

**EXCITING WORLD OF
AUTOMOBILES**



STUDENT WORKBOOK

Curriculum : AUTO-SRV L2-NQ²⁰¹²

Unit : AUTO-SRV L2U3

Vehicle Servicing

Vocational Learning Material for Schools

PSS Central Institute of Vocational Education

Bhopal

PREFACE

Improving the parity of esteem between the general academic education and vocational education, is the policy priority of the Government of India. The National Vocational Education Qualification Framework (NVEQF) developed by the Ministry of Human Resource Development (MHRD), Government of India, is a descriptive framework that provides a common reference for linking various qualifications. It will be used for setting common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, Colleges and Universities. The NVEQF will act as a translation device to make qualifications more understandable to employers, students and institutions. It will promote transparency of qualifications and facilitate learner's mobility between different qualifications, thus encouraging lifelong learning. PSSCIVE has taken lead in development of learning material for the Automobile Sector for all level in collaboration with the Automobile Skill Development Corporation (ASDC).

The present material contains activity related to Level L-2 for the Automobile service sector. This will fulfill the needs of the students willing to learn activities relating to the Automobile Service Sector. Any student/ entrepreneur willing to start an Automobile Service Sector can acquire the desired competencies with the help of this book.

The book has been written by experts but reviewed by all the members of the group. I am grateful to the authors for the development of this book and to the members of the Working Group for their candid suggestions, during the development and review. Their names are given elsewhere.

I appreciate efforts put in the by Dr. Saurabh Prakash, as the Project Coordinator of the Working Group in planning and organizing Meetings which led to the final form of this title.

I shall be grateful to receive suggestions and observations from readers, which would help in bringing out a revised and improved version of this book.

Bhopal
June, 2012

Prof. R.B. Shivagunde
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Pandit Sunderlal Sharma
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This student workbook was developed, with active involvement of the Automobile Skill Development Council (ASDC) keeping in view the National Occupation Standard (NOS) for Service Technician L4 developed by ASDC.

This project for development of the student workbook was coordinated by the PSS Central Institute of Vocational Education, a constituent unit of National Council of Educational Research and Training, which is under Ministry of Human Resource Development, Government of India.

Student Details

Student Name: _____

Student Roll Number: _____

Batch Start Date: _____

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About this Workbook

This workbook is to assist students with completing the Auto Sector **L2U3-NQ2012** unit of competency: Vehicle Servicing. Students should study the workbook in class or in their own time.

This workbook contains sessions for imparting knowledge & skills on various basic aspects of the unit of competency. The workbook also includes information, exercises, and assessment activities to complete. The assessment plan has been included in the workbook to assist you in scheduling your time for completing the assignments. Each assessment activity is followed by a checklist for meeting the assessment criteria. The criteria will help you to ensure that you have fulfilled all of the assessment requirements to receive a 'competency' grading/Certification by ASDC.

Unit Information

Unit name: Vehicle Servicing

Unit code: Auto L2U3-NQ2012

Unit descriptor:

This unit provides introductory knowledge & skills covering vehicle servicing specially car washing, changing of oil, fuel and air filter replacement of a vehicle. Students will be given a broad view of these important issues.

Resource Required:

- Notebooks, Pen, Pencil, Eraser, Computer, Open Source Software for making digital presentation, LCD projector. Sketches, pictures, animation and videos of oil, air filter of automobile and its components. Posters for building awareness about these topics.
- **Nominal hours:** 40 hours

Elements and Performance Criteria

- Elements define the critical learning outcomes of a unit of competency.
- Performance criteria specify the level of performance required to demonstrate the achievement of the Competency Element.

Element of knowledge	Performance Criteria
• Washing of a vehicle	• Able to wash a vehicle • Able to handle the washing equipment
• Changing of oil and oil filter	• Able to check and change the oil of engine • Able to check and change the oil filter of engine
• Changing of Air filter	• Able to check and change the air filter of engine
• Changing of Fuel filter	• Able to check the fuel of engine • Able to replace the fuel filter of engine
• Changing of Coolant	• Able to check and change the coolant of vehicle

