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MAINTENANCE OF THE TUNE UP SYSTEM ON TOYOTA 4K SERIES CARS IN TEGAL

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Abstract

Tune-up is conditioning the car engine so that it returns to normal after being used for daily needs. Tune-up is not a repair but rather maintenance of the car engine, so that the car is always in top condition, in other words it will not break down when used for daily needs. To produce maximum tune-up work, of course you have to follow the correct procedures and during a tune-up, not all components are checked, this depends on the kilometers the engine has traveled, and the length of time that has passed since the last time it was serviced or the condition of the engine itself. Based on the research questions above, the objectives of this research include: To find out how to maintain or tune up a Toyota Kijang 4K series engine, to find out what components must be considered when performing a tune up on a Toyota Kijang 4K series engine.

Keywords: Tune-up, Engine Maintenance, Toyota Kijang 4K Engine, Tune-up Procedure, Service Time

INTRODUCTION

In modern times, technological developments seem to be very advanced. In the development of technology in the automotive sector in particular, where people are competing to have super luxury vehicles with sophisticated engines and technology. Many of the latest cars released in 2018, some of them are *the facelifted* model Honda HR-V, Mitsubishi Xpander with *Sport* and GLS transmission, Nissan Terra, Datsun *Go-Live* M/T and CVT, facelifted version of Chevrolet Trailblazer, Toyota Land Cruiser 200 VX, and many more. These cars are designed with a more attractive design and of course have the latest and advanced automotive technology to attract consumers.

However, it is undeniable that even though we are in modern times like today, old cars that existed in their time can still be seen on the streets. One of these old cars is the Toyota Kijang I and II generations which came out in 1977 and 1981. Toyota Kijang is the most popular vehicle model for the minibus class in Indonesia since 1977. This type of car is indeed one of the commercially successful cars to date so that it can be easily found in all corners of Indonesia.

Toyota Kijang is still showing its existence in the automotive world. This type of car does have advantages such as its classic appearance, stronger body, and cheap car taxes and

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maintenance. However, equivalent to these advantages, Toyota Kijang also has many disadvantages when juxtaposed with the latest cars today where the early generation Toyota Kijang is famous for having many diseases, one of which is in the engine part which requires vehicle owners to do *Tune Up* or periodic repairs.

In this study, the object of the research is the Toyota Kijang Doyok Generation II 4K Engine Series which came out in 1981. The car underwent periodic repairs or *Tune Up* because the engine that had been lam was operating so that all its components were not in their standard condition. If you look at it, the engine oil is diluted and pitch black, the fan strap is cracked and broken because it is not maintained. In addition, the car's battery lacks power. In the distributor there is dirt that causes the flow of sparks to be blocked and the valve gap is fragile and the spark plug is wet due to oil.

The problems that exist in the Toyota Kijang Doyok Generation II 4K Engine Series can actually be overcome if the car gets regular maintenance properly and correctly. Therefore, to overcome these problems, regular maintenance or *Tune Up* is needed. This is done so that the car remains in good condition. With that, this research is aimed at finding out how to perform maintenance or *Tune Up* on the Toyota Kijang Doyok Generation II 4K Engine Series.

Problem Formulation

Based on the background as described above, the problem can be formulated as follows:

1. Maintenance for *Tune Up* on Toyota Kijang 4K series engines has not been done much.
2. Many components have not been considered in Tune *Up* on the Toyota Kijang 4K series?

THEORETICAL FOUNDATIONS

Tune Up

A vehicle consists of a number of components that are used to operate within a certain period of time the ability or functionality of these components will decrease, this is due to wear on components that cause friction or components that get pressure, besides that there are also several component parts that need to be adjusted and cleaned. *Tune up* is the activity of resetting, cleaning, and replacing components that have been damaged or worn out and performing periodic maintenance due to continuous use of the car. In other words , *engine tune up* is an activity to restore the condition of the car engine to optimal engine performance. Meanwhile, the work carried out includes resetting, cleaning and replacing components that have been damaged or worn.

