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Title: ***Standardized Work Instruction***

The accompanying research report is submitted to the **University of Wisconsin-Stout**, **Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS Technology Management

Research Adviser: Jim Keyes, Ph.D.

Submission Term/Year: Summer, 2012

Number of Pages: 56

Style Manual Used: American Psychological Association, 6th edition

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Ruggles, Olivia M. ***Standardized Work Instruction***

Abstract

Mercury Marine is a world-wide manufacturing company in the marine industry. It is a division of Brunswick Corporation that provides engines, boats, service and parts for recreational, commercial and government marine applications. Plant 15 is located in Fond du Lac, WI and builds all four-stroke outboard engines. The Materials department is an indirect department that is responsible for all shipping, receiving, inventory control, material movement and manual product pulls. It is difficult to manage the staff in materials without standard work instructions. The objective of this study is to complete standard work instructions for the Materials department staff. Standard work instructions will assist in training, re-staffing, discipline or lean activities. The results of this project should assist in creating, implementing and installing a standard work instruction for the materials department, which will align material movement in the direction of lean manufacturing.

Acknowledgments

I would first like to thank my children: Cassadie and Thaddeus for their support during the many hours I put in between work, school, homework and now researching and writing my paper. Secondly I would like to thank Dr. Keyes, for sticking with me and advising me during this process, as I know it has been trying at times. Lastly, I would like to thank UW-Stout, as I have received a wonderful education through your great programs for both my BA and MS degrees.

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Chapter I: Introduction

Mercury Marine is a world-wide leader in the marine industry. Mercury was founded by Carl Keikhaefer, who took over Cedarburg Manufacturing Company in 1939 after they had filed for bankruptcy. Cedarburg Manufacturing was a small manufacturer of outboard motors, which was renamed Keikhaefer Corporation, after the new owners (father and son team). In the 1940's Kiekhafer Corporation started to design a new line of outboard engines which they named "Mercury". This name came from the Roman god of speed.

In 1961 Mercury Marine merged with Brunswick Corporation. Currently Mercury Marine is a division of Brunswick Corporation with plants all over the world. The plant this project focused on was plant fifteen in Fond du Lac, WI which assembled the four-stroke outboard engines. This plant holds machining, paint systems, assembly lines, and inventory storage. There were a total of about 350 hourly union employees in plant fifteen. The materials department was responsible for all shipping, receiving, inventory control, material movement, manual parts pulls, and scheduling of the entire plant. There were 34 first shift hourly union employees and 8 second shift hourly union employees in the material department.

The economic downturn that had affected everyone world-wide also affected Mercury Marine in the end of 2007 and start of 2008. Mercury produces a product that is very cyclical, or considered a luxury product. Mercury was affected tremendously by the fact that spending had halted as pricing for gas and foreclosures sky rocketed. Cost savings measures were a must in order to keep cash on hand, and many adjustments were required in order for a company to survive this downturn. Brunswick required Mercury to reduce costs by 30 million dollars. In order to accomplish this, one of the main focuses was the reduction of inventory, and another was the reduction of staffing. Both reductions extremely affected the materials department. The inventory reduction meant quicker receipts of supplies, material movements and better inventory

control. The reduction in staffing intended less people in the department (an indirect department) doing "more" or working more efficiently.

Prior process did not have standard work instructions in place for the materials department or operators, which caused issues when adjustments were required. Adjustments were completed by the supervisor and their knowledge of the work. This was based off of what tasks they felt were manageable for each operator, or what the supervisor felt was an optimum utilization of the staffing to complete all tasks required. There were many assumptions made as to what the staffing levels should be, who was doing each task, knowledge, feelings, and what was required to complete each task. These assumptions caused frustration for operators being over-utilized, while others were more obviously under-utilized. The system did not allow for adjustments of job duties, staffing changes, training of new employees, or accountability. Lack of documentation made it difficult to collect data for utilization and caused interruptions in the flow. Lack of data also made it difficult to complete root cause analysis for issues, performance problems, misses, and errors. In order to effectively manage the analysis, adjustments, accountability and changes that are needed, standard work instructions were imperative.

Problem Statement

It was difficult to effectively manage staffing, adjustments, training or discipline without standard work instructions. The lack of documentation of the materials processes caused issues with utilization of staffing and elimination of non-value add actions. Accountability was difficult without a standard process or documentation.

Purpose of the Study

The goal of this project was to effectively manage the materials department at Mercury Marine in plant fifteen. Standard work instructions would provide a base for which adjustments, re-staffing, training, discipline and lean activities would begin. Standard work instructions

would also provide documentation of each position and the process involved with completing tasks on a daily basis. The focus would then be on the task at hand, not the individual. The study provided lean activities to improve prior processes and eliminate non-value added activities. The baseline provided by standard work instructions would produce information for which performance problems, errors, failures, downtime, missing parts or missing processes can be captured. Once the documentation was completed, accountability for sustaining this process on a persistent basis was established. Supervisors would have feedback and data on flow interruptions and operator utilization. This provided information for root cause analysis on issues caused by the materials departments. Operational metrics, direction, and a response system opened communication with the department and individual operators. When there was an avenue and documentation for operators to provide feedback, sustainability for a lean environment and activities would be more likely. The direction of the project moved materials towards a lean manufacturing environment, lean activities, and ultimately a lean culture.

Objectives

The objectives of this project were as follows:

1. Understand each individual job in the materials department
2. Effectively manage staffing issues (under-utilized/over-utilized)
3. Have documentation to use when training new staff
4. Be able to complete lean activities effectively
5. Have a standard to refer to when discipline is needed

Assumptions of the Study

This study assumed that the staffing levels were not adequate for production requirements. This was due to the fact that Mercury planned on adding Supplemental Technicians to adjust the staffing when needed. With this assumption it was also assumed that

training would be needed, and that prior process for training was not adequate for new employees.

The study also assumed that all changes made with prior process were completed off of history or knowledge of previous employees. This was responsible for the assumption that the adjustments made were not adequate or completed correctly.

The study assumed that all materials and employees required standard work instruction. It also assumed that material functions or tasks were repeatable and sustainable. It was assumed that this project could attain better utilization of the materials operators, a better training program, and a better process when adjustments were required.

Definition of Terms

DMAIC: a lean six sigma term, short for: Define, Measure, Analyze, Improve, Control (Brunswick Corporation, 2005).

Gemba Walk: A Japanese term meaning "the real place," or roughly, "where the action is." In manufacturing, that means the production floor (Mann, 2010).

Jidoka: Automation with a human mind. Jidoka means developing processes with both high capability (few defects made) and containment (defects contained in the zone) (Dennis, 2002).

Kaizen: A small incremental improvement. Kaizen activity should involve everyone regardless of position (Dennis, 2002).

Lean: is the continuous elimination of unnecessary, non-value added steps within a process (Adams, Kiemele, Pollock, and Quan, 2003).

LSS: lean six sigma; a methodology to eliminate unnecessary activities, reduce variation and improve process flow to improve quality, exceed customer satisfaction, and improve profitability (Brunswick Corporation, 2005).

Muda: The Japanese word for waste (Dennis, 2002).

Poka-yoke: An inexpensive robust device that eliminates the possibility of a defect by alerting the operator that an error has occurred (Dennis, 2002).

Root Cause: The basic source from which a problem grows, as distinctly from symptoms that are the visible effects of a problem. By doing a problem solving analysis to find what is causing a problem, it is often possible to eliminate the cause altogether, or to prevent it from recurring (Mann, 2010).

Standardized Work: Specifications, usually for a production workstation, that include the sequence in which steps or work elements are performed, expected time for each element and the total time for all, takt time, and the quantities of inventory before, in, and after the workstation (Mann, 2010).

Takt: The pace of production synchronized with the rate of sales (Dennis, 2002).

Limitations of the Study

The limitation of the study concerned the implementation of the lean practices and the standard work instructions. The study only focused on Mercury Marine's Plant Fifteen Materials Department. The changes to the actual department and implementation were limited due to resources, time and negotiation of the labor agreement with the union.

Changes to the daily tasks or removal of non-value added steps were not part of this project. The materials operators were not trained to the standard nor was the staffing adjusted. The limitation to the adjusting the staffing was also due to assigned areas of the plant.

The project did not attempt to change staffing levels or move tasks between operators because of time constraints. A time study of the operator's specific tasks was not performed due to being indirect labor and labor agreement with the union.

The information collected for this project was limited to the time during the project and was passed to the next Supervisor for use. The project results were limited due to relocation to another plant and not fully implemented prior to that move.

Methodology

The methodology used during this project was the Lean Six Sigma's Define, Measure, Analyze, Improve, and Control process (DMAIC), to define the problem at hand and research the best methods to solve this problem. The prior process being utilized did not give a true picture of the processes involved, nor did it properly utilize the employees, and also caused issues of downtime, frustration, waste, and lack of baseline for adjustments. The project would give documentation, understanding of each position, and a standard for training and accountability.

The project started with the Define stage. During this stage the scope, limitations, assumptions, and customers were all identified. Suppliers, Input, Process, Output and Customers (SIPOC) were defined during this phase to determine all elements involved in the process. A communication meeting was conducted to explain the direction and scope, and give an explanation of why this project was important, and provide the level involvement needed from each operator.

The project then moved into the Measure phase. The operators' involvement was the focus during this phase. Each operator wrote out each task they completed in their given position on a daily basis, creating a base for process flow of each operator. This phase allowed for the opportunity to begin moving towards a culture change and lean thinking.

Next the project moved into the Analyze phase. The analyze stage involved observing the operators to determine if all aspects of the position were captured. This also gave the opportunity to break all elements of a position into specific steps or breaks between tasks. It created a base for operator utilization through number of tasks completed by each operator. Each

task was entered into an excel spreadsheet and a bar graph was completed to show what level each operator was at for the number of tasks assigned, which painted a clear picture of utilization of the entire staff. During this phase a cause and effect diagram would be created to identify, display and examine potential causes of any observed conditions.

The project moved into the Improve phase. This was based off of the analysis completed for operator utilization by number of tasks assigned and the bar graph completed in the Analyze Phase. Adjustments were made to level out the work load of each operator within their assigned areas.

