Value Stream Map (VSM) Final Report

by:
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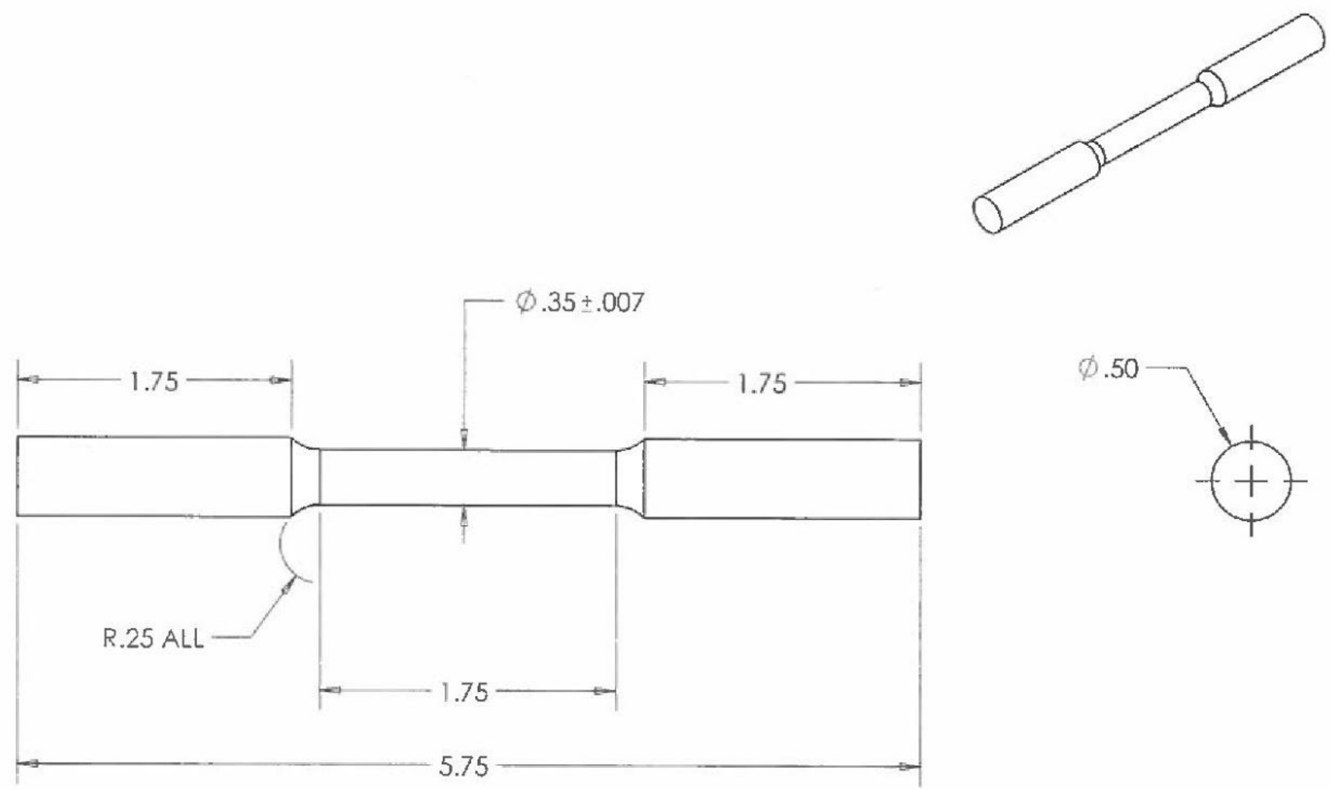

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NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

MATERIALS
> 360 HH Brass
> 6061-T6 Aluminum
> 1018 CD Steel

TITLE:

Tensile Specimen

SIZE	DWG. NO.	REV
A		
SCALE: 1:1		SHEET 1 OF 1

5 4 3 2 1

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Project Charter

PROJECT TITLE: Value Stream Map Assignment			
Start Date	2/24/2016	**Completion Date**	3/5/2016
Belt Name	Duane Beck	**Team Leader**	Zachary Weeden

