CHAPTER 1

Introduction of Industry

1.1 History of Industry

Beginnings

- Maruti 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 Gandhi, the Indian Central government salvages Maruti Limited and starts looking for an active collaborator for a new company.

Figure: 1.1 location of main workshop
Suzuki enters

- In 1982, a license & Joint Venture Agreement (JVA) is signed between MarutiUdyog Ltd. and Suzuki of Japan.
- At first, Maruti Suzuki was mainly an importer of cars.
- In India's closed market, Maruti received the right to import 40,000 fully built-up Suzuki's in the first two years, and even after that the early goal was to use only 33% indigenous parts.
- This upset the local manufacturers considerably.
- There were also some concerns that the Indian market was too small to absorb the comparatively large production planned by Maruti Suzuki, with the government even considering adjusting the petrol tax and lowering the excise duty in order to boost sales.
- Finally, in 1983, the Maruti 800 is released.
- This 796 cc hatchback is based on the SS80 Suzuki Alto and is India's first affordable car.
- Initial product plan is 40% saloons, and 60% Maruti Van. Local production commences in December 1983.
- In 1984 the Maruti Van, with the same three-cylinder engine as the 800, is released. Installed capacity of the plant in Gurgaon, reaches 40,000 units.
- In 1985 the Suzuki a 970 cc 4WD off-road vehicle, is launched. In 1986 the original 800 is replaced by an all-new model of the 796 cc hatchback Suzuki AltoFronted. This is also when the 100,000th vehicle is produced by the company. In 1987 follows the company's first export to the West, when a lot of 500 cars were sent to Hungary. Maruti products had been exported to certain neighboring countries already. By 1988, the capacity of the Gurgaon plant is increased to 100,000 units per annum.
 SJ410Gypsy In 2000 Maruti becomes the first car company in India to launch a Call Center for internal and customer services.

- The new Alto model is also released, somewhat larger and more modern than the 800.
- The estate Baleno Alturas is also shown, while IDTR (Institute of Driving Training and Research) is launched jointly with the Delhi government to promote safe driving habits.
- In 2001 Maruti True Value selling and buying used Maruti Suzuki’s, is launched in Bangalore and Delhi, later in Mumbai and elsewhere.
- In October of the same year the Maruti Versa sees the day, a bigger engine and more luxurious microbus than the Omni.
- It never catches on in the market and is discontinued by late 2009, only to be replaced by a cheaper, stripped-down version called Eeco.
- Customer information centers are also launched in Hyderabad, Bangalore and Chennai.
- In 2002 the Esteem Diesel appears. as does Maruti Insurance.

1.2 INTRODUCTION OF ATUL MOTORS

- Jentibhai started the production of “KHUSBU” rickshaw in 1990 in Jamnagar.
- The production plant of rikshaw established in 1995 at shaper-veravad Rajkot with Atul Shakti riksha.
- In 2000, Maruti Suzuki gave authorized dealership to alpeshbhai at Jamnagar.
- Atul started to give authorized dealership at tagor road Rajkot in 2005.
- In 2006, Atul started workshop at university road and in 2006, Maruti started workshop in kuvadva road.
- Atul established OR started other workshop in entire shaurastra like gondal, wakaner, jasdan, rajula, amreli and porbander.
- Atul have total 4 show room and 12 workshops.

❖ OTHER ACTIVITIES

- Mahindra &Mahindra, Honda-two wheeler and Enfield India are authorized dialer at Jamnagar.
- Atul enterprise has spare distributer in entire saurastr.
1.3 **Hierarchy of organization**

![Diagram of Hierarchy of Organization](image)

**Figure: 1.2 hierarchy of workshop**
1.4 Workshop layout

Figure: 1.3 Workshop Layout
- **Engine room**: engine room work for engine overhauls, gear box overhauls, vice bench work and any special work.
- **Store room**: store all genuine part in store and car assessors.
- **Car-o-line**: this bay special work for accident car and over all damage cars.
- **Paint mixing booth**: this work for color mixing and add color additives.
- **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 color and car body part color work area.
- **Washing area**: This area work for customer car washing & cleaning.
1.5 Modify Workshop Layout

- **What:**
  
  I added my personal parking space because the cars can be safety parking and the costumer do not have to park cars on road side.
CHAPTER 2
Major instruments & tools

2.1 list and explanation of each machines used in industry

1. Wheel balance machine
2. Wheel alignment machine
3. Injector test and cleaning machine
4. A/C gas recovery machine
5. Tyre change machine
6. SDT (Suzuki dynastic tool)

2.1.1 Wheel balance machine

- Due to vibration on steering at 60 km/h speed, wheel balancing is needed.
- Weight is Apply in wheel on wheel to balancing by the use of this machine.
- Alignment is require when vehicle pull to one side at high speed.
- This machine is approximate cost: 1,65,000.