Some things that need to be considered in tuning *up* the machine include, preparing the necessary equipment, workplace or workshop which of course must be clean. Make sure the wires from the battery terminals (*accu)* are removed. Use a fixed support (*jack stand*) if the vehicle is jacked. If you use a chisel or hammer to open the bolt nut that is difficult to open, use a screwdriver to avoid the bolt nut from being scuffed or damaged. If replacement *of spare parts* is required, replace them with original spare parts that are in accordance with the recommended specifications.

Benefits *of Tune Up*

a) Maximizing engine performance
   As we know before, vehicles that continue to be used over time will decrease in performance, so by doing *tune up work* it will make engine performance increase or maximum engine performance.
b) Maintaining the condition of the engine to keep it durable
   Regular vehicle maintenance will make the condition of the engine components last longer than vehicles that are rarely maintained.
c) Avoiding more severe damage
   When the condition of the engine has decreased and the engine components have been asked to be replaced or readjusted but the owner does not do so, it will actually make other components will be damaged. Therefore, *a tune up* must be done to avoid more severe damage to the components.
d) Ensure all engine conditions are in good condition
   The fourth *tune up* function is to ensure that the engine is always in good condition according to its specification value, which means that the vehicle is always ready at any time when it will be used. For example, when you are going to start the vehicle once, start the vehicle immediately and there is no need to start it repeatedly.
e) Saves vehicle maintenance costs
   Why can tuning *up* regularly save on vehicle maintenance costs? This is because by tuning *up* regularly can avoid the risk of damage to vehicle engine components more severely. When the engine components are severely damaged, of course, the cost incurred to carry out repairs will increase.
f) Avoid traffic jams while traveling
   The sixth *tune up* function is to avoid the vehicle from suddenly getting stuck when driving. Of course, we don't want this condition, therefore it is very important to tune *up the* vehicle.

Tune up *procedure*

The *tune up* procedure must be sequential, this is to prevent repetition of work, because servicing certain components can affect other engine components. The correct sequence of car *tune up* processes is as follows:

a) Air filter (*air filter*)
   The process is quite simple, open the lid of the air filter housing then take the air filter components and then clean them using compressed air.
b) Cooling system
   1) Checking the height of the cooling water, the height should reach the full line on the tank.
   2) Checking the possibility of there are:
      - Damage to radiators and hoses.

- Loose hose clamps.
- Rusty radiator grilles.
- Leaks of water pumps and radiator cores.

3) Check how the radiator cap works.

Using a *radiator cup tester* check the spring tension and position of the vacuum valve of the radiator cap. If the cap opens at a pressure below the specification number, the radiator cap must be replaced. Standard valve opening pressure: 0.75 kg/cm² - 105 kg/cm², limit: 0.6 kg/cm². Fan straps. Visually inspect from the possibility, Damaged, deformed or worn fan straps of oil or grease. imperfect intersection between the rope and the pulley.

4) Check the den adjust the tightness of the fan strap.

With a pressure force of 10 kg, the rope pressure must show the tightness according to the specifications. Flexural fan rope at a pressure of 10 kg: water pump-alternator 7-11 mm, crankshaft-compressor 11-14 mm.

c) Battery

1) Check the battery from the possibility:
   a) Rusty battery support
   b) Loose terminal connection
   c) Rusty terminals
   d) Damaged or rusty battery

   Measurement of battery electrolyte specific gravity: Check the specific gravity of the electrolyte on the battery using a hydrometer with specific gravity specification: 1.25 kg/cm³ at a temperature of 20°C. Check the amount of electrolyte in each cell, if there is an unexpected difference, fill it with battery water.
2) Engine oilCheck the height of the engine oil.

The height of the engine oil must be between the L and F marks on the engine oil stick, if it is lower check the possibility of a leak, if there is no leak, the engine oil can be added.

3) kemungkinan.
4) Crack at Check the quality of the engine oil.

Check the quality and viscosity of the engine oil, if the engine oil is diluted and cloudy, it is necessary to change the engine oil.

d) Spark plug

1) Check the spark plug for any other damage to the insulator thread.
2) The gasket is damaged or deformed.
3) The electrode is burned or there is excess dirt/scale.
4) Clean the spark plug.
   a) Clean the scale of combustion residue using a wire brush until it is clean.
   b) Spray the spark plug with a compressor and dry it then check whether the spark plug flame is still good or not.
5) Adjust the spark plug gap.