Element	**Description**	**Team Charter**
Objective Statement	What is the SMART (**s**pecific, **m**easurable, **a**ction-bound, **r**ealistic, **t**ime-bound) objective to be achieved?	The objective is to brainstorm ideas on how to improve the production process of steel tensile samples manufactured at the RIT Machine shop by 3/5/2016. In this report, an outline of the aforementioned will be presented as well as the implications on various departments within the production. The end result is an intricate analysis which will then be fine-tuned and discussed.
Project Scope	Which part of the process will be investigated?	The team will perform a detailed review of each step in the manufacturing process to determine the project objective.
Team Members	Who is on the team, internal and external personnel?	Team members include Daniel Ruiz and Zachary Weeden, supervised by Duane Beck.
Project Schedule (Gantt Chart)	What is the projected timeline for each phase of the project?	The project/analysis is due, in its entirety, on March 5th at 11:30PM EST.

Project Summary for Project				
Phases	Who is responsible / when?	Strategies and or tasks to complete	Deliverable Outcomes	Date Due
Define	Daniel Ruiz	Review notes from walk through	Clear picture of objective. (Charter)	3/5/2016
Measure	Zachary Weeden	Baseline the complete process	Data (SIPOC, PFC and VSM)	3/5/2016
Analyze	Zachary Weeden	Determine problems in shop	VSM analysis/balance scorecard	3/5/2016
Improve	All members of team	Implementation plan of ideas	In depth VSM analysis/business case	3/5/2016
Control	Zachary Weeden	Compare original data to ideas presented	Data shown in the analysis confirming findings.	3/5/2016

Attendance Record

Project Title: Lean Tool - Value Stream Map

Student Name/Date	**February 24, 2016**	**March 4, 2016**	**March 5, 2016**
Daniel Ruiz	Present	Present	Present
Zachary Weeden	Present	Present	Present

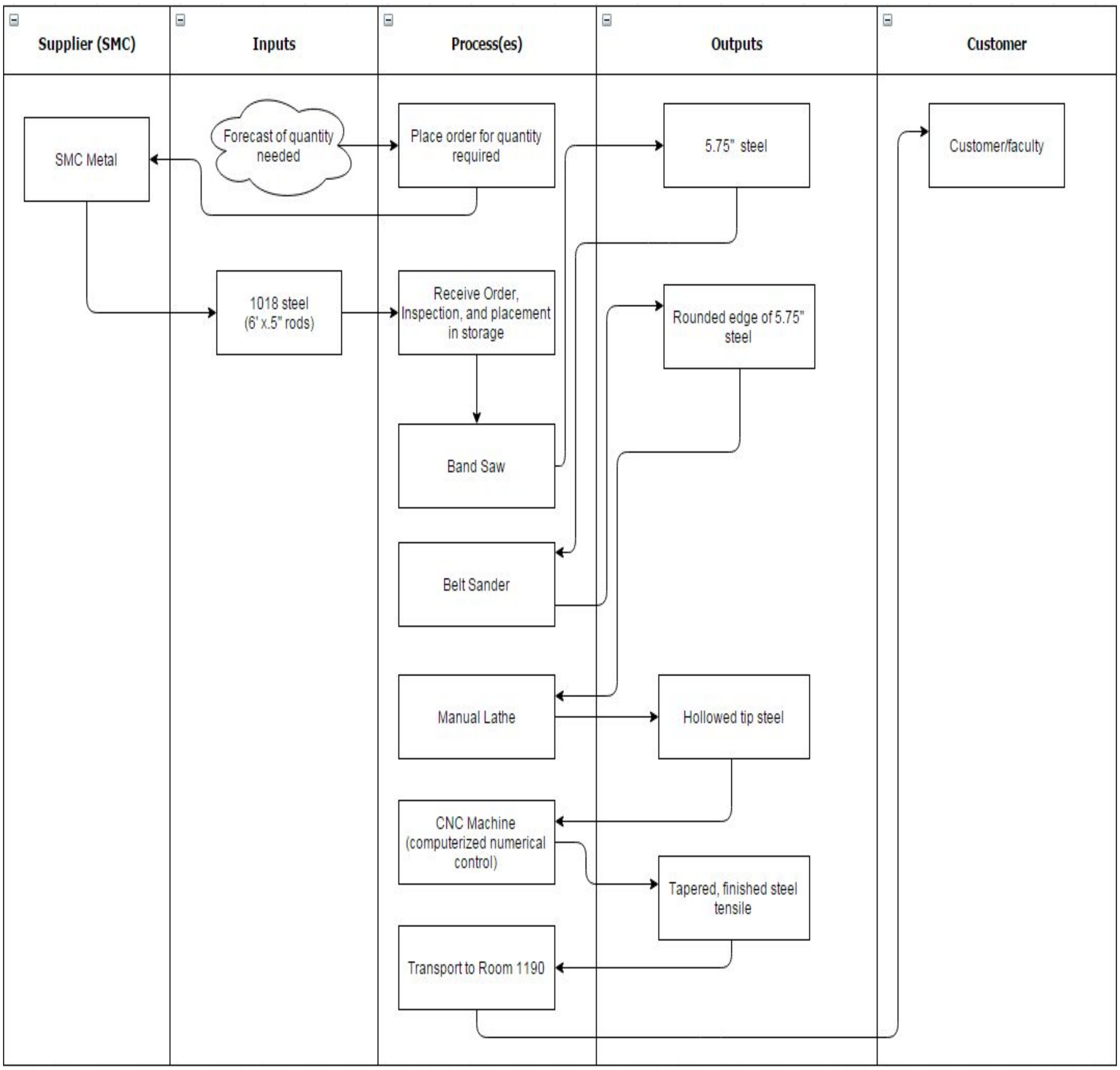
Locations were determined in an impromptu manner and ran the gamut from the on-campus library to department laboratories. Meetings were held both physically and virtually via *Google Docs*.