Figure: 2.1 Wheel balance machine
- Specification

Table: Specification of wheel balance

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor power</td>
<td>2.4kw/3.0kw</td>
</tr>
<tr>
<td>Max. rim diameter</td>
<td>2500mm (100”)</td>
</tr>
<tr>
<td>Max. rim width</td>
<td>1200mm (48”)</td>
</tr>
<tr>
<td>Power supply</td>
<td>230v, 400v, 1h/3ph 50Hz/60Hz</td>
</tr>
<tr>
<td>Place of origin</td>
<td>Liaoning China</td>
</tr>
<tr>
<td>Branch name</td>
<td>Mach</td>
</tr>
<tr>
<td>Model number</td>
<td>WB-DL-60</td>
</tr>
</tbody>
</table>

2.1.2 Wheel alignment machine

- Alignment is required when the vehicle pulls to one side at high speed.
- Alignment is also required when steering is out.
- The cost of the alignment machine is 3,80,000

Figure 2.2 Wheel alignment machine
WHEEL ALIGNMENT SPECIFICATIONS TABLE

Table 2 specification of wheel alignment

<table>
<thead>
<tr>
<th>Application</th>
<th>Preferred</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camber (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>0</td>
<td>-1 to 1</td>
</tr>
<tr>
<td>Rear</td>
<td>-1.0</td>
<td>-1.5 to -0.5</td>
</tr>
<tr>
<td>Caster (1)</td>
<td>3.33</td>
<td>2.33 to 4.33</td>
</tr>
<tr>
<td>Toe-in (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>0.16</td>
<td>0.11 to 0.21</td>
</tr>
<tr>
<td>Rear</td>
<td>0.3</td>
<td>-0.05 to 0.12</td>
</tr>
<tr>
<td>Toe-in (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>0.33</td>
<td>0.23 to 0.23</td>
</tr>
<tr>
<td>Rear</td>
<td>0.07</td>
<td>-0.10 to 0.23</td>
</tr>
</tbody>
</table>

2.1.3 Injector test and cleaning machine

Figure 2.3 Injector test and cleaning machine
Petrol injector can be test and clean. This machine is used for testing and cleaning the petrol injectors of the vehicles. The cost of injector test machine: ₹3,45,000.

Company name: Toptech

- Specification

<table>
<thead>
<tr>
<th>Specification of Injector test and cleaning machine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage</strong></td>
</tr>
<tr>
<td><strong>Power</strong></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td><strong>Modal</strong></td>
</tr>
</tbody>
</table>

2.1.4 A/C gas Recovery machine

The gas of the vehicle can be taken out and can be recharged with new gas for a/c in the vehicle.
This machine is used for recharging the gas used in A/C system gas also can be removed and filled with this machine.

- **specification**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage</strong></td>
<td>110V or 220V</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>50/60Hz</td>
</tr>
<tr>
<td><strong>Compressor power</strong></td>
<td>3/8HP</td>
</tr>
<tr>
<td><strong>Oil bottle capacity</strong></td>
<td>330ml</td>
</tr>
<tr>
<td><strong>Max. pressure</strong></td>
<td>20bar</td>
</tr>
<tr>
<td><strong>System max. pressure</strong></td>
<td>20bar</td>
</tr>
<tr>
<td><strong>Modal NO</strong></td>
<td>RCC-8A</td>
</tr>
</tbody>
</table>

### 2.1.5 Tyre change machine

![Tyre change machine](image)

*Figure: 2.5 Tyre change machine*
- This machine can be tyre separated and fitted with the help of this machine.
- Tyre can be change and fitted in machine.
- This machine is cost: 1, 22,000.

### Specification

Table:5 specification of tyre change machine

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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>
2.1.6 SDT (Suzuki diagnoses tool)

- The above image shows the SDT (Suzuki Diagnosis Test)
- The approximate cost of SDT is 1,25,000
- It is use to check the faults in engine, proper tuning etc.
2.2 **Explanation of power tools**

1. Electric lift
2. Battery tester
3. Air compressor
4. Car oliner
5. Electric drill
6. Electric Dent puller

### 2.2.1 Electric lift

- These lifts are used to lift the vehicle to work under the car they are operated electric and can lift 3.2 turn of weight.
- The above image shows the Simple Lift.
- The cost of this Lift is around 1,35,000.
- The company of this Lift is MANATEC Electronics Pvt. Ltd.
- This Lift is very helpful in workshop.
- It can easily up and down the vehicle.
- It consists of four supports.
### Specification

#### Table: 6 specification of electric lift

<table>
<thead>
<tr>
<th>Safety feature</th>
<th>Safety lock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operated by</td>
<td>Heavy duty AC motor</td>
</tr>
<tr>
<td>Maximum load capacity</td>
<td>3 tone</td>
</tr>
</tbody>
</table>

#### 2.2.2 Battery Tester

- Usage of battery test
  1. Specific gravity test.
  2. Open volt test.
  3. High discharge test.