Check each spark plug gap using *a feller gauge,* the standard spark plug gap is a maximum of 1 mm. If necessary, adjust it by bending the protruding part of the electrode.

e) High pressure cable

Check the physical condition of the cable for possible cracks or breaks. Also check the cable resistance by using an avometer, connect the two cable terminals, the cable resistance should be less than 25 KΩ per cable.

f) Compression pressure

1) Preheat the machine for 5 minutes, then turn it off.
2) Open all spark plugs.
3) Disconnect the high-voltage cable from the coil so that the secondary flow is cut off.
4) Insert the compression pressure test device into the spark plug hole.
5) Open *the throttle valve* completely and read the compression pressure while the engine is rotated with the starter motor.
6) Try to take measurements in a not too long time.
7) The compression test was carried out at 250 rpm with a compression pressure specification of 5K 12.6 kg/cm² with a limit of 9.5 kg/cm², in addition to the 5K engine with a limit of 9.0 kg/cm².

Purpose and Benefits of Car Tune Up

All activities and work on tuning up the car must be carried out periodically in order to maintain engine performance so that it continues to run optimally and optimally. In addition, car tune up also has the following goals:

1. Tune up the car is done to prevent various damages that may occur to your car.
2. Tune up the car is done to restore the performance of your car so that it always feels like new.
3. Car tune up is carried out as part of the checking process or control process on several parts and components in the car, The car tune up process can also prevent severe car damage so that engine failure does not occur. Many people also consider the car tune up process as a light service, considering that the car is used every day so that its condition is very prone to deterioration.

METHODOLOGY

The components used in the car have very sensitive properties. This requires you as a car owner to check regularly for each component. Here are some ways to tune up a car on several components:

1. **Checking the Carburetor and *Throttle Body***

   For cars with a non-injection system, you must check and clean the carburetor regularly. Don't forget to also adjust the RPM on the carburetor. Then, if the engine you are using already has an injection system in it, you only have to check and clean the *throttle body*.

2. **Checking on Car Batteries and Batteries**

   The battery voltage when the engine is off must be at 12 Volts. Then when the engine is on, the maximum battery voltage should only reach 14 Volts. In addition to voltage, check the current capacity using a *battery tester*. You can see the standard current used on your battery on the battery *cover*.

3. **Checking and Cleaning the Air Filter**

   The air filter part is mandatory for you to check and clean regularly. For the self-cleaning process, it usually uses compressed air so that the dust on the filter surface can be removed. If the condition of the air filter surface on your car is already very dirty, you inevitably have to replace it. Air filtersthat are too dirty will be difficult to clean, even if they are cleaned will be dirty

4. **Valve Gap Checking and Adjustment**

   If the engine of the car you are driving uses a conventional valve system (non-injection engine), then it is mandatory for you to carry out the process of adjusting the valve gap. This is done so that the valve remains in the standard position.

   The normal clearance of the valve should be in the range of 0.2 mm to 0.3 mm. A gap that is too wide will cause a noisy and underpowered engine sound. Then if the gap is too small, it can cause a leak in the compression.

5. **Checking on Various Fluids**

   As a car owner, you also have to pay attention and check all fluids used in the car such as engine oil, brake fluid, transmission oil, *power steering* oil, and axle oil. Not only checking the volume, you also have to always check the condition of the oil whether it is still feasible and able to lubricate the car engine.

6. **Checking on V Belt Voltage**

   The V belt must always be checked for its condition and tension level. V belts that are too loose must be reset immediately, but keep in mind that the adjustment process only applies to machines that have manual tensioners (threaded tensioners).

7. **Checking and Cleaning the Spark Plug Gap**

   Even though the spark plug gap has been regulated by the manufacturer, because of its use and interaction with compression pressure, the possibility of spark plug gaps experiencing changes still exists. That is why you must always check and clean the spark plug gap so that the flame coming out of the spark plug is not too big or too small.

