



ANALYSIS OF IMPROVEMENT CAUSING DAMAGE TO CYLINDER LINERS AND PISTON RODS IN VEHICLE MODELS (F65 # -3SZ)

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Abstract: Cases that occur complaining about the engine on the vehicle is abnormal, both in idling and high rpm, when the initial inspection is carried out, there appear to be abnormal symptoms on the vehicle's engine.

So it needs repairs to the vehicle where there is a problem in the vehicle, which complains about the abnormal state of the engine both the state of idling or middle and high rpm.

After doing repairs, the problems that occur occur. The water hammer is caused by a cowl top seal that has no locking clip and water filter assembly. As a result of the water hammer being produced, there is damage to the components inside the cylinder block, namely the cylinder liner and piston rod.

Keywords: Abnormal, When Idling, High Rpm

INTRODUCTION

The piston fuel motor uses several cylinders in which there is a moving piston translation (back and forth). Inside the cylinder there is a combustion process between fuel and air which causes the combustion gas to move the piston by the connecting rod (drive rod) connected to the crankshaft. This translational motion (back and forth) causes rotational motion on the crankshaft and vice versa the crankshaft rotational motion causes translational motion on the piston.

And cases that have occurred complained about the engine on the vehicle being abnormal, both in idling and high rpm conditions, when the initial inspection was carried out, there appeared to be abnormal symptoms on the vehicle's engine.

With the existence of problems regarding abnormal symptoms in the engine parts of the model vehicle (F65 # -3SZ) that have occurred, the author draws the title to be discussed so that the problems are more specific and controlled, namely: "ANALYSIS OF IMPROVEMENT CAUSES CYLINDER LINERS AND PISTON RODS ON VEHICLE MODEL (F65 # -3SZ)".

Problem Formulation

Based on the background description of the problems mentioned above, the authors formulate the problems to be discussed are as follows:

1. Causes of damage to the cylinder liner and piston rod in the model vehicle (F65 # -3SZ).
2. Procedure for checking cylinder liners and piston rods in model vehicles (F65 # -3SZ).
3. Corrective actions on cylinder liners and piston rods in model vehicles (F65 # -3SZ).
4. Causes of water hammer on vehicle models (F65 # -3SZ).

Limitation of problems

Based on the formulation of the problem that the author has formulated in this study, the authors limit the problems to be discussed are as follows:

1. Determine the volume of water that causes the water hammer
2. Friction force and combustion chamber temperature temperature when a water hammer occurs in a vehicle model (F65 # -3SZ).
3. Temperature temperatures in the combustion chamber which can cause damage to the cylinder liner and piston rod in the model vehicle (F65 # -3SZ).

Purpose

The objectives of problem solving in this study are as follows:

1. Find out the cause of damage to the cylinder liner and piston rod in the model vehicle (F65 # -3SZ).
2. Know the inspection procedures performed on the cylinder liner and piston rod in the vehicle (F65 # -3SZ).
3. Know the consequences of the water hammer in the vehicle model (F65 # -3SZ).
4. Know the corrective actions taken on the cylinder liner and piston rod in the vehicle model (F65 # -3SZ).

LITERATURE

Torque Motorbike

The piston combustion motor is divided into two main types, namely gasoline (otto) and diesel motors. The main difference lies in the fuel ignition system on the gasoline motor ignited by the spark jumps from the spark plug, while the diesel motor occurs on the ignition process itself.

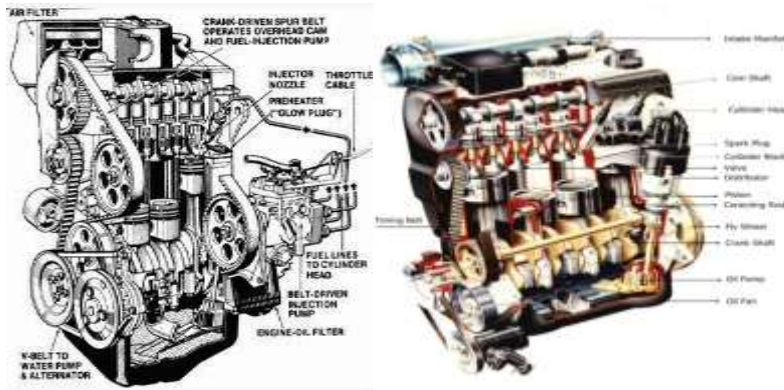


Figure 1 Diesel Engine Construction & Construction of Gasoline Engines

Gasoline Motor Cycle four steps

In a four-step piston fuel motor, two crankshaft turns occur and four piston steps to produce one power or combustion. Where the piston steps are as follows:

