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ANALYSIS OF LOW POWER ISSUES IN KOMATSU D85ESS-2 DOZER ENGINES

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ABSTRACT

The Komatsu D85ESS-2 dozer is one of the heavy machines employed by PT. Andhifa Kharisma Borneo Pratama (AKBP) at the PT. Prolindo Cipta Nusantara (PCNS) site in coal mining operations. This dozer is utilized for tasks such as excavation, grading, material pushing, and hauling logs or portable camps. However, due to several factors, this unit has experienced an "engine low power" issue, impacting its performance. This report addresses the root causes of this problem and proposes solutions to prevent recurrence. This study uses an observational approach aimed at identifying and analyzing the factors causing the low power issue. Data collection was conducted by gathering relevant information about the unit's operational conditions as experienced by operators in the field. A systematic troubleshooting procedure was applied to detect and resolve issues, allowing for precise repairs to restore the unit's performance. The study follows an 8-step troubleshooting process and uses a troubleshooting chart to assess the symptoms of the low-power issue. Findings indicate that engine low power was caused by sediment buildup in the fuel filter, which restricted fuel flow to the nozzle, leading to reduced fuel injection.

Introduction

Heavy equipment plays a crucial role in the mining industry, as mining operations are large-scale undertakings that require efficient machinery to support productivity and ensure operational success. Heavy equipment enables tasks that would otherwise be time-consuming and labor-intensive to be completed more effectively, thus enhancing overall efficiency [1]. One such machine, the Komatsu D85ESS-2 dozer, is integral to the coal mining operations at PT. Adhifa Kharisma Borneo Pratama, where it is primarily utilized for tasks such as pushing material in disposal areas and supporting various other functions across the site [2].

Given the importance of this machine in maintaining workflow, it is essential for the dozer to operate reliably and consistently to prevent disruptions in mining productivity [3].

However, like all heavy machinery, the D85ESS-2 dozer is susceptible to issues over time, especially when preventive maintenance is inadequate or when maintenance practices fail to address certain critical aspects, such as cleanliness around key components. As operations continue, the accumulation of minor maintenance oversights can result in significant mechanical issues, which in turn impact the performance and availability of the equipment [4].

The Komatsu D85ESS-2 is a formidable and versatile heavy equipment machine that has earned a strong reputation among construction and mining professionals for its impressive performance, reliability, and capability [5]. With its robust design and powerful engine, the D85ESS-2 has become a popular choice for those who require a dependable and productive tool to tackle a wide range of challenging tasks in their operations [6].

However, as with any complex machinery, the Komatsu D85ESS-2 dozer is not without its challenges, and one of the primary concerns is the issue of low power [7]. This issue can significantly

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impact the machine's productivity and efficiency, leading to decreased performance and higher operational costs [8].

Figure 1. Komatsu D85ESS-2 Dozer Engines

This study will examine the underlying causes of these low power problems in the Komatsu D85ESS-2 dozer engines, such as engine wear, fuel system issues, and air intake restrictions. Additionally, the study will explore potential solutions to enhance the overall performance of this critical piece of equipment, including engine maintenance, fuel system upgrades, and air filtration system improvements [9]. By addressing the root causes of the low power problems, this analysis aims to provide recommendations that can help operators and maintenance teams optimize the performance and reliability of the Komatsu D85ESS-2 dozer [10].

This study is motivated by the need to understand and resolve performance issues affecting the D85ESS-2 dozer, specifically the "engine low power" problem that has become a frequent concern. The machine's reduced efficiency has notable implications for PT. Adhifa Kharisma Borneo Pratama, as it can slow down operations and affect the company's ability to meet production targets. By conducting a systematic analysis of the problem, this study aims to identify the underlying causes of the low-power issue, develop a clear troubleshooting strategy, and provide actionable solutions. These steps are intended to not only restore the dozer's performance but also to establish preventive measures that will help avoid similar problems in the future [11][12].

This paper will outline the troubleshooting methodology applied, the data collected during observations, and the subsequent analysis that led to identifying the primary cause of engine low power in the D85ESS-2. It is anticipated that these findings will serve as a guide for improving maintenance practices and enhancing the overall operational reliability of heavy equipment in mining environments.

Methods

The purpose of troubleshooting is to systematically identify the source of an issue so that it can be resolved effectively, preventing further damage and ensuring the reliability of the equipment. Effective troubleshooting requires not only a methodical approach but also a comprehensive understanding of the equipment's structure and functionality. This understanding allows technicians to accurately diagnose potential issues and address root causes, rather than treating only the symptoms [13].

