Chapter: - 1

Introduction

1.1 History of industry
1.2 Introduction of organization
1.3 Organization photos
1.4 List of cars
1.1 History of industry:

- Maruti's history begins in 1970, when a private limited company named 'Maruti technical services private limited' (MTSPL) is launched on November 16, 1970. The stated purpose of this company was to provide technical know-how for the design, manufacture and assembly of "a wholly indigenous motor car".
- In June 1971, a company called 'Maruti limited' was incorporated under the Companies Act and Sanjay Gandhi became its first managing director. "Maruti Limited" goes into liquidation in 1977.
- On 23 June 1980 Sanjay Gandhi dies when a private test plane he was flying crashes. A year after his death, and at the behest of Indira gandhithie Indian Central government salvages Maruti Limited and starts looking for an active collaborator for a new company. Maruti Udyog Ltd is incorporated in the same year.
1.2 Introduction of organization:

- The founder of organization is Mr Jayantibhai Chandra. In 1990 he started production ‘Khusbu Rickshaw’ in the city of Jamnagar.
- Later on in the year 1995, he established production plant of auto rickshaw in outskirts of Rajkot in Shapar-Veraval. He named it as ‘Atul Shakti’.
- The name ‘Atul’ is used in all enterprises of Mr. Jayantibhai Chandra in the memory of his beloved son Lt. Atul Chandra.

Maruti Suzuki, Atul Motors

- In the year 2000, Atul Motors was started possessing dealership of Maruti Suzuki cars at Jamnagar.
- Initially workshop was at Hapa, Jamnagar city and Motikhavdi.
- In 2005, authorized dealership of Maruti Suzuki was started at Tagore road, Rajkot. Later on other two workshops were started in Rajkot at University road in 2006 and Kuvadva road in 2010.
- Later the network of Atul Motors was spread in the entire region of Saurashtra by starting workshops as given below:
  1. Gondal
  2. Wankaner
  3. Jasdan
  4. Rajula
  5. Amreli
  6. Porbandar

Today Atul Motors owns 4 showrooms and 12 workshops providing example of excellence in the field of automobile.

Atul Enterprise

- Atul Enterprise is distributor of Maruti Genuine spare parts in entire Saurashtra and Kutch region.
- It also distributor of spare parts for Mahindra and Mahindra in Saurashtra – Kutch.

Other Activities

- Atul Motors is also a authorized dealer of Mahindra and Mahindra, Honda (two wheelers) and Enfield India in Jamnagar.
- Atul Group sells more than 4000 Maruti Suzuki vehicles every year having gross turnover of more than 400 Crores.
1.3 Organization photos:

- **Training Organization:**
  
  Atul Authorized Service Center (Maruti Suzuki)

  ![Fig.1.2: Training Organization](image)

- **Service Department:**

  ![Fig.1.3: Service Department](image)
Body shop Department:

Fig. 1.4; Body shop Department

1.4 List of car:

- Omni
- Alto 800
- Alto k10
- Gypsy
- A star
- Eeco
- Versha
- Wagan R
- Wagan R String ray
- Celerio
- Ritz
- Swift
- Swift Dzire
- Ertiga
- Grand vitara
- Ciaz
- S Cross
- Baleno
Chapter:-2

Organization layout

2.1 Industry garage layout
2.2 Modification garage layout
2.1 Garage lay out:

- Ground floor: Service department
- 2nd floor: Body shop department
3rd floor: Paint shop department
- **Engine room**: engine room work for engine overhauls, gear box overhauls, vice bench work and any special work.

  ![Engine room](image1)

  **Fig.2.1**: Engine room

- **Store room**: store all genial part in store and car assessors.

  ![Store room](image2)

  **Fig.2.2**: Store room
• **Car-o-line**: this bay special work for accident car and over all damage car.

![Car-o-line](image)

**Fig.2.3**: Car-o-line

• **Paint mixing booth**: this work for colour mixing and add colour additives.

![Paint mixing booth](image)

**Fig.2.4**: Paint mixing booth
• **Customer relation office:** work for customer satisfaction, time to time costumer remainder, costumer complain solution, record of costume.

• **Adviser:** accept customer car and filling job card, listing customer faults.

• **Service area:** this area work for customer solution and periodic mentions service.

• **Oil room:** engine oil, gear oil and malty grad oil storage in oil room

• **Final inspection:** this area work on final inspection for service car and general check-up car and customer float reminds inspection.

• **Parking:** customer car parking.

• **Paint booth:** accidental car colour and car body part colour work area.

![Fig.2.5: Paint booth](image-url)
• **Washing area:** This area work for customer car washing & cleaning.

Fig.2.6:- Washing area
2.2 Modern Garage Layout:
Required Modification

- In the fast one there is small space then I modification it to in a large space.
- In the body work there is transportation problems of machining to the upper floor so I had placed the machinery to the ground floor.
- Customer get the fully satisfaction so I had change the place work office customer relation office change.
- There is problem in vehicle washing cleaning because of less area when the washing of one car is running it is effected to the other car so I had enlarged the area of vehicle washing cleaning or I want a new initial compartment of washing car in the vehicle washing cleaning.
- Paint shop was at top floor. So the colour part is effected by sunlight so I had place the paint shop in the fever able condition required floor.
- The transportation of engine to the engine room is difficult so I change the location the location of the engine room.
- There is a problem of incoming and outgoing of the car because of one gate so I had provided two gates.
- There is problem of intersection a car washing cleaning.
Chapter:-3

Hierarchy of organisation

3.1 Hierarchy structure of organization
3.1 Hierarchy structure of organization:
Chapter:-4

List of major equipment and instrument use in workshop

4.1 Major instrument
4.2 Major equipment
4.1 **Major Instrument:**

The shop furnishes some equipment the technical uses in diagnosis and repair. This is shop equipment. It includes power tools and machine tools, cranes and lifts, air compressor, and testers and analysers. Also included are work bench, holding fixtures, cleaning equipment, and welding equipment.

4.1.1 Wheel Alignment
4.1.2 Spark plug cleaner and tester
4.1.3 Wheel Balancing
4.1.4 Injector testing & cleaning
4.1.5 Two post car lift
4.1.6 Nitrogen air infuriate system
4.1.7 Air infraretor
4.1.8 Tyre changer
4.1.1 Wheel Alignment:

Fig.4.1: Wheel alignment
• **Specification:** A camera unit (sometimes called a "head") is attached to a specially designed clamp which holds on to a wheel.

• There are usually four camera units in a wheel alignment system (a camera unit for each wheel).

• The camera units communicate their physical positioning with respect to other camera units to a central computer which calculates and displays.

• The camera units communicate their physical positioning with respect to other camera units to a central computer which calculates and displays.

• Often with alignment equipment, these "heads" can be a large precision reflector. Setback less than the manufacturer specified tolerance (for example about 6mm) does not affect car handling.

