WAGONS MAINTENANCE PERFORMANCE ANALYSIS VIEWED FROM THE MAINTENANCE FACILITIES, EQUIPMENT, AND RESOURCES AVAILABILITY AT DEPO GERBONG SIDOTOPO, SURABAYA

by Galih Prananda

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ARTIKEL JURNAL

ANALISIS KINERJA PERAWATAN GERBONG DITINJAU DARI ASPEK KETERSEDIAAN FASILITAS, PERALATAN DAN SUMBER DAYA TENAGA PERAWATAN DI DEPO GERBONG SIDOTOPO, SURABAYA

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PERSETUJUAN DOSEN PEMBIMBING		
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ABSTRACT

Maintenance of railway facilities must fulfill the standards and be carried out by personnel who have the requirements and qualifications of expertise in the field of railway facilities and use standard maintenance equipment. Maintenance of railway facilities is carried out at the Depo or Balai Yasa in accordance with the type of railway facility and must be carried out according to a set schedule.

The Sidotopo Wagon Depot is one of the Depos that carries out periodic maintenance of wagonfacilities in Operation Area 8 Surabaya. In carrying out the maintenance of facilities, there are several obstacles, namely the workload that is not in accordance with regular working hours, the minimum number of employees who have competency certification, several measuring instruments that have not been calibrated and several damaged work facilities and equipment.

From the analysis of the workload of employees and the Importance Performance Analysis approach method, it is found that the number of maintenance personnel needed is 30 maintenance personnel and requires improvement efforts on the performance elements that are included in the Main Priority, namely: the condition of work equipment, calibration of work equipment and number of maintenance personnel.

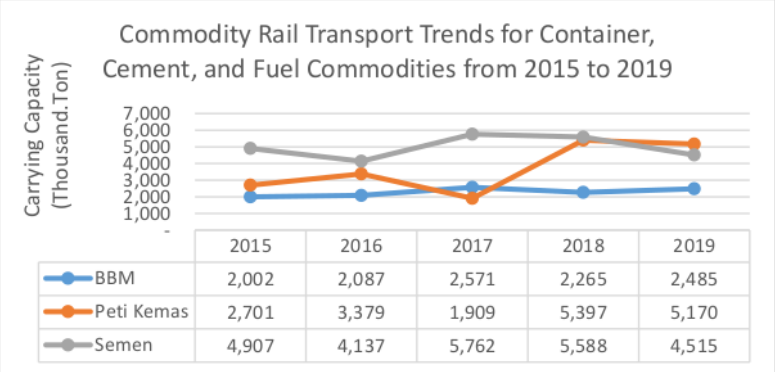
Key words: ***Maintenance, Workload Analysis, IPA (Importance Performance Analysis)***

INTRODUCTION

When compared to road transportation modes, the train is one of the forms of transportation that has unique characteristics and advantages. The special advantages of this railway are that it is a mass transportation system capable of transporting large numbers of people and goods, that it is energy efficient and environmentally friendly, that it does not necessitate a large amount of land for the construction of rail roads, and that it has a high safety factor with a signaling system.

To improve the railway sector's role and great potential, the entire railway system, including facilities, infrastructure, and operational aspects of rail travel, must always be in a safe and reliable condition so that the railway can remain operational. In order to support the development of reliable and operable rail facilities and infrastructure, train inspections and maintenance are critical for both facilities and infrastructure in order to reduce the rate of train accidents.

Area of operation 8 Surabaya is one of nine train operations areas on Java Island, with the East Java Province operating area. Operation area 8 is a large operation area with three large ports in East Java that serve as hubs/connectors for logistics flows in Eastern Indonesia, namely Tanjung Perak Port, Kalimas Port, and Teluk Lamong Port. The existence of this port promotes the creation of demand for goods transportation from and to Surabaya's operation area 8. The realization trend of freight transportation by train for container, fuel, and cement commodities is as follows.



	2015	2016	2017	2018	2019
BBM	2,002	2,087	2,571	2,265	2,485
Peti Kemas	2,701	3,379	1,909	5,397	5,170
Semen	4,907	4,137	5,762	5,588	4,515

Source: Directorate General of Railways, 2020, Processed

Picture 1. Commodity Rail Transport Trends for Container, Cement, and Fuel from 2015 to 2019

According to the data on freight transportation realization presented above, the container by train has increased significantly over the last five years, from 2.701 million tons in 2015 to 5.170 million tons in 2019.

