Decreasing the throughput times of products in an engine overhaul environment

A research into the processes and guidelines of the Pon Power workshop

-Summary-

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Summary

This study was set out to explore whether and to what extent the throughput times of engines and components overhauled at the workshop of Pon Power can be reduced towards the Pon-Cat guidelines. This research aims to identify root causes and measures to increase the efficiency and decrease the throughput times at the workshop.

The disconnect between the current workshop throughput times and the Pon Cat guidelines had to be identified first. At the start of the research it became clear that, Pon Power actually has never measured the difference. Consequently, during the study the research set-up has changed to include gathering the needed data. The report describes this full process chronologically.

PART I – Initial analysis

Part I is the initial analysis, starting with analysis of the primary processes in the workshop and a description of the material and information flow. The processes are connected to the stakeholders, who are responsible for the different process steps. Additionally analyses like activity relationship analysis and layout analysis are used to identify the problems in the current business processes.

This first review indicates that the guidelines do not consequently correspond with the worked hours of overhauled components. According to the dataset, the throughput time is unknown ~25% of the components. Of the known throughput times, 20% of the overhauled components exceeded the Pon-Cat guidelines and 71% are below the guidelines. The data is not extensive enough to get to the root causes of why some components exceed the guideline times, while other components are actually below. Additional data gathering and measurements are needed to have insight in the distribution of time and the possible causes of exceeding Pon-Cat guidelines. Therefore, a case study is set up as next step in the empirical research to further investigate these performances.

After the initial analyses, the research goal was further refined as; to provide an advice for the performance improvement of the processes at the workshop of Pon Power and to have a more efficient workshop with throughput times that do not exceed Pon-Cat guidelines. This leads to the following research question;
What are the current throughput times of the workshop of Pon Power in relation to the Pon-Cat guidelines, are these guidelines valid and how can the throughput time be decreased, while maintaining quality and taking into account available budget, space and time?

In order to answer this main question multiple sub-questions are formulated and a research approach is described. The research approach is a combination of mostly empirical research, where theoretical work might substantiate the empirical results. The outcomes of this study are formed on qualitative and quantitative research. An outline of the methodology is proposed. The research methods include (semi-structured) interviews, a case study, observations, surveys, a brainstorm, best practices, literature and gathering information from the intranet of the company.

The aim of the case study is to deepen data of the throughput time of orders at the workshop. In the case study, components are tracked during the overhaul process at the workshop and deeply explored after. The activities measured were split up and it appeared that 67% of the time the mechanic is productive for the product and 33% of the time he is unproductive. All these 1,400 measured activities give in-depth information about the attribution of the worked hours and are divided in four categories; planning, communication, operational and documentation. The 19 activities that can be faster are identified.

It is concluded from the case study that the guidelines are largely achievable as long as non core activities such as waiting time for components and tools are reduced. The measurement frequency has to be increased, so N is big enough to make the proper conclusions. For the present research, the data from the case study is used. It is assumed that the current guidelines are suitable and the throughput time has to be as good as the current Pon-Cat guidelines.

Although the tasks in the workplace are characterized by a high degree of complexity and variety, there are 19 activities identified which can improve the waiting time with a maximum of 18,6%.

PART II - Redesign

Part II presents a framework, which shows a schematic way of working to the final solution and the waiting time is minimized as much as possible. According to different methods, the partial solutions are created. To decrease the waiting time, the redesign has to be implemented. The thesis outlines and assesses the following 12 partial solutions, which contribute to a more efficient workshop:

- Organize tools storage: structure the tools, in order to avoid searching time

- Prepared order toolbox: required tools per order, which eliminate walking time

- Streamline layout: relocate areas, in order to minimize walking

- Standard reporting: create a standard, easy adopting, combined report for incoming and outgoing control

- Standard order form: create a standard order form for the components for sales, in order to have the complete information needed

- Computer course: some simple lessons and structured maps can minimize computer time

- Morning meeting: a 10 minutes meeting every morning where the long-term planning, the progress of the engines, the daily schedule of the mechanics and their next order, the maintenance per mechanics and safety is discussed

- Perform task and overhaul kit: an agreement about ordering parts and a simplification in the ordering process by standard kits

- Communication: improve communication between the different stakeholders, by a get to getter before an engine overhaul and the morning meeting for communication within the workshop.

- Measurement system: an incentive system for the mechanics to write the good hours and to work as fast as possible. A standard query for these times has to be made.

- Outsourcing task: outsource the easy tasks of a mechanic to a cheaper labor

- Layout workshop: many means and other possibilities can improve the layout of the workshop.

The partial solutions are described per category and show which activities they affect. They are also rated against the identified criteria from the research question; quality, budget, space and time. During this research, some of the solutions are already successfully implemented

CONCLUSIONS

It is concluded that the data provided by Pon Power indicates that the Pon-Cat guidelines do not correspond with the written hours. Accordingly, the case study shows that the written hours do not correspond with the actual worked hours. It also showed that there is a difference in worked time versus the Pon-Cat guidelines. 53% of the components were faster than the guidelines and 34% exceed the guidelines. The partial solutions can decrease the waiting time with 12%. Hereby, the throughput times of the case study improve from 34% to 15% of cases that exceed the guidelines. Therefore, the current Pon-Cat guidelines are for a large part achievable when decreasing the waiting time using the partial solutions. Based on this information it is concluded that the Pon-Cat guidelines are mainly valid.

In order to have a better understanding of the throughput time of the products, it is important to collect more data. A measurement system that determines the correct made hours of the mechanics is required.

Based on these research findings on the achieved data, a redesign for the performance improvement of the processes at the workshop of Pon Power is given. If well implemented this could result in a more efficient workshop with throughput times for 85% as good as the current Pon-Cat guidelines. The outcomes of the study give a better view on the throughput times, a decrease in waiting time by 12% and a higher customer satisfaction rate.