• **Cost:** 1.5 to 2 lakh

• **Use:** The purpose of these adjustments is to reduce tire wear, and to ensure that vehicle travel is straight and true (without "pulling" to one side).
4.1.2 Spark plug cleaner and tester

Fig.4.2: Spark plug cleaner

- **Specification**: As the testing unit check the plug at the high ignition voltage and at appropriate air compression, faulty plugs can be identified and eliminated.
- There are three ranges given in the dial indicator of the pressure gauge.
- If the bluish spark appears in the ‘Green’ Range, the spark plug is good.
- If it appears in the ‘Yellow’ range, the spark plug is fair and can be used for some time.
- If it appears in the ‘Red’ range, the spark plug is poor and is to be discarded.
- No spark indicates a cracked insulator inside the plug shell or a creep discharge along some crack on a carbonised portion of the plug.
- Spark Plug Cleaner and Tester should be connected to a compressed air system that gives a maximum pressure of 12.5 kg/cm². A minimum of 7 kg/cm² pressure is essential for cleaning the plugs.
- **Cost**: 20,000 to 30,000 thousand
- **Use**: This device necessary for efficient cleaning of the spark plug, and testing the same under simulated conditions prevailing in internal combustion engines.
4.1.3 Wheel Balancing

Fig.4.3: Wheel balancing

- **Specification:** This machine is capable to complete the whole wheel balancing process with high precision and quality.
- Due to the low operating speed of 150 rpm, the vibrating level of the whole unit during operation is very negligible.
- The machine is very silent there is almost no noise caused by the electric motor or the rotating parts during the balancing process. The operator enjoys a soft start and stop, a silent and comforting joy of professional quality balancing.
- A wide variety of wheel rim types and balancing lead types are already in the database and each different type can be selected on the display.
- Wheel rim specific information of up to 100 wheels can be stored and the memory and these can be retrieved whenever the same type of wheel rim is to be balanced again.
• A variety of wheel types and sizes, including Peugeot J9 and Ford Transit both of which have a comparatively larger centre bolt whole pattern can be fitted on the machine.
• Modern spin balancers use on-board computers and a spinning axle attached to highly sensitive equipment to calculate where and how much weight needs to be applied to a rim to balance the tyre.
• **Cost:** 70,000 to 90,000 Thousand
• **Use:** Wheel balancers use rotational movement applied to a wheel to determine imbalances in the wheel.
• Old or antique balancers, called bubble balancers, use air bubbles to indicate where an imbalance is on a wheel.
4.1.4 Injector testing & cleaning:

Fig.4.4: Injector testing & cleaning
• **Specification:** Ultrasonic cleaning to perform simultaneous cleaning on several injectors and to remove the carbon deposits on the injector completely.
• **Uniformity/Spray ability test:** To test the uniformity of injecting amount of each injector, and to monitor the spraying status of each injector with the help of backlight. This test is also for reverse flush.
• **Leakage test:** To test the sealing and dribbling conditions of injectors under system pressure.
• **Injecting flow test:** To check the injecting amount of the injector in 15 seconds of constant injection.
• **Auto. Test:** To test injectors by simulating different working conditions.
• **Cost:** 2 to 3 lakhs
• **Use:** cleaning diesel injectors Fuel injectors that are clean and functioning properly are a key element to getting the best performance and fuel mileage from your diesel engine (and gas engine, too).
• **Properly functioning fuel injectors** will inject the fuel in an optimal atomized-mist that burns cleanly and gets the most out of the fuel.
4.1.5 Two post car lift:

Fig.4.5: Two post car lift
- **Specification:**

Table no.4.1:- Specification of car lift

<table>
<thead>
<tr>
<th>Specification</th>
<th>Newton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift capacity</td>
<td>4082kg</td>
</tr>
<tr>
<td>Rise height</td>
<td>1984mm</td>
</tr>
<tr>
<td>Column height</td>
<td>3070mm</td>
</tr>
<tr>
<td>Overall width</td>
<td>3493mm</td>
</tr>
<tr>
<td>Drive-thru clearances</td>
<td>2494mm</td>
</tr>
<tr>
<td>Front- arm reach</td>
<td>623mm/1131mm</td>
</tr>
<tr>
<td>Rear- arm reach</td>
<td>623mm/1131mm</td>
</tr>
<tr>
<td>Screw pad height</td>
<td>102mm/149mm</td>
</tr>
<tr>
<td>Inside of column</td>
<td>2769mm</td>
</tr>
<tr>
<td>Motor</td>
<td>2HP /60Hz</td>
</tr>
<tr>
<td>Voltage</td>
<td>208v-230v</td>
</tr>
<tr>
<td>Max. load par arm</td>
<td>1220kg</td>
</tr>
<tr>
<td>Shipping weight</td>
<td>873kg</td>
</tr>
<tr>
<td>Speed of rise</td>
<td>60 second</td>
</tr>
</tbody>
</table>

- **Cost:** 1 to 2 lakhs (variant by this load capacity)
- **Use:** This lift use and easy to under body work, engine work .inspection of under body panel and also use for safety work.
4.1.6 **Nitrogen air infuriate system:**

- **Cost:** 70,000 to 90,000 (variant by storage capacity)
- **Use:** Less inflation pressure loss
- Reduced wheel corrosion
- Prevents inner-liner rubber deterioration by oxidation
- Tires run cooler
- Increases tread life
- Increases fuel mileage
- Helps prevent uneven wear

Fig.4.6:- Nitrogen infrared system
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Purity</td>
<td>95.0-99.5%</td>
</tr>
<tr>
<td>Maximum Pressure</td>
<td>7 bar (100 psi)</td>
</tr>
<tr>
<td>Maximum Flow Rate (per hour)</td>
<td>137 liters</td>
</tr>
<tr>
<td>Atmospheric Dewpoint</td>
<td>-50 °C (-58 °F)</td>
</tr>
<tr>
<td>Recommended Ambient Temperature</td>
<td>200 °C (68 °F)</td>
</tr>
<tr>
<td>Maximum Pressure Drop (@99%N2 purity, 125 psig)</td>
<td>10 psig</td>
</tr>
<tr>
<td>Maximum Inlet Air Temperature</td>
<td>43 °C (110 °F)</td>
</tr>
<tr>
<td>Dimensions (L x H x D)</td>
<td>473 x 361.5 x 150 mm</td>
</tr>
<tr>
<td></td>
<td>(18.62 x 14.23 x 5.91 in.)</td>
</tr>
</tbody>
</table>
4.1.7 Air infraretor

- **Cost:** 10,000 to 20,000 thousand
- **Use:** The MXA Digital Workshop Inflator is specially designed for tyre changing machines, generally found in mechanic workshops. It has a light and compact enclosure that makes it a superior alternative to the traditional mechanical gauge. The MXA includes over-pressure and purging features for use with nitrogen filled tyres.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Extruded aluminium enclosure, IP46 rating</td>
</tr>
<tr>
<td>Dimensions</td>
<td>320W x 320D x 1400H mm</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>220<del>240VAC (optional 12VDC or 100</del>120VAC)</td>
</tr>
<tr>
<td>Unit of Measurement</td>
<td>psi / kPa / bar</td>
</tr>
<tr>
<td>Operating Range</td>
<td>5<del>60psi / 35</del>415kPa / 0.3~4.1bar (145psi opt. on request)</td>
</tr>
<tr>
<td>Accuracy ±</td>
<td>0.3psi / 2kPa / 0.02bar</td>
</tr>
</tbody>
</table>

*Table no.4.3: - Specification of air infrared*
4.1.8 Tyre changer

Fig4.8:- Tyre changer

- **Cost:** 50,000 to 70,000 thousand
- **Use:** This equipment use for tyre change, tyre thread check and tyre condition check.
Table no.4.3: Specifications of tyre changer

<table>
<thead>
<tr>
<th>Tyre changer machine technical specification</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>net weight</td>
<td>200Kg</td>
</tr>
<tr>
<td>Power</td>
<td>240V 1Ph 50Hz 0.55Kw</td>
</tr>
<tr>
<td>Air operating pressure</td>
<td>8 - 12bar</td>
</tr>
<tr>
<td>Bead breaker force</td>
<td>2500Kg</td>
</tr>
<tr>
<td>Min/max rim diameter (clamped internally)</td>
<td>12”-23”</td>
</tr>
<tr>
<td>Min/max rim diameter (clamped externally)</td>
<td>10”-20”</td>
</tr>
<tr>
<td>Maximum wheel diameter</td>
<td>44”</td>
</tr>
<tr>
<td>Min/max wheel width</td>
<td>3”-15”</td>
</tr>
</tbody>
</table>
4.2 Major equipment:

4.2.1 Thickness gauge
4.2.2 Wire gauge
4.2.3 Hammer
4.2.4 Open-end-wrench
4.2.5 Box wrench
4.2.6 Adjustable wrench
4.2.7 Torque wrench
4.2.8 Torque wrench angle gauge
4.2.9 Pullers
4.2.10 Taps and dies
4.2.11 Bench vies
4.2.12 Electric drill
4.2.13 Grinding wheel
4.2.14 Hydraulic jacks
4.2.15 Vacuum cleaner
4.2.16 Cleaning brush
4.2.17 Piston ring servicing tools
4.2.18 Lubrication equipment
4.2.19 Axle stand
4.2.20 Spray painting machine
4.2.1 **Thickness gauge:**

![Fig.4.9: - Thickness gauge](image)

Thickness gauges or feeler gauges are strips or blades of metal of various thickness. They are used to measure small gape or distance such as the clearance between two parts. Many thickness gauges are dual-dimensioned. Using a thickness gauges to check the clearance between an engine rocker arm and valve stem.