![Battery Tester Image]

Figure: 2.8 Battery tester
### Specification

Table: 7 specification of battery tester

<table>
<thead>
<tr>
<th>Reading</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.220-1.230</td>
<td>Fully charged</td>
</tr>
<tr>
<td>1.200-1.210</td>
<td>¾ charged</td>
</tr>
<tr>
<td>1.175-1.185</td>
<td>Charged</td>
</tr>
<tr>
<td>1.150-1.160</td>
<td>Charged</td>
</tr>
<tr>
<td>1.125-1.135</td>
<td>Very little charged</td>
</tr>
<tr>
<td>1.100-1.110</td>
<td>Discharged</td>
</tr>
</tbody>
</table>

#### 2.2.3 Air compressor

- Air compressor stores the air for the use of pneumatic tools and machines to operate.
- The compressed air is used for many purposes such as for operating pneumatic drills, riveters, road drill, paint spraying, in starting and supercharging of internal combustion engine, in gas turbine plants, jet engines and air motors, etc.
- Approximate cost: 7,000
- This machine company is “TOYO Pvt. Ltd.”
### Specification

#### Table 8 specification of air compressor

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply power</td>
<td>100V/50Hz/220V/50Hz</td>
</tr>
<tr>
<td>Speed</td>
<td>1400 RPM</td>
</tr>
<tr>
<td>Weight</td>
<td>200 KG</td>
</tr>
<tr>
<td>Modal</td>
<td>RS-601/9</td>
</tr>
</tbody>
</table>

#### 2.2.4 Car o line

- The above image shows the Simple car-o-liner.
- The mordent trend in automobile garages is to go for automation, comprising of automation equipments, automated tool and machine.
- The electric platform is one such equipment used in automated workshop.
- The cost of this car-o-liner is around $16,500
- The company of this “YANTAI SMITHD ELECTROMECHANICAL EQUIPMENT MANUFACTURING CO. LTD.”
➢ **Specification**

Table: 9 specification of car O line

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>1300kg</td>
</tr>
<tr>
<td>Maximum lifting capacity</td>
<td>3500kg</td>
</tr>
<tr>
<td>Maximum hydraulic pressure</td>
<td>70mpa</td>
</tr>
</tbody>
</table>

### 2.2.5 Electric drill

![Electric drill](image)

Figure: 2.11 Electric drill
- A drill is a tool fitted with a cutting tool attachment.
- Electric drill used for boring holes in various materials.
- Drills are available with a wide variety of performance characteristics such as power and capacity.

2.2.6 Electric Dent puller

Small dents and uneven surface are repaired with this machine it gets welded with a spot on the surface and the with help of the puller the surface is made even.
2.3 Explanation of other tools

1. File
2. Bench vise
3. Spanner
4. Hammer
5. Filler gauge
6. Paint spray gun

2.3.1 File

- File of one of the most important tools of fitting shop.
- Hand files are used in the workshop to smooth rough edges.
- They can be used to smooth a range of materials including metal such as brass and steel to wood based material such as MDF.
- They are made from high carbon steel and they are heat treated so that they are tougher than the steel or other materials that they are to be applied to.
- Approximate cost: 600
2.3.2 Bench vice

- Sometimes, the shearing of thin sheets is also carried out with the help of the vice.
- The bench fitter and machinist uses this vice for holding a variety of manual jobs and assembly and dismantling of machine parts and equipment.
- Approximate cost: 3000

Figure: 2.14 Bench vice
2.3.3 Spanner

- **Summary** There are many types of spanners. The most common are the ring spanner, open end spanner & the combination spanner. Spanners will only do a job properly if it’s the right size for the nut or the bolt to be turned.
- Spanners (which are also often known as wrenches in some countries) will only do a job properly if it’s the right size for the nut or the bolt to be turned.
- Approximate cost: 9,865.
2.3.4 Hammer

- The most common hammer in an automotive workshop is the ball pain or engineer's hammer. The soft-face & dead blow hammers are also used, faces.
- It's usually used for flattening, or paining, a rivet.
- Approximate cost: 150

2.3.5 Filler gauge

Figure: 2.16 Hammer

Figure: 2.17 Filler gauge
The name feeler gauge comes from the fact that they are used to check such a small gap or dimension which can just be felt.

They are used to check and adjust the gaps of spark plug electrodes, contact breaker point, air gap point in distributor rotor assembly, and valve tapped clearance, etc.

Approximate cost: 250

2.3.6 Paint spray gun

With the help of paint spray gun paint is applied on the surfaces. Different adjustment can be done in the gun to apply the paint property-thick or thin layer can be done through this adjustment.
- Hence, the spray gun is used with a compressor which a pressure regulator for uniform spray and an air filter for supplying cleaner air to the spray gun.
- Approximate cost: 2,330
CHAPTER 3

Particular Experiences

3.1 Particular experiences in my workshop

3.1.1 Brake Oil Changing:

- The function of Brake Oil is to circulate the Oil into all wheels While Braking.
- The reason for changing the Brake Oil is because the Brakes are not working properly.