Business Case

The objective is to improve the manufacturing process of tensile steel samples at the RIT Machine Shop. Every step in the current process will undergo a detailed review to identify and eliminate wasteful elements. Various tools will be used in our examination such as a SIPOC, a Value Stream Map and a flow chart. Suggestions will be given to make for a more efficient process all the while complying with customer requirements. An efficiently run production is one that is both lucrative and sustainable. The machine shop has areas of improvement and reduction which provide for great potential. Later on, modification and intricate details in the process of producing tensile samples will be discussed.

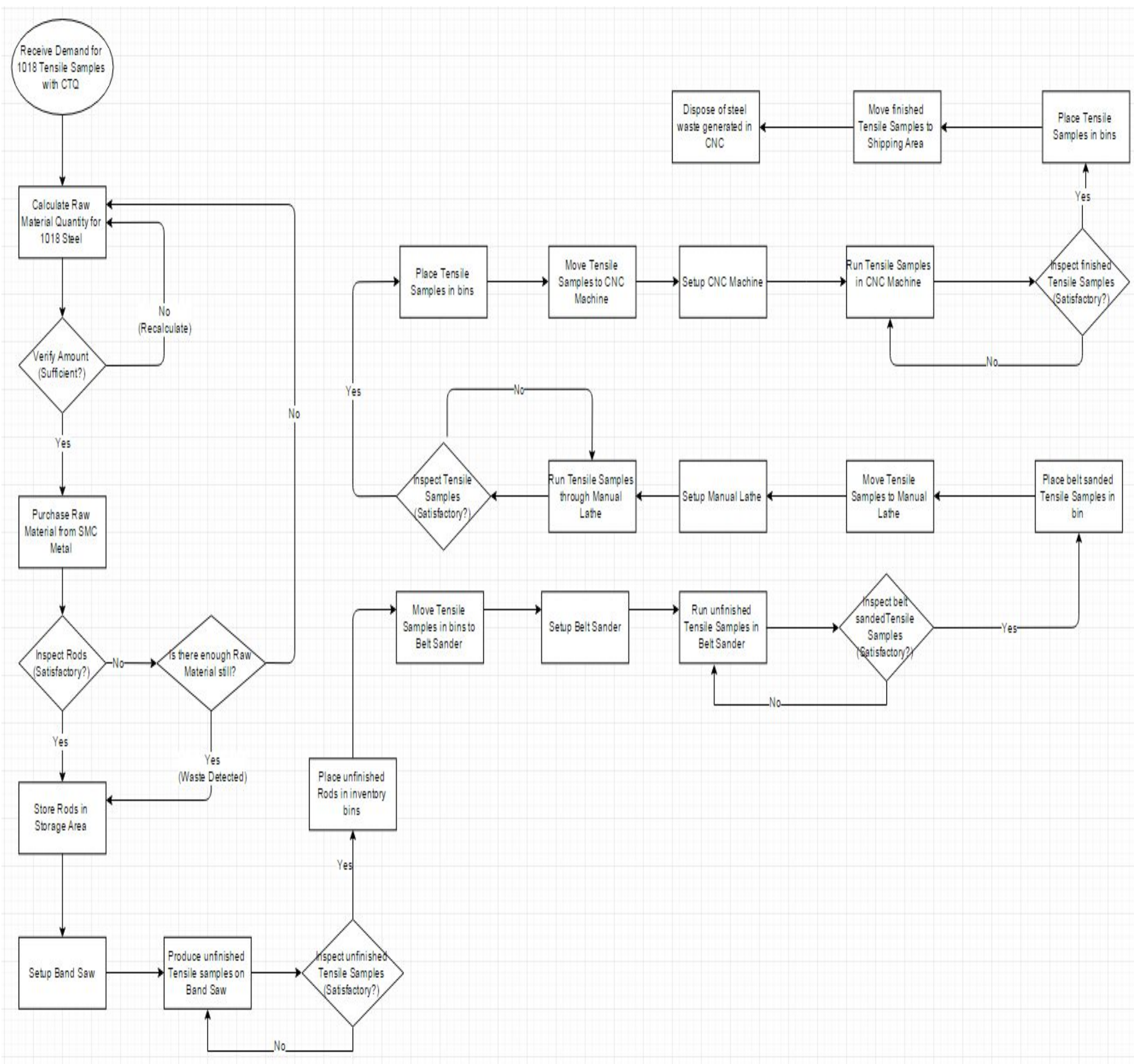
SIPOC

A SIPOC (suppliers, inputs, process, outputs and customers) is a tool implemented in lean engineering in an attempt to improve a process. It tabulates the inputs and outputs for a process resulting in a visual representation of a timeline as well as showing direction after each step. A "swim lane" is another frequently used tool that is analogous to a SIPOC.