4.2.2 **Wire gauge:**

Wire gauges are precisely-sized pieces of round wire. The diameter is usually marketed on the handle or holder. Spark plug gaps other operating are measured with wire gauges. The specified gauges should fit into the gap snugly, without binding.

4.2.3 **Hammer:**

A hammer is a hand tool for striking. Ball-peen hammer is the one used most in the shop. Grip the hammer on the end handle. Swing it so the hammer face strikes the objects or surface squarely. Avoid hitting the object at an angle. Use rawhide, plastic, brass, and rubber hammers to strike easily marred surface.
4.2.4 Open-end-wrench:

The open-end wrench usually has the jaw opening at a 15 degree angle to the handle. Turn the bolt or nut as far the space permits. Then flip the wrench over for further turning of the fastener. An open-end wrench has a
different size on each end. Make sure the wrench files snugly against the flats. These are the sides of a nut or bolts.

4.2.5 **Box wrench:**

![Fig. 4.12- Box wrench](image)

The box wrench opening surrounds or “boxes in” the nut or bolts head. An advantages is that the box will seldom slip off. However, you must lift the box wrench completely off and then place it back on for each swing. The wrench is thin for use in tight places. The head usually sets at a 15 degree angle to the body. This provides hand clearance for swinging the wrench.
4.2.6 **Adjustable wrench:**

![Adjustable wrench](image)

Fig.4.13:-Adjustable wrench

An adjustable wrench has a movable jaw that you adjust to fit nuts and bolts heads of various sizes. Figure shows its use. Tighten the jaws against the flats of the nut or bolts before applying a Turing force. Adjustable wrenches are normally used only when applying relatively light torque. They are not as strong as fixed jaw wrenches and may be damaged if excessive torque is applied.

4.2.7 **Torque wrench:**

![Torque wrench](image)

Fig.4.14:-Torque wrench
A torque wrench is basically a special handle for a socket. An indicator on the torque wrench measures the torque or twisting. This is the amount of force applied to a nut or bolts while tightening it. Vehicle service manuals and auto repair manual give the torque specification for most fasteners. A typically specification might to be tighten a bolt to “20 lo-fi”. This men’s to apply a 20-pound pull at a distance of 1 foot from the bolts.

4.2.8 **Torque wrench angle gauge:**

Tighten torque to yield bolts to an initial torque with a torque wrench. Then final-tighten the bolts by turning them though specified angel with a socket wrench.
4.2.9 **Pullers:**

![Pullers](image)

Fig.4.16:-Pullers

Pullers remove parts assembled with an interference fit. This includes removing gears and hubs from shaft, and bushing from blind holes. Pullers also remove seals from bores and cylinder liner from engine block. A puller set has many pieces that can fit together to form the needed for the job. There are three basic types of pullers. These are pressure screw, slider hammer and combination.
4.2.10 Taps and dies:

Most shops have tap-and-die sets for cutting USC and metric threads. Taps cut inside threads. To tap a hole, determine the thread size needed. Refer to a tap drill chart and select the size of drill bit required. The hole made by the specified tap drill will be the proper diameter for tapping.

Fig.4.17:- Taps and dies
4.2.11 Bench vies:

The bench vies is a holding device mounted on a workbench. The vies has flats steel jaws that you can close to grip an object. Then the object not move while you work on it turning the handle of the vies moves the movable jaw must toward or away from the stationary jaw. Sometimes you must protect the surface of a part. Cover vies have pipe jaw below the flat the jaws. The pipe jaws are less likely to damages a pipe or other round object while holding it more securely then the flat jaws.

4.2.12 Electric drill:

The electric drill has an electric motor that drives a chuck. This is a devise with adjustable jaws that holds a tool in a machine. The chuck jaws are opened and a drill bits inserted. Turning a check key closes the jaws. They tightly grip the shank of the drill bit.
4.2.13 Grinding wheel:

The grinder mounts on a bench pedestal. It may have one grinding wheel and one wire wheel, or two grinding wheel to sharpen a chisel. The grinding wheel also removes the mushroom from the head of chisel or punch. (spinning) motion. This pounding or impact force loses or tightens nuts and bolts. Moving a reversing button or lever change the direction of rotation. The most common impact wrenches have a ½-inch of 3/8-inch drive lug. Hand-tool sockets should be use.

4.2.14 Hydraulic jacks:

The automotive shop use a variety of hydraulic jacks. One type is the portable floor jack. Pumping the handle increases the pressure in the hydraulic cylinder. This causes the ram to extend and raise the lifting saddle. Tuing the top the handle or moving a lever on the handle the pressure. Then the saddle and load settle back down. Always lift at the proper lift point under the vehicle. If in doubt, refer to the vehicle manufacturer’s service manual.
4.2.15 **Vacuum cleaner:**

Many shops have a shop vacuum. Its uses include cleaning floors and vehicle interiors after service work. Never use this vacuum cleaner to clean clutch and brake assemblies. The filter will not trap asbestos dust on clutch and brake part. For this, use a special vacuum cleaner with a high efficiency particulate air filter.
4.2.16 Cleaning brush:

Wire brush are used for clearing rough surface whereas soft bristle brushes are mint for cleaning part being washed in solvent. Power driven rotary wire brushes are used to remove carbon fro, combustion chamber etc. scrapers are used to scrape gasket or other such aerial from or irregular surfaces.
4.2.17 **Piston ring servicing tools:**

![Piston ring compressor](image)

**Fig.4.22:** Piston ring compressor

The servicing and overhauling of piston and piston ring are one of the most essential necessity of an automobile engine. This requires removal of piston of piston ring, cleaning of the ring groove and compressing the piston ring for re-installation. Following tool are used to accomplish these service.
4.2.18 **Lubrication equipment:**

![Lubrication Equipment](image)

The two commonly used piece of lubricating equipment are the oil gun and the oil gun has been shone in fig. The grease gun employed with a mobile grease units is shown in fig. a composite type of lubrication equipment which is located overhead is also available.

4.2.19 **Axle stand:**

It is always necessary to make sure before starting working under the car that it is not supported on jack alone because that could be dangerous if the jack give way any time. Placing bricks below the axle is also not very safe. It is always better to use axle stand for this purpose.
4.2.20 **Spray painting machine:**

Spray painting is done by a spray gun. The spray of paint is sprinkled by compressed air hence, the spray gun is use with a compressor which is equipped with a pressure regulator for uniform spray and an air filter for supplying cleaner air to the spray gun. Sectional view of paint gun is shown in fig. It consists of cartridge type air valve, passage for paint, lacquer or enamel and air entrance path.
Particulars and practical experiences in industry.