3.1.2 Brake Pad Changing:

![Image of brake pad changing](image)

Figure: 3.1 Brake pad changing

- After the car has been lifted, and remove lug nut.
- Once the wheel has been remove.looser the caliper bolts remove.
- Now lift the brake caliper off the rotor and brake paid.
- Remove both Brake paid.
3.1.3 Air filter change:

- The Air Filter is located on top of the Engine & left or right side.
- Air Filter removes the dust and dirt from the air entering the engine.
- If Air Filter should be change according the periodic maintenance apply on the car, engine life & engine performance improves.
3.1.4 Petrol Filter Changing:

- Petrol Filter is located near the Petrol Tank, near the Charcoal Canister.
- There is no service to clean the Filter either replaces.
- The Filter consists of two pipes, one for Inlet and one for return pipe.

3.1.5 Spark plug changing.

Figure: 3.3 petrol filter changing

Figure: 3.4 (a) spark plug changing
The Spark Plug is located on top of the Engine or front of the Engine.

- The Spark Plug Gap is very important factor for desired engine performance.
- Wide Gap may result in no firing some time at high speed, this may reduce the engine power and fuel efficiency.

3.1.6 Wheel alignment:

- The Alignment machine adjusts the Toe-in & Toe-out.
- Attach to for wheel sensor.
Adjust caster camber.

3.1.7 Fuel pump remove:

- Figure: 3.6 (a) fuel pump remove

- Disconnect the negative battery terminal.
- Remove the gas cap and insert a hard plastic line into the filler neck to draw the fuel out.
- Locate and remove gas tank filler neck mounting bolts.
- Disconnect electrical connectors to fuel tank.
- Locate and disconnect fuel line.
Support the tank using a device. (fuel tank weight 30 to 40)
Once the tank has been removed, disconnect fuel lines from the fuel pump.
Removing fuel pump mounting bolts.
After the fuel pump has been remove.

**Figure: 3.6(c) remove fuel pump**

### 3.1.8 Radiator replacement:

- With the engine cold locate and remove the radiator cap.
- Once the drain plug is loosened coolant will start draining from the radiator drain.

**Figure: 3.7 radiator replacement**
- Remove the air filter assembly.
- Located and remove coolant reservoir mounting bolt.
- Disconnected by all house pipe.
- After the disconnect radiator cooling fan.
- Remove all cooling fan mounting bolt.
- Removing radiator and radiator fan.

### 3.2 Engine overhaul

(1) **Remove the bonnet:**

- Disconnect the bonnet support at the lower end by removing the pivot bolt, nut and washer, then unscrew the two hinge bolts, one on either side and remove, together with the flat washers.
- Disconnect the battery.
- Drain the front of the vehicle and fit stands beneath the forward jacking points.

(2) **Remove the engine:**

- Then open the bolts of Mounting of engine & Gear Box, and then slowly start warding the lift.
- Disconnected by all electric sockets.

![Figure: 3.8 Remove the engine](image-url)
(3) Remove the radiator and condensation:

- Detach the upper and lower radiator hoses at the engine end then remove four bolts and spring washer securing the radiator.
- Remove A/C gas pipe and condensation.
- Disconnect the fuel inlet pipe to the fuel pump and remove the engine breather by unscrewing one engine to clutch housing bolt.
- Remove the top bolt from the starter motor.
- Disconnect the spark plug leads and remove.

Figure: 3.9 Remove radiator and condensation
(4) Remove the head:

![Figure: 3.10 Remove the head](image)

(5) Throttle body

![Figure: 3.11 throttle body](image)
(6) Common real

- Remove the vacuum (throttle body) pump.
- We remove the Common Rail.
- Then we remove the Injectors, (and keep in mind that injectors should not change & give them numbers 1 2 3 4. according to numbers of Cylinders.)
- Remove the igniter and spark plug.
- Unscrew the exhaust pipe clamp bolt and disconnect the exhaust pipe from the manifold, the uncouple the choke and throttle controls at the carburetor end unscrew the two and spring washers and detach the carburetor.

(7) Remove the timing chain

Figure: 3.12 common real

Figure: 3.13 Timing chain
- Remove the timing belt and tappet cover.
- Remove the camshaft sprocket and chain. Bend back the camshaft sprocket locking plats tabs and unscrew the two retaining bolts, remove the locking plate and pull the camshaft sprocket off its locking dowel on the camshaft flange.
- Detach the timing chain from the crankshaft sprocket.
- Removal of Cylinder Head Gasket.

(8) Detach the clutch assembly:

Figure: 3.14 pressure plate

(9) clutch plate

Figure: 3.15 clutch plate
Unscrew the pressure plate bolts evenly and detach the pressure plate and clutch disc. Note that the clutch pressure plate is located by three dowels on the face of the flywheel.