In this study, troubleshooting was conducted using a structured troubleshooting chart, which provides a step-by-step process to isolate and verify each possible cause of engine low power. The troubleshooting chart served as a diagnostic roadmap, guiding the analysis from initial observations to the identification of specific faults in the equipment. Each step in the chart outlines a sequence of actions and checks that help to narrow down possible sources of the problem based on observable symptoms [14].

A crucial component of this troubleshooting approach was gathering firsthand information from the equipment operators, as they are most familiar with the dozer's daily performance and operational anomalies. Interviews with operators focused on documenting their observations and experiences, such as specific symptoms they noticed during operation, recent maintenance history, and any changes in performance. By combining these operator insights with systematic data collection, this approach allowed for a comprehensive analysis of the potential causes of engine low power [15].

This study applied an 8-step troubleshooting methodology to systematically address the "engine low power" issue on the Komatsu D85ESS-2 dozer, aiming to identify the root cause and implement preventive measures. The process began with Problem Identification, recognizing the low power issue and its operational impact. Next, Identify Possible Causes involved listing potential issues like fuel contamination or airflow restriction. In Observation and Diagnosis, detailed observations were made of the unit's performance, incorporating operators' insights. Data Collection followed, gathering maintenance history and recent performance records. In the Analysis phase, patterns and anomalies were examined to correlate with the symptoms. Subsequently, Identify Root Cause pinpointed sediment buildup in the fuel filter as the primary cause, restricting fuel flow and diminishing power. Conclusion was drawn to assess the impact and suggest preventive steps, leading to Corrective Actions where the fuel filter was replaced and recommendations were made for regular fuel system checks [16].

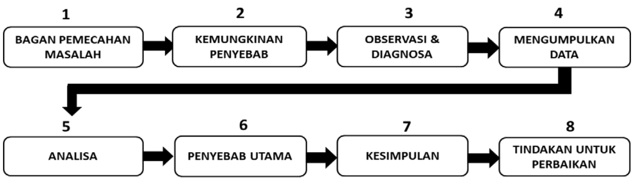


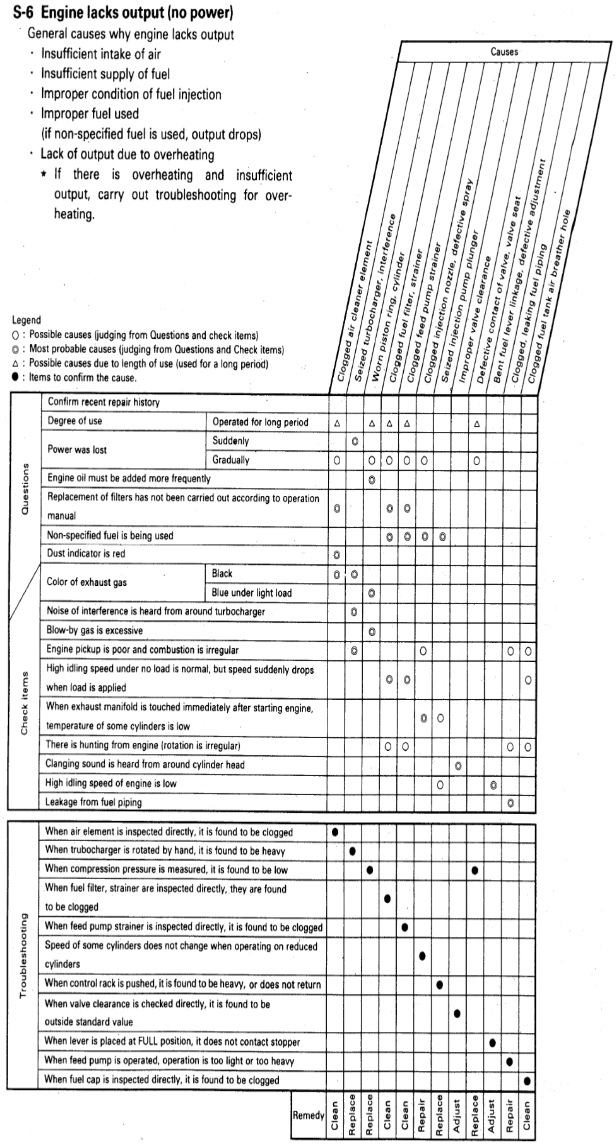
Figure 2. Troubleshooting

This structured approach allowed for accurate problem resolution and reinforced the need for systematic troubleshooting to maintain equipment reliability in mining operations.Through this structured approach, the troubleshooting process was able to pinpoint sediment accumulation in the fuel filter as a significant cause of low power, as it restricted fuel flow to the nozzle, impairing engine performance [17]. By applying the troubleshooting chart in conjunction with operator feedback and targeted inspections, the study was able to establish a detailed understanding of the issue and propose preventive maintenance measures to avoid similar problems in the future [18][19].