Recognizing this opportunity, PT. Kereta Api Indonesia (Persero) has prepared Freight Transport by Train services that serve transportation for goods in that area, such as Container Transport, Cement Transport, Fuel Transportation, and Delivery Goods Transport (Parcel), with as many as 36 Regular Trains and 14 Facultative Trains (executed when needed). The average number of cars in one train series (stamformation) for fuel transport can be as high as 20 cars per series, but the stamformation for container transport can be as high as 30 cars per series.

To accommodate the operational needs of the freight train, the carrieges available at Sidotopo WAGON depot is **597 units of carrieges,** with the details 422 units of 42 Ton Flat Wagons (GD), 91 units of 30 Ton Tank Wagons (GK) and 70 units of 40 tons Tank Wagons (GK), 14 units of Open Wagons (GB). The Wagons are prepared to support the following railway operations:

Table 1. Good Carrieges that maintained at Sidotopo Carrieges Depot

No	Train Name	Cross Service
1	Container	Kalimas – Tanjung Priok
2	Container	Kalimas – Klari
3	Container	Beteng-Kampung Bandan
4	Fuel	Benteng-Madiun
5	Fuel	Benteng-Malang

Source: Gapeka Facility Support 2019, Processed

To support it, Operation Area 8 Surabaya need to keep the wagoncondition as a means of transportation to remain reliable. According to Sofjan Assauri (2017), maintenance is an activity to maintain or maintain factory facilities or

equipment and make necessary repairs or adjustments so that there is a satisfactory production operating condition in accordance with what is planned. While according to Corder dan Kusnul Hadi (1992:4) maintenance is a combination of any actions or actions taken to maintain an item in, or repair it to an acceptable condition.

Maintenance that carried out by Sidotopo wagondepot is periodically maintenance of wagonsuch as daily maintenance, 3 monthly maintenance (P3), 6 mothly maintenance (P6), and annually maintenance (P12). In that process, according to Law of the Republic of Indonesia Number 23 of 2007 concerning Railways, Article 29, mandatory maintenance of facilities:

1. Meet the standard of maintenance of railway facilities;
2. Conducted by personnel who meet the requirements and qualifications of expertise in the field of railway facilities.

Carriege maintenance performance will achieve maximum result if the human resources (maintenance personnel) which meet the qualification requirements and availability of work facilities and equipment at the depot available properly. According to Herman Sofyandi (2013:6) that Human Resources management is defined as a strategy in implementing management functions those are planning, organizing, leading and controlling, in every Human Resources operational activity or function starting from process of withdrawal, selection, and development, placement which includes promotion, demotion, and transfer, performance appraisal, compensation, industrial relation, and termination of employment which are shown to increase the productive contribution from organization of human resources towards achieving organizational goals more effectively and efficiently.

Work facilities and equipments are important factors in the dependability of facilities that are not a resource for maintenance personnel. According to Zakiah Daradjat (2012:230), facilities are anything that can make efforts and work easier in order to achieve the goal. According to Moekijat (2001:155), a facility is a physical facility that can process an input and produce the desired output. Maintenance

equipment is available equipment in Depots and Service Halls to be used in carrying out maintenance of railway facilities, according to the provisions stipulated in the Peraturan Menteri Perhubungan Republik Indonesia Nomor 18 Tahun 2019 concerning Standard Places and Equipment for Maintenance of Railway Facilities, while the definition of maintenance facilities. Maintenance equipments the available at least as follow:

1. Path for maintenance,
2. Main building for maintenance,
3. Building for supporting equipment,
4. Office, and
5. Public facilities.

While the working equipments tha must be at the depot are work equipments that have a high level of accuracy in the carriege facility maintenance instruction manual.

Even though the maintenance process activities were completed correctly, there are still issues with the facilities in the operation of the freight train. There were 37 time disruptions and 19 facility disruptions recorded between 2018 and 2019. Carrieges are interrupted an average of three times per month, which has a negative impact on maintenance performance at the Sidotopo Wagon Depot. Wagon disturbances occur once per month on average, according to the facility disturbance control norms established by Depo management. It demonstrates that there is a mismatch between what is specified in the control norm and the reality of the facility's operation.

According to Nurfaulinza (2009), in her study “Locomotive Maintenance Performance Analyzing at Locomotive Depot Kertapati, in South Sumatra,” the number of operational disturbances on locomotives in the South Sumatra Regional Division occurred due to limited maintenance personnel, spare parts availability, and work equipment availability.

