produce parts when they receive a card. In case of line interruptions, each work station will only produce enough components to fill the container and then stop.

Record the "Current State"

When reviewing a product or process line, the first value stream map you develop should record the current state of the line. Remember, conventional value stream mapping tends to focus at a facility-wide level. The current state map should take a snapshot of the current practices and materials usage rates for all processes. A current state map should also record where environmental impacts occur in the product line. The following processes typically have environmental impacts:

- Metal Fabrication (Milling, Welding, Stamping, and Machining)
- Parts Washing
- Surface Cleaning
- Plastic Forming (Extrusion and Molding)
- Metal Finishing
- Surface Coating
- Chemical Formulation
- Hazardous Materials Handling
- Waste Management
- Wastewater Treatment

A current state value stream map should also establish baselines for all inputs and outputs including, but not limited to, the 10 Green Suppliers Network environmental metrics, which are presented below.

Inputs
Pounds of materials used
Pounds of hazardous materials used
Gallons of water used
Gallons of water consumed
Watts of energy used
BTUs of energy used

Outputs
Pounds of solid waste generated
Pounds of hazardous waste generated
Pounds of air pollution emitted
Gallons of wastewater treated

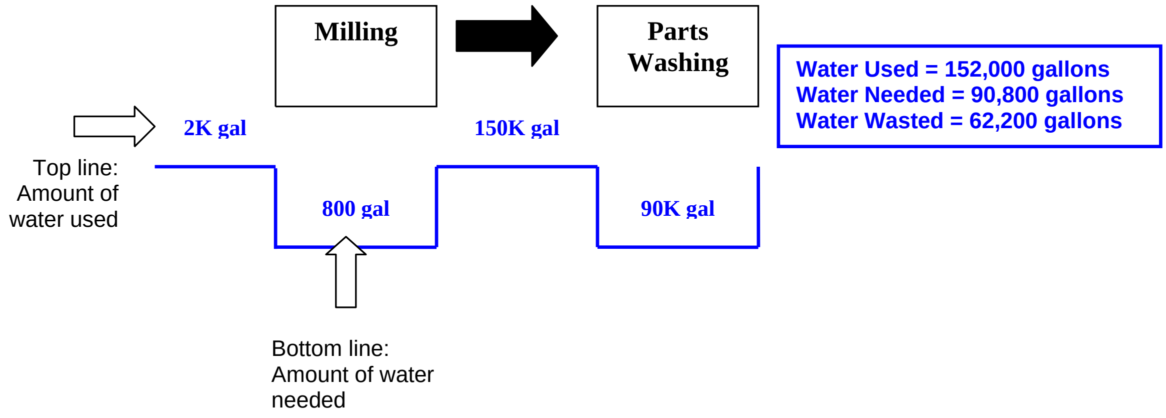
Other inputs and outputs that conventional value stream maps identify include changeover and cycle time, labor, and rework. Exhibit 1 illustrates a conventional value stream map, shows how to denote process inputs and outputs, and provides example of where Green Supplier Network environmental metrics may exist in the product line.

Compare "Use" Verses "Need" Using a Materials Line

In the past, value stream maps would examine the time it takes to produce a product and the proportion of that time that is value added─or the time spent actually working on the product. The timeline was a graphic representation that compared the two, but didn't focus on the resources consumed and waste generated in making the product.

A materials line is a variation of a timeline and can be developed for any type of resource (e.g., water, energy, total materials, and/or a critical substance used in the product). A materials line, located on the bottom of a value stream map, shows the amount of raw materials used by each process in the value stream and the amount of materials that end up in the product and add value from a customer's perspective.

For example, the materials line illustrated below compares the amount of water used and needed in the milling and parts washing processes in a product line.



Once you collect data for the materials line, you may notice large differences between the amount of material used and the amount needed for the product. This exercise can help you target the largest sources of waste for prioritizing improvement efforts.

Exhibit 2 presents a value stream map with a materials line that focuses on water usage. You can also create separate maps that address other inputs such as hazardous materials or energy use.