The final phase of the project was the Control phase. This part of the project was not implemented, and further notes are my recommendations. At this point the project would be fully implemented. Part of the implementation would be to sit down with each operator and train to the assigned tasks involved in their particular position. During this time an explanation was given on lean manufacturing, including how and why it was important for this project. An important part of the Control Phase is to setup a control plan. This was assigned a person the task of following up and re-analyzing operator utilization. There was a check for sustainability of the project implementation. Lastly it involved a summary of the adjustments or savings involved in implementation of the project.

Applications of lean activities, Six Sigma and standardization would be utilized in order to eliminate waste, level the workloads, and fully utilize all staff. Standardization and Lean activities were adopted for this project to create a baseline for documentation and elimination of non-value added movements. Next step in the project was to work on standard worksheets to include time for each task completed by each operator, to understand the time limitations involved in utilization.

Summary

Mercury Marine was running the Materials Department based on past knowledge and assumptions which included the training program, staffing needs, accountability, standards, and adjustments. This process was causing multiple issues from downtime to waste, not to mention the frustration to all employees involved. Continuing this process and not applying lean principles and standardization could have ultimately caused issues with employee stress, more downtime, more waste, and ultimately loss of customers due to product not getting completed in a timely fashion. The literature reviewed in Chapter II would cover the purpose of standardized work instructions and lean activities. The literature review would provide background to both lean and standardization and why it was needed at Mercury Marine in the Plant 15 Materials Department.

Chapter II: Literature Review

A review of related literature was completed to gain understanding in lean manufacturing and standard work instructions. This is important for any company to gain competitiveness and improve processes. Standard work is the beginning step for lean manufacturing and will cover the purpose and the change in culture involved. With any change, employee involvement and communication are crucial to a successful implementation of projects or new processes. Last discussed will be the importance of training employees to this change. The following literature review will cover the key principles.

Lean Manufacturing

Lean manufacturing is, "looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-added wastes" (Liker & Meier, 2006). Fred Winslow Taylor was the first to systematically apply scientific principles to manufacturing. Taylor's system was based on separating planning from production. Through new techniques such as time and motion studies, one could determine the "best way" to do the job, leaving the workforce to do the short cycle, repetitive tasks (Dennis, 2002).

The key to lean manufacturing is to eliminate waste. In order to eliminate waste, there must be an understanding of what is required of each position or machine. There are seven major types of non-value-adding activities in business or manufacturing processes: overproduction, waiting, transportation, over processing, excess inventory, unnecessary movement, and defects. All of these can be improved by setting a standard, adjusting the standard when improvements are identified, and holding people accountable to the standard (Dennis, 2002).

Creating a standard work instruction eliminates waste and creates principles to move towards a lean process. When writing standard work instructions, lean manufacturing is fundamental. This is very important in order for lean practices to truly work in a company. "The two requirements for working in a truly lean enterprise are 1) follow standard work, and 2) find a better way" (Miller,2001, p1).

Another element of lean manufacturing is "gemba" walks. A gemba walk is simply going to the place where action is happening, looking at the processes, and talking to the people (Mann, 2010). This is very important for multiple reasons. First is accountability, which means the presence of leadership, promotes motivation and accountability of operators. The second is that to truly understand the processes, you must see the action. The last reason is that talking to the people who are performing these actions gives operators an opportunity to discuss what is working, what is not working, and offer improvement ideas.

Lean processes and performance work towards improvements in lead times, decreasing lot sizes, and improving reliability while increasing flexibility and yielding consistent results. Most prescriptions for lean production are missing a critical ingredient: a lean management system to sustain it. A lean management system consists of the discipline, daily practices, and tools you need to establish and maintain a persistent, intensive focus on process. It is the process focus that sustains and extends lean implementations. The practices of lean management produce process focus (Mann, 2010).

Knowing that there needs to be a change does not fix the issue. Deciding what the resolution is to the issue can be equally challenging as agreeing on the business need. For a lean approach, it can help to illustrate the current situation and how it is affecting the end goal (Zylstra, 2006).

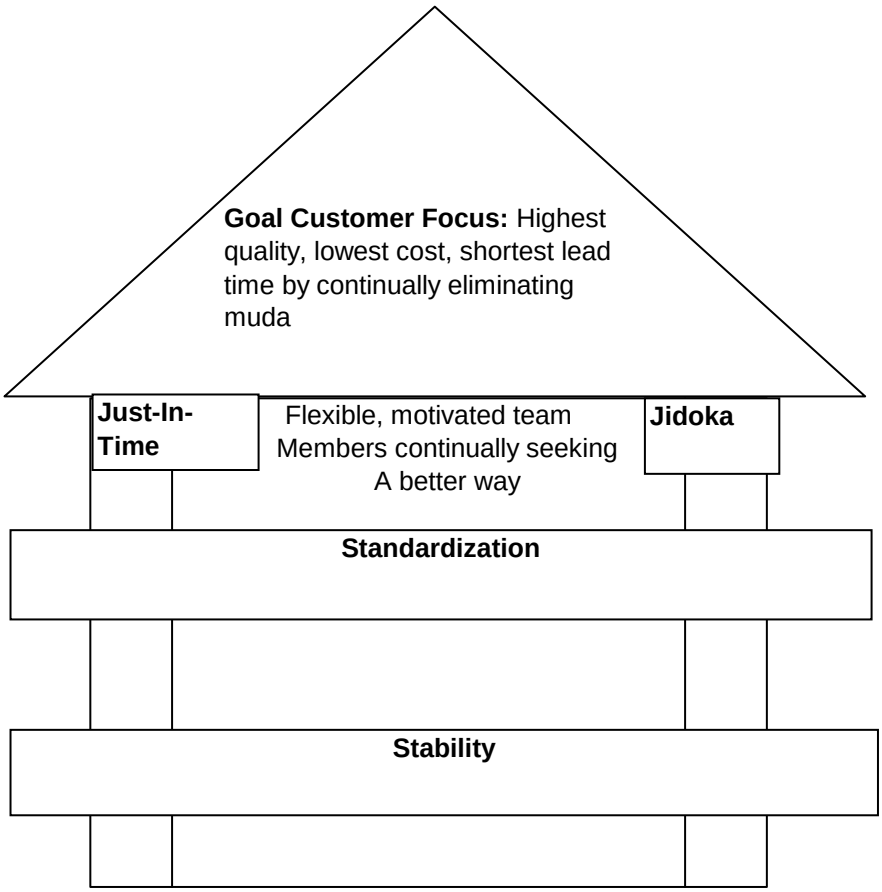


Figure 1: Basic Image of Lean Production (Dennis, 2002)

Standardized Work

Leaders in standard work stress the importance of standard work being layered from the bottom up. Work instructions can assist in the process of leaning out a company and aligning production with the corporate strategy. Overall, this literature emphasizes the importance of standard work instructions and how they are going to lead to effectively managing staffing, adjustments, training, and discipline.

The definition of standard work is the most efficient use of manpower, material, machinery and method. Once the standard is defined it is only effective until it is improved (Miller, 2006). A tool used to identify the breakdown of each is called a fishbone diagram or cause and effect diagram. A list of measurements, methods, machines, people, materials, and environments would be provided. Then determine if each item listed is a C, N, or X. The C

would be those variables or entries that were being held as constant as possible by utilizing standard operating procedures. The N would be those variables or entries that were not being controlled or held constant, noise variables. The X variables were considered to be key process variables that were being tested in order to determine what effect each had on the outputs and what their optimal settings should be to achieve the desired performance, and in order for a process to be standard, it must be repetitive. For a process that is not repetitive or variable it may not be possible to establish standard work instructions. The establishment of standardized processes and procedures is the greatest key to creating consistent performance. The creation of standardized process is based on defining, clarifying (making visual), and consistently utilizing the methods that will ensure the best possible result. It is an ongoing activity of identifying problems. It is only when the process is stable that you can begin the creative progression of continuous improvements establishing effective methods, and defining the way those methods are performed (Liker & Meier, 2006).

There are many reasons to standardize work, but there are seven main benefits as mentioned by Dennis, (2002):

1. Process stability. Stability means repeatability. We need to meet our productivity, quality, cost, lead time, safety and environment targets every time.

2. Clear stop and start points for each process. These and knowledge of our takt, that is, our pace of production rationalized with our rate of sales and cycle times which allow us to see our production condition at a glance. Are we ahead or behind? Is there a problem?

3. Organizational learning. Standardized work preserves know-how and expertise. If a veteran employee leaves, we won't lose his or her experience.

4. Audit and problem solving. Standardized work allows us to assess our current condition and identify problems. Checkpoints and vital process steps are easy to track. We are able to ask important questions:

    a. Are team members able to do the process smoothly or are they falling behind?

    b. If they are falling behind, by how much and in what job elements?

    c. How can we improve these elements?

5. Employee involvement and poka-yoke. In the lean system team members develop standardized work, supported by supervisors and engineers. Moreover, team members identify opportunities for simple, inexpensive error-proofing or poka-yoke devices.

6. Kaizen. Our processes are mainly muda. Once we have achieved process stability, we are ready to improve. Standardized work provides the baseline against which we measure improvement.

7. Training. Standardized work provides a basis for employee training. Once operators are familiar with standardized work formats, it becomes second nature for them to do the job according to standards. Vital steps and checkpoints serve as constant reminders. Process training is easier, we can more easily respond to changes in demand (and the corresponding changes in takt time and process steps).

When completing standard work instructions it is very important to understand what the process is. Rother and Harris (2001) offer the following advice when starting standard work:

Always break work into elements. A work element can be defined as the smallest increment of work that could be moved to another person. This helps identify and eliminate waste that is otherwise buried within the total operator cycle. Standard Work Instructions can be broken down into four main steps. Those steps are the key to moving towards the path of standardization. The first step is figuring out the work elements and their sequences. The second step would be to time that work element. The third step would be recording operator and machine downtime and cycle time. The fourth step would be the interaction between operators and machines or between different operators.

Once there is a clear understanding of what the work is, the next step would be how to distribute the work fairly or appropriately. "The appropriate number of operators should not be determined by estimate or by negotiation between the different members of the team. Instead you should begin the process of determining the operator need" (Rother & Harris, 2001, p. 51).