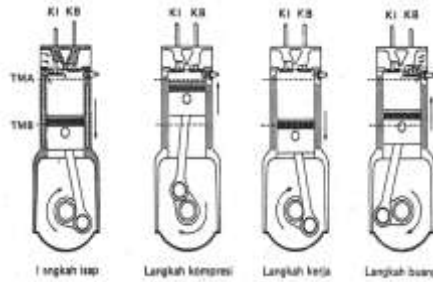


Figure 2 Steps four-step work

Otto Cycle

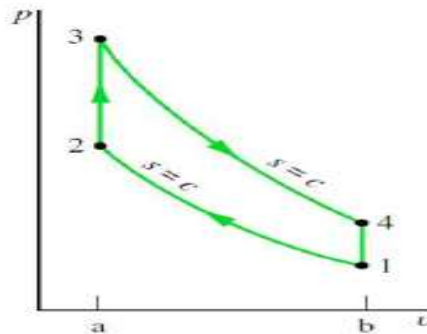


Figure 3 P - v Otto Cycle Diagram

Caption:

- 1 - 2: Isentropic compression process
- 2 - 3: The heat process enters at a constant volume
- 3 - 4: Process of isentropic expansion
- 4 - 1: The process of removing heat at a constant volume

Applicable constants:

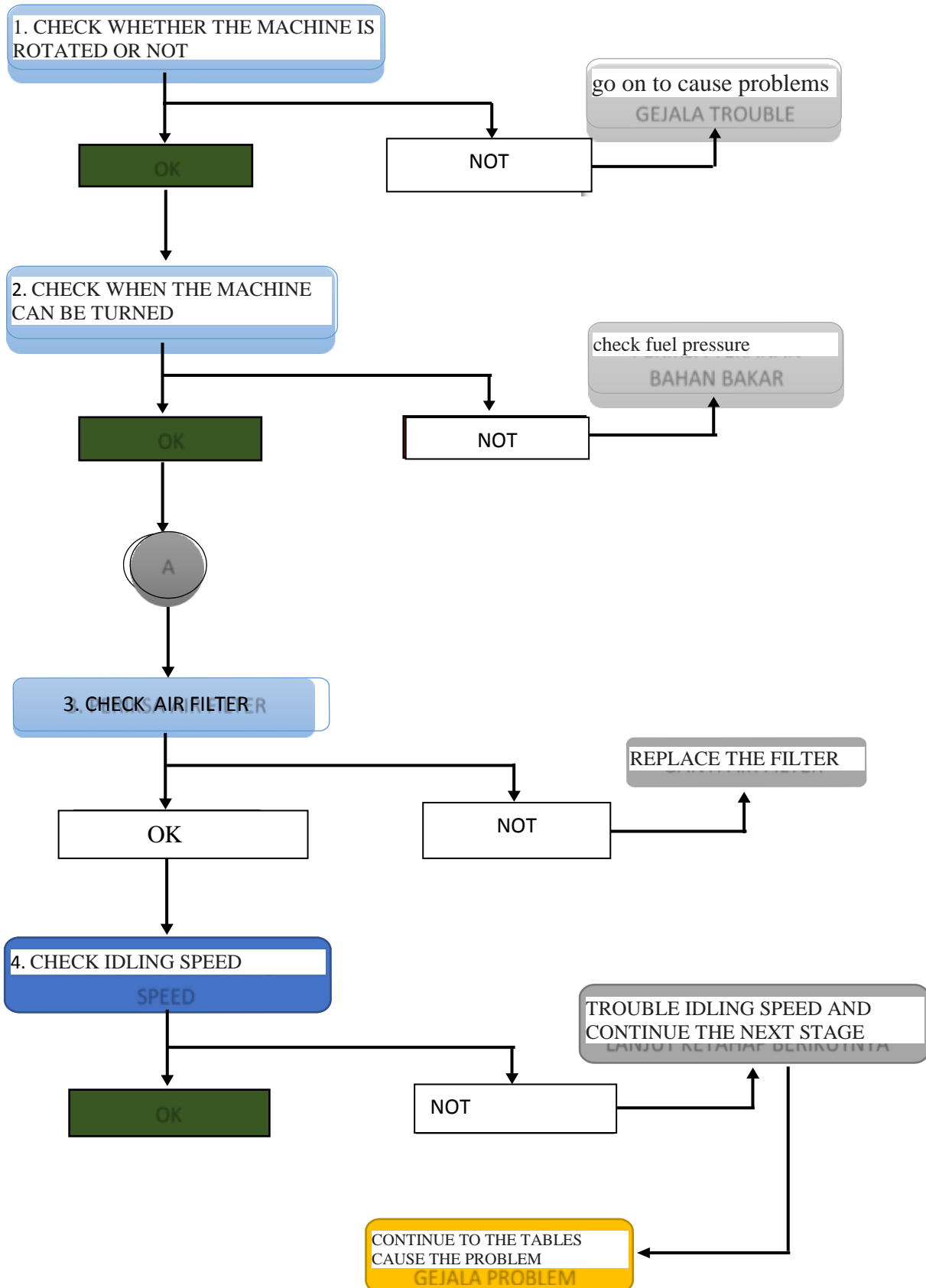
- k: Specific heat ratio constants
- : $cp \ cv = 1.4$
- cp: Specific heat constant at pressure constant
- : 1.005 kJ / kg. K
- cv: Specific heat constant on volume constant
- : 0.718 kJ / kg. K
- R: Air constant
- : $0.287 \text{ kPa. m}^3 / \text{kg. K}$
- : 0.287 kJ / kg. K
- r: Compression ratio
- : $v1 \ v2 = v4 \ v3$

