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# MAINTENANCE OF THE STARTER SYSTEM ON THE 1992 MAZDA MR CAR

**Kasum [1*], Albert Kasman [2], Aziz Zeni Setiawan [3]**
D3 Mechanical Engineering Study Program, Akademi Teknologi Bogor
Jl. Bina Marga No.17, RT.05/RW.08, Baranangsiang, Kec. Bogor Tim., Kota Bogor, Jawa Barat 16143, Indonesia
[1] kasum.wira@gmail.com, [2] albert.kasman.rec@gmail.com

## ABSTRACT

In the final project report. Teknik Mesin DIII. Faculty of Engineering. Bogor Academy of Technology Automotive technology is one of the fields whose technological developments always keep up with the times and demands. The starter system functions to make the engine start process easier. An electrical system that works on the starter motor to convert electrical energy from the current source (battery) into mechanical energy (rotary). The DC series motors consume direct current electric power with a generated field coil to form a magnetic field connected in series with an almature coil. The current that flows on the conductors in the motor assembly causes an electromotive force due to the occurrence of the Lorentz force so that it produces rotation and torque with a magnitude of 2249.86 Nm. From the resistance that exists in the starter motor, an efficiency of 87.2% is obtained from the 24v 4.5kw motor. The rotation produced by the motor is transmitted by reducing the pinion gear with the ring gear on the flywheel on the top of the gear calculation. The gear ratio is determined to reduce the rotation and increase the torque with the reduction of the planetary gears.

***Keywords:*** *Starter System, Current, Reduction Level, In Mazda Cars*

## *1.* INTRODUCTION

Today's advanced technology has many types of vehicles on the market, from two-wheeled vehicles to four-wheeled vehicles. In the operation of an engine on a heavy machine, it cannot immediately start on its own. Therefore, an initial drive system is needed that can move the crankshaft so that the engine can carry out the combustion process. Before technology developed, there were very few vehicles, but that was with technology that was still simple.

Vehicles in the past how to start the engine by cranking or pushing until the engine starts, unlike now just by turning the ignition key the vehicle can be turned on immediately, namely with the help of a tool called a starter motor or starting drive.

Engin cannot live on its own, it needs a starter system to provide an initial rev for the engine to run its work cycle. The starter system functions to start the engine and it is important to have an engine as a beginner starter.

The starter system functions to facilitate the process of starting the engine, where the starter system is an electrical system that works with electromagnetic power on the direct current starter motor with a mechanism to convert electrical energy from the battery with its current source into mechanical energy in the form of rotation. This mechanical energy is then used to make the initial movement when the engine will be started by rotating the flywheel through the gear connection between the pinion gear on the starting motor and the ring gear on the flywheel.

The starter system consists of the electrical components of the battery as the main source of electric current, Ignition

Swich (ignition key): functions to disconnect or positively connect the battery to the starter motor and as a safety. If one of the components is damaged, the starter system will not run, therefore the starter system components are very important.

Symptoms of damage that often occur in the starter system often occur in the starter motor mechanism, namely worn brushes resulting in the starter motor not being able to rotate.

## *2.* THEORETICAL FOUNDATIONS

The starter system is a part of the system in the vehicle to provide the engine with the initial revs to run its work cycle. By turning the flywheel, the engine gets an initial spin and can subsequently work to provide its own spin through the combustion cycle in the combustion chamber.

The working principle of the starter system is to convert electrical energy into energy for starters. This process utilizes the left-hand fleming method. Which reads, "what happens when an electric current flows through a conductor, while the conductor is located in a magnetic field. Then the conductor will push according to the magnetic force line shown by the left-hand fleming method". The relationship between the lines of magnetic force, electric current and thrust force is shown in three fingers. The middle finger shows the direction of the current, the index finger shows the direction of the magnetic field, while the thumb or thumb shows where the thrust is going. From the method, it is then arranged in such a way that the direction is reversed so that the resulting force is also reversed. Because it is placed on a shaft causes a continuous rotational force. This principle is the same as the principle of the starter motor in general and is almost equal to the working principle of the generator but the difference is that the generator converts mechanical energy into electricity while the starter motor works the other way around.

Working Principle of Starter in a Car

1. When the ignition is in the "ON" position the main relay or main relay will connect, causing current from the battery to flow to all of the car's electrical systems.
2. When the ignition is turned in the "ST" position, the starter switch relay will be connected so that current will flow from the battery to terminal 50 on the starter clutch. Because terminal 50 is subjected to an electric current, it causes magnetism in the pull in coil so that the pull in coil moves in the direction of the hold in coil. In this case, the pull in coil movement will push the drive lever so that the pinion gear is related to the flywhee

In this phase, the pull in coil push is not just moving the pinion. But it also moves the pull in coil itself in the direction of the hold in coil. As a result of this thrust, the hold in coil is also pushed towards the contact switch solenoid.

So that the electric current in terminal 30 of the starter motor will flow directly into the starter motor. In the starter motor, the current is flowed to the field coil to generate a magnetic field, and flows to the armature coil through the brush. Because there is electricity in the magnetic field, the result is that the armature will rotate to move the flywheel.