Visualize an Improved "Future State"

Future state maps are created to show what a product or process line would look like after improvements are made. Future state maps should be drafted by the Green Suppliers Network review team following the completion of a current state map. Green Suppliers Network practitioners play a vital role in developing future state maps, as they can help suppliers identify areas where environmental improvements can be made. More often than not, future state maps look closer at process level improvements. Facilities cannot typically make changes to the order in which processes take place in a product line, but they can implement changes to specific steps of a process. Opportunities for process improvement can be shown on a value stream map with a starburst as illustrated in Exhibit 3. Starbursts can identify processes that need to be examined closer, such as in Exhibit 4.

Future state maps should represent the product or process line in a perfect state or fully optimized and highly efficient. It should not be restrained by cost. The future state should include the best available technologies and equipment, and estimated waste reductions should be included where appropriate. For example, if a surface coating line could reduce solvent use by installing a solvent recycler, the future state map should represent that improvement.

The materials line that should be included on a current state map can be a good indicator of where improvement opportunities exist. If a process showed a large difference between the amount of a material used and the amount of material needed, Green Suppliers Network practitioners should question why the difference exists. Inefficiencies are the root cause of most wastes. Efficient production lines will have little to no difference between the amount used compared to the amount actually needed to produce the product.

Exhibits 5 and 6 show the difference between a current state and a future state parts washing line. Current and future state process maps can be generated for one or many processes that occur in a facilities product line.

