

CHAPTER 3 - RESEARCH METHODS

3.1 Materials and Equipment

This research was conducted on units under the care of UT FMC Tanjung Enim totalling 16 units of Komatsu HD785-7 with the following data.

Table 3.1. Population of unit FMC Tanjung Enim

Population of unit FMC Tanjung Enim

Code Unit	SMR	Avg. Running Hours (Daily)	Avg. Running Hours (Monthly)
HD78279	8035,6	13,59	407,7
HD78280	8120,3	12,99	389,7
HD78281	7340	9,76	292,8
HD78282	8023,8	10,88	326,4
HD78283	7811	13,32	399,6
HD78284	7899	13,91	417,3
HD78285	7798	12,45	373,5
HD78286	7617,8	12,16	364,8
HD78287	7765,7	13,45	403,5
HD78288	8015	12,78	383,4
HD78289	7774	13,7	411
HD78290	7729	11,55	346,5
HD78291	7529	11,22	336,6
HD78292	7636,8	12,3	369
HD78293	7609,5	12,24	367,2
HD78294	7775	12,54	376,2
Min	7340	average	Average
Max	8120,3	12,43	372,83

From the data in Table 5, it is explained that the current age of equipment has reached an average of 8000 hours with the average walking hours each month is 373 hours. From the average road hours, it shows that these units operate quite high every month. This means that with the average road hours, it can be known that each equipment will

get 2 periodic maintenance every month with the downtime of each periodic maintenance is 16 hours.

Then we will see how the unit performs after regular periodic maintenance shown in Figure 15 below

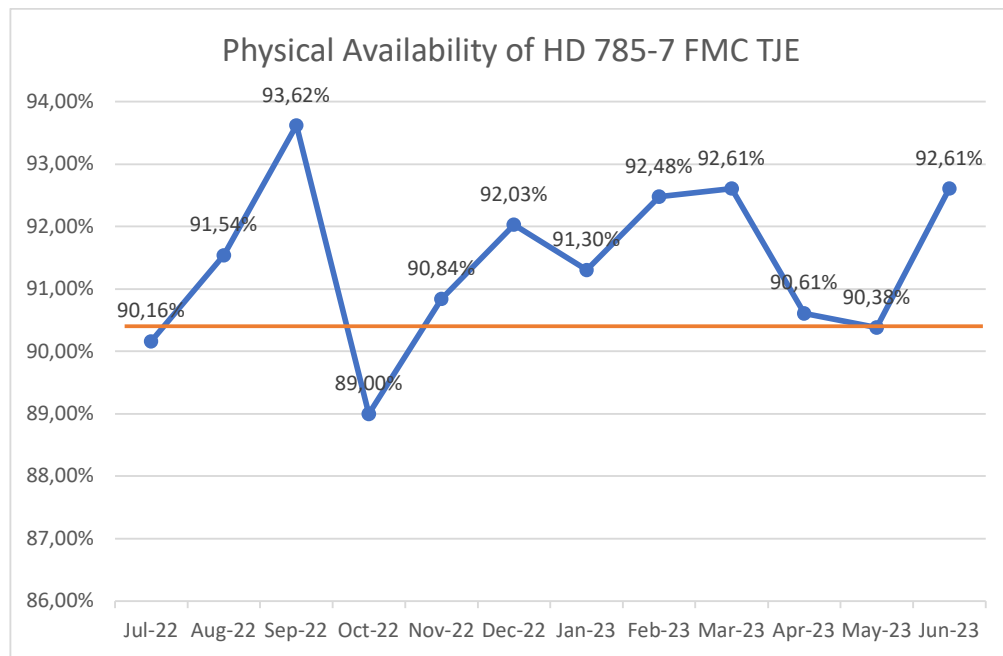


Figure 3.1. Performance of HD785-7 FMC's from July 2022 until June 2023

The graph shows the performance of HD785-7 which is quite standard achievement and sticks strictly to the contract target, this is enough to make customers less satisfied because of the low utilization of the tool. When compared to the performance of HD785-7 units from other sites with almost the same conditions, the performance of FMC TJE units is quite low and still far behind which only reaches an average of 91,43% while in other sites it still reaches an average of 93,77%.