METHOD

Diagnosis

At first, service and repair of the vehicle where there is a problem in the vehicle, and complain about the abnormal state of the engine both the state of idling or middle and high rpm. The basic inspection procedure is carried out on the vehicle engine the model (F65 # - 3SZ) is as follows:

Table 1: flow chart



(Source: 2013 CD Repair Manual Model F65 # -3SZ)

After a basic examination and known complaints or problems with the machine when idling, the inspection procedure steps are followed by examination of the problem symptom table, where the symptom table of the problem is as follows:

Table 2 Table of causes of the Problem

cause	Suspected area
Idling rough (idling bad)	Idle speed control valve circuit
	Fuel injector assembly
	Ignition system
	Spark plug
	Kompresi
	PCV valve
	Fuel pump control circuit

(Source: 2013 CD Repair Manual Model F65 # -3SZ)

From the inspection table, it can be seen that there was a problem during the compression check, where the compression pressure on cylinder No. 3 was less than the specified specification.

ANALYSIS

Problems

Damage to the cylindrical liner and piston rod can basically be caused by a number of problems, but on defective cylinder liner problems and piston rods that change shape are caused by the water hammer.

Causes of Water Hammer in Vehicle Models (F65 # -3SZ)

The cause of the water hammer in the vehicle model (F65 # -3SZ) was caused by the absence of a locking clip on the cowl top seal and filter assembly water that had not been made improvement. Here is the reason for the water hammer in vehicle model (F65 # -3SZ), namely:

1. Rain water enters through the rear engine hood gap



Figure 4 Rear Hood Engine Slits (Source: 2018 research documentation)

2. Then the water enters through the gap between the seal cowl and cowl



Figure 5 Seal Cowl (Source: 2018 research documentation)

3. Because the air filter assembly has not been repaired, there is a gap in the water filter assembly



Figure 6 Gap in Air Filter (Source: 2018 research documentation)

4. Because of the water that is pooled in the water filter assembly, the water enters the intake manifold due to the vacuum and then goes into the combustion chamber and a water hammer occurs.

