Improving the Stainless Steel System at Process Technology International Using 5S, Process Improvement, and Inventory Control

Juan Sanchez, Jordan Nash, Enis Ormanci, Erion Tafa

Department of Industrial and Systems Engineering

KENNESAW STATE UNIVERSITY

BACKGROUND

INTECO PTI Process Technology International, LLC has supplied chemical energy systems for the steel industry in particular for Electric Arc Furnaces (EAF), including oxy-fuel burners, material injection systems, control and automation systems, preheating and drying combustion systems, since 1993.

PTI has experienced higher than expected costs on raw materials over the past several years. They have been forced to make inventory adjustments to account for loss of raw material at each of their annual inventory counts.

The identified root causes of the unexpectedly high raw material costs are a combination of (1) improper establishment of inventory controls, (2) A lack of picking process controls and SOPs that would ensure correct measurement and reading of BOM, and (3) The stainless steel areas do not have a standardized organizational system in place

DATA COLLECTION AND ANALYSIS

We decided to focus on collecting and analyzing data related to inventory control, process improvement, and workspace efficiency since these are the potential primary root causes that were identified in the problem definition.

Data was collected that reflected the demand of each stainless steel part over the past 3 years. Table 1 contains the raw demand data, seen below. Total demand for all stainless steel was valued at $139,289.84.

The demand data was then sorted from highest demand to lowest and Pareto analysis was performed to determine the items that most influenced demand. (See Figure 1, right)