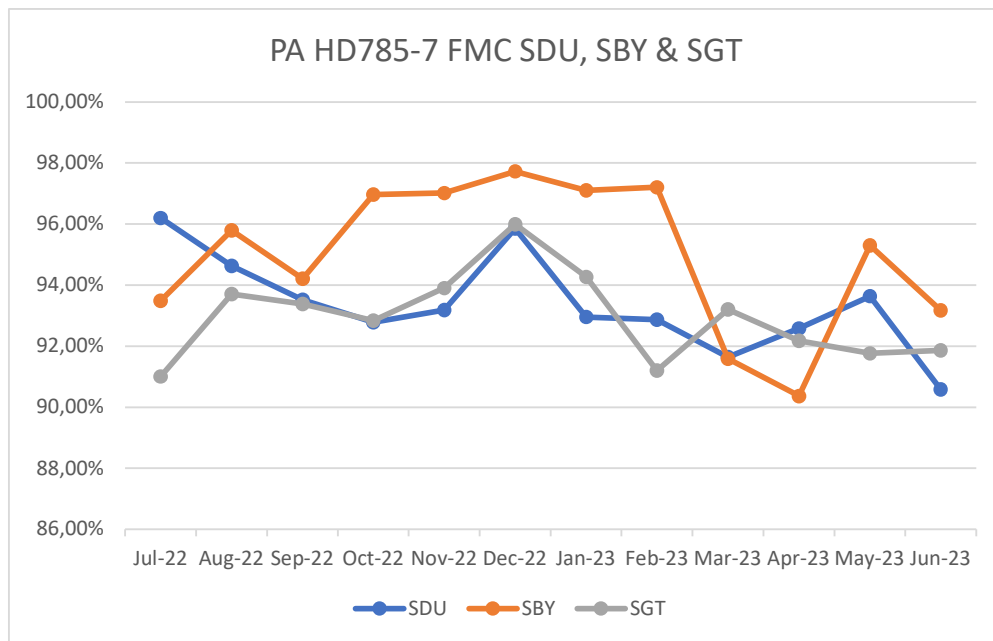


Figure 3.2 . Performance of HD785 FMC in another site.

Then we will try to see the pareto of the duration that cuts the equipment performance data that occurred over the last 12 months or from July 2022 to June 2023.

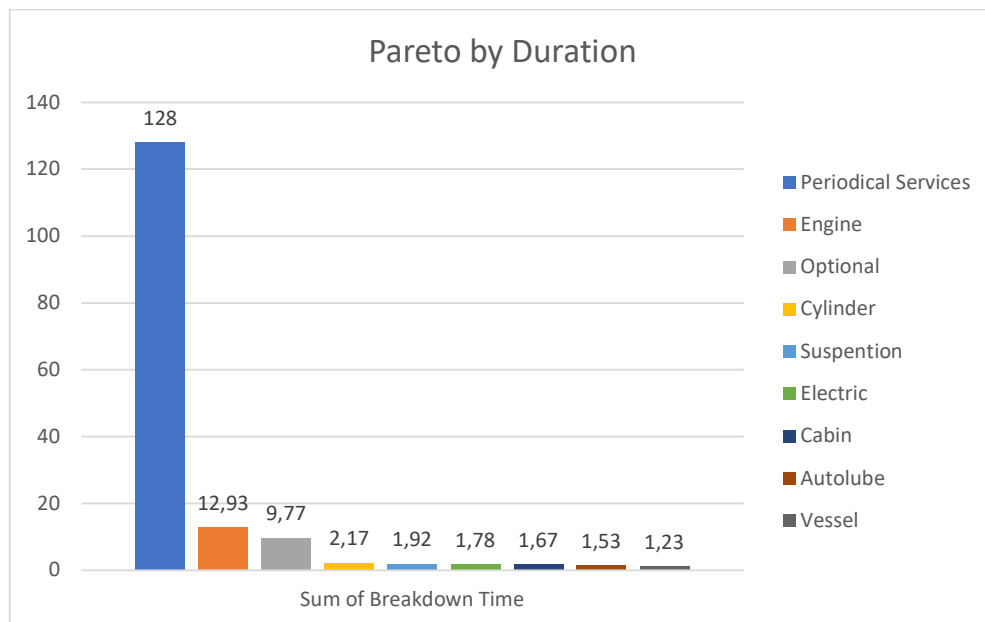


Figure 3.3. Pareto by breakdown duration

From the pareto chart it can be seen that maintenance plays the highest duration, from the data it can be concluded that one unit requires an average of 8-10 hours for one maintenance.

Then we will look at the six performance parameter data that is the concern of customers so that they feel less satisfied with the services provided by UT.