(10) Remove the flywheel:

![Flywheel](image)

Figure: 3.16 Flywheel

This secured by four bolts and a looking plate, and is located by a sleeve and dowel in the crankshaft rear flange. Bend back the tabs on the locking plate, unscrew the bolts and gently tap the flywheel off the crankshaft flange.

(11) Remove the crankshaft:

![Crankshaft](image)

Figure: 3.17 crankshafts
- Remove the oil.
- Remove the oil sump.
- Remove the oil Steiner.
- Remove the alternator.
- Remove the crankshaft rear bearing oil seal.
- Remove the connecting small end bearing nut bolt.

(12) **Remove the connecting, piston, Ring:-**

![Figure: 3.18 piston & piston ring](image)

(13) **Connecting rod**

![Figure: 3.19 Connecting rod](image)
First remove the piston rings. Extract the two piston pin circles and push the pin out of each piston.

It may be necessary to warm pistons slightly by immersing in hot water or oil to enable the piston pins to be removed.

3.3 Gear box Overhaul

1) Drain off the transmission fluid.

![Figure: 3.20 Transmission oil remove](image)

2) Mount the transmission on an assembly stand.

- Screw the tool bolt into the threaded hole for the oil drain plug and tighten it.
- Secure the mounting bracket to the transmission.
3) Detach the pressure line and the bleed screw.

- Pull out the spring clip; disconnect the quick-release coupling.
- Remove the bleed screw.

4) Unscrew the drive flange nut from the main shaft.

- Use a 30 mm socket wrench.
- Hold with the special tool.
- Discard the nut.
5) Pull off the drive flange.

![Figure: 3.23 Pull off the drive flange](image)

6) Remove the guide sleeve.

- Remove the thrust washer.
- Remove input shaft guide sleeve oil seal.

7) Remove the radial oil seal.

![Figure: 3.24 Remove the radial oil seal](image)
8) Remove the countershaft bearing housing.

- Remove the radial oil seal using a suitable lever.

- Figure: 3.25 Remove the countershaft bearing housing

- Remove the bearing housing locking plate.
- Unscrew the bearing housing using a 17 mm Allen key.

9) Remove the selector interlock mechanism.

- Remove the plug with a 14 mm Allen key.
- Remove the spring, pin, ball and sleeve.

10) Unscrew the transmission housing bolts.

- Figure: 3.26 Unscrew the transmission housing bolt
- Housing flange (10 bolts).
- Only slacken the bolt of the reverse gear idler shaft (marked in blue).
- Unscrew the bolt of the reverse gear idler shaft (marked in blue).

11) **Remove the speedometer drive pinion and worm Gear.**

![Image: Remove the speedometer](image)

**Figure: 3.27 Remove the speedometer**

12) **Separate the transmission housing halves.**

13) **Remove the 3rd/4th gear selector fork.**
Move the main selector shaft to the neutral position.
Pull out the auxiliary selector shaft.
Remove the 3rd/4th gear selector fork.

14) **Remove the synchronizer ring**

![Image](image-url)
3.4 Major vehicle repairs

3.4.1 Synchronizer Ring Changing

- The Synchronizer Ring are used in Synchromesh Gear Box.
- Each Gear Box consists of four Synchronizer Ring for 1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd}, & 4\textsuperscript{th} Gear.
- The customer problem is the 3\textsuperscript{rd} & 4\textsuperscript{th} Gear is hard to shift.

Figure: 3.30 (a) synchronizer ring

Figure: 3.30 (b) synchronizer ring change
• **PROCEDURE:**

- First of all adjust the car into lift.
- Then remove the front tyres and put them under the Gear Box.
- Then remove the Drive Shafts.
- Then start opening the bolts and connections from the Gear Box.
- Then in last open the bolts of mounting, result gear box disassemble.
- Counter Shaft consists of 1st & 2nd Gear. Lay Shafts consists of 3rd & 4th gear.
- Finally, change the Rings with the help of Hydraulic Press.

### 3.4.2 Clutch Plate & Pressure Plate Changing:

- The function of Clutch Plate is to Engage & Disengage the Engine from Transmission, thus clutch is located between engine & Transmission.
- Pressure Plate consists of a Diaphragm Springs.
- When we press the Clutch Pedal the clutch is in Disengage position, in which the Pressure Plate consists of a Diaphragm Spring, helps to stop rotating the Clutch Plate.

![Figure: 3.31 (a) pressure plate](image)
PROCEDURE:

- First of all adjust the car into lift.
- Then open the front tyres and put them under the car.
- Remove the gear box.
- After this all, open the bolts of mountings.
- Open the bolts of mountings. After this all, open the bolts of mountings.
3.4.3 Rack & Pinion Replacement

- The vehicle’s rack and pinion gear is mounted under the hood of the vehicle.