Exhibit 1: The Current State with Inputs and Outputs

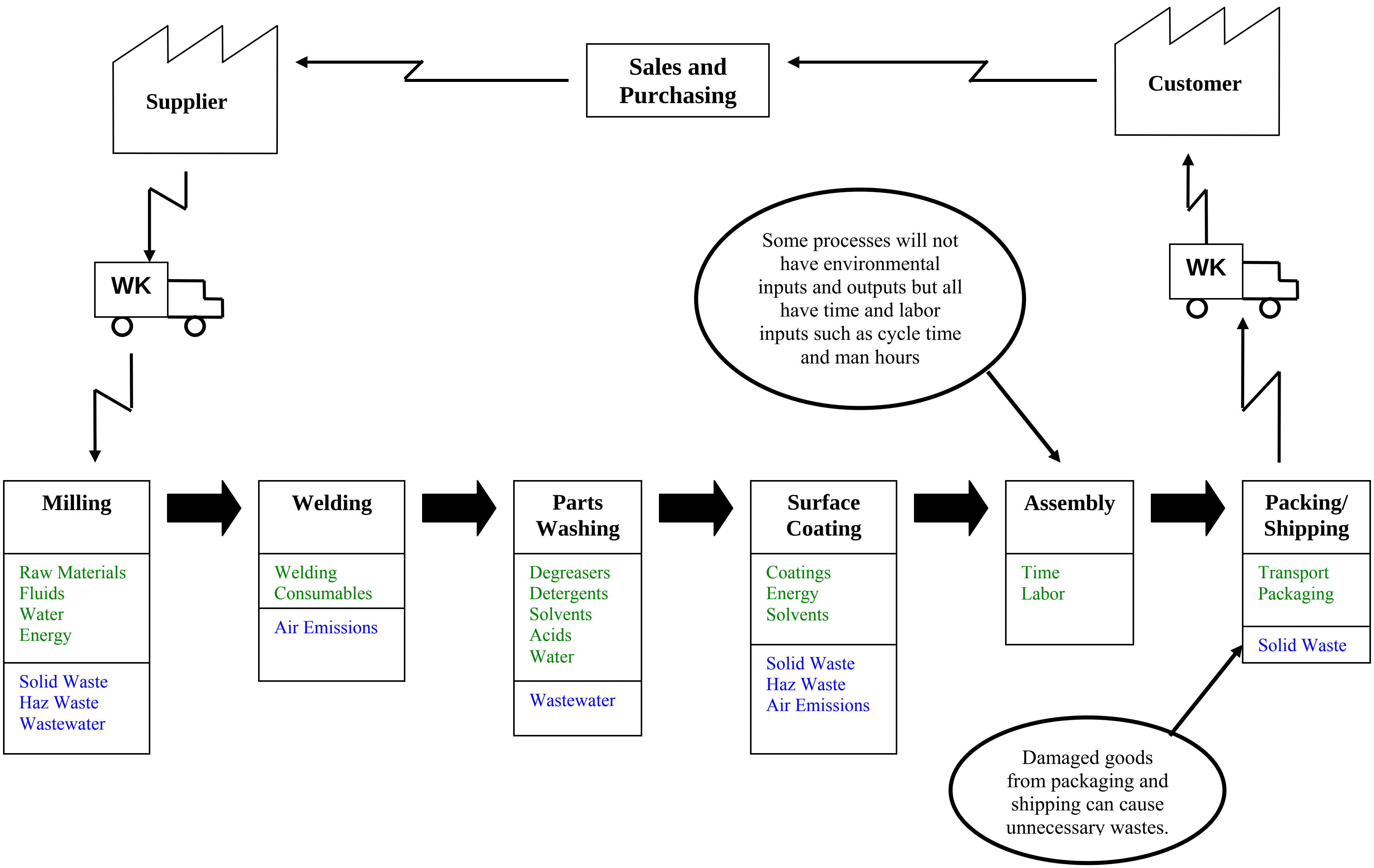