According to Sulistyarini (2011), in her study “Optimization of Driving Means on the Cross by Reducing the Days of Yogyakarta Service Hall Center,” Yogyakarta

Service Hall has some problems in locomotive maintenance, such as a lack of maintenance equipments and spare parts for locomotives due to limited procurement of spare parts, technical personnel, and maintenance personnel at Balaiyasa Yogyakarta. To address the issues, one solution is to reduce the number of days that Yogyakarta service hall is open. The accelerated alternative is to add workers to some activities in order to reduce day-to-day service hall maintenance.

According to Dwi Yuli Harianto (2014), in his study "Improved Maintenance of Jakarta Wagon Depot Warehouse Operation Area 1 Jakarta," the completeness of maintenance facilities and maintenance personnel at the Jakarta wagon warehouse is still lacking, which is why it is necessary to add wagon maintenance facilities and improve the quality and quantity of human resources to improve the situation.

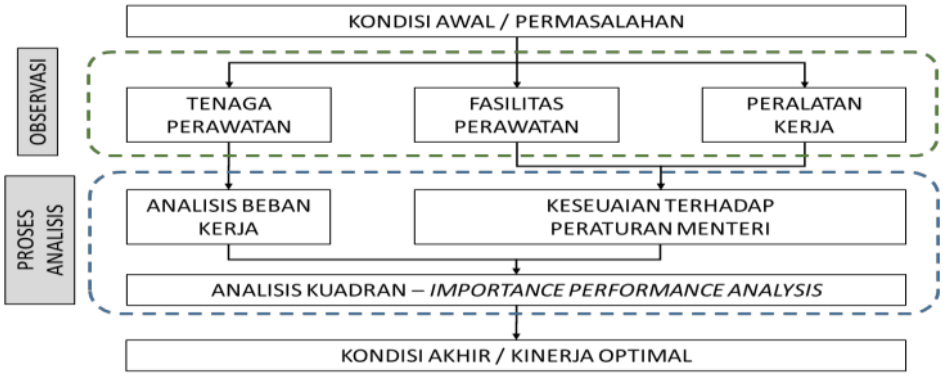
According to Vivi Setyaningsih (2018), she is researching ways to improve locomotive maintenance performance at the Medan Locomotive Depot. This study focuses on efforts to improve locomotive maintenance performance with the help of Human Resources (maintenance personnel) and maintenance facilities at the Medan Locomotive Depot. Based on the analysis, there is a delay in locomotive facility maintenance time caused by several factors such as employee workloads that are not in accordance with regular working hours, resulting in a shortage of employees, employee competencies that do not meet the requirements, incomplete equipment at the depot, and deck facilities that are not suitable.

Based on the literature review and previous research, the following problems can be formulated :

1. Is the workload of regular maintenance personnel at the Sidotopo Wagon Depot appropriate ?
2. Is the condition of the facilities and equipment for maintenance work at Sidotopo Wagon Depot has confirmed to the laws and regulation ?
3. How is the facilities maintenance at Sidotopo wagon depot ?
4. How is the support of human resources especially the maintenance at Sidotopo Wagon Depot?

5. What effort can be carried out to improve the working performance of wagondepot to support operational needs of wagon facilities?

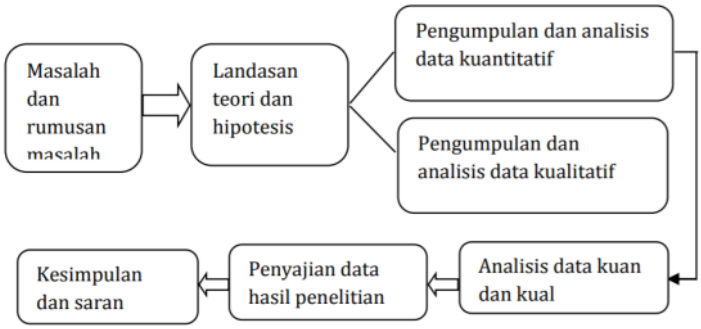
To answer the problems above, this study has designed using what explained at the picture below.



Picture 2. Frame of Mind

RESEARCH METHOD

This type of study is a mixed methods study with a concurrent embedded strategy model that is designed to use quantitative and qualitative methods in tandem. The quantitative method was used as the primary method in this study..



Picture 3. Mixed Research Model *Concurent Embedded*, Quantitative Model as The Primary Method

In this study, that will be the sample of **facilities maintenance personnels** at Sidotopo wagondepot are **28 people**. Remembering that the limit population (28), so all the population will be the samples, so that this study using **saturated sample** taken by census technique.