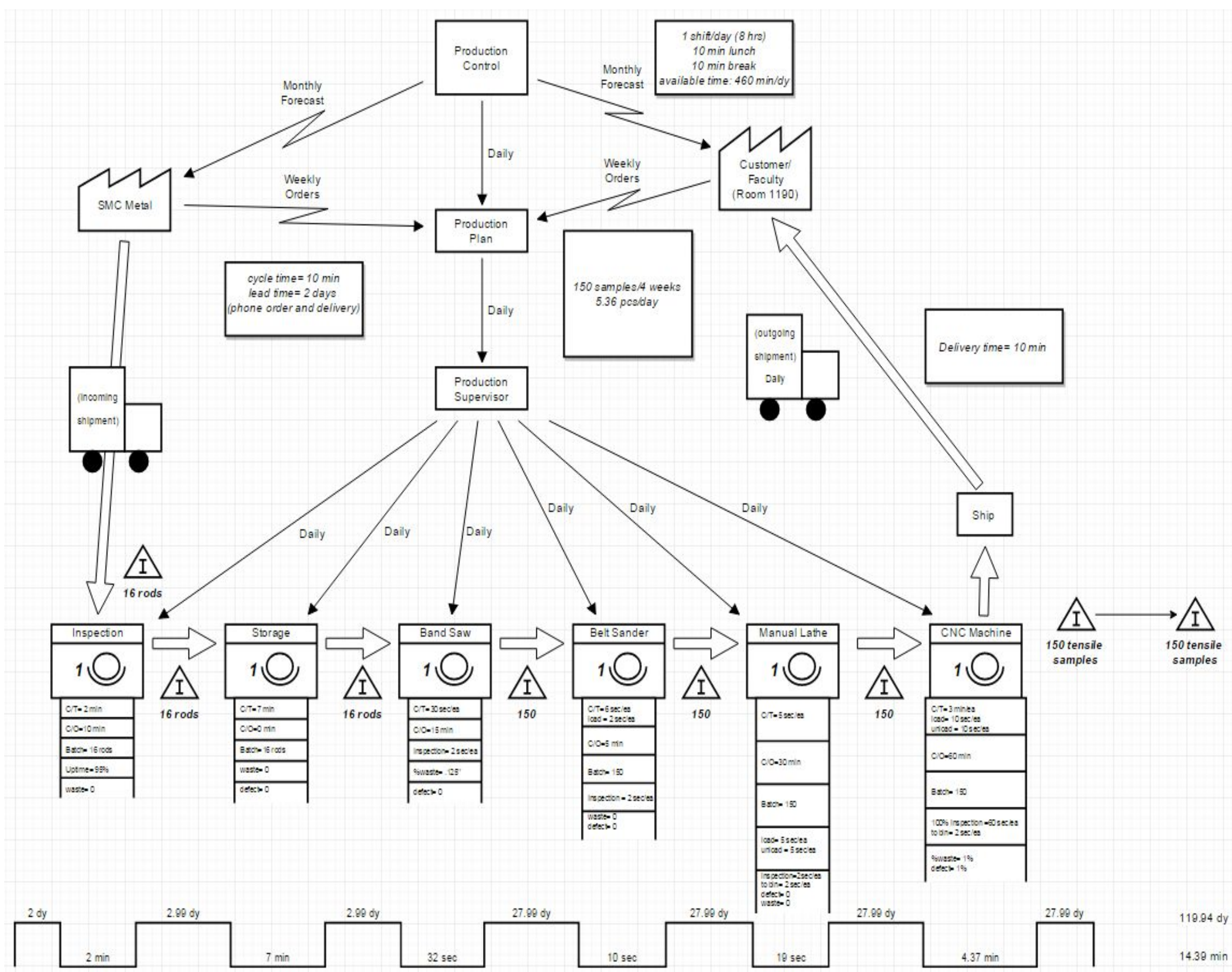
Process Flowchart

A process flowchart is another tool implemented in lean engineering. It serves to show the workflow of a process. It can help in the analysis, design and managing of a process. It is a deeper level of intricacy than the SIPOC and focuses on the internal processes of the production. A goal is to reduce the number of diamonds (decisions), as these can introduce a variety of problems including poor time management, and incorrect decision making. A process flowchart raises the enthusiasm of employees and heightens the sense of camaraderie.



Value Stream Map

A Value Stream Map (VSM) is a lean manufacturing technique that is used to document, analyze and improve the production flow from raw material to the customer. The purpose of the Value Stream Map is to understand what is going on in the process and to identify any opportunities to cut out waste. After reviewing the current state it can be used to design the future state for the next series of events that will take place in the procedure. It helps to initiate teamwork and shows the interaction between information, the process and product flow. Non value and value added components are also shown.



Value Stream Map Analysis Overview

After analyzing the VSM there appears to be some areas that can potentially be improved. The CNC machine takes the longest out of all the value added elements, this is primary due to set up time. To speed up this process a program could perhaps be downloaded onto, so that one wouldn't have to input the instructions every time; something similar to a thumb drive or memory card which could be inserted into the machine. Emulating automation as close to possible would result in many benefits. Assuming that the average pace is 135ft/min, transit from machine to machine can be calculated. $y=[(x/135)*60]$, where x is the distance between machines in ft. yield the time in seconds that it takes to cover the allotted distance. From this, a total of 33.32 seconds are accumulated during the process from simple transit from machine to machine. This could be reduced with a pipeline design in which a machine feeds another machines or, where machine operator use is needed, laid next to one another so instead of travel a simple turn of the operator's body would position them at the next machine in the process. This would ultimately reduce foot traffic and therefore reduce time of non-value added components.

Also, as opposed to simply disposing of waste, recycling or reselling the scrap may be a better alternative. Figuring that 16 6ft steel rods are defective/wasted at a rate of 2%, a resulting 1.92ft of scrap are produced.