Relevant Knowledge and Skills

1. Relevant Knowledge

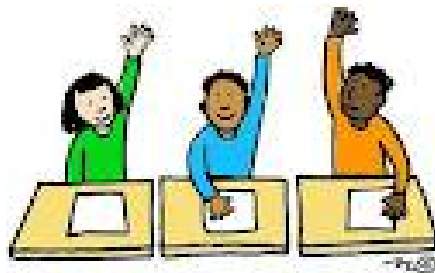
- Car washing
- Air Filter
- Oil Filter
- Fuel Filter
- Fuel replacement
- Oil replacement
- Coolant replacement

2. Skills

Able to do/replace above items in a vehicle

Assessment Plan

Session No.	Assessment method	Due Date	Completion Date
1.	Fill in the Blanks		
2.	Fill in the Blanks		
3.	Fill in the Blanks		



Introduction

When you get up in the morning and clean your face and body regularly, it makes you feel fresh. You use soap, shampoo, and detergent for cleaning. Similarly, a vehicle requires a cleaning operation. Cleaning of vehicles is very important. It makes the vehicle look better and gives comfort to the driver and passengers. We have to change the oil, lubricant and coolant of a vehicle whenever its quality is disturbed. We have to properly check all the important components of a vehicle.

In this Unit, you will develop an understanding of the methods of washing car, procedure for changing of oil, coolant; lubricants, air and water filter of a vehicle, so that the efficiency of a vehicle increases.

Session 1: Washing of a vehicle

Relevant Knowledge

We see in the picture that a person is washing the vehicle by cloth. It is a common practice in our country. We may call the person cleaning a vehicle, carwash wala. He comes in the morning to your house, collects the keys of your vehicle and cleans the car. Generally this person keeps two type of cloths with himself first one is dry and other one is wet. Dry cloth is used first for removing dust and the wet cloth is used for cleaning. You can see in these photographs, a carwash wala is manually cleaning the vehicle.



Fig : Manual car washing

Proper steps for manually cleaning a vehicle

We will learn here the step by step practice to be followed while washing a vehicle our selves

- It is suggested that a shady spot should be chosen, preferably away from trees so that the car doesn't get leaves etc..
- All the doors and windows should be closed.
- Take a bucket of clean water and pour one full spoon of car soap



Fig : Manual car washing

- Remove the dirt from the car, starting at the roof and getting down to the tyres.
- Take a sponge or terry cloth piece in the bucket of soapy water and sponge the roof of the car.
- Spray off excess soap when the entire roof has been cleaned

