OPTIMIZATION OF TOOLING DESIGN PROCESS FOR ASSEMBLY OF MOTOR PARTS

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ABSTRACT

This project developed a DMAIC process to start improving the results of a new task been performed in the company.[The project will focus on improving the quality and turnaround time of the work performed. the quality is going to be improve by looking for the areas that produce waste, study those areas and look for alternatives to eliminate the waste produced and be leaner. by improving, the quality of the work provided to the customer by eliminating waste the turnaround time that takes to deliver the task is going to improve. as this is a new task, been performed the way that it is going to be improved is by designing a new standard work for all the designers to use it.

INTRODUCTION

There is always a need for new tools to be designed when a motor is being build. This project is important because these types of tools help the mechanics perform their job in a much easier way and some of the parts being assembled are heavy parts. As this is a new project the proficiency of the people performing the designs are low and they need to learn fast and performing on the job training. This report will help to establish a more standardize process in order to reduce waste and give the customer a better product.

DESCRIPTION

This report will help to establish some guidelines and/or standardize a process that is a pilot project at this moment. The emphasis of the article is to standardize the areas where the project is having more waste. By establishing guidelines or a standard work the process can be maintained in control and look for opportunities to continuous improvement in the future.

OBJECTIVES

The objectives of the report is to standardize the process of the project in order to reduce waste. Create a standard work document or guidelines that can help the people performing the job of the requirements or where to look if some assumptions are made. Help people performing the job know how to make any type of assumptions or suggestions in order to make their design better. This type of things will help the project to be leaner and have a better product for our customers.

CONTRIBUTIONS

The main contributions that this project is that a procedure is going to be written for a process that is new in the company and the proficiency of the employees is low. This will help the employees in the decision making and guide guidelines of what to do in some cases and with more experience they will be able to make suggestions of how things can be done. Another contributions is that the guidelines of the process can be improved as the employees get more experience and can help to have a product of high quality in a short time for the customers.

METHODOLOGY

This report will consist of the application of quality measures to establish a process for a project that is in a pilot program and don't have any type of instructions or guidelines to follow. The creation of this instructions or guidelines will help all employees to know the requirements the customers wants in the products and be able to achieve the delivery in a very lean way.

The areas to be analyzed first are the customer requirements for example: what they are looking for? How to get the requirements? Who can help if there is any doubt? These types of questions will help the designer to establish a plan in order to develop the product the customer is looking for. After this initial steps are completed the designer needs to be able to start his process. The objectives of this background research is for the designer to have a clear understanding of what is been look for in that request by the customer and try to be as much lean possible in the process.

After performing a research background about this topic in the university databases all of the topics that were found was about machinery design and that is not the topic I'm writing my report of. This report will consist of performing or establish a series of processes to write guidelines or a standard work about a project that is starting and can help its designers to follow these instructions to be more efficient (lean) in the product that we are delivering to the customer.

The method that will be used to conduct this project is using a DMAIC process. The project will be defined of what the customer wants, their requirements, and a standard work will be developed. When the project start it will be measured, how much time it took for each designer to perform the job and the error found in the process will be recorded. Then the errors found will be analyzed to look for ways to improve the process and don't do the same errors in the future. And finally the process will be controlled, after the standard work gets updated another DMAIC will be run in order to validate that the errors previously made are much less than in the beginning and looks for other areas to improve.

Another tool that will be used and will help this project is Project Management. This tool will help to monitor the time that takes to perform the task by each designer and also will help to understand each request made and categorize it by the difficulty of it. This will make the future estimation of time to take the task more accurately based on the difficulty of the task. For example, an easy task can be estimated to take 30 hours of work while a hard task can take 130 hours of work. This time measurement will be observed and measure using the project management tool.