In order to get standard work fully implemented, the focus must be on lean leaders. Leader standard work has a purpose of shifting the focus from only results to both process and results (Mann, 2010). When trying to create a lean culture, you should start by layering standard work from the bottom up.

It is essential to start with creating a standard for the leadership team because in order to sustain change or standards on the production floor, leadership teams need to have standards for holding themselves accountable. This makes accountability very visual and crucial to all members and does not single out any particular group.

According to Reed (2001):

> One of the myriad production challenges we face is bringing the same degree of discipline to manual operations as there is in automated operations. Providing control and information across the enterprise is a critical element of any organization's success.

This involves the efficient operation of automated systems as well as timely communication of specific instructional and procedural information. (p.1)

When changing or trying to improve any process, an implementation plan should be completed. This plan should consist of the reason for the change, an explanation of what is happening presently, and what the future goals should encompass. Once this is established, then setup a schedule and track weigh against the goal (Rother & Harris, 2001).

Once the implementation has taken place, it is important to begin debugging immediately. If this process does not take place right away, employees will get frustrated with the changes and will lose faith in the system. In order to sustain these results it is important to create an audit system to ensure that issues are identified and the improvements keep going. "The key element of your operations should be the day-to-day involvement of production associates and team leaders in maintaining standards, finding improvement opportunities, and developing new standards" (Rother & Harris, 2001, p.82). Creating a standardized work table is an important part of breaking down each element involved in completing that particular job. An example of a standardized work table is listed in table 1.

Table 1: Example of Standardized Work

Process Name	Foam Boxing	**Date:**	4/1/2011	**Takt Time:**	65
Part Number	8M8022050	**Part Name**	Gear case	Manual, System, Walking	
#	**Work Elements**	**Time Elements**	**Operation Time (Seconds)**		
		Man Syst Walk	**10 20 30 40 50 60**		
1	Pick up box	5 10			
2	Place box on conveyor	5			
3	Place film in box	10 5			
4	Spray foam on film	20			
5	Fold film over foam	2 2			
6	Place part on film	3			
7	Place box top over box	5			

Communication

Communication is one of the most important elements with anything you do. This is also one of the most common mistakes when trying to change or implement change. The most common mistakes people make when communicating expectations are as follows:

1. Barking out "marching orders" without making your directions clear enough that people fully understand and accept them.
2. Assuming people need only on explanation in order to understand what you expect them to deliver.
3. Failing to form an expectation clearly yourself before communicating it to others.
4. Excluding any explanation about "why" you want something done within a specific time frame.
5. Asking people to do something, but not clearly explaining when you need it done.
6. Failing to describe the resources available to help people do what you want them to do.
7. Issuing such specific instructions about what to do and how to do it, that people hesitate to "own it" themselves and think out of the box to ensure the result (Connors & Smith, 2009, p.57).

When communicating with the operators the best approach is to follow the three W's. The first W is Why; why are we doing this? The second W is What; Which includes expectations, what the boundaries are, and how are the changes supported. The Third W is When; when is to expect this change, include dates and times for steps involved and completion. After the above three W's have been completed, then the next thing needed is to be sure to step back and figure out how the communication will be completed. There are important details to keep in mind as you create this communication to make it not just another company line and engaging. The message should be tailored, short, simple, clear and honest (Connors & Smith, 2009, p.44).

The final area involved in communication is the power of persuasion. The power of persuasion can come in many different forms. Some of the techniques included are encouragement to speak up and tell what they really think, or waiting to express your own views until after theirs has been heard. It is important to have information that will help convince people of the expectations. Appropriate patience with the process, allowing people to work through the issues, and allow people to buy into the direction needed. Then invite operators' comments about the processes, what is working and what is not working, after a set period of trial and error. Then make adjustments to fix those issues (Connors & Smith, 2009).

"A positive and principled inspection is a thoughtful and planned activity with the following purpose: To assess the condition of how closely key expectations are being fulfilled, to ensure continued alignment, to provide needed support, to reinforce progress, and to promote learning, all in order to bring about the delivery of expected results" (Connors & Smith, 2009, p. 45).

Involvement

Another important element with standardizing any work environment is employee involvement. "Just as the wind brings a splendid sailboat to life, involvement animates the Toyota system. Involvement should be managed as intensely as production and quality" (Dennis, 2002, p.101). This will be crucial to writing accurate standard work instructions and then sustaining those instructions going forward. Employee involvement is something that is very sensitive and at times the most difficult aspect of any change. The only way to move towards standard work instructions and accountability is to walk through each part of the process ensuring that the skills needed are thought of optimistically, are foreseeable, and yield a positive outcome. This will assist in taking away frustration and confusion (Connors & Smith, 2009).

Holding people accountable fairly and in a positive way begins with forming expectations. There are many techniques that have been used to create and explain the process for setting goals and objectives, but it would be recommended to apply the FORM checklist(see table 2). The four main attributes of the FORM checklist include: Framable, Obtainable, Repeatable, and Measurable (Connor & Smith, 2009).

Table 2: Description of FORM attributes (Connor and Smith, 2009, Pg 44)

FORM CHECKLIST

F	RAMABLE	To ensure the expectation is consistent with the current vision, strategy, and business priorities.
O	BTAINABLE	To ensure the expectation is achievable in terms of current resource and capacity constraints all the way through the Expectations Chain.
R	ECPEATABLE	To ensure that the expectation is portable and can clearly be communicated through the Expectations Chain.
M	EASURABLE	To ensure that progress toward achieving the expectation can be tracked and that ultimate fulfillment of the expectation can be measured.

There are five basic principles to get people fully engaged, enrolled or involved. Those basic principles start with accountability. This may be accountability for following the change or accountability of the leadership to enforce the change. The second would be preparation for change. It is very important to keep people informed about what is coming prior to it beginning. The third would be to always start with the correct team. This team should be made up of top leaders that can communicate, implement and engage people in the change. The fourth is to be sure to have a process in place to ensure follow-up and compliance. Be sure this plan is something that can be sustained. The fifth and final principle is to be sure this is an open environment that people feel comfortable to come forward with ideas and feel they are being heard (Connors & Smith, 2011).

Team member involvement is the heart of lean production. Involvement develops the capability of our team members and improves our prospects for long-term success. Involvement

activities must be fair, hassle-free systems, and should satisfy both extrinsic and intrinsic motivators (Pascal, 2002). People and their ideas for improvement are close to the heart of lean production, but can also cause pain (Mann, 2010).

Training

Once the standard is figured out, communicate the direction the standards are heading towards and work with the operators for their support, and then train operators to that standard. It is not easy to identify training as the answer to the problem. This involves an elevated attentiveness about what is needed. People get into a comfort zone and fail to realize the pattern or practice they are following (Connors & Smith, 2009). To get the most out of training as a solution to unmet expectations, first make sure operators are ready for it. In order to get operators ready for the training, start with the FORM checklist, communication, and operator involvement. If operators understand how to make something happen, they will want to repeat that action.

In order to prepare for the training, answer the following "why" questions:

1. Why is it important?
2. Why me (and not someone else)?
3. Why now?
4. Why do it this way?
5. Why would I want to do this?

(Connors & Smith, 2009, p.159).

Continually revisit training and standards by involving new operators, reinforcing it with operators already involved and celebrating it with everyone involved. When the resolution is figured out that is the driving force, it can portray a convincing foundation for people to accept. People that will refuse to get onboard, but teaching or inspiring people to get onboard with the

direction is important. Training people to develop the skills and knowledge needed to recognize resolutions to improve will be crucial to a successful implementation. (Connors & Smith, 2009)

Culture

Culture is the last element involved in sustaining standardized work and lean production. Culture is the way operators or the organization thinks or acts. Simply stated, the organization can either be a culture that works together or divided. It is very important to figure out what type of culture the organization has, and then move that culture towards thinking and acting in a way to achieve needed results (Connors & Smith, 2011).

One of the most important parts of change is spending the time to change or move the focus of the culture. When implementing change, 20 % of the change includes rearranging the layout to improve the flow, creating pull signals instead of pushing product through, increasing the pace of production, visual tracking methodology, startup meetings, and standardizing the work at each station. 80% of the change is getting the culture to adapt to lean thinking and methodology. This would include changing the ingrained work habits, the day-to-day or hour-by-hour routines and the way everyone looks at a problem, production and work. This is what is referred to as "breaking" the habit (Mann, 2010). The most important change during cultural transition is to emphasize accountability (Connors & Smith, 2011).

An organization's culture plays a very large role in change and accountability. Even inspiring individuals that take great pride in their job can find some organizational cultures discouraging that inhibits them from delivering the wanted results (Connors & Smith, 2009).

Operators that work in a culture of accountability feel a strong sense of organizational integrity. There are three main values at the core of sustaining an atmosphere where optimistic or constructive accountability can survive. Those values are crucial to creating a culture of accountability of actual work. Without those values organizational reliability wears down and

eventually disappears. The three values that put accountability into action are: follow through, get real, and speak up. Follow through means "do what you say you will do"; get real means to "get to the truth"; and speak up means to "say what needs to be said." Each of the values is a necessary part of organizational reliability (Connors & Smith, 2009).

People management is a company-wide effort and there are six fundamental practices that you may want to follow to assist in managing people well. Below is a description of those practices from Jack Welch (2005):

People Management Practices:

1. Elevate HR to a position of power and primacy in the organization, and make sure HR people have the special qualities to help managers build leaders and careers. In fact, the best HR types are pastors and parents in the same package.
2. Use a rigorous, non-bureaucratic evaluation system.
3. Create effective mechanisms – read: money, recognition, and training – to motivate and retain.
4. Face straight into charged relationships – with unions, stars, sliders, and disrupters.
5. Fight gravity, and instead of taking the middle 70% for granted, treat them like the heart and soul of the organization.
6. Design the organizational chart to be as flat as possible, with blindingly clear reporting relationships and responsibilities.