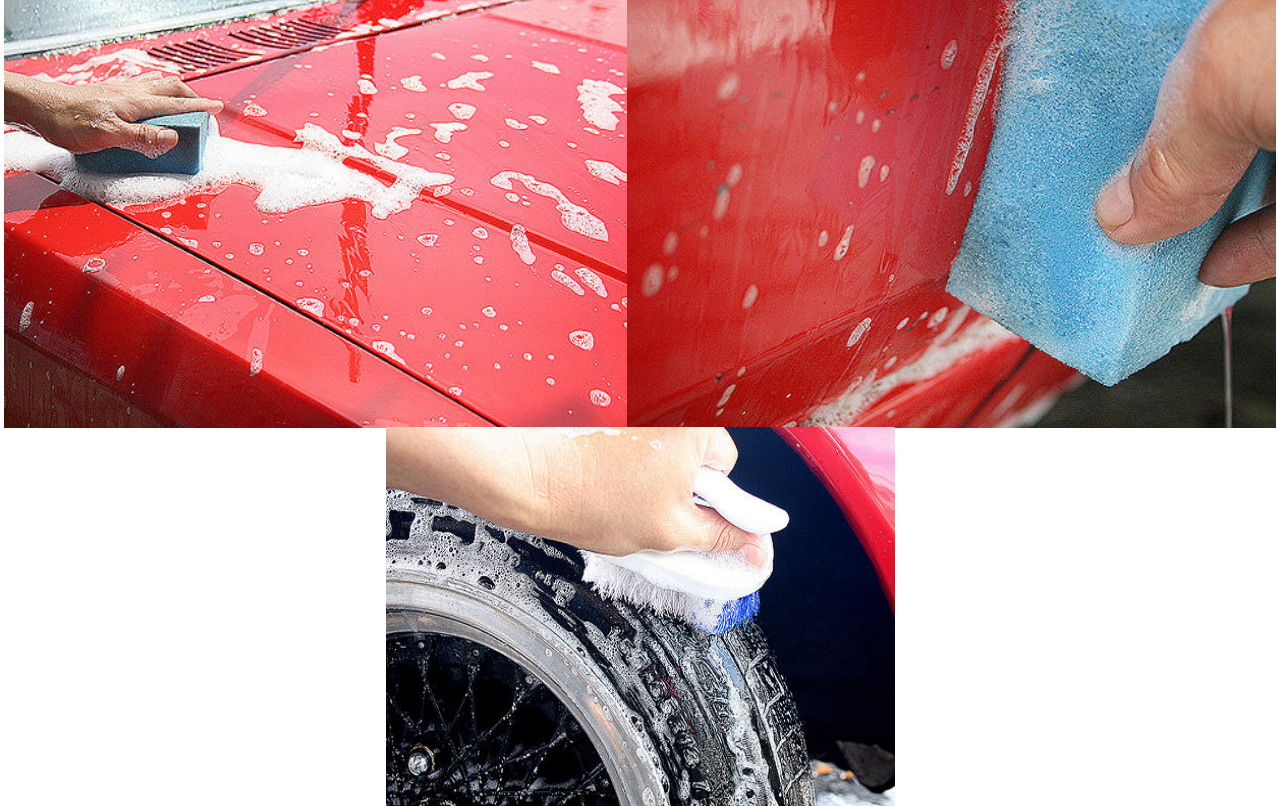


Fig : Manual car washing

- Clean the tyre sidewalls with a plastic brush
- Clean the car with the water pipe properly, so that, there is no soap or dirt spot.
- Take an old towel and dry the car thoroughly by setting the towel flat against the surface of the car and dragging it along the surface to pick up any water spots. Start from the roof and work your way down to the tyres.
- For cleaning the windows use pieces of newspaper on both the inside and the outside of the windows. Rub and clean metal or chrome parts so that there are no water spots.



Fig : Car washing with cloth

Precautions during washing

- Wear old clothes for this job.
- Soap dries fast. Wash one side at a time to keep the soap from drying on your car's paint.
- Wet and wring out your clothes before you dry; it will absorb water better.
- Do not use detergent, dish soap. Detergent, dish soap is designed for dishes. Use car wash soap only.

Washing at a Service Station

Similarly, a vehicle is also washed at service station or a car wash station. The service stations use automatic washing unit in which procedure of washing takes place. In an automatic washing unit, cleaning as well as shampoo washing takes place. You can view here a photo of automatic washing unit. You may plan a visit to nearest car service station and observe how the washing of a vehicle is taking place. You may see that water is sprayed on the car with the help of mist sprayer. Brushes are used for cleaning the body of a vehicle.



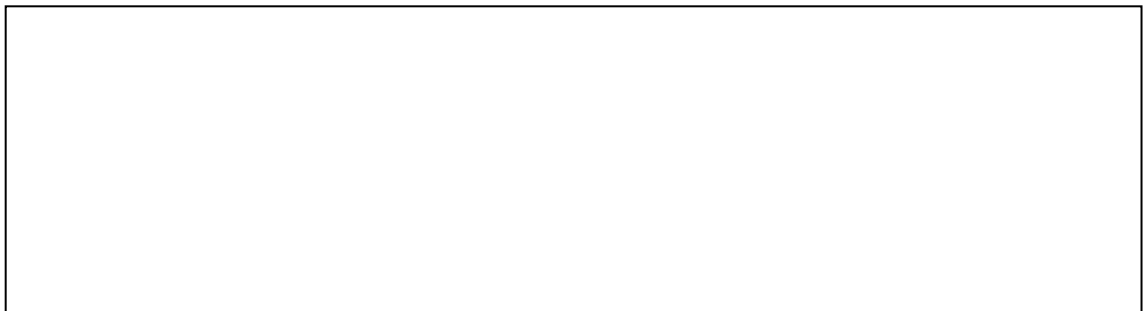
Fig : Automatic car washing unit

Session 1: Washing of a vehicle**Exercise: Assignment**

1. List the steps used in manual washing

S.No.	Steps used

2. Prepare a poster showing steps used in car washing of a vehicle.

**Session 1: Washing of a vehicle**

Answer the following questions

(Use additional sheets of paper if necessary)

A. Fill in the blanks

- _____ is used for cleaning the vehicle.
- Detergent, soap powder should _____ be used while washing a vehicle
- Start cleaning from the roof and work your way _____ to the tyres.
- For cleaning the windows use pieces of _____ on both the inside and the outside of the windows.
- Service stations use automatic washing unit in which _____ the operation of washing takes place.