- There were many experiences to be faced during training.
- There were many rules and regulations to be followed strictly and discipline was must.
- While fitting or removing parts from cars for the first time was like a big experiences.
- Fast It was difficult to adjust in new atmosphere as and one time went I was familiar with it.
- To learn new things did all the work instructed by them.
- May do out regarding work cleared by technical.
- Had to finish the given task in the given time….no today, no tomorrow …only now!
- Responses at different time scales: behaviour, acclimation, plasticity, adaptation.
- The technicians used dialects instead technical words while giving answers to my questions which was initially difficult to understand.
- Before asking any question I had to think about the question and make it in a simple form and ask to the mechanics.
- I had to make adjustment in my schedule according to company.
- I was unable to unstandardized to set the timing of throttle body sensor which was reputedly laugh to me.
- I was learn work in simple way.
- After completing several weeks of training I found that NOTHING IS IMPOSSIBLE.
Chapter 6:- Testing of automobile

Vehicle check-up:-

- **Road Test:**
  1) Check of noise from engine compartment.
  2) Suspension noise.
  3) Noise for muffler and under body.
  4) Noise of rear area.
  5) Some problem of customer.
  6) Check dashboard and speedometer, fuel level gauge, other equipment.
  7) Check stirring system.
  8) Wheel bearing noise.
  9) Engine jerking.
  10) Engine knowing.
  11) Check backing system.
  12) Check accelerator pedal ply and clutch pedal ply.
  13) Check body penal noise.
  14) Check Air conditions system.

- **Diagnoses for SDT (Suzuki diagnosis tool)**

Fig.6.1:- SDT (Suzuki diagnosis tool)
1. SDT is used to diagnose major damaged vehicle. Especially use for electronics system damaged check.
2. SDT is also used after and before damaged vehicle repair.
3. SDT also generate data logger of vehicle faults or diagnosis test.
Chapter: -7

Engine & Gear Box Overhauls

7.1 Engine Overhauls
7.2 Gear Box Overhauls
7.1 Engine Overhauls:

**Engine**: The engine is a water-cooled, in-line 3 cylinders, 4-stroke cycle gasoline unit with its S.O.H.C. (single overhead camshaft) valve mechanism arranged for “V”-type valve configuration. The single overhead camshaft (S.O.H.C.) is mounted over the cylinder head; it is driven from crankshaft through timing belt. Unlike conventional overhead valve (O.H.V.) engines, this engine has no pushrods. Thus, drive for valve is more direct and enables the valves to follow the crankshaft without any delay.

![Figure 7.1 - Engine](image-url)
### 7.1.1 ENGINE SERVICES NOT REQUIRING ENGINE REMOVAL:

The following parts or components do not require engine removal to receive services (replacement, inspection or adjustment).

**Table no.7.1:- Engine overhauls**

<table>
<thead>
<tr>
<th>Parts of Component</th>
<th>Nature of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spark plug</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>2. Distributor</td>
<td>Replacement or inspection or adjustment</td>
</tr>
<tr>
<td>3. Exhaust manifold</td>
<td>Replacement</td>
</tr>
<tr>
<td>4. Oil filter</td>
<td>Replacement</td>
</tr>
<tr>
<td>5. Oil pressure unit</td>
<td>Replacement</td>
</tr>
<tr>
<td>6. Cylinder head cover</td>
<td>Replacement</td>
</tr>
<tr>
<td>7. Rocker shaft</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>8. Rocker arm</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>9. Rocker arm spring</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>10. Cam shaft</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>11. Cylinder head</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>12. Radiator</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>13. Distributor gear case</td>
<td>Replacement</td>
</tr>
<tr>
<td>14. Camshaft timing belt pulley</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>15. Crankshaft timing belt pulley</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>16. Timing belt</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>17. Fuel pump</td>
<td>Replacement</td>
</tr>
<tr>
<td>18. Throttle body</td>
<td>Replacement, inspection</td>
</tr>
<tr>
<td>19. Intake manifold</td>
<td>Replacement</td>
</tr>
<tr>
<td>20. Generator</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>21. Starter motor</td>
<td>Replacement or inspection</td>
</tr>
<tr>
<td>22. Water pump belt</td>
<td>Replacement inspection or tension adjustment</td>
</tr>
<tr>
<td>23. Water pump</td>
<td>Replacement</td>
</tr>
<tr>
<td>24. Pulleys (crank, water pump)</td>
<td>Replacement</td>
</tr>
<tr>
<td>25. Timing belt cover</td>
<td>Replacement</td>
</tr>
<tr>
<td>26. Water hose</td>
<td>Replacement or inspection</td>
</tr>
</tbody>
</table>
7.1.2 DISMOUNTING ENGINE:

1) Release fuel pressure in fuel feed line.
2) Disconnect negative cable at battery.
3) Remove engine hood after disconnecting windshield washer hose.
4) Remove front bumper.
5) Drain cooling system.
   (WARNING: To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.)
6) Remove radiator with cooling fan and reserve tank.
7) Remove air cleaner with air cleaner hose and breather hose.
8) Disconnect following cables.
   • Accelerator cable from throttle body
   • Clutch cable from clutch release lever
   • Speedometer cable from transmission case
9) Disconnect following hoses.
   • Radiator outlet hose from outlet pipe
   • Radiator inlet hose from thermostat cap
   • Heater inlet and outlet hoses from heater unit (if equipped)
   • Fuel return and inlet hoses from pipes
   • Canister purge hose from canister purge control valve
10) Disconnect the following electric wires.
    • Radiator fan
    • Distributor (High-tension cord and terminal)
    • Starter motor
    • Generator
    • Back-up light switch
    • Oil pressure switch
    • Oxygen sensor
    • ECT sensor
    • Right side of engine harness
    • Ground wire from cylinder block
    • Ground wire from transmission case
    • A/C compressor (if equipped)
11) Remove exhaust centre pipe.
12) Disconnect gear shift control shaft and extension rod from transmission case.
13) Drain engine and transmission oil.
14) Remove stabilizer bar, refer to Section.
15) Disconnect right and left drive shaft joints from differential side gear snap rings.
16) Draw right and left drive shafts out of differential side gears. (NOTE: Be careful not to damage brake flexible hose.)
17) Remove water pump and A/C compressor belts (if equipped).
18) When removing A/C compressor belt, first remove water pump pulley.
19) Recover refrigerant from refrigeration system by using recovery and recycling equipment, refer to Section (if equipped).
20) Disconnect suction and discharge hoses from compressor, (if equipped).
   (NOTE: Cap open fittings immediately to keep moisture out of system.)
21) Remove A/C compressor, upper and lower bracket (if equipped).
22) Check to ensure all hoses, electric wires and cables are disconnected from engine and transmission.
23) Set a piece of wire across the hook on intake manifold and
24) Transmission case so that engine can be lifted by using chain block.
25) Remove transmission left side mounting and mounting bracket.
26) Remove bolts securing engine member to make engine ready for removal.
27) Lower engine assembly together with transmission and engine member out of vehicle slowly and carefully.

Fig.7.2: Engine remove on body sell
7.1.3 **ENGINE DISASSEMBLY**

1. Remove starter motor, engine mounting with engine member and clutch housing lower plate, and loosen the transmission securing bolts after removing the radiator outlet pipe.
2. Take off transmission from cylinder block and remove clutch cover and clutch disc by using special tool.
3. Remove distributor cap and then remove distributor assembly. Remove generator.
4. Remove crank pulley similarly, by using special tool hitched to flywheel so that crankshaft will not turn. Special Tool.
5. Remove water pump pulley and then remove timing belt cover. Remove timing belt tensioner after removing a part of tensioner spring from water pump securing bolt. Remove timing belt.
6. Remove camshaft timing belt pulley, by using special tool attached, as shown, to lock camshaft. Special Tool. Similarly remove crankshaft timing belt pulley after removing pulley key, take out timing belt guide. Remove timing belt inside cover.
7. Remove exhaust manifold covers and exhaust manifold.
8. Remove oil filter by using special tool. **(NOTE: Be careful not to spill the oil when removing filter.)**
9. Disconnect PCV outlet hose and bypass hose.
10. Remove intake manifold with throttle body and remove intake manifold plate.
11. Remove cylinder head cover and loosen valve adjusting screws fully. Leave the screws in place.
12. Loosen rocker arm shaft securing screws. While drawing out rocker arm shaft, separate valve rocker arms and rocker arm springs.
13. Remove camshaft thrust plate, and draw camshaft out toward distributor gear case side.
14. Remove cylinder head.
   A. Using special tool (valve lifter) to compress valve spring and then remove valve cotters by using special tool (Forceps). Release special tool, and remove valve spring and valves.
   B. Remove valve stem oil seal from valve guide by using flat head rod or the like, and then valve spring seat. **(NOTE: Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.)**
C. Using special tool, drive valve guide out from combustion chamber side to valve spring side.