One last area of culture that must be considered is toxic personalities. A toxic personality is someone that is harmful to group through negative actions. Most toxic individuals can get under our skin, de-motivate teams, sap our energies or make everyone doubt their competency and productivity. This could include rumors or negative comments, or otherwise known as "someone that stirs the pot." These types of personalities truly are toxic to an organization

especially when it comes to culture and change. There are four definite ways for working with a toxic person. The four strategies are: targeted feedback, performance appraisals, coaching and termination. Any one or blend of these strategies will assist in decreasing the likelihood that toxicity will spread beyond the situation at hand. This will assist in the immunization of the organization, teams, and coworkers against further toxic threat (Kusy & Holloway, 2009). Prepare ourselves for these individuals. Prepare not by generalizing or using judgmental language. Complete a one on one discussion with the individual describing why the behavior is a problem, let that person give feedback, and get them to agree to the problem. Collaboratively deciding on a resolution to the problem should be agreed on and made the norm going forward. It is important to follow-up with toxic individuals on the collaborative resolution, specifically focusing on how they are doing or how they can improve. There should be clear steps on what is needed to improve, and if the individual fails, the consequences for that failure is termination as last resort.

Summary

The literature review exposed the importance of lean manufacturing, standardized work, and the steps needed to successfully implement and sustain the change. Lean manufacturing is the process of eliminating waste, and standardize work instructions is the beginning of working towards lean. Communication is the key to employee involvement and accountability. Lean manufacturing combined with training to the standards will ensure the standards are sustained. Culture change is the most difficult element of lean manufacturing, but is the best way to achieve needed results. The literature review discusses lean and standardized work as a multi-step process that requires involvement from the entire organization that will optimize manpower, machinery, material, and method. The literature review provided the information needed to move into the methodology for pursuing the project. This project was completed using the

Mercury Lean Six Sigma process. The purpose of the Lean Six Sigma process is to improve business performance, turn activity into results, and improve everything touched. In a business process this is completed by eliminating non value adds activities, improving quality, and an overall increase in customer satisfaction.

Chapter III: Methodology

The goal of this project was to effectively manage the materials department at Mercury Marine in plant fifteen. Standard work instructions would provide a base for which adjustments, re-staffing, training, discipline, and lean activities would begin. The areas examined were lean manufacturing tools and activities, standardized work instructions, communication, involvement, training, and culture. All of these were important areas to research to establish methods for reducing non-value added wastes, set the standard, getting everyone onboard, and implementing and sustaining the change. The project was completed using Mercury's Lean Six Sigma methods.

Six Sigma

Six Sigma reduces waste and inefficiency and improves a company's products and processes so that customers get what they ordered, on time, and within the time frame set forth by company goals (Welch, 2005). To survive in the marketplace, it is imperative to understand the delivering constant high quality products and service is important. The interest in six sigma is related to the appeal of only three defects per million products produced. Six sigma created the consciousness that producing high quality was a must (Liker & Meier, 2006). As stated earlier, a standard work instruction is a start to eliminating waste. The first part of setting the standard was figuring out what type of skills and capabilities are in your workforce (Gross, 2009). This started with getting a clear understanding of what skills and knowledge are available to create a base. Next use the power of employee involvement to successfully implement any change. The last action taken was following through. In order to get results with any standard, first transform the power of accountability. Accountability for outcome is the center of continuous improvement, innovation, customer satisfaction, team performance, talent development, and corporate governance movements (Hickman, Smith, & Connors, 2004).

"Accountability: A personal choice to rise above one's circumstances and demonstrate the ownership necessary for achieving desired results – to see it, own it, solve it, and do it" (Hickman, Smith, & Connors, 2004, p. 17).

The data required to complete this field study project involved each employee in the materials department. It was essential to collect a list of job duties involved for each person in the department. The current job description was generated back in 1976 by the Human Resources department. This document was outdated and did not pertain to how the department was run or divided at the time of this study. It was used as a baseline for understanding what the general descriptions were when each position was created. The data was required from each individual regarding their daily tasks during normal operations, which was used as a baseline for writing the standardized work instructions.

The population that was involved in completing these standardized work instructions was the group of 34 hourly union employees within the Materials Department. Also involved in writing these instructions was the lean administrator of the materials department and the materials planning administrator.

Method

This project was completed using the Mercury Lean Six Sigma process. The purpose of the Lean Six Sigma process is to improve business performance, turn activity into results and improve everything touched. The definition of Lean Six Sigma within a business process is a methodology to eliminate unnecessary activities, reduce variation and improve process flow and quality, exceed customer satisfaction, and improve profitability (Brunswick Corporation, 2005). This project was completed through the DMAIC process, which stands for Define, Measure, Analyze, Improve, and Control according to each phase is equally important in completing the project and will be explained in detail.

Define Phase

The define stage works with the tools that assist in taking a look at the project from the top down, or forming the project around business perspectives, goals, and objectives. It is important to start with customer feedback and prioritize where our greatest opportunities of improvement are.

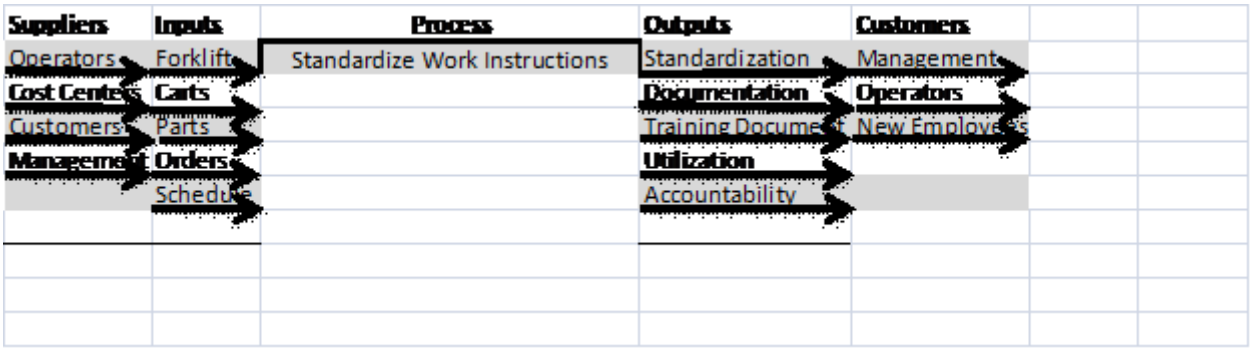
The project started out with creating a charter. During this time the following questions were answered:

1. What impact will this project have on the business?
2. What key business output measure will this project impact? How?
3. Has the problem been described?
4. What is in and out of scope?
5. What are your limitation and assumptions?
6. Who is your executive sponsor of this project?
7. Has this or a similar project been completed? Can we learn from that?
8. What is the goal for the project? Is that attainable?
9. Who is on your team?
10. How will team success be measured?
11. Have milestones been established?

Once the charter was completed, then a SIPOC diagram (Supplier, Input, Process, Output, Customer) was completed to ensure everyone agreed upon the process, and from there the cross-

functional team needed to move forward with the project. This was the first step towards improving or investigating a process. The suppliers included any individuals that provided input to the process. The inputs were any individuals or any items that provide specific requirements to the process, such as materials, people, equipment, policies, procedures, methods, or environment. The process is what the project focused on. The output involved any specific quality or performance desired from the process. The customers were anyone that the process affected, which included internal, external, or both types of customers. Figure 1 is the SIPOC diagram that pertained to this project.

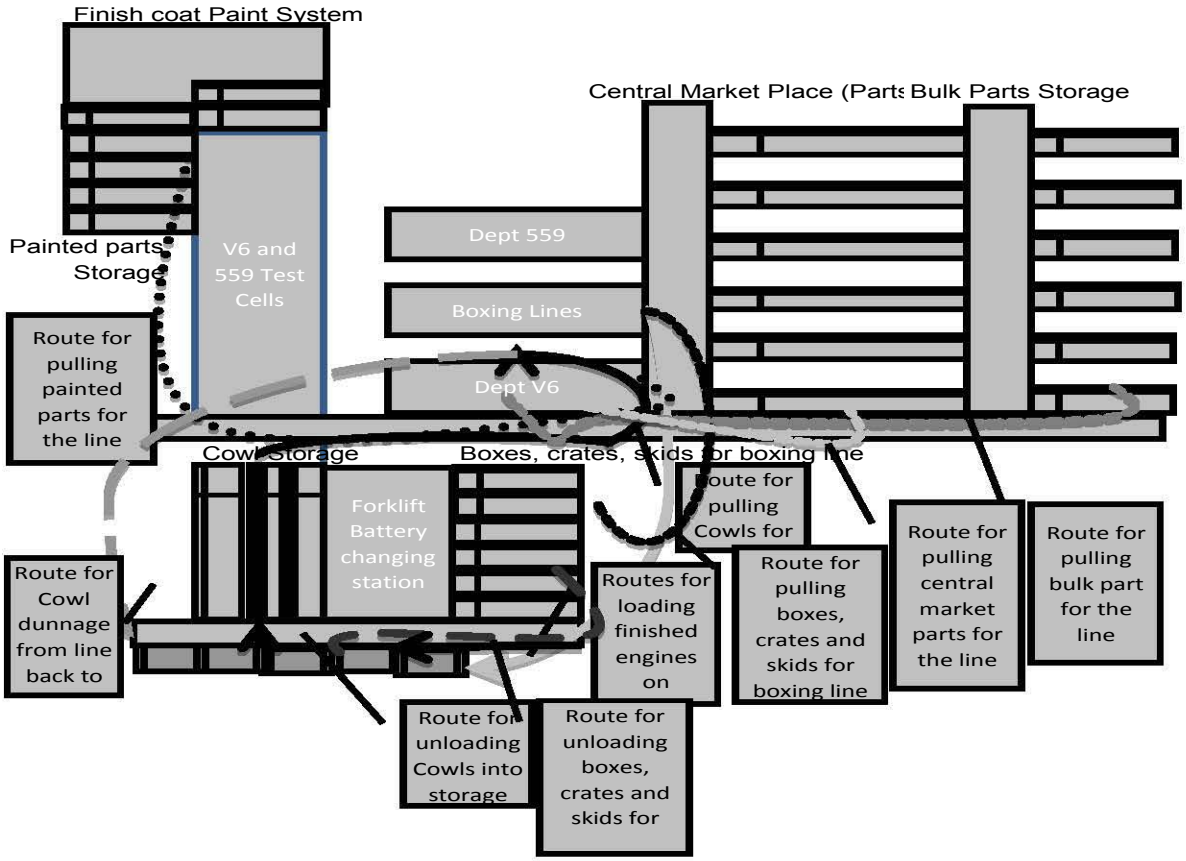
Figure 1: SIPOC of the materials department



Measure Phase

The Measure phase used tools to assess the current performance or process. This phase determined in detail, how the current process was doing. As discussed during the Define phase, it focused on the materials, people, equipment, policies, procedures, methods, or environment. This project completed a high level process flow map for each individual to determine overall physical distance and traffic pattern to complete the process.