Session 1: Washing of a vehicle

Checklist for Assessment Activity

Use the following checklist to see if you've met all the requirements for washing of a vehicle.

Part A

Share importance of washing of a vehicle.

Part B

Discussed in class the following:

- Why vehicle washing is necessary?
- What are the steps to be followed for manual washing of a vehicle?

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to explain importance of washing		
Able to list general steps during washing		

Session 2: Changing of oil and oil filter

Relevant Knowledge

As you know, engine oil is an important material in a vehicle. Incorrect oil levels can cause serious damage to your vehicle's engine, so it's important to check the oil level regularly. This is very easy to do and just takes a few minutes. It is recommended always to keep a 1 litre bottle of oil in your car so that you can top up whenever necessary.

How to check the oil

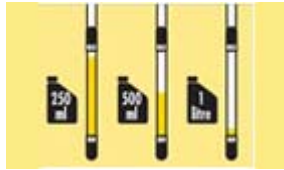
First, choose the right oil for your vehicle or car by checking your vehicle manufacturer's recommendation.



Ensure that your car is parked on level ground, with the hand brake on and the engine off. Open the bonnet with the help of a lever under the dashboard and keep it open with its support. Avoid touching the hot engine. Allow one minute for the oil to settle.



Put on some protective gloves and pull out the dipstick. Wipe it clean with a paper towel and replace it fully for several seconds. Then remove it again to study the oil level.



The oil level should fall somewhere between the minimum and maximum marks on the dipstick and may need topping up. See the diagram for an indication of how much oil to add.



Remove the oil filter cap to top up the engine with the appropriate amount of oil, preferably using a funnel. The scale on the bottle will indicate how much has been used. Repeat steps 2 and 3 to check the new level.



Replace the dipstick and the oil filler cap securely. Clean any finger marks from the bonnet and wipe any oil from your hands with a moist towel, disposing of any waste materials in an appropriate place.

When you notice that your oil level is below the minimum mark, find out how many kilometers have passed since the last oil change. If you're not sure, refer to your handbook for recommended oil-change intervals or if your mileage is above 15000kms, it's advisable to perform a complete oil change. If the mileage is between 4000kms and 15000kms you will only need to top up your oil. You may see the vehicle service manual and find the recommended time or distance for changing of oil regularly, so that you can keep your car running well. Over time your oil breaks down and your filter

becomes clogged with contaminants. Fortunately, changing your oil is both easy and inexpensive. You will learn it in this section.

How to change the engine oil yourself

Changing your car oil is easier than it sounds and could also save you money in the long term. It shouldn't take longer than 45 minutes – just make sure that you follow your manufacturer's specific instructions and safety directions. Firstly, choose the ideal oil for your car from the market as per recommendation of the manufacturer.

Material and tools requirement for changing of the oil.

- Engine Oil (4 or 5 litres – check the vehicle's service manual)
- New oil filter - check vehicle's service manual
- Safety glasses and rubber gloves
- Plastic container and funnel
- Car jack and jack stands
- Drain plug socket wrench
- Paper towels and a rag
- Oil filter wrench

What you have to do:

1. Prepare your car

The car should be on a level surface with the parking brake on and engine off, leaving the oil to cool for a few minutes. If you need space under the car, jack it up and use jack stands to support it. Jacks on their own are very unstable – never get under your car without using jack stands. You could also put something underneath the engine to prevent spilling oil onto the ground.

2. Unscrew the oil cap

Locate the oil cap (check with the manual to locate it) and unscrew it. This is very important, as a vacuum will not allow all the oil to drain out.

3. Locate the oil drain plug

Get underneath the car and locate the oil drain plug. This is a lone bolt at the bottom of the oil sump.

4. Place the container

Place a container big enough to hold the oil beneath the oil drain plug and unscrew the plug, being careful not to let it fall into the container. Do not come in contact with the oil – it can be extremely hot.

5. Drain out the old oil

Allow all the oil to drain out. This can take several minutes.

6. Locate the oil filter

Locate the old oil filter with the help of your car's service manual. It should be identical to the one you are replacing it with.

7. Remove the old oil filter

Turn the filter wrench anti-clockwise to loosen the oil filter. The filter may be full of oil so take care not to spill any.