15. Remove flywheel by using special tool as shown
16. Remove oil level gauge and then remove oil pan and Remove oil pump strainer.
17. Remove connecting rod cap and Remove piston for cylinder
18. Disassemble piston and connecting rod assembly.
19. Remove oil pump case, Remove oil pump gear plate and Take out inner gear and outer gear.
20. Remove oil seal housing. Remove crankshaft bearing caps, and take out crankshaft.
7.2 Gear Box Overhauls

7.2.1 Removal Gearshift control lever
Remove the gearshift control lever according to the following Procedure.
1) Gearshift control lever housing nuts and bolts
2) Lift the front end of vehicle by jacking, and support it on safety Stands.
3) Remove lever joint bolt.
4) Remove extension rod with its bracket.
5) Pull out the gearshift control lever downward.

7.2.2 Dismounting/Remounting
Dismount or mount transmission with engine referring to “ENGINE MECHANICAL”, and separate or combine transmission and engine.

1) Remove back up light switch.
2) Remove clutch release bearing
3) Clutch release shaft return spring from release lever
4) Remove clutch release bearing retainer Inserting bolts in the upper and lower points of retainer will facilitate removal.
5) Remove bolts fastening upper and lower cases.
6) Detach lower and upper transmission case
7) When upper case is removed, all parts should be left on the lower case.
8) Remove input shaft assembly from the lower case.
9) Remove counter shaft assembly from the lower case.
10) Tap the spring pin out of the 3 shift fork shafts with special tool.

Fig.7.4: Remove upper cases & lower cases
11) Draw out 3 shift fork shafts in the order of low speed gear shift fork shaft, high speed gear shift fork shaft and reverse gear shift fork shaft. (NOTICE: The 2 shafts should be positioned at neutral when removing shift fork shafts. Take care when drawing out shafts so that locating balls do not fall out)

12) Fit special tool on low speed synchronizer sleeve and fix it securely with a vice as shown below. Loosen countershaft nut and draw out speedometer drive gear.

13) Remove bearing. After removing bearing, all the parts on counte- shaft can be removed.
Chapter:-8

Major vehicle repair:

8.1 Determining the extent of damage
8.2 Removing the paint film on the penal
8.3 Repair of dent and bulges with washer welder
8.4 Penal shrinking
8.5 Repair with dolly and hammer
8.6 Penal filling with plastic body pillar and putty’s
8.7 Antirust treatment of damage area
8.8 Paint penal
Major vehicle repair

1. Damage penal
2. Determining the extent of damage
3. Remove the paint film for extent damage
   - Remove small dents repair with file
   - Penal shrinking
   - Repair with washer-welder & hammer-dolly
   - Filling with plastic filler(putty) or solder
   - Antyrust treatment of damage area
   - Paint panel
   - Completion of repair
8.1 **Determining the extent of damage:**

Before beginning the repair determine the extent of damage. The illustration on about side show an example a damaged vehicle which has suseatend and impact has the centre of the door (on moulding the inspection.

![Determining the extent of damage](image)

8.2 **Removing the paint film on the penal:**

Remove the paint film from the damaged (dented) area before welding the washer to the sheet metal.
Fig. 8.2: Remove the paint film

8.3 **Repair of dent and bulges with washer welder:**

Fig. 8.3: Repair with dent puller
The rigidity of the penal is minted by the body line if the body line of a penal is deformed there will be war page. spreading over a large portion of the penal. If the body line is required currently the strain on the penal will decries the procedure is follow.

**8.4 Peninal shrinking:-**

It is safe to assumed that penal has been streatchced if the string on the cannot be removed even after the penal has been work properly. The damaged area can be easily field with plastic body filler to give the proper appearance but road vibration many Couse that penal to make a flapping noise’s the vehicle is drive on the road.

**8.5 Repair with dolly and hammer:-**

![Use of hammer dolly](image)

Fig.8.4- Use of hammer dolly

Repairing body penal with the hammer and dolly requires expertise so in many cases the repair procedure has been change to the washer welding method since as much technic don’t require nearly as much expiration as a hammer and dolly operation.
8.6 Penal filling with plastic body pillar and putty’s:-

Fig.8.5:- Filling plastic body pillar

The Morden approaches to file small dent and in perfection is to use plastic filler and fillers. This product contained high soiled material which are light weight provide good adhesion and have supper filling caretdistric. Ther are many different type and combination fillers and putty.
8.7 **Antirust treatment of damage area:**

![Image](image_url)

**Fig.8.6:** Antirust treatment

The damage area is not protected for antirust then protect to corrosion of penal or dents.
8.8 **Paint penal:** -
Paint panel your choice colour use paint spree gun

![Paint panel](image)

*Fig.8.7:* Paint panel
Chapter:-9

Faults and remedies of vehicle repair:

9.1 Engine related
9.2 Carburettor
9.3 Exhaust and muffler
9.4 Clutch
9.5 Transmission
9.6 Differential
9.7 Propeller shaft
9.8 Brakes
9.9 Front suspension and steering
9.10 Starter motor
9.11 Alternator
9.12 Wiper motor & fuel motor
9.13 Other lamps and meter
### 9.1 Engine related:
- Engine poor starting

#### Table no. 9.1: Faults and remedy for engine

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter will not run</td>
<td>Replace, repair</td>
</tr>
<tr>
<td>No sparking</td>
<td>Set the gap of spark plug or replace, check fuse.</td>
</tr>
<tr>
<td>Faulty intake and exhaust system</td>
<td>Adjust carburettor as prescribed, clean or replace.</td>
</tr>
<tr>
<td>Abnormal internal condition in engine</td>
<td>Replace head gasket, retighten and as necessary, replace piston ring and piston</td>
</tr>
<tr>
<td>Not enough power</td>
<td>Adjust valve clearance, replace piston and piston ring as necessary</td>
</tr>
<tr>
<td>Improperly timed ignition</td>
<td>Adjust ignition timing, adjust spark plug gap</td>
</tr>
<tr>
<td>Fuel system out of order</td>
<td>Disassemble carburettor and clean, repair fuel pump</td>
</tr>
<tr>
<td>Abnormal condition in air intake system</td>
<td>Replace air filter, adjust choke</td>
</tr>
<tr>
<td>Clogged exhaust system</td>
<td>Muffler clean</td>
</tr>
<tr>
<td>Sudden drop speed in high speed cruise</td>
<td>Adjust ignition timing, adjust spark plug gap</td>
</tr>
<tr>
<td>Abnormal condition in fuel system</td>
<td>Float level set, clogged condition of main jet circuit so cleaned carburettor</td>
</tr>
<tr>
<td>Abnormal condition in engine</td>
<td>Loss of compression pressure due to leaky cylinder head gasket so replace gasket</td>
</tr>
<tr>
<td>Engine not responding quickly to control in picking up speed.</td>
<td>Adjust ignition timing, adjust contact breaker point</td>
</tr>
<tr>
<td>Erratic idling</td>
<td>Set ignition timing, clean carburettor port, clean air filter</td>
</tr>
<tr>
<td>Abnormal detonation</td>
<td>Set air-fuel ratio, defective breaker point so adjust timing, adjust valve clearance</td>
</tr>
<tr>
<td>Overheating</td>
<td>Adjust float level, erratically working</td>
</tr>
</tbody>
</table>
thermostat then replace, change oil filter, wrong kind of lubrication oil so check adjust brakes