This method highlights the importance of combining systematic tools like the troubleshooting chart with operator input and technical knowledge to conduct effective troubleshooting. The findings from this process not only address the current problem but also provide a framework for more proactive and efficient maintenance practices in heavy equipment operations [20].

Results and Discussions

Upon receiving information that one of the units operated by PT. Andhifa Kharisma Borneo Pratama (AKBP) was experiencing issues, we promptly visited the affected unit to investigate. The first step was to consult with the operator to gather insights regarding the initial occurrence of the issue. Based on the information provided, we conducted an operational test on the unit to accurately diagnose the problem. Observations from this test indicated that the unit was indeed experiencing low power. Following this discovery, we aimed to determine if the low power issue stemmed from a malfunction in one or more components associated with the engine's power system.



S-6 Engine lacks output (no power)

General causes why engine lacks output
- Insufficient intake of air
- Insufficient supply of fuel
- Improper condition of fuel injection
- Improper fuel used
  (if non-specified fuel is used, output drops)
- Lack of output due to overheating
  - ★ If there is overheating and insufficient output, carry out troubleshooting for overheating.

Legend
○ : Possible causes (judging from Questions and check items)
◎ : Most probable causes (judging from Questions and Check items)
△ : Possible causes due to length of use (used for a long period)
● : Items to confirm the cause.

		Causes: Clogged air cleaner element	Seized turbocharger, interference	Worn piston ring, cylinder	Clogged fuel filter, strainer	Clogged feed pump strainer	Clogged injection nozzle, defective spray	Seized injection pump plunger	Improper valve clearance	Defective contact of valve, valve seat	Bent fuel lever linkage, defective adjustment	Clogged, leaking fuel piping	Clogged fuel tank air breather hole
Questions	Confirm recent repair history												
	Degree of use — Operated for long period	△		△	△	△				△			
	Power was lost — Suddenly		◎										
	Power was lost — Gradually	○		○	○	○	○			○			
	Engine oil must be added more frequently			◎									
	Replacement of filters has not been carried out according to operation manual	◎			◎	◎							
	Non-specified fuel is being used				◎	◎	◎	◎					
	Dust indicator is red	◎											
Check items	Color of exhaust gas — Black	◎	◎										
	Color of exhaust gas — Blue under light load			◎									
	Noise of interference is heard from around turbocharger		◎										
	Blow-by gas is excessive			◎									
	Engine pickup is poor and combustion is irregular		◎				○					○	○
	High idling speed under no load is normal, but speed suddenly drops when load is applied				◎	◎							○
	When exhaust manifold is touched immediately after starting engine, temperature of some cylinders is low						◎	○					
	There is hunting from engine (rotation is irregular)				○	○						○	○
	Clanging sound is heard from around cylinder head								◎				
	High idling speed of engine is low							○			◎		
	Leakage from fuel piping											◎	
Troubleshooting	When air element is inspected directly, it is found to be clogged	●											
	When trubocharger is rotated by hand, it is found to be heavy		●										
	When compression pressure is measured, it is found to be low			●						●			
	When fuel filter, strainer are inspected directly, they are found to be clogged				●								
	When feed pump strainer is inspected directly, it is found to be clogged					●							
	Speed of some cylinders does not change when operating on reduced cylinders						●						
	When control rack is pushed, it is found to be heavy, or does not return							●					
	When valve clearance is checked directly, it is found to be outside standard value								●				
	When lever is placed at FULL position, it does not contact stopper										●		
	When feed pump is operated, operation is too light or too heavy											●	
	When fuel cap is inspected directly, it is found to be clogged												●
	Remedy	Clean	Replace	Replace	Clean	Clean	Repair	Replace	Adjust	Replace	Adjust	Repair	Clean

Figure 2. Troubleshooting Chart

The possible causes of the low power issue were identified using the troubleshooting chart, which provided a systematic approach to analyze potential faults. Based on the chart, several factors were considered that could contribute to the reduced engine performance. These potential causes included a clogged air cleaner element, which could restrict airflow and reduce combustion efficiency, and worn piston rings, which could lead to compression loss and diminished power output. Another possibility was a clogged fuel filter, which would restrict the fuel flow and impact engine performance. Additionally, the feed pump filter might be obstructed, further limiting fuel delivery to the engine. A malfunctioning or clogged nozzle was also identified as a possible cause, as it could disrupt fuel injection, leading to inefficient combustion. Lastly, valve seat damage was considered, as this could interfere with proper valve sealing and disrupt engine operation. Each of these potential issues was carefully evaluated to identify the root cause and guide corrective measures, ensuring that all aspects related to engine performance were thoroughly examined.