8. Prepare the new filter

Clean up the filter seat on the engine and place a light coating of oil on the gasket of the new filter.

9. Install the new filter

Carefully screw the new filter into place by hand, making sure it is not over-tight. Screw back in the oil drain plug and tighten it with the wrench.

10. Fill up with oil

Using the funnel, carefully fill the engine oil, avoiding spillages. Measure the oil level with the dipstick after every two litres filled.



Fig: Fill up oil with funnel

11. Check the level is correct

When oil has reached the correct level, replace the oil cap. Turn on the engine for ten minutes and then off again. Check the oil level with the dipstick once again - if the level is low, add more oil.

12. Clean up

Clean up all oil spillages on your engine and check for any leaks from the drain plug.

13. Properly dispose of the old oil and filter

Used oil is highly toxic and must never be disposed off with domestic waste. It's illegal to pour used oil into the sewage network. Put the used oil in a

sealed container and label it. Then take it to an auto repair centre, service station or recycling centre. Most places will accept used oil for free.

Session 2: Changing of oil and oil filter

Exercise: Assignment

1. List the tools required for changing of oil

S.No.	Name of tools

2. Prepare a poster showing tools used in changing of oil.

--

Session 2: Changing of oil and oil filter

Answer the following questions

(Use additional sheets of paper if necessary)

Fill in the blanks

1. Follow vehicle manufacturer's specific _____ and safety directions
2. Choose the ideal oil for your car from the market as per _____ of manufacturer.
3. Highly toxic oil must _____ be disposed of with _____ waste.
4. Car should be on a _____ surface with the _____ brake on and engine _____.
5. Changing of car's engine _____ and _____ is one of the most important things.

Session 1: Changing of oil and oil filter**Checklist for Assessment Activity**

Use the following checklist to see if you've met all the requirements changing of oil and oil filter.

Part A

- Share importance of changing of oil and oil filter

Part B

- Discussed in class the following:
 - Why oil changing is important?
 - What are the different types of tools used in changing oil and oil filter? Steps used in oil replacement process.

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to explain importance of oil replacement		
Able to identify general steps followed in oil replacement		

Session 3: Changing of air filter

Relevant Knowledge

You know that any vehicle needs air just as much as it needs fuel. Air filters keep the inside of the engine free of dust and insects. Replacing or cleaning air filter at the recommended interval to keep air flowing freely helps the car run well. Air filters are inexpensive and quick to replace, so we can do this routine maintenance with ourselves.

Material and Tools Requirement for the changing of air filter

- a new air filter/ specifications as recommended by the manufacturer
- a flat screwdriver
- a Phillips screwdriver
- a compressor air valve w/hose

Steps

Obtain the correct replacement filter: It should be the same as the one you will replace. Consult your vehicle service manual or auto parts store if you need assistance finding the right part.

Secure the vehicle: Park the car on level ground and apply the parking brake. Shift into first gear (manual transmission) or Park (automatic transmission) and turn off the ignition.

Open the bonnet (hood): Release the bonnet with the lever inside the car. Move the exterior bonnet catch for final release. Lift the bonnet and secure it with the prop rod.

Locate the air filter: Air filter is located on the top of engine

Remove the air filter cover: Loosen the hose clamp that seals the air conduct. Undo all the screws holding the air filter cover. Some models have wing nuts, other air filters are just clamped on with a quick release system. *Keep screws and other parts together and in a safe location so you can find them later.* Pull the cover out of the air conduit and lift it up so it comes off the lower part of the housing.

Take out the air filter: Now you can see a round or rectangular filter made of cotton, paper or gauze. Filters have a rubber rim that seals off the unit's interior. Simply lift the filter out of the housing.

Clean the air filter housing: Connect the air hose to the compressor and use the compressed air to blow out the dust, or use a vacuum cleaner to suck up any dirt.



Fig : Cleaning of air filter housing

Seal the air conduit with removable adhesive tape. It only takes a minute and that way you won't get any dirt into the engine whilst cleaning.

Replace the filter: Replace the old filter with a new one. Simply insert it into the housing with the rubber rim facing up. Make sure the edges are sealed by the rubber rim.