RESULTS AND DISCUSSION

Disadvantages of Toyota Kijang 4K series

In the Toyota Kijang 4k series engine, there are weaknesses in the engine itself that cause a decrease in engine performance, including:

1. Masih OHV *(Overhead Valve)*
2. Still using a carburetor
3. Not wearing valves with hydraulic adjustment system
4. Still using platinum and condenser
5. Wasteful fuel

Figure 4.1. Toyota Kijang 4k Series Engine

Test Results

Table 1. Benign Inspection Results 4 K series (Engine Oil)

No	Name Component	Symptom	Repair Steps
1	Engine Oil	Black oil	Drain the oil and replace it New Oil
		Reduced oil height	Add n oil
		The filter was tersumb at	Replace the filter with a new one
		Oil Mixed	Oil drain and change the oil to a new

Engine oil quality standard: clear and viscous. Standard oil height : point F (Fuel *)*

Table 2. Fan Strap Inspection

No	Component Name	Symptom	Step
1	Fan strap	Ganti such kipas new	Replace the fan strap with a new one
2		Fan strap exposed Oil/Slip	Ganti such kipas new

Fan voltage srandar : New
: 125 +/-25lbs Old : 80+/-

20 lbs

Table 3. Battery Checks

No	Name Component	Symptom	Step Repair
1	Battery	Battery terminals loose	Dating Battery terminals
		Damaged Battery Terminals	Battery Terminal Sandpaper
		Broken Battery Terminals	Replace the new terminal
		Low Battery Water	Add Battery Water
		Battery Voltage Lack	Battery Charge

Standard battery voltage : 12 volts Standard weight of enis : 1.25 – 1.28 at 20o C

Table 4. Spark Plug Inspection

No	Component Name	Symptom	Step Repair
1	Spark plug	Dirty spark plug head	Clean the head spark plug
		Electrode discharged	Replace new spark plugs
		Wet spark plug head	Wipe and clean spark plug head
		Small sparks	Adjust spark plug gap
2	Cable Busi	No prisoners	Replace with a new cable
		No prisoners	Replace with a new cable
		Leaking spark plug wires	Insulation of spark plug wires
		Loose cable terminals	Set up terminals

Standard spark plug clearance: 0.80 mm (0.031 in)

Recommended spark plugs:

- ND : W 16 EX-U
- NGK : BP 5 EY

Standards for distributors are:

a. Gap platinum or pegas peredam 0,05 - 0.45 mm (0,002 - 0,018 in)
b. Gap *rubbing block* 0.4 –0.5 mm (0.016 - 0.020 in)

Table 5. Valve Gap Inspection

It	Component Name	Symptom	Step Repair
1	**Valve Gap**	Squeeze machine	Adjust valve gap
		Engine is unstable	Adjust valve gap
		Loose trigger	Set trigger
		Leakage valve	Disassemble the re-skiing
		Leaking valve seal 24	Replace the valve seal with a new one

Valve gap standards are:

- Suction valve (In) : 0.20 mm
- Exhaust Valve (Ex) : 0.30 mm

CONCLUSION

Based on the results of the above writing, it can be concluded that the condition of the engine has experienced a shortage such as oil that has been mixed with water and is black so it must be replaced. The fan strap is cracked so it must be replaced with a new one. The spark plug also experiences a gap in its gap therefore it must be reset according to its standards. The distributor replaced the components on the platinum because it was damaged, and the valve gap had experienced a gap so that it had to be readjusted according to the standard. However, the condition of the battery is still in a usable condition.

The components of the Toyota Kijang 4k series engine that are tuned up are engine oil, fan ropes, batteries, spark plugs, distributors, and valve gaps. These components are tuned up to get maximum engine performance and also keep the engine in good and excellent condition. If the engine is operated continuously, it will allow for a decrease in engine performance.

Suggestion

1. The wearer is advised to carry out periodic maintenance if it has entered the month for treatment or has entered the predetermined kilometers
2. Use precise measuring tools to get accurate data
3. Clean the tools before performing the experiment so that they can be used at all times and under the condition of

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