Subsequent to the operational test, a series of targeted checks were performed on the unit, focusing specifically on components related to fuel and air systems, as these are commonly associated with engine power issues. The preliminary findings suggested that the low power condition might be linked to problems within the fuel system or possibly the air intake system. To gain a clearer understanding, additional data were collected and examined, including performance parameters and maintenance records related to these systems. This structured approach allowed us to systematically investigate and document the potential sources of the problem, ensuring a comprehensive analysis and supporting accurate diagnosis for appropriate corrective actions.

Conclusions

The inspection results, as detailed in the troubleshooting table, revealed that several components in the fuel system, particularly the filters and strainers, were contaminated with debris. This buildup of impurities obstructed the flow of fuel through the system, leading to a decrease in fuel supply to the nozzles during injection. The restricted fuel flow caused the engine to experience low power, as the reduced fuel delivery impacted the combustion process and, subsequently, the overall engine performance.

This finding highlights the critical role of maintaining clean fuel pathways to ensure efficient engine operation. Regular cleaning and replacement of filters and strainers are essential to prevent similar issues in the future, supporting optimal fuel injection and preserving engine power.

Table 1. Analysys Data

NO	ITEM	ACTUAL	STANDARD	CONDITION
1	Dust Indicator	No damage found on dust indicator; reads 2.5 kPa.	Reading below 7.5 kPa	OK
2	Air Cleaner	No damage or dirt detected on air cleaner.	Clean and undamaged	OK
3	Engine Speed	Low Idle: 809 RPM; High Idle: 2080 RPM; Stall Speed: 1792 RPM	Low Idle: 800-850 RPM; High Idle: 2,050-2,150 RPM; Stall Speed: 1,600-1,850 RPM	OK
4	Strainer Fuel Tank	Dirt present in fuel tank strainer.	Clean and undamaged	NOT OK
5	Water Separator	No water mixed with fuel.	No water mixed with fuel	OK
6	Strainer Feed Pump	Strainer feed pump in good and clean condition, no dirt.	Clean and undamaged	OK
7	Fuel Filter	Sediment in fuel filter obstructing optimal fuel flow.	Clean and unblocked	NOT OK

This table presents an assessment of key components in the fuel and air intake systems of the unit, focusing on cleanliness, integrity, and operational performance. Each item was evaluated against a set standard, with deviations noted:

- Dust Indicator: The reading of 2.5 kPa is within the acceptable range (below 7.5 kPa), indicating no clogging or excessive dust accumulation, which confirms the intake system is effectively sealed from dust intrusion.

- Air Cleaner: Found to be clean and intact, which ensures unimpeded air intake necessary for optimal engine combustion and performance.

- Engine Speed: All idle and stall speeds fall within the specified range, indicating proper throttle and fuel-air mixture adjustments.

- Strainer Fuel Tank: Presence of dirt in this component suggests contamination in the fuel system, potentially leading to restricted fuel flow and reduced engine performance. This issue requires cleaning to restore full efficiency.

- Water Separator: No water was detected in the fuel, which is ideal for preventing corrosion and ensuring efficient combustion.

- Strainer Feed Pump: This component is in good condition without any dirt, which supports uninterrupted fuel delivery to the engine.

- Fuel Filter: The sediment found here restricts fuel flow, likely contributing to the low power issue. Cleaning or replacement is needed to ensure full, consistent fuel supply to the injection system.

This diagnostic data suggests that, while most components are in optimal condition, issues with the fuel tank strainer and fuel filter are impairing engine power. Proper maintenance, including cleaning and possibly replacing these parts, would likely resolve the low-power issue and improve the unit's operational efficiency.

Figure 3. Fuel Filter Problem

Based on the inspection results, it was concluded that the occurrence of low engine power was primarily due to a blockage in the fuel filter, which restricted optimal fuel flow to the engine. This restriction hindered fuel delivery, leading to a decrease in engine performance. As an initial step, the fuel filter was cleaned to temporarily restore fuel flow; however, to prevent recurring issues and to optimize engine performance, it was determined that replacing the fuel filter entirely would be the most effective solution. By installing a new filter, the engine’s fuel supply will be ensured, promoting consistent and efficient operation in the long term. This proactive replacement strategy is essential to maintaining the reliability of the unit and avoiding potential downtimes due to fuel-related inefficiencies.

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Author Contributions

Hendro Purwono, S.T., M.T.: Conceptualized the study, designed the experimental procedures, and conducted the primary data analysis. Provided critical insights into the failure mechanisms and developed the framework for the analysis.

Ari Aryadi, S.Pd., M.T.: Assisted in drafting and editing the manuscript, including figures and tables. Reviewed and contributed to the final revision and formatting of the paper.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. All research and analysis were conducted with impartiality and without any external influence or financial interests that could have affected the outcomes. Any potential conflicts of interest have been disclosed, and the study adhered to ethical standards in research and reporting.

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