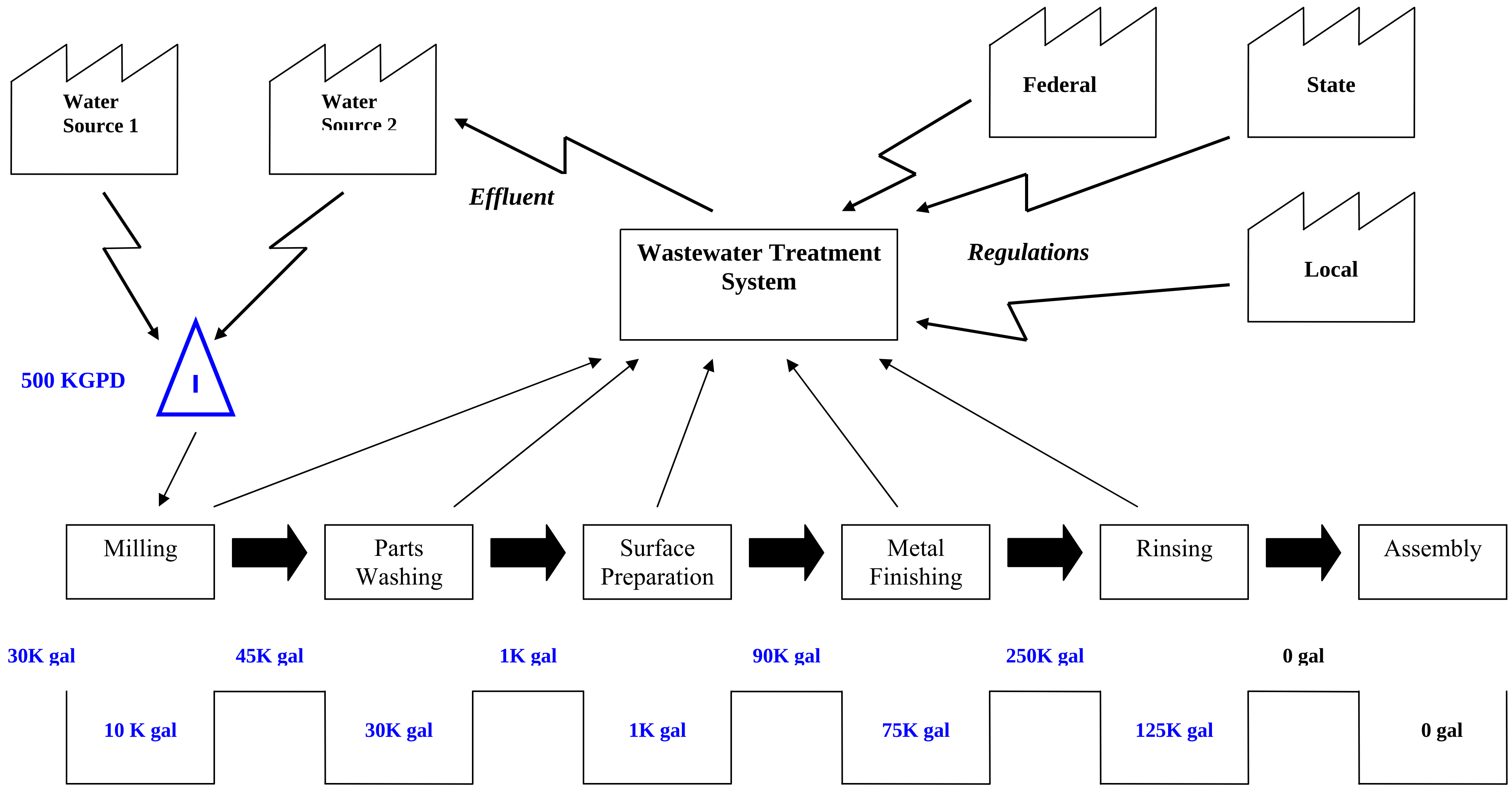
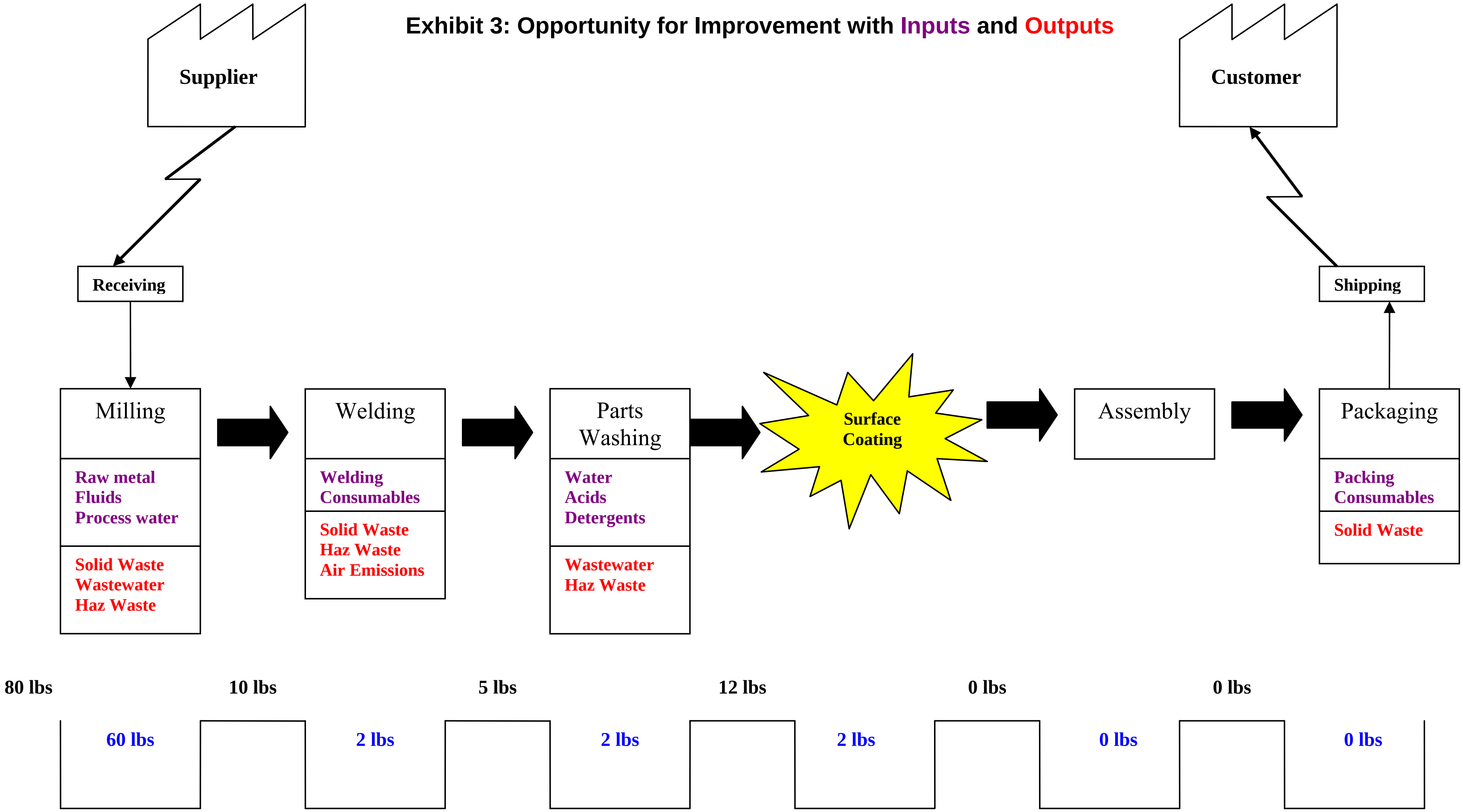