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal engine noise</td>
<td>Replace crankshaft bearing, replace piston, piston ring, adjust valve clearance, set tappet</td>
</tr>
<tr>
<td>High fuel consumption</td>
<td>Adjust ignition timing, change spark plug, clean carburettor, check fuel linkage, set fuel ratio,</td>
</tr>
</tbody>
</table>

### 9.2 Carburettor:

Table no.9.2: -Faults and remedy for carburettor

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel overflow from carburettor</td>
<td>Adjust valve clearance, adjust fuel pump pressure, retighten loose float chamber, replace float is ruptured and contains some fuel.</td>
</tr>
</tbody>
</table>

### 9.3 Exhaust and muffler:

Table no.9.3: -Faults and remedy for muffler

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor muffling performance</td>
<td>Check loss exhaust pipe, replace muffler gasket, repair broken manifold, repair eliminating any contact.</td>
</tr>
</tbody>
</table>
### 9.4 Clutch:

Table no.9.4:- Faults and remedy for clutch

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slipping clutch.</td>
<td>Adjust pressure plates pressure and as necessary replace facing,</td>
</tr>
<tr>
<td>Dragging clutch</td>
<td>Adjust clutch pedal ply, replace pressure plate, replace transmission shaft, dirty with oil clutch then replace clutch set.</td>
</tr>
<tr>
<td>Clutch vibration</td>
<td>Replace clutch plate, weakened torsion spring then replace clutch plate, clutch rivets so replace clutch</td>
</tr>
<tr>
<td>Noisy clutch</td>
<td>Replace clutch bearing, replace front input shaft bearing, cracked clutch disc so replace clutch plate, as necessary replace pressure plate</td>
</tr>
<tr>
<td>Grabbing clutch</td>
<td>Replace clutch acing are soaked with oil and excessively worn, tension spring are weakened</td>
</tr>
</tbody>
</table>

### 9.5 Transmission:

Table no.9.5:- Faults and remedy for transmission

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gears slipping out of mesh</td>
<td>Repair distorted shaft</td>
</tr>
<tr>
<td></td>
<td>Replace shift fork, replace worn ring or hub in synchronizers, replace bearing of counter shaft</td>
</tr>
<tr>
<td>Gears refusing to disengage</td>
<td>Replace synchronizer ring, replace shift fork</td>
</tr>
<tr>
<td>Excessive gear noise</td>
<td>Replenish transmission oil, replace synchronizer, replace bearing</td>
</tr>
<tr>
<td>Hard shifting</td>
<td>Adjust clutch pedal ply, replace clutch plate replace synchronizer ring</td>
</tr>
</tbody>
</table>
9.6 **Differentials:**

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakage (case, gears, bearing)</td>
<td>Change oil, adjust pinion bearing and pinion ring gear, replace rear axle housing, check loos bolts</td>
</tr>
<tr>
<td>Gear noise</td>
<td>Adjust pinion and ring gear, replace drive pinion and ring gear,</td>
</tr>
<tr>
<td>Bearing noise</td>
<td>Change oil, damage bearing replace, replace axle bearing</td>
</tr>
</tbody>
</table>

9.7 **Propeller shaft:**

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration and noise</td>
<td>Replace bearing of universal joint, replace distort and unbalanced propeller shaft,</td>
</tr>
<tr>
<td>Noise occurring at standing start or during coasting</td>
<td>Replace damage universal joint, lubrication slip joint, proper fit propeller shaft.</td>
</tr>
</tbody>
</table>

9.8 **Brakes:**

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enough braking force</td>
<td>Check linkage brake oil, adjust pedal ply, adjust brake shoes and replace</td>
</tr>
<tr>
<td>Pedal stroke too large</td>
<td>Adjust brake drum and shoe clearance, proper fitting brake shoe, repair master cylinder.</td>
</tr>
<tr>
<td>Dragging brake</td>
<td>Check master cylinder, check brake shoe, replace return spring of brake, and repair</td>
</tr>
</tbody>
</table>
75

Pedal pulsation( pedal pulsates when depressed for braking)  Replace brake drum, replace wheel bearing,
Braking noise  Repair brake shoe linkage, replace brake shoe, replace wheel bearing, replace brake plate

9.9  Front suspension and steering system:

Table no.9.9:-Faults and remedy for steering and front suspension

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard steering</td>
<td>Adjust wheel air pressure, lubrication steering linkage, as replace steering linkage</td>
</tr>
<tr>
<td>Wobbly steering wheel</td>
<td>Adjust wheel air pressure, replace wheel, loose hub nut then fitting all bolts</td>
</tr>
<tr>
<td>Steering wheel pulling on one side</td>
<td>Adjust wheel alignment, replace tyre, set air pressure</td>
</tr>
<tr>
<td>Steering noise</td>
<td>Retighten lose nut bolts, damage wheel bearing, lubrication</td>
</tr>
</tbody>
</table>

9.10  Starting Motor:

Table no.9.10:-Faults and remedy for starting motor

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starter runs but pinion will not mesh into ring gear</td>
<td>Replace brush, adjust pinion plunging position, starter clutch</td>
</tr>
<tr>
<td>Starter does not stop running</td>
<td>Repair fused contact points of magnet switch contact plate</td>
</tr>
</tbody>
</table>
9.11 **Alternator:**

Table no.9.11:-Faults and remedy for alternator

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery quickly becomes over-</td>
<td>Adjust Loos and broken ‘v’ belt, repair alternator, replace brush,</td>
</tr>
<tr>
<td>discharged.</td>
<td></td>
</tr>
<tr>
<td>Alternator noise</td>
<td>Replace worn, loose or otherwise defective bearing</td>
</tr>
</tbody>
</table>

9.12 **Wiper Motor & Fuel Motor:**

Table no.9.12:-Faults and remedy for wiper motor & fuel motor

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiper will not run</td>
<td>Tighten or replace fuse, repair metal to metal contact, repair wiper motor,</td>
</tr>
<tr>
<td>Wiper will not stop running</td>
<td>Replace defective wiper switch, repair wiper motor</td>
</tr>
<tr>
<td>Faulty meter indication</td>
<td>Repair earth, replace defective level gauge,</td>
</tr>
<tr>
<td>No indication</td>
<td>Repair open circuit, replace wiring , replace deformed bimetal element,</td>
</tr>
</tbody>
</table>
### 9.13 Other lamps and meter:

Table no.9.13:-Faults and remedy for other lamps & meter

<table>
<thead>
<tr>
<th>Faults</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn signal lamps</td>
<td>Replace lamps bulb, check wiring, check corrosion resistive</td>
</tr>
<tr>
<td>Change warning lamp</td>
<td>Replace lamp bulb, check fuse, repair alternator</td>
</tr>
<tr>
<td>Horn</td>
<td>Replace defective horn, set horn, change horn fuse</td>
</tr>
<tr>
<td>Speedometer</td>
<td>Replace damage speedometer drive gear, replace defective cable, replace speedometer</td>
</tr>
<tr>
<td>Water temperature meter</td>
<td>Check earth, check water temperature sensor, replace defective temperature gauge</td>
</tr>
<tr>
<td>Oil pressure warning lamp</td>
<td>Replace lamp bulb, check fuse, replace defective oil pressure switch, replace defective wiring</td>
</tr>
</tbody>
</table>
Chapter : 10
Maintenance and preventive maintenance of vehicle

10.1 Service Provided By Atul Motors:-

10.1.1 Free Service
10.1.2 Paid Service
10.1.3 Monsoon checkup

10.2 General Service Sequel:-
10.1 Service Provided By Atul Motors:

10.1.1 Free Service:

1) 1st free service
   - General check-up (all light check, water level check, engine working checked. )
   - Engine oil change
   - Oil filter change
   - Check all electrical equipment

2) 2nd free service
   - General check-up
   - Underbody nut bolt check
   - Wheel alignment (as per require)

3) 3rd free service
   - General check-up
   - Engine oil change
   - Oil filter change
   - Air filter change (as per require)
10.1.2 Paid Service:

1) Demand repair: -
   Providing service repair as per customer requirement and their demand.