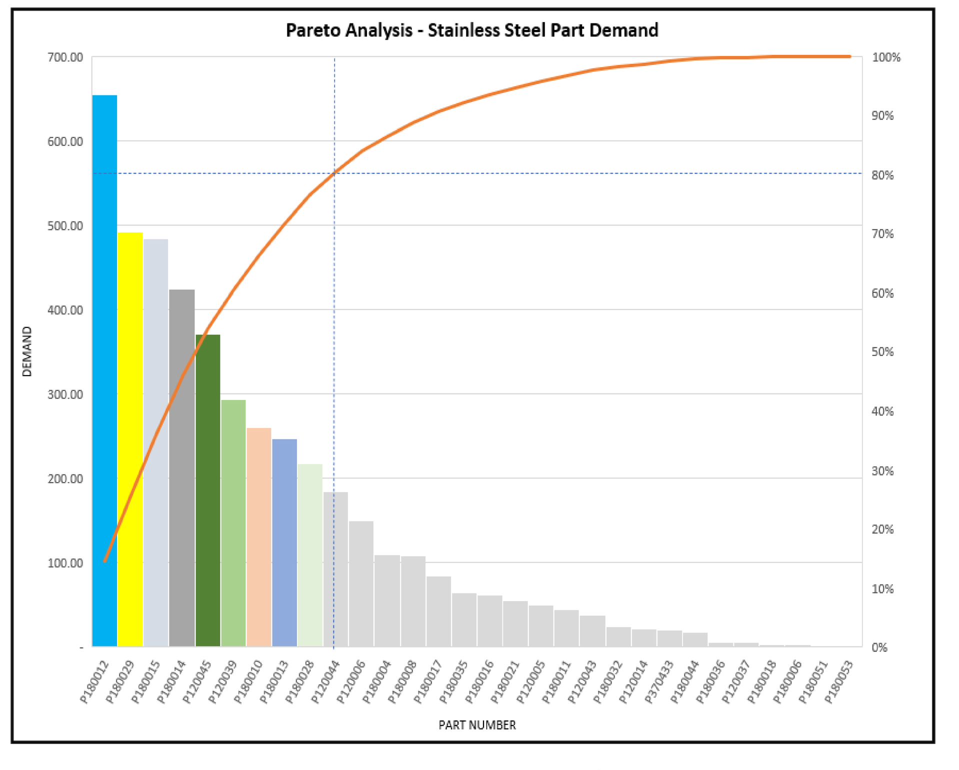

Figure 1 – Pareto Analysis of Demand

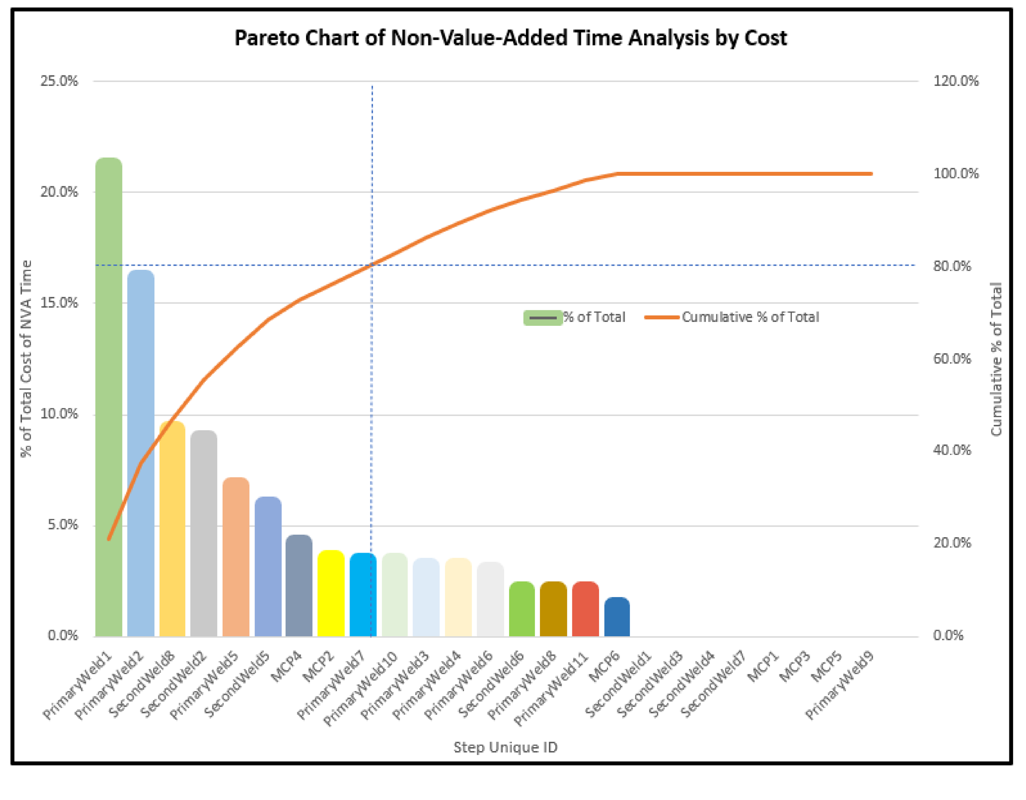

Figure 2 – Pareto Analysis of Costliest Process Steps

In order to establish a cost baseline for the process and physical workspace inefficiencies noted in the problem definition, the team had to devise a measurement strategy. To accomplish the task of measuring these inefficiencies, it was decided that process observation and time studies would be the best way to capture the data. Time studies (work measurement) were performed for each of the materials handling processes involved in the production of the burners. The tables below are the results of each time study.

We calculated the cost associated with each process step using the labor cost and cycle data. We then arranged them in order by percentage of total cost from greatest to least and generated a Pareto chart to identify the costliest steps.

RESULTS

The team determined four potential solutions that could be used to effectively capture the potential savings found, through process implementation, process improvement, or workspace rearrangement.

The first step was determining the impact of EOQ implementation. Figure 3 (right) shows the resulting EOQ and reorder points for each part analyzed.