- **Part and supplies needed to replace a rack and pinion**
  1. New rack and pinion
  2. Power steering fluid
  3. Power steering house

**PROCEDURE:**

- Disconnected the negative battery terminal.
- Using the floor jack, lift the front of the vehicle.
- Remove both the front wheels and set aside.
- Remove the seal around the steering coupler and unbolt the steering shaft pinch bolt.
- Remove the outer tie rod ends from the steering knuckles.
- Remove the cotter pin and bolt from the tie rod and using the ball joint fork and a hammer, separate the tie rod from its mount.
- Remove the power steering hoses and allow the fluid to fully drain into the large pan.
You may find it difficult to remove the rack even after it is unbolted. If all bolts are off, it will come out, but may require some persuasion. Remove the old rack and pinion from the vehicle

3.4.4 Fuel injector test

- Automotive engine fuel injector this information pertains to electronic fuel injector vehicle.
- This injector located by engine upper.

![Fuel injector test](image)

**Figure: 3.33 Fuel injector test**

- **PROCEDURE:**
  - Start the engine and idle condition.
  - With the ignition key turned to the “ON” position without starting the engine.
  - Connected a test light to the negative side of the battery and probe the injector wires one of the wires should illuminate the test light.
  - While the test light clamp is on the battery, move the test light probe to the opposite wire in the injector connector, have a helper start or crank the engine.
  - Identify the injector to be tested and inspection for defects or bad connection.
- To test fuel injector valve while installed, a fuel gauge is connected to the fuel system via fuel rail port or fuel filter.
- For the final check remove the injector and attach pressured air to the injector inlet, then use a 12v power.
3.5 Faults and remedies

Table 10 Faults and remedies

<table>
<thead>
<tr>
<th>Faults</th>
<th>Possible causes</th>
<th>Remedies</th>
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</thead>
<tbody>
<tr>
<td>(1) Overheating</td>
<td>Abnormal condition in ignition system:</td>
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<tr>
<td></td>
<td>(1) Ignition timing out of adjustment.</td>
<td>Adjust as prescribed.</td>
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<td>(2) Wrong heat value of spark plugs.</td>
<td>Chang heat value.</td>
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<td>(3) Breaker point gap out of adjustment in distributor.</td>
<td>Adjust as prescribed.</td>
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<tr>
<td>Abnormal condition in fuel and exhaust system:</td>
<td>(1) Float level set to low.</td>
<td>Adjust as prescribed.</td>
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<td></td>
<td>(2) Clogged exhaust port.</td>
<td>Clean.</td>
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<td></td>
<td>(3) Clogged jest in carburetor.</td>
<td>Clean.</td>
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<tr>
<td>Abnormal condition in cooling system:</td>
<td>(1) Not enough coolant.</td>
<td>Refill.</td>
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<td></td>
<td>(2) Loose or broken fan belt.</td>
<td>Adjust or replace.</td>
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<td></td>
<td>(3) Poor water pump performance.</td>
<td>Replace.</td>
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<tr>
<td></td>
<td>(4) Leakey radiator pipe.</td>
<td>Repair or Replace.</td>
</tr>
</tbody>
</table>
### Abnormal condition in lubrication system:

1. Clogged oil strainer.  Clean
2. Clogged oil filter.  Replace
3. Deteriorated oil pump performance.  Replace

### (2) Slipping clutch

1. Loss of clearance at the tip of release fork.  Adjust
2. Clutch facings dirty with oil.  Replace
3. Clutch facings excessively worn.  Replace
4. Not enough play of clutch pedal.  Adjust and, as necessary, replace clutch facings.

### (3) Hard and slipping shifting gear

1. Worn ring or hub in synchronizers.  Replace
2. Worn synchronizer hub.  Replace
3. Clutch disc facing are worn.  Replace

### (4) Hard steering and steering noise

1. Wheel tyre not adequately inflated.  Adjust the pressure
2. The road ends testing to seize.  Replace
3. Steering gearbox out of adjustment.  Adjust
4. Loose bolts and nuts.  Retighten
5. Linkage joints needing grease.  Replace

### (5) Wiper motor

1. Fuse is set loose or Blown off.  Tighten or replaces
2. Worn or floating Brushes.  Replace and repair
3. Short circuited or Fused field coil.  Replace
### (6) Horn will not sound off

<table>
<thead>
<tr>
<th>Poor sound quality</th>
<th>Cause</th>
<th>Action</th>
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<tr>
<td>(1) Blown-off fuse.</td>
<td>Replace</td>
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<td>(2) Broken circuit Wire.</td>
<td>Repair</td>
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<td>(3) Defective horn.</td>
<td>Replace</td>
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<tr>
<td>(1) Incomplete contacting action Inside horn switch.</td>
<td>Repair or Replace</td>
<td></td>
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<tr>
<td>(2) Improper point gap or burnt point Inside the horn.</td>
<td>Replace</td>
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<td>(3) cracked Diaphragm.</td>
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### (7) Abnormal engine noise