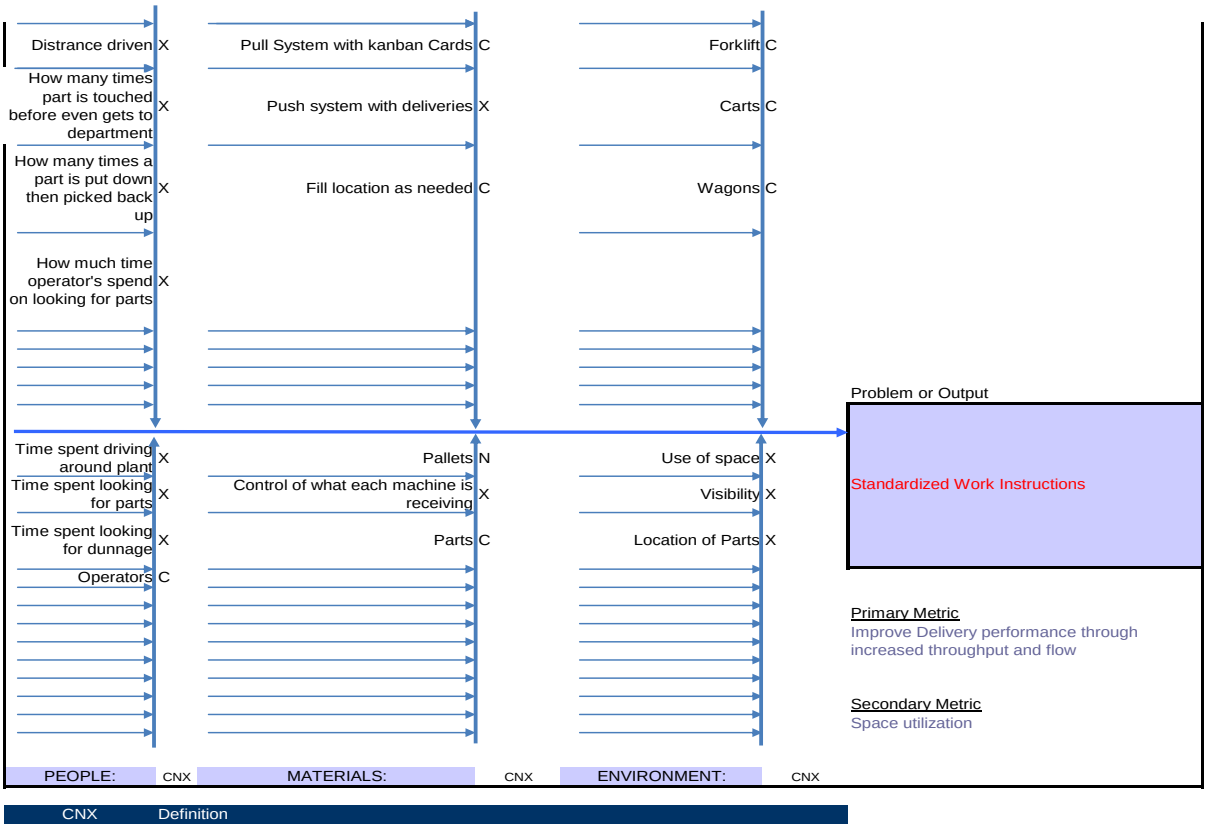
Figure 2: Example of Process Flow for forklift driver



Analyze Phase

The Analyze phase used tools to determine gaps in performance and goals. This was the root cause phase of the project. The results of this phase presented several opportunities for improvement. One of the tools used during this phase was a cause and effect diagram (fishbone diagram). The cause and effect diagram provided a list of measurements, methods, machines, people, materials, and environments. An analysis was completed and a decision was made as to which variables were noises (N), constants (C) or experimental (X). Then the X variables were experimented with to determine what effect each change would have on the output and to determine what the desired performance level was for each variable. Figure 3 is a cause and effect diagram that will indicate the areas in which experimenting took place.

Figure 3 cause and effect diagram of materials function:



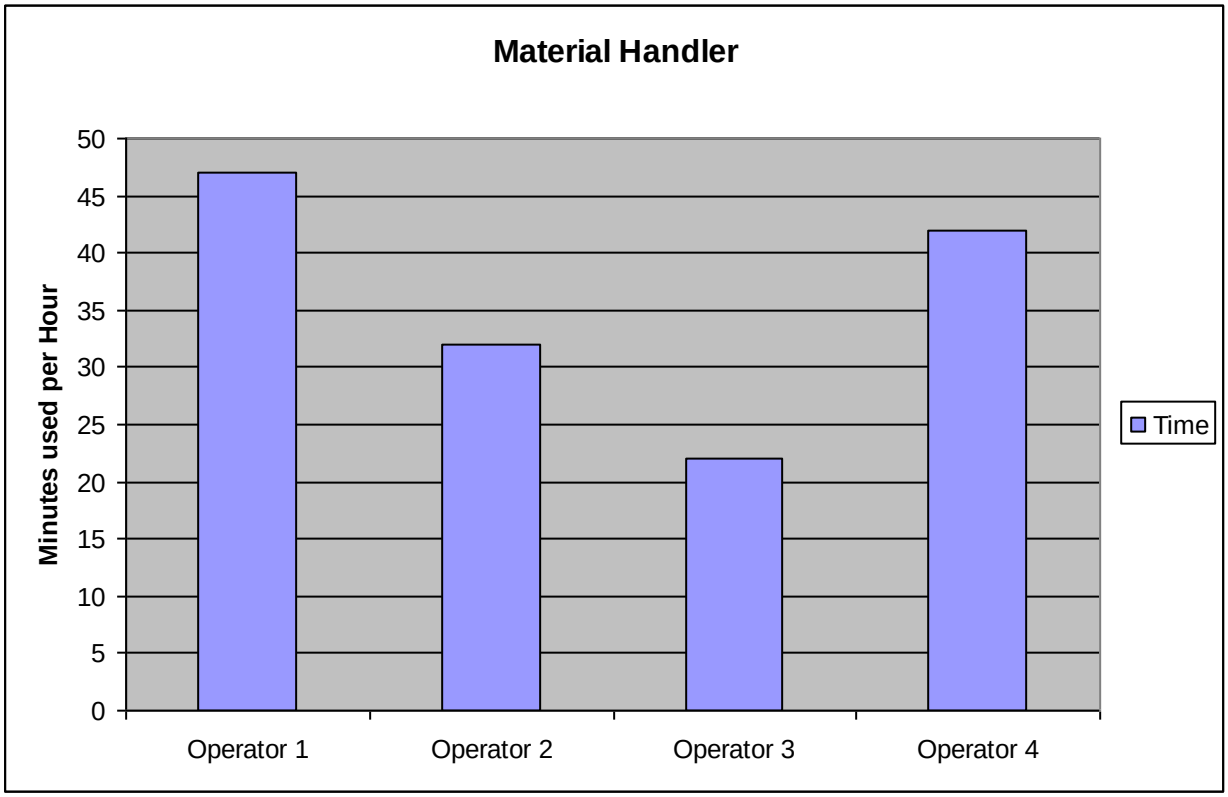
Improve Phase

The Improve phase used tools to identify and test proposed solutions to the problems. This phase was also used for collecting more data and further analyzed after completion. Once the data was collected, selection of the best possible solution and prediction of the new capabilities of the process was completed. The tools used for implementation and validation for improvements were also used during this phase. Cycle time or distance traveled were tools used during this project. There are three types of cycle times: operator cycle, equipment cycle, and processing cycle. Operator cycle time is the time for an operator to complete one cycle of their assigned tasks within the cell and return to start position. Equipment cycle time is the time for a piece of equipment to finish one complete cycle of its production task. Processing cycle time is the combined time required for the operator to load and start the equipment, the equipment cycle time, and the time for the operator to unload the finished part in preparation for the next cycle.

Cycle time is dependent on the operator and equipment capability, and is not related to the customer demand. However, if cycle time for every step in a process numerically equals the takt time, then it is possible for the process to be operated using a single piece flow strategy. Takt time can be used in conjunction with a load chart to balance tasks within a work cell. A load chart compares the cycle time of each operator to the takt time.

Each bar on the load chart represents the cycle time for an operator (see figure 4). The takt time could not be used for the project due to the labor agreement for indirect labor.

Figure 4: Load Chart completed on 4 materials operators:



The chart completed during the project assisted with leveling out utilization of time by each operator. The project also took into consideration the distance that each operator traveled.

Control Phase

The control phase included tools that were used to monitor the improved process and provide continuous evidence that the gains were sustained. Tools for implementing the plan to

hold those gains were also presented. Documentation of the standardized work instructions were also prepared and presented during the control phase (see appendix a). Standard work improves work efficiency by designing the best method to complete a work task, documenting the method and then training other operators doing the same work task to use the same method. The control Plan was also presented during the Control Phase (see appendix c).

Summary

A comprehensive design and implementation of standardized work instructions for the material department were vital for minimizing stress, downtime, waste, and ultimately loss of customers due to the product not getting completed in a timely fashion. Six Sigma is a very thorough system by which process improvements focused on optimizing the needs of the customer. Applications of lean activities, Six Sigma and standardization were utilized in order to eliminate waste, level the workloads, and fully utilize all staff. Standardization and Lean activities were adopted for this project to create a baseline for documentation and elimination of non-value added movements. Mercury Marine was running the Materials Department from past knowledge and assumptions which included the training program, staffing needs, accountability, standards, and adjustments.