Value Stream Map Cost Analysis

Using the forecast of 150 and a lead time of 4 weeks from Steve to consumer, total lead time was calculated. A typical work shift was indicated as 8 hours. Total lead time was 119.34 days

$$y=[(inventory/((150/28days)/(2*8hours)))/(2*8hours)]$$

Value added time or time that the customer would be willing to pay for was the summation of cycle, loading, unloading and inspection time. This came to 14.39 minutes/sample.

One of the primary goals and focuses on cost analysis is eliminating waste. Waste is defined as anything that does not add value. Some examples of non value added culprits include: storage, inspection, delay, waiting, and defective parts

Transportation was previous discussed and should be the first area of rectification on the itinerary. Excess inventory can cause a deficit in revenue is not needed. Just for sake of argument consider the following:

The cost of each 6ft steel rod is $10.00

As outlined, the required inventory is 16 rods. This results in $160 primarily due to defect and waste both from the CNC machine and the sickness of the band saw.
In an ideal world with no waste we are given that 150 tensile samples are needed at 5.75inches each. With only 6ft rods available:

6ft*12 = 72inches per rod
150*5.75inches = 862.5inches of steel needed
862.5inches/72inches per rod = 11.98 rods needed

Rounding up, 12 6ft rods would be needed with excess. The quantity ordered can be modified and fine-tuned based on measurements. Assuming at most the sickness is 0.125inches/cut is the worst case scenario. This results in .125*150 = 18.75inches wasted at the bandsaw

862.5inches needed + 18.75inches = 881.25/12 = 73.4375ft needed/6ft rods = 12.24 rods.

This is still neglecting the 2% of waste and defect of the CNC machine. This is to say that 98% of total inches needed is: 881.25. 881.25/.98 = 899.24inches. This is the final measurement needed by the process including all waste and defect.

Our final results:
899.24/12=74.94ft needed/6ft per rod = 12.49 rods. Yielding an order of 13 rods.
Compared to the original shipment needed, the findings show that 3 rods were ordered in excess at $10 a rod.

This saves $30 and reduces unnecessary inventory.

Value Stream Map Cost Analysis

Also defined in waste is the storage of items. This manifests itself in the placement of bins after majority of the processes. Although it seems vital in the moving of materials, this is also remedied in the redesign of the workshop's layout. A spaghetti diagram is another tool that aids in the tracking of footprints in the process and could be implemented in further analysis.

Another strain on cost includes tight tolerances as it manifests itself in longer inspection/verification times. Specifications weren't outlined by the customer but further inquiry could yield a wide variation on the product which could reduce stress on perfecting each tensile sample.

On the matter of waiting, it may be beneficial to pipeline the whole process in which one sample is carried through the whole process as opposed to bulk production. This is sometimes referred to as a waterfall in that each sample would be one behind the other. In this strategy, more employees would be needed as it requires more hands to see many individual parts from start to finish.

Balanced Scorecard Report

A balanced scorecard is a management tool frequently used by managers to assess the activities of employees and that allow foresight of the consequences resulting from said actions both financial and non financial. It also has longevity in its ability to monitor both short and long term measures. A proper scorecard helps achieve strategic objectives and eliminate non-value added endeavors as well as track progress along the way.

Customer's Requirements	Learning & Growth	Internal Processes	Financial
• Critical to Quality - Each tensile sample must meet the specifications of 5.75" in length and .5" diameter • Fulfilling the forecast presented: 150 samples tensile samples needed/	• Employee growth and opportunities through training • Versatility in operation of any/all machines • Productivity must be improved. • Communication is key between operators • Invest into technology for better performance • Ensure employees are satisfied - create positive work environment. • Give employees more action items; challenge them and they will feel accomplished. (customer's also benefit)	• Delivering a quality, correct tensile sample is critical to achieve customer satisfaction. • Increase productivity rates of machines and employees. • Reduce cycle time to 'pump out' tensile samples quicker without suffering in quality or aptness. • Nominal inspection times maybe reduced further with automation/self-checking systems/mistake-proofing. (poka-yoke)	• Calculated $25/hr wage (inclusive of all expenditures) • Reducing waste and defect rates on the CNC machine can reduce this cost. • Foot traffic from machine to machine can be reduced for more time focused on project and time actually adding to value in production. • Introduce recycling as opposed to disposal at the end of the process. • Reduce setup time of machines - reduce non value added.