When the engine starts, the starter will stop by stopping the current from terminal 50. So that the pull in coil comes off and returns to its original position. With the return of the pull in coil, the pinion gear will also lose contact with the flywheel and the rotation of the motor will also stop because the electric current in the contact switch solenoid is cut off.

However, the pinion gear is actually designed to automatically reverse when the flywheel rotation is greater than the starter rotation. This function is shown to facilitate the process of linking and disconnecting the pinion gear with the flywheel gear.

Types of Starter Systems

Starter Mechanics

It is a human-powered starter, for example, kick starter, slinger (starter for diesel engines, and some types of old cars):

1. Kick starter (starter khaki)
2. Slenger (starter for diesel engines)

Starting Elelktrik

An electric starter is a starter whose power source comes from electric current. This starter is widely used in cars and is currently widely applied to motorcycles.

Starting Pneumatics

A pneumatic starter is a starter whose power source is compressed air. It is widely used in marine ship engines, because the ship engine is quite large, this type of starter is used.

## *3.* RESEARCH METHODOLOGY

Tools used

1. One-set wrench and ring wrench
2. Multiple jumper cables
3. Car battery for starter motor testing
4. Avometer (digital or analog)
5. Caliper
6. Dial Gauge and V-block (a tool for measuring run-outs)

Components that will be checked for Mazda Car Starter Motorcycles are envious:

1. Battery or Battery
2. Circuits on the Dynamo Starter
3. Bendik
4. Dynamo

## *4.* RESULTS AND DISCUSSION

Inspection and Maintenance of the Starter System

Before taking care of the car's stater system, you should pay attention to the components as carefully as possible. Don't rush to take action to remove components that do not need to be removed, pay attention and pay attention first then take care of them. Pay attention to maintenance procedures, so that there are no unnecessary parts or components that need to be dismantled, unless they get in the way of the process.

To determine whether the starter system components in the car must be serviced or maintained are as follows:

1. Judging from the hours of use, whether it is time for maintenance or must be replaced, this approach is carried out with the reason, if it is time for the component to be serviced or replaced, and there are components that must be replaced according to the hours of use, so as not to cause more severe damage to that component or other components.
2. The components of the starter system on the car will be serviced and replaced, if the components are not checked for a long time it will result in damage to these components, and also damage to other components that are more severe.

Failure in the process of operating this starter system due to lack of maintenance can have an impact on very serious damage. To overcome this damage, it is necessary to carry out regular maintenance and repairs. The problems that occur in the car starter system are:

1. Starter not working
2. Noise
3. There is a "crack" sound and the starter motor cannot rotate
4. All control lights are off if on the starter.

Before dismantling the starter system, we first choose a good and safe place and prepare the necessary tools.

Work Steps

The process of the work is carried out as follows:

1. Remove the field coil cable attached to the C terminal of the solenoid, then remove the solenoid.
2. Remove the main bolt of the starter motor.
3. Remove the screw from the end of the back house.
4. Remove the brush and brush holder by using sharp pliers. If the brush uses a spring-loaded type, be careful so that the brush does not break and the spring does not disappear.
5. Remove the armature from the starter motor housing.
6. Remove the screw from the end of the drive housing.
7. Remove the drive end housing.
8. Remove the starter clutch from the end of the drive housing.
9. Remove the jade ball from inside the starter kpling.
10. Remove the retainer.
11. Remove the roller from the end of the drive housing.
12. Remove the buffer spring from the solenoid.

Examination

Inspections and maintenance need to be carried out on the starter motor in case of damage or interference with the starter motor. The checks that must be carried out are the armature inspection, the yoke inspection, the brush inspection, and the starter clutch inspection.

## *5.* CONCLUSIONS

Based on the description above, it can be concluded as follows:

1. The components of the starter system consist of yoke and pole core, field coil, armatuer, brush, starter clutch, lever drive, armature break, magnetic switch. Damage is usually caused by the age of these components
2. Starter motors work by converting electrical energy into mechanical energy. This process utilizes the left-hand fleming method. Which reads, "when there is an electric current flowing through the conductor, the conductor's energy is located in the magnetic field. Then the conductor will be pushed according to the magnetic force line shown by the left-hand fleming method".
3. The relationship between the lines of magnetic force, electric current and thrust force is shown in three fingers. The middle finger shows the direction of the current, the index finger shows the direction of the magnetic field, while the thumb or thumb shows where the thrust is going.
4. The way to maintain and overcome disturbances that occur in the starter system on the 1992 Mazda MR car is to analyze and check periodically so that it can overcome the disturbances that occur as best as possible effectively.

Suggestion

The writing suggestions that I want to convey are as follows:

1. Check if there is a problem with the starter system carefully and understand what is wrong with the starter system. Then make repairs and maintenance regularly.
2. Perform a check on the components in the starter system, such as brushes. Repairs must be made when the time limit for use has expired, it is possible that the brush has run out so that it cannot carry out its function.
3. To overcome the disturbances that

occur in the starter system on the Mazda MR 1992 car, it must be done in accordance with the procedures specified in the service manual.

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