Replace the cover: Carefully insert the cover back into the air conduit and then press the entire piece down onto the lower half of the air filter unit. Make sure it's on straight and securely, otherwise you could alter the engine's performance. Tighten all the screws or clamps and recheck that you have put everything firmly back together by rocking the unit gently with both hands. Shut the bonnet securely

Check the filter regularly to keep your car breathing at maximum efficiency by keeping the dust out.

Change the filter every 50,000 km or about once a year: If you drive in a dusty area, it will need replacement more often. Your vehicle's service manual or periodic maintenance guide should have recommendations for

your car. You can clean the old filter as long as the material isn't torn, cracked or oil stained. Use a light to check if it is oily inside. Hold a lamp behind it and see if the light gets blocked out by oil. Proceed, if the light can be seen. Now, blow out the dust with compressed air if you have it, or else vacuum it up. Turn the air filter around to clean both sides. If you choose to clean the filter, you can put the filter back in this time, but buy yourself a new filter soon and change at the next check.

Session 3: Changing of air filter

Exercise: Assignment

1. List the tools used in changing of air filter

S. No.	Name of tools

2. Prepare a poster showing air filter used in automobiles.

Session 3: Changing of air filter

Answer the following questions

(Use additional sheets of paper if necessary)

A. Fill in the blanks

1. Air filter is used for_____.
2. Air filter is a _____ used for _____.
3. Air filter should be changed at _____ km.
4. Air filters are _____ and _____ to replace.

B. Tick the correct answer

1. Air filter is made of
 - A. Iron
 - B. Wood
 - C. Steel
 - D. Paper

1. Air filter is cleaned by
 - A. Chemical
 - B. Air Blower
 - C. Oil
 - D. Water

**Session 3: Changing of air filter
Checklist for Assessment Activity**

Use the following checklist to see if you've met all the requirements for pollution control.

Part A

Share importance of air filter used in vehicle.

Part B

Discussed in class the following:

- Why air filter is important?
- What are the different steps used in changing of air filter.

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to explain importance of air filter		
Able to identify air filter		

Session 4: Changing of fuel filter

Relevant Knowledge

Changing a vehicle's fuel filter is a regular part of normal maintenance. Dirt in the fuel is captured in the filter and over time clogs the filter, causing it to operate less efficiently. The clogged filter reduces fuel pressure to the vehicle. Replace the filter at the manufacturer's recommended interval.

Material and tools requirement for the changing of fuel filter

- Safety glasses or some other sort of eye protection
- Replacement filter
- Screwdriver to undo clamps
- Container to catch fuel that leaks from hoses
- Rags to clean up any spilled fuel, dispose of them if used.
- Specialty tools. Some vehicles require the use of special tools to disconnect fuel fittings, including the fittings connecting the fuel filter.

These tools should be available at the same parts store from which you purchased your fuel filter.

Steps

- Purchase the filter.
 - Locate the old filter - it may be in the engine compartment or under the car near the fuel tank.
 - If recommended by manufacturer, follow procedure to remove fuel pressure.
 - Unscrew each hose clamp bolt until it nearly comes apart from the nut.
 - Push the clamp up the hose
 - Remove the old filter and replace with new filter
 - Run the engine and check for leaks.
-

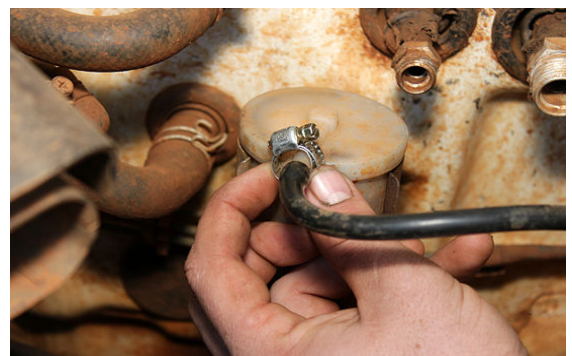
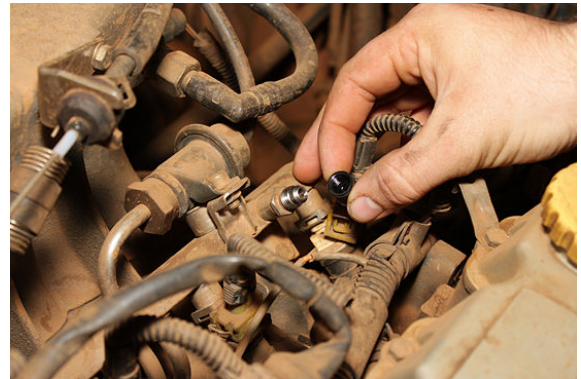


Fig: Photographs of Replacing Fuel Filter

Session 4: Changing of Fuel filter

Exercise: Assignment

Prepare a poster showing fuel filter used in a vehicle.