2) Running repair: -
   - General check-up
   - Transmission system check-up
   - Suspension check-up
   - Braking system check-up and brake paid service
   - Engine work check-up and other engine noise check-up
   - Engine cooling system check-up
   - Wheel alignment
   - Wheel balancing

10.1.3 Monsoon checkup

- Air Filter (Clean)
- Petrol Filter (Clean)
- Engine Oil Level (Check)
- Lights (Check)
- AC (Check)
10.2 General Service Sequel

1) Engine oil & oil filter
   - Every 10,000km/1 year
   - Synthetic oil – 1,00,000km

2) Engine coolant
   - Petrol-40,000km/2 year
   - Diesel-20,000km/2 year

3) Spark plug
   - 20,000km/2 year
   - Euro4 – 40,000km
     (As per required clean and replacement)

4) Fuel filter
   - Petrol- 40,000km/2 year
   - Diesel – 20,000km/2 year

5) Transmission oil
   - Petrol/diesel- 40,000km/ 4 year ( 75w90 )
   - Synthetic- 1,60,000km/ 10 year ( 75w80 )

6) Brake oil
   - Petrol/diesel-20,000/2 year ( as per required )

7) Water pump belts
   - Petrol-50,000km/3 year
   - Diesel – 40,000km/2 year

8) Tapped set
   - Petrol- 40,000km/4 year

9) Wheel balancing & wheel alignment
   - Every 10,000km/1 year ( as per require tyre rotation )
10) Air filter
   - Petrol - 40,000/2 year
   - Diesel – 20,000/2 year (as per require clean filter)

11) Brake pad
   - Petrol – 40,000km/2 year
   - Diesel – 20,000km/2 year

12) Injector
   - Petrol - 40,000km/2 year
   - Diesel – 20,000km/2 year (as per require clean, testing and replace)

13) Suspension
   - Every 20,000km/1 year check suspension system.

14) Battery testing
   - Petrol - 20,000/2 year
   - Diesel – 10,000/1 year

15) Engine mounting
   - Petrol – 50,000/5 year
   - Diesel - 40,000/1 year

16) Wheel bearing
   - Petrol – 60,000km/5 year
   - Diesel – 50,000km/4 year
Chapter 11:- Reconditioning of parts

- A reconditioning of parts is done because to reduce the actual cost.
- Reconditioning means not to change parts but, servicing of those parts and repairing.
- In our organization sometimes we, can’t repair a part but change that part. The following are the things that done in workshop for reconditioning of parts.

11.1 Gear-Box:
- Once, while gear-box over hauling, as the gear-box overhaul costs higher, the gear-box assembly/housing has a crack and leads to leak the oil.
- So for the cost reduction, we decide to weld the housing infect to replace it and as the housing costs high.
- By the welding, the housing crack is fixed properly, and no leakage is found, these leads for cost-reduction.

11.2 Brake Pads/Shoes:
- Brake pads generally torn out but sometimes, because of the dust and removal of the pad material, they don’t work properly.
- So, in our workshop, first we check the pads, if they are in good condition, we don’t replace them and try to re-condition them.
- We rub the pads with glass-paper, and remove the dust and make them polish.
- From this process, the pads can work for long and perfectly.
- This can lead to cost reduction and the re-conditioning should be done.
11.3 **Bumper:**

- Once, there was a car with the damaged bumper, after inspection, we decide to re-condition it infect to replace because new bumper costs high.
- One of the support hooks of the bumper was cracked and the material used for making bumpers is fiber for light-weight.
- So we decide to join the cracked hook with the help of glue and sand, glue for holding, and sand for making the holding tough.
- It worked and the bumper was assembled again and leads for cost reduction.

11.4 **Spark Plugs:**

- Very of the few times, Spark-Plugs can be re-conditioned.
- As the spark-plug can’t be serviced and comes with short life.
- But sometimes for cost reduction and customer satisfaction, we re-conditioned the spark-plugs.
- The major problem in spark-plug is the gap between the plug and the spark goes big, infect it should remain in contact to each other.
- So most times, spark-plugs get replaced, but it can be re-conditioned by creating the gap of proper measurement.
This process works some-times and leads for cost reduction.

Fig.11.2:-Spark-Plug

11.5 **Steering Rank/Assembly:**

- Steering Assembly costs high, so usually customer wants to service the steering assembly infect to replace it.
- So, if the assembly is in good condition and can be used for further, we service it and try to re-condition them.
- In servicing, we fill the oil and grease in the steering assembly with the help of bench wise, these can work as a lubricant.
- Through this, it can work properly and for limited time, but leads for cost reduction.
Chapter 12: Safety features

➢ To help prevent accidents, follow these safety rules.
1. Work quietly and give your full attention to the job you are doing.
2. Keep your tool and equipment under control.
3. Never indulge in horseplay or foolish action. You could cause someone to get seriously hurt.
4. Never put screwdriver or other sharp objects in your pocket. You could cut or stab yourself or damage the upholstery in a car.
5. Make sure your clothes are right for the job. Dangling sleeves or ties can get caught in machinery and cause serious injury.
6. Do not wear sandals or open-toe shoes. Wear fully leather shoes with non-skid rubber heels and soles. Steel-toe shoes are best for shopwork. Keep long hair out of machinery by wearing a cap.

Fig. 12.1: Work shoes

7. Do not wear any ring, bracelet when working around moving machinery equipment. Jewellery can get caught in moving machinery with very serious result. Also, a ring or bracelet can accidentally fall into the ring or bracelet may become white hot in an instant, this will severely burn you.

8. Wipe oil and grease off your hands and tools, you need a good grip on tools and parts.
9. If you spill oil, grease, or any liquid on the floor, clean it up. Help prevent injury from slips and falls.

10. Never use compressed air to blow dirt from your clothes. Never point a compressed air blow gun at another person.

11. Always wear eye protection when using a grinding wheel. Safety glasses, safety goggles, or a face shield should be available.

12. Watch out for sparks flying from a grinding wheel or a welding job. The sparks can set hair or clothes on fire.

13. When using a floor jack, position it properly. It must not slip out. Never lift a vehicle while someone is working under it! People have been killed when the jack slipped and the fell on them. Always put safety stands in place before going under a vehicle.
14. Always use the right tool for job. The wrong tool could damage the part you are working on could hurt you.

15. Keep your hand away from the engine the engine fan and accessory drive belts when the engine running. Your hand could get caught in the fan or between a belt and pulley. You are working on or could hurt you.
Chapter 13:- Cost estimates of major repair

13.1 Cost Estimates of Engine Overhaul:
- Cost of engine overhauled depends upon work done on engine and parts replaced.
- It also depends upon the petrol or diesel variants and car.
- Following table shows the cost estimates of Hyundai I-20 petrol.