The methodology addressed the steps involved with changing the previous process in place. The Mercury Lean Six Sigma program walked through each of the phases in completing a project to get to the root cause of the issues, and the best approach to address those causes. Next the results of the project will be covered showing each phase at the current state and a direction on implementation.

Chapter IV: Results

The purpose of this project was to effectively manage the Materials Department at Mercury Marine in plant fifteen. Standard work instructions provided a base for which adjustments, re-staffing, training, discipline and lean activities began. Standard work instructions also provided documentation of each position and the process involved with completing tasks on a daily basis. It focused on the task at hand, not the individual. The study provided lean activities to improve prior processes and eliminate non-value added activities. The baseline provided by standard work instructions produced information for which performance problems, errors, failures, downtime, missing parts or missing processes can be captured. The completed documentation established accountability for sustaining this process on a persistent basis. It also provided information for root cause analysis on issues caused by the materials departments. Operational metrics, direction, and a response system opened communication with the department and individual operators. The feedback loop provided an avenue for suggestions, input for fixes, and sustainability for a lean environment and activities happened. The direction of the project moved the Materials Department towards a lean manufacturing environment, lean activities, and ultimately a lean culture.

Results: Define Stage

The define stage established communication, direction, scope, goals, roles and responsibilities. The focus was the tasks involved in each of the operator's daily routines. There were eleven questions that were covered during the define phase to assist with creating the project charter. The first question: "What impact will this project have on the business?" The projects impact on the business was setting up standards for training the new temporary workforce that Mercury was now moving toward. This was negotiated in the last labor agreement with the union to assist in filling in gaps during the peak seasons. The second

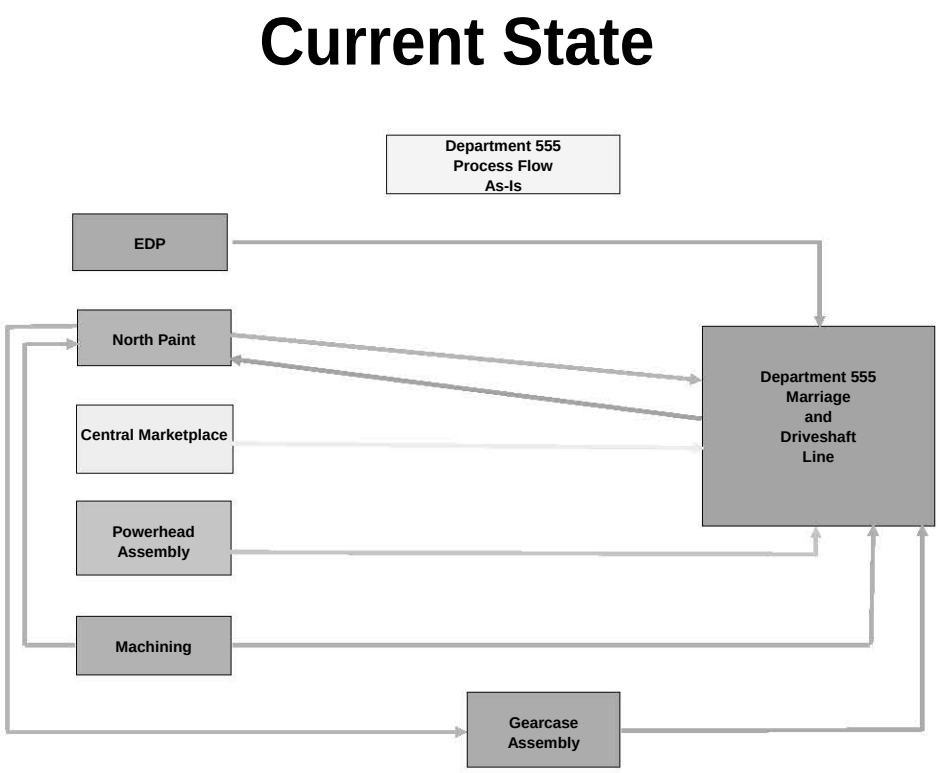
question: “What key business output measure will this project impact? How?” There were many different areas affected by this project, but the key business output measure impacted by the project was fill rate improvement. The third question: “Has the problem been described?” The problem dealt with the difficulties in effectively managing staffing, adjustments, training or discipline without standardized work instructions. Another issue this project addressed was the roles and responsibilities of a Support Tech II job classification. All of the roles that fall within this classification were listed under one job description. There were unique characteristics and tasks to each of the positions in the materials department, and without standardization these characteristics and tasks are not adequately controlled. The fourth question: “What is in and out of scope?” The scope included any material handler within department 614 and any other departments were out of scope. The fifth question: “What are your limitations and assumptions?” The limitations to the project included changes to the actual department and implementation were limited due to resources, time, and negotiation of the labor agreement with the union. The project assumed that the staffing levels were not adequate and that temporary staffing would be added in the near future. The project also assumed that the changes made in the past were not adequate. The sixth question: “Who is your executive sponsor for this project?” The sponsor for this project was the Materials Manager. The seventh question: “Has this or a similar project been completed? Can we learn from that?” There were similar projects completed in the past with line side delivery and assembly lines. The eighth question: “What is the goal for the project? Is that attainable?” The goal of the project was to develop standardized work instructions for job responsibilities and tasks in order to create controls to serve as basis for training, accountability, re-staffing, make adjustments and lean initiative. This was an attainable goal. The ninth question: “Who is on your team?” The team members consisted of the Materials Administrator, the Materials Engineer, the Materials Manager, and all of the Materials Operators. The tenth

question: How will team success be measured? The team success will be measured by downtime savings and operator utilization. The eleventh question: "Have milestones been established?" The milestones of this project were established by the due dates for each phase of the DMAIC process being Define, Measure, Analyze, Improve, and Control. Each of these phases were completed in the Mercury LSS workbook and then uploaded to the Power steering website for approval. Approval by the champion, sponsor, job owner, and LSS black belt was required in order to move the project into the next phase towards completion. The completed project charter was developed (see charter in appendix d).

Results: Measure Phase and Analysis Phase

The results of the measure and analyze phases took four months to complete. The first step was to understand what each operator had for individual tasks in their daily routines. This phase involved studies completed on each of the operators along with traffic patterns of those operators. There were operators with half the number of tasks of others, and operators that were driving double the distance of others. The downtime was measured for one of the departments for material handling issues. The results of this study were significant in the justification for this project. One department had 6055 minutes of lost time in a four month time frame. This information provided a clear picture to the problem and gave the team a clear direction for the improvements needed in operator utilization, flow and training. The measure and analysis phases did establish that the work was not evenly distributed between operators. This resulted in operator frustration and possible down time due to time or distance constraints. The tasks lists completed along with the high level process flow maps did confirm that changes were needed in work levels and tasks for each of the operators. One example of the movement involved for one department was completed in this process flow.

Figure 5: Current state process flow for material movement in dept 666:

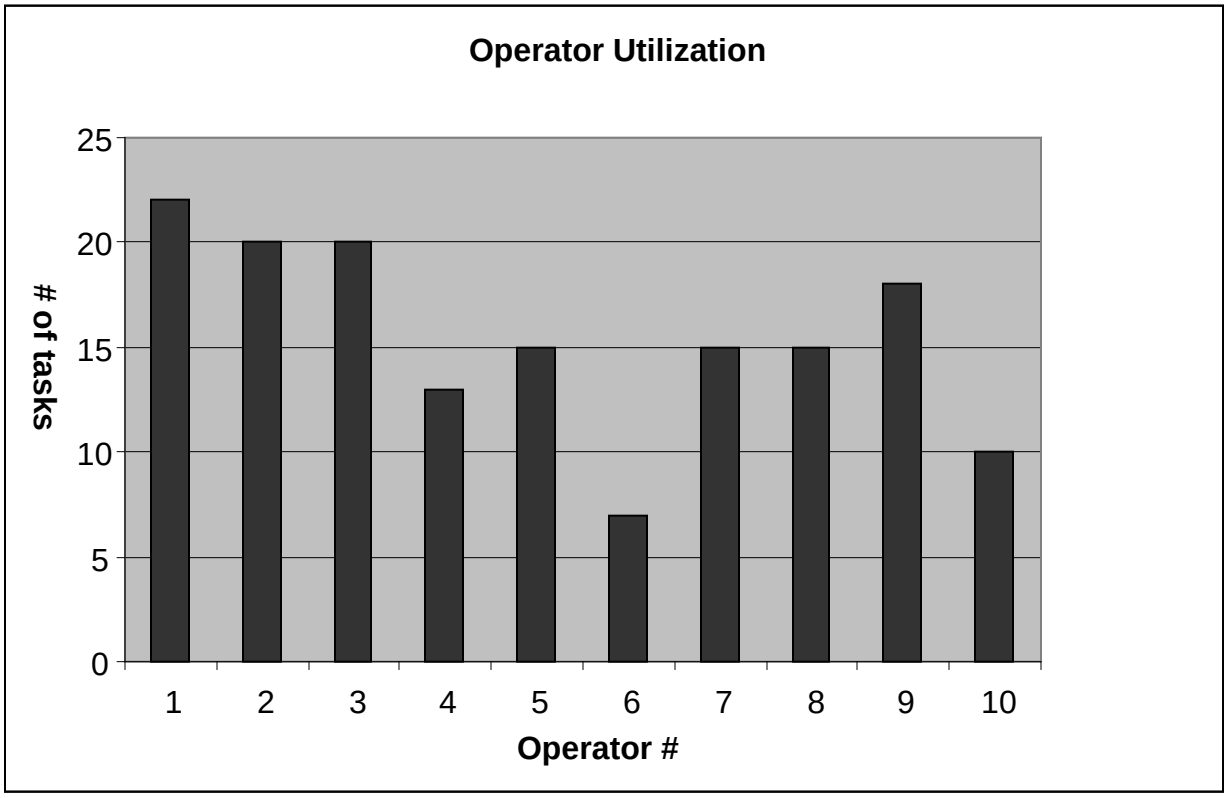


The analyze phase involved experimenting with some of the variables in the cause and effect diagram. One result from this experiment was to move some of the market areas closer to point of use. This reduced the time and distance driven by some of the operators. This assisted in taking some of the outside variables out of the picture, so during the improve phase the focus would be on re-establishing operator tasks and work levels.