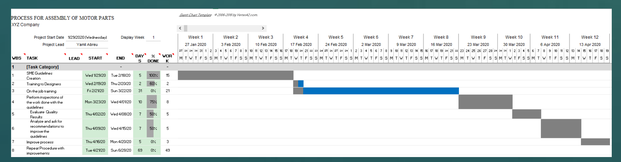

Figure 1. Project Schedule

RESULTS & DISCUSSION

After the research schedule process was performed to optimize the design process with the information gathered the process saw an improvement of some defects that the designers were hitting constantly. This defects that the subject matter expert found common in some of the designers were isolated and studied thanks to the implemented inspection process. This inspection process make the subject matter expert realize the defects that the designers were hitting constantly in order to study the defects of why this is happening and train again all the designers involved in the process to improve that area of the process by creating an area on the work instructions to add this defect and how to avoid it in the future. This type of lesson learned correction process will be applied when an occurrence of a defect become very usual in the team performance and the subject matter expert notices it by the inspection process applied as part of the optimization process we are discussing in this project.

As this is, a new project the best way to improve it is to standardize the process as much as possible, the tasks related to it in order for the designers to know what the requirements are and perform the task as smooth as possible. This way the work instruction can be reviewed regularly and even updated due to a defect appearing regularly in the job of the designers and the work instructions updated to be able to eliminate it in future tasks. One of the goal to achieve in this new process is the quality of the design of each project to be the best possible in order to get the jobs done correctly and to comply with the customers' requirements with the less turnaround time and with the best quality possible for them to have the product they desire. These results are going to be explained and analyzed using a DMAC process in the following paragraphs.

The Define process of the DMAIC in this case is define in a project charter. The project was approve as a DMAIC candidate and the developed project charter. In the project charter we are going to see the information that correspond to the project in general like purpose, scope, goals , final deliverable, etc. The project charter of this project is as follow in Figure 2:

Prepared by	Yamil Abreu
Date Issued	1/29/2020
Project Name	Optimization of tooling design process for assembly of motor parts.
Purpose of Project	Improve the quality and turnaround time of the product delivered to the customer
Business Case/Need (Business reasons for the project)	Standardize the process to improve quality and turnaround time.
Team Members	Subject Matter Expert and 8 designers.
Estimated duration of the project	3 months
Suppliers to the Process	None
Project Scope (start/end)	September 30 2019 to December 22, 2019
Project Goal(s) (What is it intended to achieve?)	Improve quality and turnaround time of the tasks performed.
Estimated Cost $	As this is a new project the cost to perform the job is not available at the time.
Timeline and estimated project completion date	3 months.
Estimated Savings $	N/A
Final Deliverable(s)	A drawing to manufacture an assembly tool.
Approach	Kaizen

Figure 2. Project Charter

RESULTS & DISCUSSION

Suppliers (a)	Inputs (b)		Process (c)	Outputs (d)			Customers (e)
	Description (b1)	Quantified measure (b2)		Description (d1)	Quantified measure Delivery (d2)	Quantified measure Quality (d3)	
XYZ Co.	Engine Part Information	Correct Engine part configuration and related data (weight, loads, etc.)	Preliminary	Concept model uploaded to database, First sheet of drawing, containing ISO View, and engine part cross section.	Final drawing fully dimensioned. Correct notes, and dimensions.	Tool meets requirements stipulated in the request.	ABC Co.
	Reference Drawing	Data for design as defined by references.					

Figure 3. SIPOC

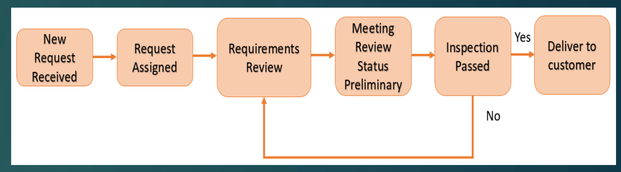

Figure 4. Process Map

Figure 5. Mistakes found in inspection process

CONCLUSION

The optimization of the tooling design process for assembly engine parts is a continuous process that by standardizing the process at first the people performing the jobs can use these instructions and be able to provide the customer with a high quality product at a low turnaround time. This will ensure for the customer that the job done is what the customer look when hiring us to perform the task. This optimization process is not a thing that you do once and forget about it, this process needs to be continuous in order to optimize the process in the areas that the designers are failing to provide a good idea or missing continuously some requirements to attack that area and provide directions to them for a full understanding of what is needed and what the customer is looking for.

By continually looking to perform improvements in the process this will ensure that the designers get the job done right at this first try and with the best quality possible to minimize that the inspector returns the job to the designer for corrections. As much training is provided and improvement makes during the time the project is being done the product that will be provided to the customer is one with high quality and low turnaround time.