Session 4: Changing of Fuel Filter

Answer the following questions

(Use additional sheets of paper if necessary)

A. Fill in the blanks

1. Fuel filter is used for_____.
2. Fuel filter removes _____ from fuel
3. Clogged filter _____ fuel pressure to the vehicle.
4. Replace the _____at the manufacturer recommended interval.

Session 4: Changing of Fuel Filter

Checklist for Assessment Activity

Use the following checklist to see if you've met all the requirements for change of fuel filter.

Part A

- Share importance of tools used in workshop.

Part B

Discussed in class the following:

- What is meaning of fuel filter tools?
- What are the different between oil and fuel filter?
- Name two popular tools used in removing fuel filter

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to explain importance of fuel filter		
Able to identify fuel filter		

Session 6: Changing of Coolant

Relevant Knowledge

Coolant

A coolant is a fluid which flows through a device to prevent its overheating, transferring the heat produced by the device to other devices that use or dissipate it. An ideal coolant has high thermal capacity, low viscosity, is low-cost, non-toxic, and chemically inert, neither causing nor promoting corrosion of the cooling system. While the term **coolant** is commonly used in automotive, residential and commercial temperature-control applications, in industrial processing also.

Changing of coolant

Most people never change their engine coolant or even know that they should. Whether you call it coolant, antifreeze or radiator fluid, it's the stuff that helps keep your car's engine from overheating, and without it, your car most certainly will overheat quickly and cause massive damage to the engine. To keep your radiator system free of corrosion and performing well keeping your car engine cool; you should change it about every two years. Check your auto's manual for when to change your coolant. While it's a general rule to change vehicle coolant every two years, some manufactures differ on the coolant they use.

Material and Tools Requirement for the changing of coolant

Coolant

- Pan
- Coolant
- Spanner

Steps

1. Purchase the coolant as per manufactures specifications
2. Prepare the vehicle: Keep your car in plain space and keep engine off for few hour so that engine is cool.
3. Keep a pan below radiator
4. Open the radiator cap and see level of coolant

5. Open the drain plug nut below radiator chamber by using wrench or by hand if possible
6. Coolant will start coming out and all coolant will be emptied.
7. Put back the drain plug at the bottom of radiator
8. Fill the radiator to the top with the coolant.
9. Turn the engine on. Let it run for several minutes to get any air out of the system. Watch the temperature gauge to make sure the car does not overheat. After the radiator has burped up air bubbles, turn the car off and carefully fill the radiator to the top with coolant. Close the radiator cap tightly. Watch the temperature gauge carefully for the next few days.

Session 6: Changing of coolant

Exercise: Assignment

Prepare a poster showing coolant being changed in a vehicle.



Session 6: Changing of coolant

Answer the following questions

(Use additional sheets of paper if necessary)

A. Fill in the blanks

1. Coolant is used for_____.
2. Coolant removes _____ from engine
3. Coolant should be changed at every _____ year.
4. Replace the _____at the manufacturer recommended interval.

Session 6: Changing of coolant

Checklist for Assessment Activity

Use the following checklist to see if you've met all the requirements for coolant change.

Part A

- Share the importance of coolant.

Part B

Discussed in class the following:

- What is meaning of coolant?
- What are the different between oil and coolant?
- Name tool used in changing coolant in vehicle.

Performance standards/criteria covered by this assessment

Performance standards	Yes	No
Able to explain importance of coolant		
Able to identify coolant		

Suggested Reading

Books

Title	Author	Publisher
Automobile Engineering Vol I	Kirpal Singh	Standard Publishers
Automobile Engineering, Vol II	Kirpal Singh	Standard Publishers
Text Book of Automobile Engineering	R K Rajput	Laxmi Publications
Automobile Engineering	R K Singal	S. K. Kataria and Sons
Automobile Engineering Theory	Kapil Dev	Computech Publications
Automobile Engineering,	K. M. Moeed	S. K. Kataria and Sons

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www.shell.com/home/content/ind/products_services/on_the_road

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