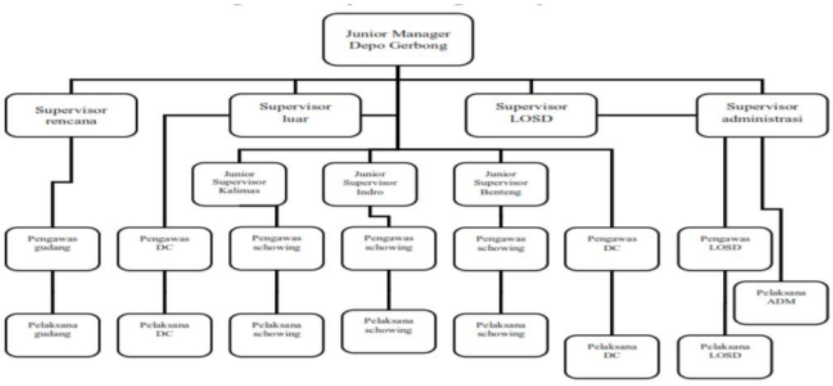
As for the number of informants taken as many as 6 informants, those are:

a. Regulator (Directorate General of Railways), as many as 2 informant,
b. Operator, as many as 4 informant.

From the data that has been collected by the writer, carried out analysis and problem solving using the ***Importance – Performance Analysis (IPA) Methods,*** which is equipped with an Analysis of the Characteristics and Needs of Maintenance Personnel and Analysis of the Availability of Facilities and Equipment for Maintenance Depots.

DISCUSSING RESULT

1. Human Resources



Picture 4. Sidotopo Carriege Depot Structure Organization

Sidotopo Wagon Depot is led by a Senior Supervisor-level Wagon Depot Head who has main duties and responsibilities of carrying out wagon

maintenance/maintenance and repair, daily utilization and quality control inspection of the carriages, preparation of the carriages, setting up the train service department and the administration of the Wagon Depot. The number of employees serving at the Sidotopo Wagon Depot is very limited, as many as 28 employees including the Head of the Sidotopo Depot. All employees of the Sidotopo WagonDepot are male.

Woeking hours per day for each employee is 6 hours in a day and there are 6 days work a week, but in pactice there are often additional working hours that has to be done. In average, employees have 26 days work a month, according to the data from Administration Supervisor of Sidotopo Wagon Depot, the basis of the calculation at the Sidotopo Carriege Depot is:

Table 2. Employee Workload Calculation Table

No	DESCRIPTIONS	NUMBER OF FLEET (Q)	MAINTENANCE FREQUENCY (F)	STANDARD JO	BKP = Q x F x JO
GK					
1	P3	161	3	16	7728
2	P12	161	1	52	8372
GB					
1	P3	14	3	16	672
2	P12	14	1	52	728
GD					
1	P3	422	3	16	20256
2	P12	422	1	52	21944
	TOTAL				**59700**

Source: analysis result processed

1) Calculation person's hour (JO) Per day

Working load Per Month = Bkp : 12

BKP Per Month = 59.700 : 12

BKP Per Month = 4.975 Person's hour

JO Per Day = BKP Per Month : Total of working day per month

JO Per Day = 4975 : 26

= 191,3 Person's hour

2) Calculation person's hour (JO) Per day Per person

JO Per Person = JO Per Day : Lots of maintenance staff

JO Per Person = 191,3 : 18 persons

JO per Person = 10,6 ≈ **11 JO / Day**

From the analysis above, found that the calculation of the workload af people per employee per day is 11 hours per day, while the regular working hours in a day is 6 hours, so it needed to add employees so that the workloads for each employee is in accordance with the working hours.

Based on the Director's Regulation about workload calculation and maintenance employee needed is :

Maintenance Employees = (Bkp/Jkp) x In

Maintenance Employee = (59.700 / 1947,75) x 1,04

Maintenance Employee = 29,5 ≈ **30 employees**

Based on the calculation above, it is found that need of the employee should be 30 employees while the number of maintenance employee that exist are 18 employees. So for maintenance employees there are still less than **12 maintenance personnels**.

2. Maintenance Work Facilities and Equipment

In determining the minimum need for equipment at the Depot, the following criteria must be met :

a. Prioritizing the conditions that absolutely require.

   Equipment must be prioritized in conditions that absolutely require it, to carry out maintenance on the main components that greatly determine the operational performance of a system.

b. Calculating the Workload

   Equipment must take into account the workload of the Depot, such as the number of carriages that must be maintained.

c. Considering the scope of equipment / Machinery

   It is necessary to learn about the usefulness and capabilities of an equipment in supporting the system and maintenance activities, including the use of special equipment and general equipment.

d. Technology

   The technology of the equipment must be in accordance with the process and maintenance system as well as the technology of the wagon to be maintained. It is necessary to update maintenance equipment for example modernization of wheel diameter measurement equipment, so that speeding up the measurement process.

e. Reliability

   Equipment must be reliable and have high accuracy in accordance with international standards and be certified by the authorized agency.