Result: Improve Phase

The result of all of the information was then compiled into a spreadsheet to show number of tasks per operator and cycle time per operator.

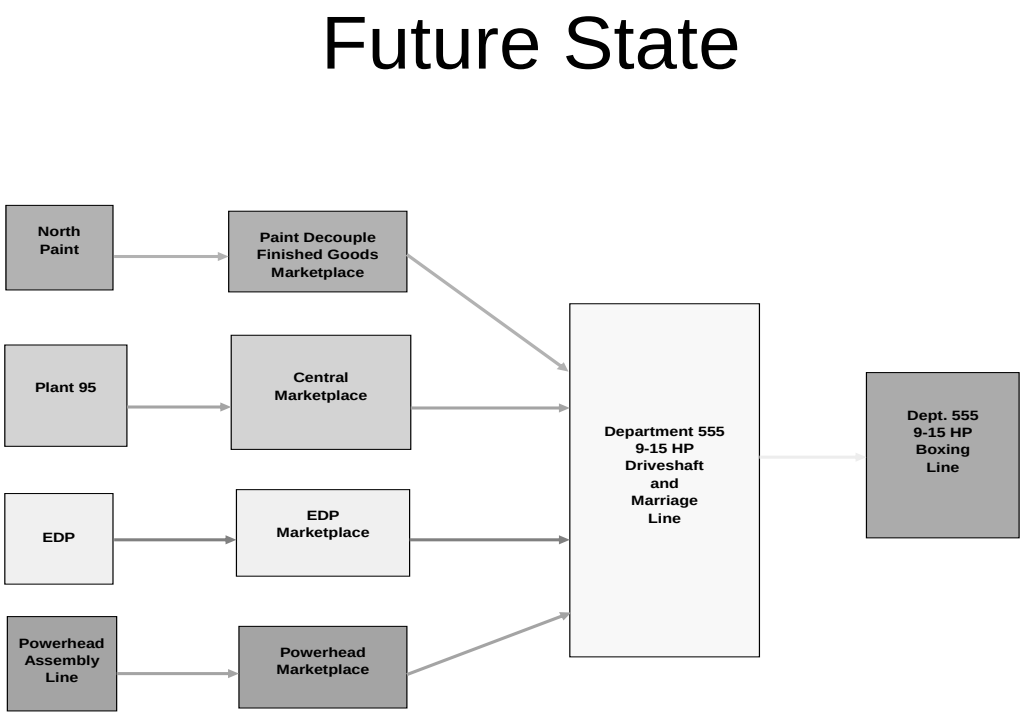
Figure 6: Operator Utilization chart for number of tasks:



The information in figure 6 established that operator 6 had 7 tasks, but operator 1 had 22 tasks. Each of the operators ended up with around 15 tasks each. The amount of time was considered during the project, but due to labor agreements could not be used for operator utilization for an indirect department. The opportunity to include cycle time and takt time for standardized work for indirect labor may want to be considered in the future when the next labor agreement contract is negotiated.

Also taken into consideration were the distances that each operator drove in order to complete each task. This resulted in leveling out operator work loads in order to establish an even flow through the plant with material. It also reduced amount of stock outs or down time for the production lines. The same department logged downtime and the changes resulted in a fifty percent improvement.

Figure 7: Future state process flow for material flow in department 666:



The final phase of the project was to write out Standardized Work Instructions for each of the operators. A final review of these work instructions was conducted on a one on one basis with the operator for understanding and training purposes. An example of the standardized work instruction is shown in appendix A.

Results: Control Phase and Implementation

The Control Phase established the owner of this process along with the tasks required by the owner in order to keep the project in control. Controls would consist of the Materials Supervisor adjusting or updating assignments as tasks get added to operators. The Materials

Manager would audit this by a sign off required on each audit or revision as the changes were made. Controls and change would be an on-going process (see appendix C for example).

Also developed during this phase was a feedback loop. This loop included a form that could be filled out and turned into the Materials Supervisor asking this person to look at their standardize work instruction, to update for tasks added to that operator, suggested changes, or add, delete or change general job tasks as they are assigned. An example of this form is shown in appendix B. It was important to keep this means of communication open for operators to feel involved in establishing or changing their assigned areas.

The results of this project were not fully implemented due to time constraints and relocation to another Plant. The implementation in full is planned for the near future with the current business owner.

Summary

The result of this project was to effectively manage the materials department at Mercury Marine in plant 15. Standard work instructions provided a base for which adjustments, re-staffing, training, discipline and lean activities would begin. Standard work instructions also provided documentation of each position and the process involved with completing tasks on a daily basis. This project established that operator work loads were not level or equal, resulting in the need for shift of tasks between operators. The numbers of tasks completed by each operator prior to the project were from as little as 6 to as many as 22. The results for this project leveled the work loads out to around 15 tasks per operator. The amount of down time before the project for one line was 6055 minutes in four months, and was half of this after the project. Communications and an established method for feedback were completed. The projects objectives, information, and the control plan were transferred to the new process owner. The implementation in full will be completed in the near future by the new process owner.

Chapter V: Discussion

The purpose of this project was to effectively manage the materials department at Mercury Marine in plant fifteen. Standard work instructions provided a base for which adjustments, re-staffing, training, discipline and lean activities would begin. Standard work instructions provided documentation of each position and the process involved with completing tasks on a daily basis. The previous methodology used for adjusting, staffing, training, discipline and lean activities was by knowledge of the operators and guessing which tasks were assigned to with operators. The study provided lean activities to improve prior processes and eliminate non-value added activities. The baseline provided by standard work instructions would produce information for which performance problems, errors, failures, downtime, missing parts or missing processes can be captured. Once the documentation was completed, then accountability for sustaining this process on a persistent basis was established. Supervisors would have feedback and data on flow interruptions and operator utilization.

Chapter I explained the need for standardized work instructions for the Plant Fifteen materials department. The purpose of this discussion was due to the difficulty in effectively managed staffing, adjustments, training or discipline without standard work instructions. The lack of documentation of the materials processes caused issues with utilization of staffing and elimination of non-value add actions. Accountability was difficult without a standard process or documentation.

Chapter II literary content exposed the importance of lean manufacturing, standardized work, and the steps needed to successfully implement and sustain the change. Lean manufacturing is the process of eliminating waste, and standardize work instructions is the beginning of working towards lean. Involvement is the heart of lean manufacturing, in addition

to training to the standards will ensure the standards are sustained. Culture change is the most difficult element of lean manufacturing, but is the way to achieve needed results.

Chapter III outlined the processes used to complete the project. The project was completed using the Mercury Lean Six Sigma methodology. This endeavor was completed using the Define, Measure, Analyze, Improve, and Control (DMAIC) process. The implementation of standardized work instructions for the material department were vital for minimizing stress, more downtime, more waste, and ultimately loss of customers due to product not getting completed in a timely fashion.

Chapter IV outlined the results which indicated the reduction of 6055 minutes of down time in four months by 50%. The result of this project was to effectively manage the materials department at Mercury Marine in plant fifteen. Standard work instructions provided a base for which adjustments, re-staffing, training, discipline and lean activities would begin. Standard work instructions also provided documentation of each position and the process involved with completing tasks on a daily basis. The project established that operator work loads were not level or equal, resulting in the need for shift of tasks between operators. Communications and an established method for feedback were completed.

Limitations

The limitation of the study concerns the implementation of the lean practices and the standard work instructions. The study only focused on Mercury Marine's Plant 15 Materials Department. The changes to the actual department and implementation were limited due to resources, time and negotiation of the labor agreement with the union.

Changes to the daily tasks or removal of non-value added steps were not part of this project. The materials operators were not trained to the standard nor was the staffing adjusted. The limitation to adjusting the staffing was also due to assigned areas of the plant.

The project did not attempt to change staffing levels or move tasks between operators because of time constraints. A time study of the operator's specific tasks was not performed due to being indirect labor and labor agreement with the union.

The information collected for this project was limited to the time during the project and was passed to the next Supervisor for use. The project results were limited due to being moved to another Plant and not fully implemented prior to that move.

Conclusions

The literature review explained key elements needed in order to fully understand and complete this project on standardized work instructions. The major areas covered were an understanding of lean manufacturing. This was vital to the project due to standardization being one of the first steps in moving towards becoming a lean environment. It was also important due to establishing a background and basic understanding for communication with operators and everyone on the team on importance in moving the materials department in the direction of lean manufacturing. Also covered during the literature review were communication, involvement, and culture. These major areas were crucial to the projects success. The culture of the materials department has never focused on standardization or lean manufacturing; keeping operators involved and communication were significant in the project. Established standardized work and training new operators to this standard are essential for the project to work properly. Implementation strategy is critical to get the operators buy in and acceptance for moving forward in this project.

Recommendations

Once the basic standardized work instructions is fully implemented and working to its full potential, next phase of this project would be to work to reduce takt times, cycle times, and process times to each of the tasks for each of the operators. This would provide a precise

analysis for work flow and operator utilization. This would also set a baseline for working towards improved material movement into the plant. This initiative can be used to develop each of the departments in completing all tasks the same. Communication is the key to employee involvement and accountability. Operator involvement is a vital part of lean manufacturing and training to the standards will ensure the standards are sustained. Changing the culture is the most difficult task involved any project, but is one of the most important for lean manufacturing.

Holding people accountable fairly and in a positive way begins with forming expectations. It is vital to be very open with ground rules and consequences for not following these standards, stressing the importance of coming forward using the feedback loop for issues or tasks that are not working. Close the discussion with appreciation for each of the operators help and support during this implementation.

Another element of lean manufacturing is "gemba" walks. Basically, a gemba walk is simply going to the place where action is happening, looking at the processes, and talking to the people. This is very important for multiple reasons. First is accountability, which means the presence of leadership, promotes self accountability. The second is that to truly understand the processes, you must see the action. The last reason is that talking to the people who are performing these actions gives operators an opportunity to discuss what is working, what is not working, and offer improvement ideas.

