Enhancing Safety and Efficiency with Loading Room Scale Equipment

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Abstract

This paper presents a comprehensive analysis aimed at enhancing safety and efficiency in manufacturing processes, particularly those involving hazardous materials. Using the DMAIC methodology, the study identified safety concerns and inefficiencies in the current process at a manufacturing facility. Insights from process flow diagrams, time studies and PQ analysis revealed areas for improvement in safety protocols and workflow. Implementing Loading Room Scale equipment emerged as a key solution, promising significant reductions in cycle time and labor costs. The findings underscore the importance of workplace safety policies and ongoing efforts to ensure a safe working environment.

Introduction

The imperative to enhance safety protocols, primarily by minimizing exposure to hazardous materials, serves as the driving force behind the project. Simultaneously, there is a concerted effort to optimize operational efficiency. This involves refining cycle times and labor standards to mitigate potential risks associated with handling and transporting hazardous materials. Moreover, the implementation of a rigorous inspection process aims to reduce the occurrence of false notifications of escape, thus reinforcing overall safety measures within the manufacturing facility.

Literature Review

Safety is crucial in manufacturing processes involving hazardous materials. Previous studies and literature, including the DOD Contractor's Safety Manual, underscore the critical importance of limiting personnel exposure to these hazardous materials to ensure safe and efficient operations [1]. Common safety hazards in such environments include exposure risks to operators and the potential for accidents, which can significantly impact manufacturing operations. These hazards necessitate rigorous safety protocols and procedures to minimize risks and protect personnel and facilities. In the pursuit of manufacturing efficiency, Lean Manufacturing principles play a pivotal role, focusing on waste elimination and process optimization. A core tenet involves minimizing unnecessary transportation, as excessive movement of materials and products can introduce inefficiencies and escalate costs. This aligns with the project's goal of reducing the need for transporting parts within the facility, facilitated by Lean methodologies like single-piece flow. By prioritizing waste elimination, quality improvement, lead time reduction, and expense limitation, organizations can optimize efficiency and deliver enhanced value to customers [2].

Analysis Approach

The analysis comprehensively evaluated the safety and efficiency of the manufacturing process within the facility using the DMAIC methodology. Its primary focus was to identify and address any shortcomings or areas for enhancement. This included assessing procedures, inspection methods, quality control measures, and overall workflow. Clear objectives were set, such as minimizing exposure to hazardous materials and optimizing operational efficiency, aiming to provide valuable insights for improving safety protocols and streamlining processes. Data collection methods, including process mapping and statistical analysis, were utilized to gain a thorough understanding of existing protocols and identify enhancement opportunities.

To initiate the project, the first major task involved conducting a thorough review of existing safety protocols and procedures within the manufacturing process. This comprehensive assessment aimed to identify any potential weaknesses or areas for improvement. By employing methods such as process mapping, Gemba walks, spaghetti diagram, the project team gained insights into operational practices and identified opportunities to enhance safety standards. Additionally, this task involved evaluating the utilization of resources and employees during operations to understand the current workflow and identify any inefficiencies or bottlenecks. Through the systematic application of these methods, the project laid the foundation for implementing targeted improvements that prioritized safety and efficiency in the manufacturing environment.

The methodology employed a range of techniques to enhance process efficiency. Detailed time studies gauged task durations, pinpointing areas with potential for improvement. PQ Analysis (Figure 1) identified parts frequently inspected, allowing focused examination of inspection times. Then, labor standards were established by cross-referencing findings with hours logged by the inspectors (Table 1). This systematic approach facilitated a thorough grasp of the process, guiding informed adjustments for smoother operations.

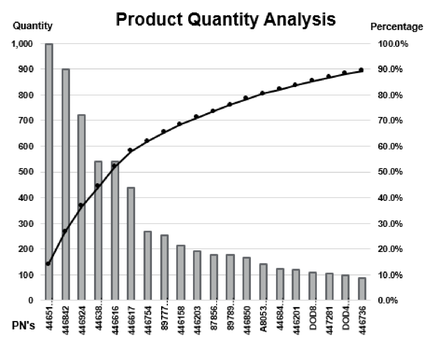

Figure 1
PQ Analysis Graph

Table 1
Inspectors Hours Labor Charged

Inspectors Labor charge (Aug 23' - April 24')			
Orders	**Total hrs**	**Avg hrs**	**Avg min**
104	138	1.33	80

Results and Discussion

The process flow analysis revealed significant inefficiencies in the current process, aligning with Lean Manufacturing principles. Key findings indicate unnecessary transportation of parts to and from the inspection area, leading to wasted time and resources.

Figure 2
Current and Future State Spaghetti Diagram

Concurrently, time studies revealed inefficiencies in the process, with personnel spending significant time on parts transportation. Additionally, examination of inspection data highlighted the substantial labor required for each order. An analysis of the current labor hours worked was conducted.

Table 2
Inspection Process

Inspection Process				
Operations	**Personell**	**Minutes**	**Total Min**	**Total Hrs**
Delivery	2	15	30	0.5
First Inspection	1	80	80	1.3
Pickup	2	15	30	0.5
Rotation	1	30	30	0.5
Delivery	2	15	30	0.5
Second Inspection	1	80	80	1.3
Pickup	2	15	30	0.5
Final Inspection	1	30	30	0.5
Total			340	5.66

To understand the potential impact of the new Loading Room scale equipment, an analysis of the current labor hours worked was conducted. The following calculations illustrate the expected improvements in efficiency and reduction in cycle time with the new equipment. Previously, each order required 5.66 labor hours at a cost of $850, totaling $25,500 monthly for 30 orders. The new process reduced labor to 0.5 hours per order at $150 per hour, resulting in $75 per order and $2,250 monthly. This change achieved approximately 90% labor cost reduction, from $25,500 to $2,250 per month. After careful calculations, it is evident that the anticipated time for completing one order of cups using the new scale equipment is approximately 0.5 hours. In contrast, the current process, necessitates approximately 5.66 hours, as depicted in Table 2. This substantial reduction in cycle time signifies a noteworthy enhancement in efficiency, estimated at around 91%.

Conclusions

In conclusion, the project has made substantial strides towards enhancing safety and efficiency through the integration of Loading Room Scale equipment. The endeavor has been underscored by a commitment to saving lives through safety risk reduction, aligning with minimizing exposure to hazardous materials and reducing cycle time by over 90%. By minimizing transportation exposure and enhancing inspection steps, particularly in mitigating risks associated with notification of escape (NOE), the project has prioritized safeguarding lives. Moreover, the emphasis on critical to quality (CTQ) operations, notably in the process, demonstrates a dedication to ensuring product integrity and mitigating operational risks.

Future Work

Moving forward, the project's findings extend beyond immediate implications, emphasizing the importance of organizational protocols to further optimize safety and efficiency. Future work will focus on exploring additional safety measures and continuing research efforts to enhance the effectiveness of Loading Room Scale equipment, ensuring sustained evolution and improvement in the manufacturing landscape. Through systematic analysis and strategic implementation, the project has laid a solid foundation for ongoing improvement initiatives, reinforcing the commitment to safety, efficiency, and sustainability in manufacturing operations.

References

[1] Department of Defense. (2008, March 13). DOD Contractor's Safety Manual [Website]. Available: http://www.epa.gov/sites/default/files/2015-02/documents/2008_dod_contractor_safety_manual_for_ammunition_and_explosives_dod_4145.26-m.pdf.

[2] ASCM. (n.d.). What is lean manufacturing? [Website] Available: http://www.ascm.org/topics/lean-manufacturing/.