Table 3.2. Six Performace Parameter

Performance	Target (%)	Achievement (%)											
		Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23
PS Achievement	90	97,1	100	100	97,1	100	100	100	100	100	97,1	100	100
PS Accuracy ($\pm$ 50h)	90	97,1	100	88,2	100	97,1	100	100	100	100	100,0	97,1	88,2
PS Unit Accuracy	90	75,0	100	100	100	100	97,1	100	88,2	100	75,0	100	100
PS Leadtime Accuracy	90	83,3	65,4	79,5	79,4	76,0	85,7	69,7	62,5	91,5	75,0	87,7	72,7
PS Start Time Accuracy	90	100	88,2	97,1	97,6	100	97,6	100	100	100	97,6	100	97,6
PS Quality	90	90,5	90,7	73,0	74,8	84,6	76,1	83,9	90,1	88,3	88,9	87,0	91,7

From the table, it is clear that PS accuracy Leadtime has not even reached the target since the last 12 months. In addition, the quality of PS data has also decreased significantly and tends not to achieve the target.

3.2 Analytical Metode

3.2.1 Ruang lingkup penelitian

Penlitian ini berfokus pada dampak dari penerapan Maintenance Management Portal (MMP) pada performa unit Komatsu HD78-7 di FMC UT Tanjung Enim terutama pada performa pengerjaan periodical service (PS) pada unit tersebut.

3.2.2 Research Framework

The research Framework used in this study is DMAIC. DMAIC is a Six Sigma method consisting of five steps, namely Define, Measure, Analyze, Improve, and Control. In this study the five steps can be described as follows.

Phase	Define	Measure	Analyze	Improve	Control
Purpose	• Objective: To assess the effectiveness of the Maintenance Management Portal (MMP) in enhancing the equipment performance of HD785-7 • Scope: The research will focus on the impact of the MMP on the performance of HD785-7. • Success criteria: The research will be considered successful if it can demonstrate that the MMP has led to a statistically increase in the average performance of HD785-7	• Collect data on the uptime of HD785-7 before and after the implementation of the MMP • Gather data on the Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR) of HD785-7. • Collect feedback from maintenance personnel on their experience using the MMP	• Compare the uptime data from before and after the implementation of the MMP • Analyze the MTBF and MTTR data to identify any trends or changes • Review the feedback from maintenance personnel to identify areas where the MMP can be improved	• Develop strategies to address any identified issues with the MMP • Implement the proposed improvements and monitor their impact on the uptime of HD785-7 • Continue to gather feedback from maintenance personnel to ensure the MMP is meeting their needs	• Continue to gather feedback from maintenance personnel to ensure the MMP is meeting their needs • Regularly monitor the uptime of HD785-7 to ensure it is meeting the desired target • Provide ongoing training and support to maintenance personnel on the use of the MMP
Primary Tools	• Performance record • SIPOC analysis • Problem statement	• Maintenance Records: Gather historical maintenance data • MMP: collect real-time data on equipment parameters • Maintenance Personnel Feedback: gather their subjective feedback on the MMP's usability, effectiveness, and areas for improvement	• Overall Equipment Effectiveness (OEE) • P-M Analysis • Technology Acceptance Model (TAM)	• Process improvement plan • Implementation schedule, • Training materials	• Standard operating procedures, • Monitoring plan • Control charts
Output	Clear understanding of the project's goals and limitations	Baseline data on process performance	• Effectiveness of using MMP • Problem statement • Factors influencing the implementation of MMP	• Improved process performance • Reduced defects	• Sustainable process performance • Continuous improvement

Figure 3.4 DMAIC steps in this research

Figure above is a flowchart that shows the phases of the implementation of the mapping program. This flowchart is divided into five phases:

Phase 1: Define

Define the purpose and scope of the study. The purpose of the mapping program was to assess the effectiveness of the Maintenance Management Portal (MMP) in improving

the performance of HD785-7 equipment. The scope of research will focus on the impact of MMP on HD785-7 maintenance performance from searching data, analyzing, planning and carrying out maintenance so that it can affect the accuracy of PS Leadtime.

Phase 2: Measure

In this phase, data is collected about six performance parameters and OEE HD785-7 before MMP implementation. Feedback was also gathered from maintenance personnel about their experience using MMP using the Technology Acceptance Model (TAM).

Phase 3: Analysis

In this phase, six performance parameters and OEE HD785-7 are analyzed to identify any trends or changes. Feedback from maintenance personnel is reviewed to identify areas where MMP can be improved.

Phase 4: Improve

In this phase, strategies are developed to address the problems identified in the analysis phase. The proposed fix was implemented and its impact on the accuracy of PS Leadtime HD785-7 was monitored.

Phase 5: Control

In this phase, MMPs are monitored on an ongoing basis to ensure that they meet the needs of maintenance personnel. Ongoing training and support provided to maintenance personnel on the use of MMP.