<table>
<thead>
<tr>
<th>Crankshaft noise:</th>
<th>Action</th>
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<tbody>
<tr>
<td>(1) Worn connecting Rod bearing.</td>
<td>Replace</td>
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<td>(2) Distorted Connecting road.</td>
<td>Replace</td>
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<tr>
<td>(3) Worn crankpins.</td>
<td>Repair by grinding and replace</td>
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</tbody>
</table>

**Pistons, rings, pins or cylinders noise:**

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<th>Action</th>
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<tr>
<td>(1) Abnormally worn Bores of cylinder.</td>
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<tr>
<td>(2) Worn piston ,ring or pins.</td>
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<tr>
<td>(3) Pistons tending to Size.</td>
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</table>
3.6 Maintenance and preventive

3.6.1 Paid service

- Free service

1) 1st free service
- General check-up
- Engine oil change
- Oil filter change
- Check all electrical equipment

2) 2nd free service
- General check-up
- Underbody nut bolt check
- Wheel alignment

3) 3rd free service
- General check-up
- Engine oil change
- Oil filter change
- Air filter change

- 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

### 3.6.2 Maintenance

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<th>Parts name</th>
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CHAPTER: 4
Additional data

4.1 Accidental vehicle studies

4.1.1 Determining the extent of damage:

Figure: 4.1 Determining the extent of damage

- Before beginning the repair determine the extent of damage. The illustration on about side shows an example a damaged vehicle which has suseatend and impact has the centre of the door on molding the
4.1.2 Removing the paint film on the penal:

Figure: 4.2 Removing the paint film on the penal

- Remove the paint film from the damaged (dented) area before welding the washer to the sheet metal.
4.1.3 Repair of dent and bulges with washer welder:

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.

Figure: 4.3 Repair of dent and bulges with washer welder
4.1.4 Penal shrinking:-

- It is safe to assume that penal has been stretched 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 Coues that penal to make a flapping noise’s the vehicle is drive on the road.

4.1.5 Repair panel with help of dolly and hammer:-

![Figure: 4.4 Repair panel with help of dolly and hammer](image)

- 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 technical don’t require nearly as much expiration as a hammer and dolly operation.
4.1.6 Penal filling with plastic body pillar and putty’s:

- The Mordent 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.

Figure: 4.5 Penal filling with plastic body pillar and putty’s
4.1.7 Antirust treatment of damage area:-

- The damage area is not protected for antirust then protects to corrosion of penal or dents.

Figure: 4.6 Antirust treatment of damage area
4.2 Workshop Safety

To help prevent accidents, follow these safety rules.

- Work quietly and give your full attention to the job you are doing.
- Keep your tool and equipment under control.
- Never indulge in horseplay or foolish action. You could cause some to get seriously hurt.
- Never put screwdriver or other sharp objective in your pocket. You could cut or stab yourself or you could damage the upholstery in a car.
- Make sure your cloth is right for the job. Dangling sleeves or ties can get caught in machinery and cause serious injury.
- 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 the workshop. Keep long hair.
- Do not wear any ring, bracelet when working around moving machinery equipment. Jewellery can catch in moving machinery with very serious result. Also a ring or bracelet can accidentally catch in the ring or bracelet may become white hot in an instant, this will severely burn you.
- Wipe oil and grease off your hands and tools, you need a good grip on tool and part.
- If you spill oil, grease, or any liquid on the floor, clean it up. Help prevent injury from slips and falls.
- Never use compressed air to blow dirt from your clothes. Never point a compressed air blow gun at another person.
- Always wear eye protection when using a grinding wheel. Safety glasses, safety goggles, or a face shield should be available.
- Watch out for sparks flying from a grinding wheel or a welding job. The sparks can set hair or clothes on fire.
- When using 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 stand in place before going under a vehicle.
- Always use the right tool for the job. The wrong tool could damage the part you are working on and could hurt you.
- Keep your hand away from the engine, the engine fan and accessory drive belts when the engine is running. Your hand could get caught in the fan or between a belt and pulley. You are working on or could hurt you.
4.3 cost estimates of major repair

- Oil filter = 90.00Rs (Wagon-r, Alto, Maruti 800, etc)
- Oil Filter = 390.00Rs (Swift, Ertiga, Sx4, etc)
- Old Diesel Filter = 1250.00Rs
- New Diesel Filter = 1322.00Rs
- Fog Lamp = 6600.00Rs
- Throttle Body = 6990.00Rs
- Blower Motor = 1887.00Rs
- Brake Disc = 875.00Rs
- Spark Plug = 125.00Rs
- Stabilizer Bush = 50.00Rs
- Rear Wheel Bearing = 700.00Rs
- Brake Pad = 428.00Rs
- Clutch Plate = 1800.00Rs
- Pressure Plate = 1900.00Rs
- Front Stabilizer = 455.00Rs
- Air Filter = 350.00Rs
- AC Filter = 350.00Rs
- Strut Mount = 346.00Rs
- Cylinder Head Gasket = 616.00Rs
- Intake Manifold = 88.00Rs
- Antenna Rod = 215.00Rs
- Oil Gauge = 32.00Rs
- Rear Axle = 12000.00Rs
- Viper Kit = 495.00Rs
- Drive Shaft = 5000.00Rs
- Synchronizer Ring = 2400.00Rs
- Turbocharger = 14000.00Rs
- Crankshaft = 9000.00Rs
- Cylinder head = 9000.00Rs
- Piston = 2500.00Rs
- Piston Pin = 1400.00Rs
- Connecting Rod = 2500.00Rs
- Diesel Injector = 11000.00Rs
- Water Pump = 6000.00Rs
- Catalic Converter = 12000.00Rs