From the results of the inventory of work equipment owned by Sidotopo Carriege Depot, there are still equipment that has not been calibrated, including wheel diameter measuring instruments., *E Knuckle Nose Worn Limit Gauge, Type E Coupler, F Knuckle Nose Limit Gauge, Type F Coupler* (coupler wear gauge tools). Calibrating is the process of checking and measuring the accuracy of a measuring instrument by

comparing it with standards. Calibration is required to ensure that the measurement results are accurate and consistent with other instruments.

3. Efforts to Improve Care Performance Based on Analysis of the Level of Interest and Performance

Based on the analysis obtained using the IPA method, the following results are obtained :

a. Quadrant A (Main Priority)

In this quadrant explains that the current level of performance is low while the level of importance or expectations for the implementation of care is high. So the factors in this quadrant are considered very important and affect the quality of care, but the implementation is not appropriate, so the results are disappointing or unsatisfactory.

Based on the results of the analysis of the respondent's assessment, it was found that the condition of work equipment, calibration of work equipment and adequate number of employees need attention and improvement.

b. Quadrant B (Low Priority)

In this quadrant explains that the current level of performance is in accordance with the level of importance or expectations for the implementation of care but is low. So the factors in this quadrant are considered normal in the treatment carried out. Based on the results of the analysis of the respondent's assessment, it was found that the completeness of work equipment and timeliness in the wagonmaintenance process were included in Low Priority to be improved.

c. Quadrant C (Keep Achievement)

This quadrant explains that the current level of performance is in accordance with the level of importance or expectations for the implementation of care. So the factors in this quadrant have been successfully realized/fulfilled and for that they must be maintained. Considered very important and very satisfying. Based on the results of the analysis of the respondent's assessment, it was found that

the availability of maintenance facilities, condition of treatment facilities, appropriate training and competence, and reliability of facilities can be maintained. ;

d. Quadrant D (Excessive)

This quadrant explains that the current level of performance is high while the level of importance or expectations for the implementation of maintenance is low. So the factors in this quadrant are considered to be less influential/less important, but their implementation is excessive. Considered less important but very satisfying. Based on the results of the analysis of respondents' assessments, it was found that the optimal working time and employee understanding of SOP, Check Sheets were included in Quadrant D.

CONCLUSION

Based on the analysis and explanation of the research result is carried out to maintenance performance Sidotopo Carriege Depot, it can be concluded that Depot's maintenance performance is generally **good** but there are some findings that can be followed up as follows :

1. Human Resources
    a. The workload per day for each employees are 11 hours per day. Ideally 6 hours per person per day.
    b. Maintenance personnel needed at Sidotopo Carriege Depot based on the study was 30 personnels, while the number of maintenance employee that exist are 18 employees.
    c. It is recorded that only 8 employees have certification for maintenance of non-motorized railway facilities and 2 employees who have certification for inspection of non-motorized railway facilities.

2. Facilities and Equipments of Maintenance Work

   a. Facilities

      Sidotopo WagonDepot declared still in accordance with the provisions stipulated in the Minister of Transportation Number PM. 18 of 2019 concerning Standards for Places and Equipment for Maintenance of Railway Facilities.

   b. Working Equipments

      There are still equipment that has not been calibrated, including wheel diameter measuring instruments, *E Knuckle Nose Worn Limit Gauge, Type E Coupler, F Knuckle Nose Limit Gauge, Type F Coupler* (coupler wear gauge tools).

3. Importance of Treatment Performance

   The results of the analysis of the level of importance on the Maintenance Performance of the Sidotopo Wagon Depot on the elements of the quality of care, obtained several things as follows:

   a. Condition of work equipment, calibration of work equipment and number of employees are in Quadrant A which is the main priority in an effort to improve carriege maintenance.
   b. Completeness of work equipment and timeliness of the wagonmaintenance process is in Quadrant B where is is a low priority.
   c. Availability of treatment facilities, Physical condition of treatment facilities, appropriate training and compensation for maintenance personnel and reliability of facilities for facility disturbances are in Quadrant c, where these conditions need to be maintained.
   d. Optimal Working Time and employee understanding of SOP and Maintenance Check Sheets are in Quadrant D, where it is excessive, that is the performance of these elements is good but has a low importance value.

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