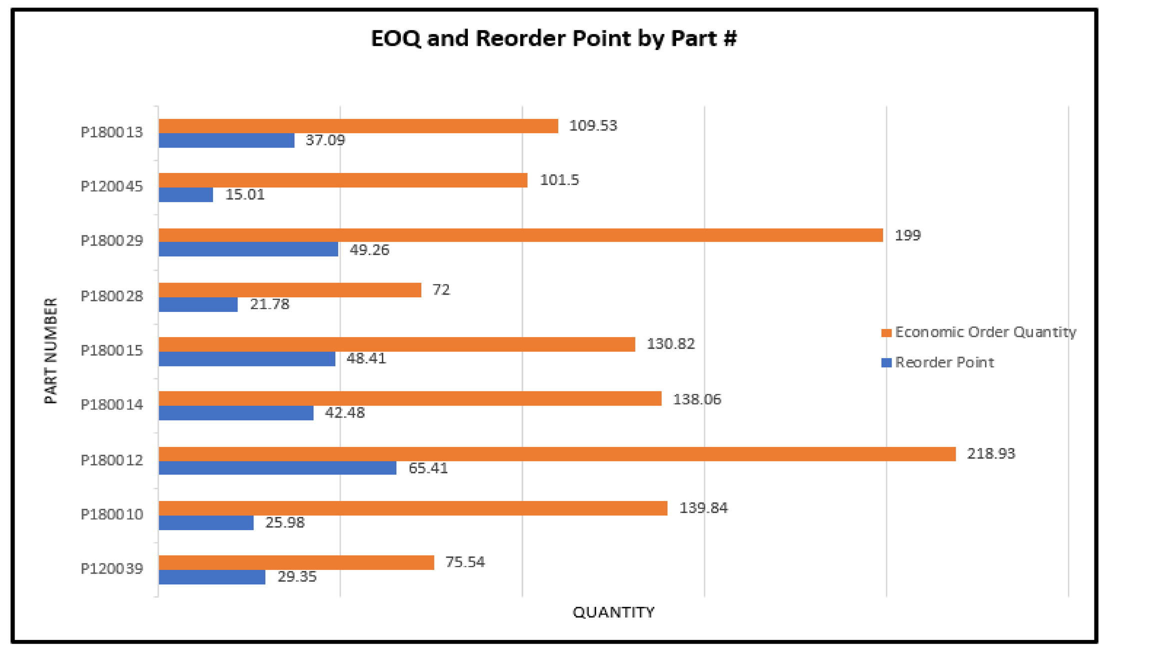

Figure 3 – Results of EOQ and Reorder Point Analysis

The second potential solution was the creation of new SOPs to eliminate non-value added steps. Figure 4 (below) Shows the process steps that would be corrected using SOPs

Step Unique ID	Action(s) Performed	NVA Time (hours/cycle)	Daily Cost of NVA Time	Annual Cost of NVA Time
PrimaryWeld1	Review Work Order and Determine	0.083	$ 30.00	$ 7,830.00
PrimaryWeld5	3 Inch Root Path Weld	0.027	$ 9.60	$ 2,505.60
SecondWeld5	Welding and Machining Little Flange	0.023	$ 8.40	$ 2,192.40
PrimaryWeld7	3 Inch Cover Path Weld	0.013	$ 4.80	$ 1,252.80
	Total		$ 52.80	$ 13,780.80

Table 1 – SOP Process Step Eliminations

The third potential solution was the rearrangement of the physical workspaces to eliminate non-value-added steps. Figure 4 (below) shows the suggested cart, rack and tool shelf to be used to eliminate these steps.