Exhibit 2: Water Use Materials Line



Water Used = 416,000 gallons per day
Water Needed = 241,000 gallons per day
Water Wasted = 175,000 gallons per day

Exhibit 3: Opportunity for Improvement with Inputs and Outputs



Hazardous Materials Used = 107 lbs
Hazardous Materials Needed = 66 lbs

Exhibit 4: Surface Coating with Inputs and Outputs

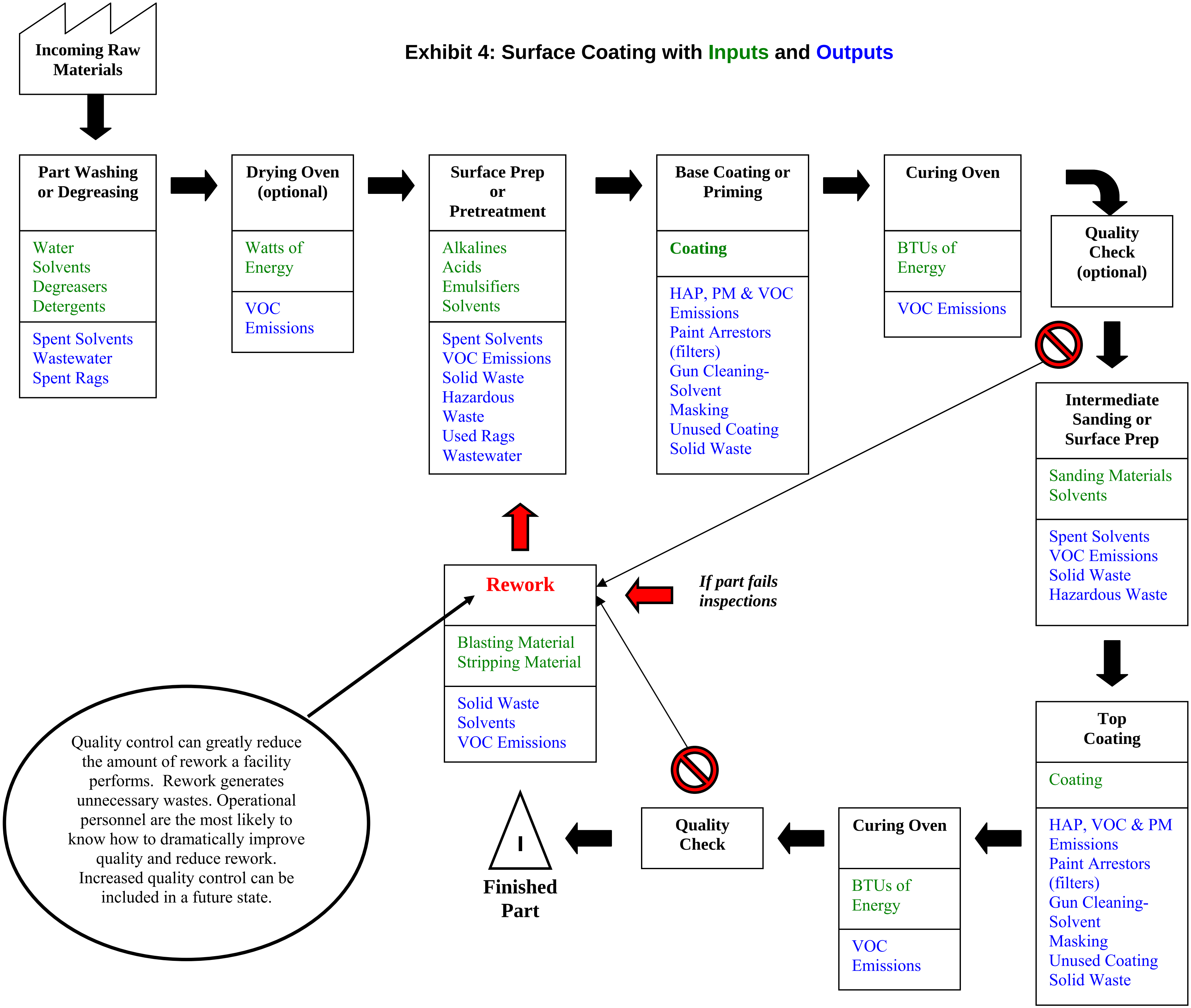


Exhibit 5: Current State Parts Washing for Rust Removal with Inputs and Outputs

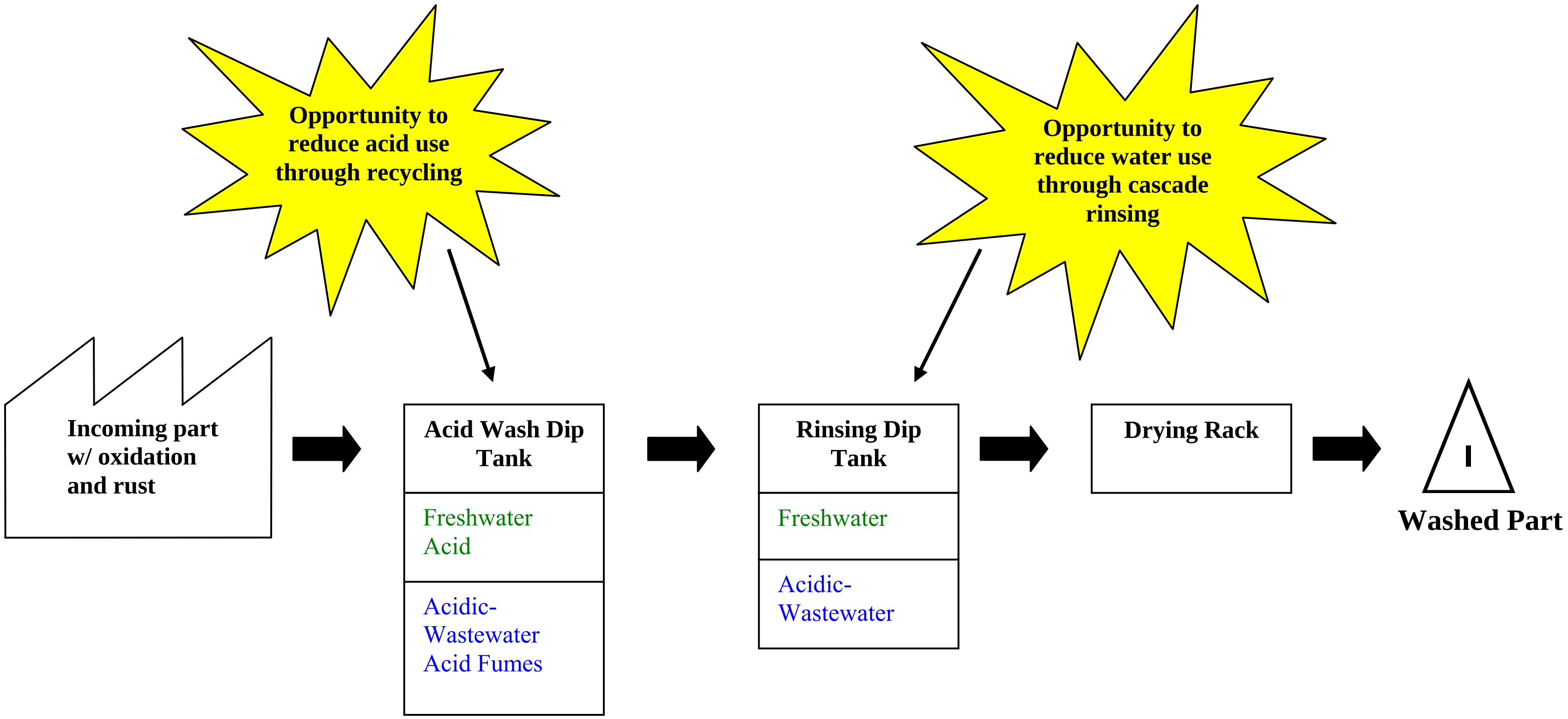


Exhibit 6: Future State Parts Washing