Compression Pressure Checks Due to Water Hammer

As a result of the water hammer that occurs causes damage to the piston rod and cylinder liner which results in reduced compression pressure, causing an abnormal idling engine rotation.



Figure 7 Results of Compression Pressure Checks on Cylinder & Pressure Compression Checks on Cylinder (Source: 2018 Research Documentation)



Figure 8 Results of Pressure Compression Checks on Cylinder & Results of Pressure Compression Checks on Cylinders (Source: 2018 Research Documentation)

From the results of the examination carried out it can be seen that the compression pressure on cylinder No. 3 is less than the specified specification. Where the specifications of compression pressure on vehicle models (F65 # -3SZ) are:

Standard pressure: 1470 kPa (15.0 kgf / cm², 213 psi) Minimum pressure: 1079 kPa (11.0 kgf / cm², 156 psi)
The difference between each cylinder: 147 kPa (1.5 kgf / cm², 21 psi)
After it was known that the compression pressure on cylinder No. 3 was less than the standard drinking compression pressure which ranged from 8.2 kgf / cm² it was decided to overhaul the engine.

Due to Water Hammer in Cylinder Liners and Torque Rods

After the engine overhaul is carried out, it can be seen the effects of the water hammer on the cylinder block and piston rod, here are the consequences of the cylinder liner and piston rod caused by the water hammer, among others:



Figure 9 Difference in Torque Height when Upper Dead Point & Damage to the piston rod due to water hammer (Source:2018 Research Documentation)

As a result of the damage that occurs to the piston rod causing a collision between the piston rod and the lower cylinder liner, causing a cylindrical liner to be defective.

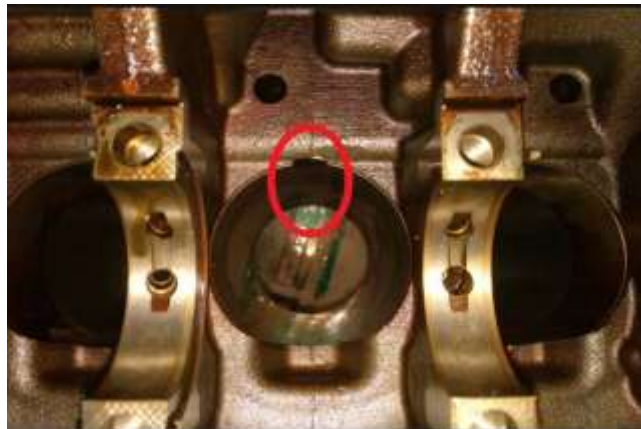


Figure 10 Damage to the piston rod due to water hammer (Source: 2018 Research Documentation)

Repairs Made on Cylinder Liners, Torque Rods and Air Filter Assembly

After analyzing the problems and examining the causes of the water hammer, the last step is to repair and replace the cylinder liner components, piston rods and air filter assembly, here are the descriptions carried out in the repair of cylinder liners, piston rods and air filters, including:

1. In the cylinder liner over size is 0.50 mm



Figure 11. Cylinder Block After Oversize (Source: 2018 Research Documentation)

2. Replacement of piston rod and piston fittings is carried out.



Figure 12 Torque and Torque Rods after replacement (Source: 2018 Research Documentation)

3. Improved air filter assembly



Figure 13 Air Filter Assembly After Improvement (Source: 2018 Research Documentation)

CONCLUSIONS

Based on the results of the discussion in the previous chapters, the authors can draw conclusions from the results of the study. The conclusions are as follows:

1. The cause of the water hammer is caused by a cowl top seal that has no locking clip and water filter assembly that has not been made so that rainwater can enter the water filter assembly and get to the combustion chamber.
2. As a result of being generated from a water hammer, there is damage to the components inside the cylinder block, namely the cylinder liner and piston rod.
3. The corrective action taken is to do an over size
4. 0.50 mm on the cylinder liner, replacing the piston rod and the completeness of the piston and repairing the air filter assembly.

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