Table no.13.1: Cost Estimates of Engine Overhaul

<table>
<thead>
<tr>
<th>No</th>
<th>Spare Parts</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cylinder boring</td>
<td>2,000</td>
</tr>
<tr>
<td>2</td>
<td>Crankshaft Turning</td>
<td>800</td>
</tr>
<tr>
<td>3</td>
<td>Cylinder head Turning</td>
<td>2,000</td>
</tr>
<tr>
<td>4</td>
<td>Piston and piston ring</td>
<td>6,000</td>
</tr>
<tr>
<td>5</td>
<td>Crankshaft bearing</td>
<td>800</td>
</tr>
<tr>
<td>6</td>
<td>Hosepipe</td>
<td>1,400</td>
</tr>
<tr>
<td>7</td>
<td>Spark plug</td>
<td>250</td>
</tr>
<tr>
<td>8</td>
<td>Clutch plate and pressure plate</td>
<td>8,000</td>
</tr>
<tr>
<td>9</td>
<td>Clutch bearing</td>
<td>2,000</td>
</tr>
<tr>
<td>10</td>
<td>Both oil seal</td>
<td>1,350</td>
</tr>
<tr>
<td>11</td>
<td>All gasket</td>
<td>2,300</td>
</tr>
<tr>
<td>12</td>
<td>Oil pump</td>
<td>4,000</td>
</tr>
<tr>
<td>13</td>
<td>Oil and oil filter</td>
<td>1,500</td>
</tr>
<tr>
<td>14</td>
<td>Coolant</td>
<td>800</td>
</tr>
<tr>
<td>15</td>
<td>Timing chain</td>
<td>3,000</td>
</tr>
<tr>
<td>16</td>
<td>V belt</td>
<td>1,200</td>
</tr>
<tr>
<td>17</td>
<td>A/C gas refilling</td>
<td>350</td>
</tr>
<tr>
<td>18</td>
<td>Timing tensioner</td>
<td>1,400</td>
</tr>
<tr>
<td>19</td>
<td>Laborer charged</td>
<td>10,000</td>
</tr>
<tr>
<td>20</td>
<td>Air filter body assembly</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Cost</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>21</td>
<td>Timing cover</td>
<td>1,400</td>
</tr>
<tr>
<td>22</td>
<td>Timing sprocket</td>
<td>1,800</td>
</tr>
<tr>
<td>23</td>
<td>Main connecting bearing</td>
<td>1,500</td>
</tr>
<tr>
<td>24</td>
<td>Valve, Valve seal &amp; valve Guide</td>
<td>3,090</td>
</tr>
<tr>
<td>25</td>
<td>Injector Service</td>
<td>565</td>
</tr>
<tr>
<td>26</td>
<td>Throttle body service</td>
<td>480</td>
</tr>
<tr>
<td>27</td>
<td>ISI Valve service</td>
<td>375</td>
</tr>
<tr>
<td>28</td>
<td>Thrush washer</td>
<td>225</td>
</tr>
<tr>
<td>29</td>
<td>Cylinder head bolt 2 piece</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60,653</strong></td>
</tr>
</tbody>
</table>
Chapter 14:- I faced challenges during training.

- Before coming to organization I thought that it was impossible to repair a fully damaged car or to operate a decade old rusty cars.
- Because an extremely damaged, non-removable part of the car can also be made new by cutting it and replacing with new part.
- At first I have to do a small work like cleaning oily floor to fitting of engine component. Ignorance in any work instructed by them was not acceptable.
- How to find the correct fault in a break down car was something interesting work done by mechanics showing their skill of work.
- Responsibilities were increased while doing mechanic work as a single nut kept loose can be dangerous for the customer.
- I have to use simple (non-technical) language while asking questions to the mechanics.
- Sometimes the mechanic repeatedly taught until I was able to understand it properly.

❖ Most challenging work:-

❖ Case 1: Finding the Problem for Black Smoke Release:

- **Car:** Swift ZDI(Diesel) **Mileage:** Around 75,000Kms.
- **Major Problem/Customer Complain:** Black Smoke Release, RPM don’t go up from 2,000, low pick-up.
- **Challenging Experience:** We’ve done every possible things to reduce the black smoke and get back the pick-up but every of our try’s go fail, at last we found the major and weird problem, there was a plastic bag & a cloth inside the inlet manifold, which causes problem in taking air and due to heavy compression and not perfect fuel consumption, reduces black smoke.

- This time, customer came with the normal problem which occurs many times but the solution to find this problem in this car was very challenging.
- The problem in the car was releasing of black smoke & the car has low pick up like it can’t go over 2,000 Rpm.
- For the black smoke, our service advisor decides through his experience, that injectors need to be serviced.
• So we gave injectors for servicing to the owning injector brand so that there was no chance for imperfection.
• But the important thing customer said was, the car is recently being serviced at other Hyundai workshop and the problem started from there.
• And that workshop has done every possible thing to solve the problem but they failed so customer came to us.
• So it’s an overall challenging experience for our entire workshop.
• So as, on we gave the injectors for servicing we got them back and as we marked the position we decide to assemble them again.
• But the unlucky, the car did started but yet the black smoke release was as same and yet the Rpm don’t go over 2,000.

Fig.14.1:-Serviced Injectors

• The same, the injectors of the other car didn’t work the same black smoke and low Rpm is there.
• So on the next day, our manager decided to solve this problem, no matter how, so he told the advisor and mechanic to clean and check every important thing which can cause this problem.
• So first, we decide to check the turbo charger, as we start dissembling every important part.
Finally we have the turbo charger but the same with no problem with it.

Fig. 14.2: Dissembling of Turbo-Charger
Than we decide to check the glow plug so that if there is any problem with it, and as all the parts were dissembled so we decide everything which comes in our eye.
Case 2: Engine temperature meter is not work.

- **Remedy:** Check fuse on fuse box. Then fuse is ok but change more fuse. And meter is not work.
- Check wiring harness (wiring cracks, wiring cutting, etc.) but no any problems in wiring harness.
- Check radiator cooling fan then fan is not work, replace radiator fan after that engine temperature meter do not start.

Fig. 14.4: Engine temperature meter

Fig. 14.5: Damage thermoset valve
Fig. 14.6: Replace thermostat valve

- Check thermostat valve. Thermostat valve is damaged, valve is replaced after then check meter but meter is not work.

Fig. 14.7: Suzuki diagnosis tool
Diagnosis for ECM (engine control module) with help of SDT (Suzuki diagnosis tool)

Fig. 14.8: - Engine temperature sensor

- Diagnosis data is indicate engine temperature sensor is not work.
- Replace engine temperature sensor. Then meter is work.
Chapter 15: My likes & dislike of work places

➤ **My Likings about the Workshop:**

- First of all I would like to say that, I had really enjoyed the training.
- I got a lot of practical knowledge about automobiles from the Training, Manager, Mechanics, Helpers, etc.
- The staff members at my workshop are very helpful and co-operative.
- The management of organization is very disciplined, co-operative and helpful.
- The distribution of work is equal for every mechanic.
- The customer satisfaction is the main goal for the organization.
- Very good and knowledgeable mechanic staff is available.
- All the necessary Machines, Instruments & Equipment’s are available in the workshop.
- The regular maintenance of Machines, Instruments & Equipment’s is done.
- The service advisor highly skilled and behave nicely & politely with the customers.
- The Service Manager is very knowledgeable and polite with every staff members and the customers.
- All the equipment’s with the latest technology is used.
- All the staff members are very helpful according to the training.
- I also like, the road tests, in which the advisor takes us along with them for knowledge.
- There is now a special bonding done with mechanics, we all treat like friends and helped me a lot in expanding my knowledge.

➤ **My Disliking’s about the Workshop:**

- Some rules I don’t like.
- Security system.
- Parking arrangement.
- Lack of space in the workshop, sometimes it causes problems.
Chapter 16: Organization Group Photos

Fig no.16.1: Service Department Group Photos

Fig no.16.2: Body Shop Department Group Photos
Chapter 17:- References

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