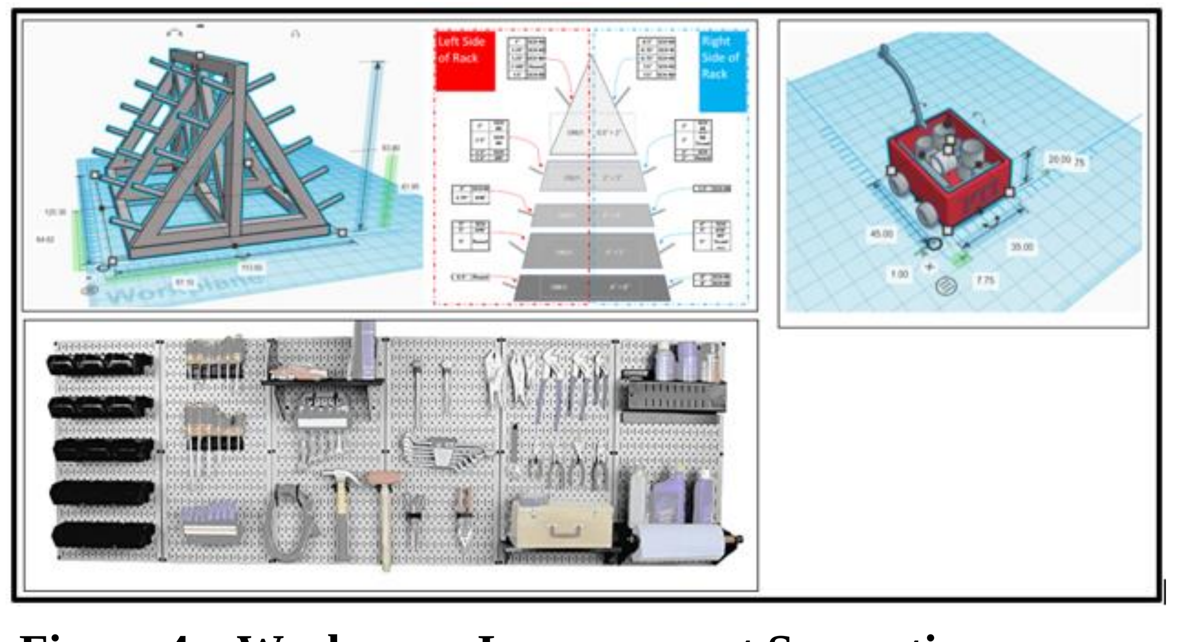

Figure 4 – Workspace Improvement Suggestions

The fourth potential solution was a complete 5S implementation that included the first three solutions as well as completely reorganizing the way the facility was laid out, and introducing color coded systems and walkways for total quality. Figure 5 (below) Shows the updated, color coded rack.

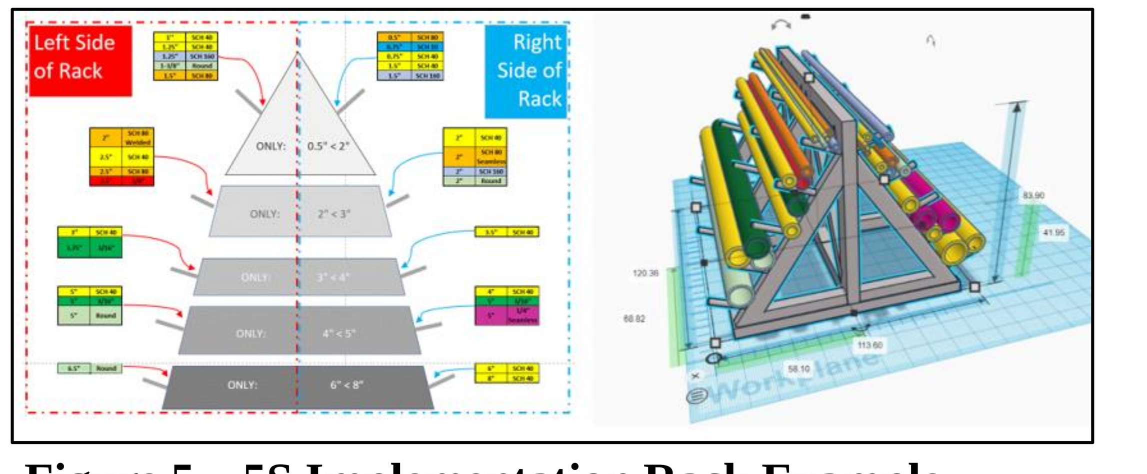

Figure 5 – 5S Implementation Rack Example

Cost benefit analysis was performed for each potential solution. Results of this are seen in table 2 below.

Solution	Cost to Implement	Estimated Annual Cost Savings	Net Cost Savings Year 1
EOQ Implementation	$ 840.00	$ 4,245.04	$ 3,405.04
SOP Implementation	$ 1,920.00	$ 13,780.00	$ 11,860.00
Workspace Improvements	$ 3,788.00	$ 18,217.80	$ 14,429.80
5S Implementation	$ 14,909.00	$ 41,150.44	$ 26,241.44

Table 2 – Summary of Cost-Benefit Analysis Results

CONCLUSION

The team decided to perform TOPSIS analysis to choose the best alternative given the fours solutions presented. The results of the TOPSIS analysis are to the right. The workspace improvement suggestions provide the closest to ideal solution

Solution	Closeness to Ideal Solution	Rank
EOQ Implementation Only	0.5247	3
Standard Operating Procedure Implementation	0.6268	2
Workspace Rearrangement (Rack, Cart, Specialized Storage at Each Workspace)	0.6496	1
5S Total Implementation (Full rearrangement, SOPs and Inventory Controls)	0.4271	4

Table 3 – TOPSIS Analysis Results