Lean processes and performance work towards improvements in lead times, decreasing lot sizes, and improving reliability while increasing flexibility and yielding consistent results. Most prescriptions for lean production are missing a critical ingredient: a lean management system to sustain it. A lean management system consists of the discipline, daily practices, and tools you need to establish and maintain a persistent, intensive focus on process. It is the process focus that sustains and extends lean implementations.

The process of improvement means to always be looking for better ways of doing things. In order to stay competitive, it is important to always stay on the path of continuous improvement. Consistency is crucial when change or standards are involved. This will be important as the company moves forward with lean activities.

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Appendix A: Example of Standardized Work Instruction:

MERCURY

WORK STANDARD

PRODUCT	All
AREA / DEPT	554
MACHINE NO.	N/A
OPERATION NAME	**EDP Driver (s)**

DATE	SHEET NO.	1 of 1
PREPARED BY	Olivia Ruggles	
APPROVED BY	DEPT.	DATE
Olivia Ruggles	614	4/7/2010

#	WORK ELEMENTS	KEY POINT	SKETCH , DRAWING or PHOTO
1	Bring raw material from EDP/Plant 17 Stockroom		
2	Bring raw material from Machining		
3	Stages EDP material on floor for operators		
4	Stages IRR material on corner		
5	Attaches PI cards to raw material		
6	Decides from kanban board/cards which parts are needed		
7	Places IRR raw material on loadbars in corral		
8	Unloads IRR from back of EDP machine		
9	Brings empty baskets to floor operators when needed		
10	Puts finished product in finished markets		
11	Pulls parts from finished market for PW cards		
12	Attaches PW cards to load and loads parts on train		
13	Returns PI kanban cards to the appropriate rack/area		
14	Delivers finished service parts to appropriate shipping dock		

Training Required:

	Y/N
Fork Lift License	Y
Hazmat	
Safety / Ego	Y
PIMS	N
FTZ / C-TPAT	N
Standard work	Y
Kanban	Y

Equipment Required:

Tow motor	
PPE	Safety shoes, glasses and ear plugs

15	Reports shortages to planner as necessary		Radio
16	Dumps cardboard for Dept 554		
17	Recycles cardboard in baler		
18	Breakdown large cardboard boxes		
19	Removes unneeded dunnage from area		
20	Removes unused raw parts, and puts back in stock area		
21	Runs HOT parts to Depts as needed		
22	Misc other tasks when needed		

Appendix B: Example of the Feedback Loop Form:

Materials Feedback Form

Department you are assigned to: _____

Task # in question _____

Change needed with task _____

_____

_____

Does a task need to be added _____

Describe the task _____

_____

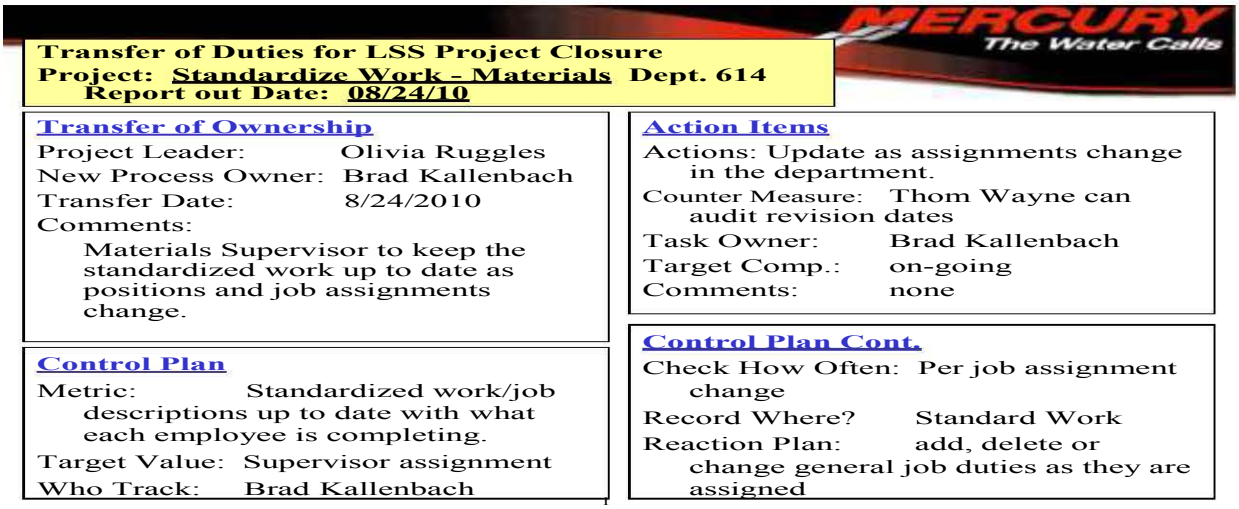
_____

Comments _____

_____

_____

Appendix C: Control Plan for Standardized Work Instruction for Materials:

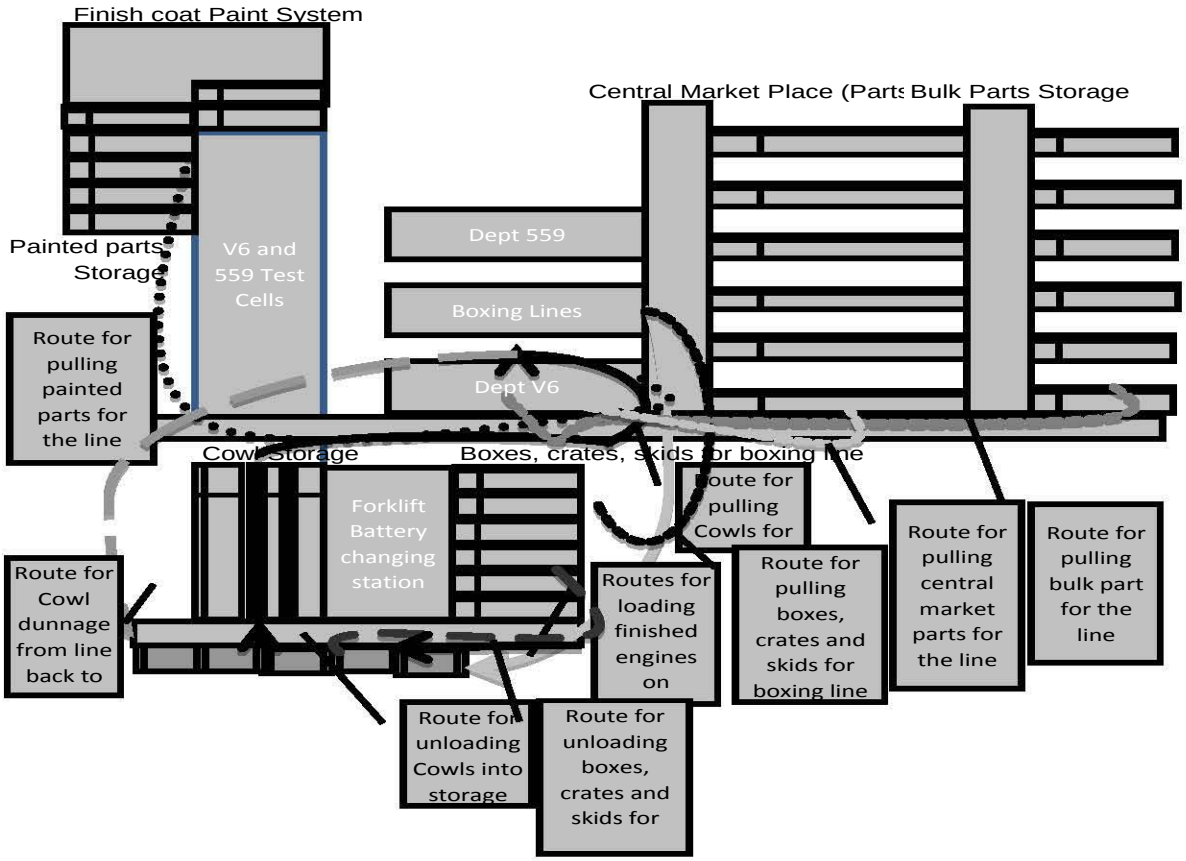


Appendix D: Project Charter for Materials Department:

Project Name	Standard Work for Dept 614	**Champion**	Thom Wayne
Project Leader	Olivia Ruggles	**Sponsor**	Thom Wayne
Financial Rep	Phillip Haan	**Revision Date**	June 25, 2012
Problem Statement	Roles and Responsibilities inside the Support Tech 2 job classification are not clearly defined. All roles are listed within one job description while each role has some unique characteristics. Without standardization these characteristics are not adequately controlled.		
Project Objectives	Develop a system to document job responsibilities and controls to serve as the basis for Job ownership, training, and development		
Scope	Dept 614 Employees	**Out of Scope**	All other Depts.
Project Metrics			
Primary Metric	Earned Hrs/Materials Att Hrs	**Secondary Metric**	
Current	4.68	**Current**	
Goal	5	**Goal**	
Financial Estimates			
Primary Metric	Earned Hrs/Materials Att Hrs	**Secondary Metric**	0
Financial Category	Labor Redeployment	**Financial Category**	
Net Level 1		**Net Level 1**	
Net Level 2		**Net Level 2**	
Net Level 3		**Net Level 3**	
Estimated Phase Completion Dates		**Other Project Benefits**	

Start Date	June 25, 2012	This project serves as the baseline for improvement. It is essential to the deployment of supplemental workers as well as the redistributing of work.
Define	July 2, 2012	
Measure	July 23, 2012	
Analyze	August 22, 2012	
Improve	September 21, 2012	
Control	September 23, 2012	

Figure 2: Example of Process Flow for forklift driver



Analyze Phase

The Analyze phase used tools to determine gaps in performance and goals. This was the root cause phase of the project. The results of this phase presented several opportunities for improvement. One of the tools used during this phase was a cause and effect diagram (fishbone diagram). The cause and effect diagram provided a list of measurements, methods, machines, people, materials, and environments. An analysis was completed and a decision was made as to which variables were noises (N), constants (C) or experimental (X). Then the X variables were experimented with to determine what effect each change would have on the output and to determine what the desired performance level was for each variable. Figure 3 is a cause and effect diagram that will indicate the areas in which experimenting took place.