- Oil Drain = 80.00Rs
- Viper Blade = 300.00Rs
- Side Mirror = 1000.00Rs
- Radiator = 5000.00Rs
- Door Handle = 135.00Rs

- Crankshaft Bearing = 550.00Rs
- Ignition Coil = 950.00Rs
- Distributor = 3200.00Rs
- Electronic Control Module = 17000.00Rs
- Jumper Strut = 1700.00Rs

- Tyre Tubeless = 5000.00Rs
- Wheel Rim = 1500.00Rs
- Fuel Tank = 9000.00Rs
- Simple Silencer = 6000.00Rs
- Door = 6000.00Rs

- Door Fender = 2500.00Rs
- Front Windshield = 5000.00Rs
- Door Latch = 1800.00Rs
- Head Light = 3500.00Rs
- Tail Light = 1500.00Rs

- Radiator Fan = 5500.00Rs
- Intercooler = 10,000.00Rs
- Differential = 8000.00Rs
- Gear Box = 51000.00Rs
- Intake Manifold = 3500.00Rs

- Valve = 1300.00Rs
- Exhaust Manifold = 4000.00Rs
- Ac Belt = 900.00Rs
- Timing Chain = 1100.00Rs
- Oil Pump = 800.00Rs

- Master Cylinder = 10,000.00Rs
- EGR (Exhaust Gas Recirculation) = 3800.00Rs
- Starting Motor = 8000.00Rs
- Seat = 6000.00Rs
- Dashboard = 12000.00Rs
- Seat Belt = 1300.00Rs
- Air Bag = 1,00,000.00Rs
- Power Window Set = 12000.00Rs
- Carburetor = 5000.00Rs
- Hand Brake = 1200.00Rs
- Thermostat Valve = 400.00Rs
- UJ (Universal Joint) = 800.00Rs
- Steering Assembly Sx4 = 34000.00Rs
- Steering Assembly Swift = 25000.00Rs
4.4 special challenging experience in my Workshop

4.4.1 Swift DZire (diesel)

Remove head

- The car is came to workshop for Changing a Timing Chain because of little noise came from right side of engine.
- First of all we taken a test drive.
- The noise is coming from the right side of engine, we decided to change a Timing Chain.
- The reason for Cam-Shaft Broken is because Timing Chain not fitted properly & car doesn't started in first time, then also tried 3 to 4 times and result is heavy noise occurs & Cam-Shaft Broken.

![Image: Remove The Head]

An new Cam-Shaft is fitted to car & Timing Chain is also properly fitted then we start a car, easily started and after starting an car a noise also not occurs from right side of the engine.
4.4.2 Swift DZire (petrol)

Sparkplug and air filter replace

Figure: 4.8 (a) Spark plug replace

Figure: 4.8 (b) spark plug
When the vehicle vibrates even after changing the air filter, throttle Body cleaning, etc.
Then we decided to replace all the Spark Plugs.
, sometimes customers says don’t change spark plugs.
Then we test and clean all spark plugs with the help of Polish paper.

4.4.3 Swift (diesel)

Steering Assembly remove

When we taken a test drive & confirm that the steering is hard, more effort is required to turn & steering is not coming back after turning.
The steering assembly should be change.
But sometimes customers says don’t change it, it is very costly.
Then we service that steering assembly.
In servicing of steering assembly nothing special is required, just to fill the oil & grease into the assembly with the help of Bench Vise.
It is easy way to reduce the cost.
4.4.4 Alto (petrol)

Brake pad replace

Figure: 4.10 (a) brake pad replaces

Figure: 4.10 (b) brake pad
- When the customer problem, is there is decrease in braking performance.
- We change the brake oil, even brake is not working properly.
- Then we decide to change a Brake Pads.
- Sometimes customers says don’t change the Brake Pads, then we rub the polish paper on Brake Pads.
- And there is increase in brake performance.
- It also reduces the cost.
CHAPTER 5

My like & disliking

❖ My like in my workshop

➢ Fust of all like to say that I really enjoy the training.
➢ A lot of knowledge I got from the training manager, supervisor, mechanic, helper etc.
➢ The machine, instrument & Equipment use in my workshop are also of stander quality.
➢ There is good Co-ordinates arming mechanic.
➢ The tools use in workshop is of stander quality.

❖ My disliking in my workshop

➢ No, parking space.
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