CHAPTER-1
INTRODUCTION OF INDUSTRY

- Brief introduction on Hyundai motor company
- Hyundai’s Brand slogan
- Research and development
- Hyundai motor company India
- Introduction of Patel Hyundai.
- Models of Hyundai motor company in India
INTRODUCTION

1. HYUNDAI MOTOR COMPANY

Chung Ju Yung founded the Hyundai Engineering and Construction Company in 1947. Hyundai Motor Company was later established in 1967. The company's first model, the Cortina, was released in cooperation with Ford Motor Company in 1968. When Hyundai wanted to develop their own car, they hired George Turnbull in February 1974, the former Managing Director of Austin Morris at British Leyland. He in turn hired five other top British car engineers.

They were Kenneth Barnett body design, engineers John Simpson and Edward Chapman, John Crosthwaite ex-BRM as chassis engineer and Peter Slater as chief development engineer. In 1975, the Pony, the first Korean car, was released, with styling by Giorgio Giugiaro of ItalDesign and powertrain technology provided by Japan's Mitsubishi Motors. Exports began in the following year to Ecuador and soon thereafter to the Benelux countries.

In 1984, Hyundai exported the Pony to Canada, but not to the United States, because the Pony didn't pass emissions standards there. Canadian sales greatly exceeded expectations, and it was at one point the top-selling car on the Canadian market. In 1985, the one millionth Hyundai cars were built.

2. HYUNDAI’S BRAND SLOGAN

“NEW THINKING. NEW POSSIBILITIES.”

A brand slogan embodies the essence of a brand, from its philosophy to its vision and identity. Hyundai’s brand slogan “NEW THINKING. NEW POSSIBILITIES.” reflects the will of Hyundai Motor Company to create new possibilities to benefit the world and its people by encouraging and developing new thinking. All members of Hyundai have the brand slogan deeply engraved in their hearts as they move forward in their effort to provide new values and experiences desired by today’s customers through innovative ways that are unique to the brand, driven by new thinking about customers and cars.

3. RESEARCH AND DEVELOPMENT

Hyundai has six research and development centers, located in Korea (three offices), Germany, Japan and India. Additionally, a centre in California. Develops designs for the United States. Hyundai has made an app with augmented reality, showing users how to operate and maintain vehicles.
Hyundai Motor India Limited (HMIL) is a wholly owned subsidiary of Hyundai Motor Company (HMC). HMIL is the largest passenger car exporter and the second largest car manufacturer in India. It currently has ten car models across segments – Eon, i10, Grand i10, Elite i20, Active i20, Xcent, Verna, Creta, Elantra and Santa Fe. HMIL’s fully integrated state-of-the-art manufacturing plant near Chennai boasts advanced production, quality and testing capabilities.

HMIL forms a critical part of HMC’s global export hub. It currently exports to around 92 countries across Africa, Middle East, Latin America, Australia and the Asia Pacific. HMIL has been India’s number one exporter for the last 10 years consecutively. To support its growth and expansion plans, HMIL currently has 456 dealers and more than 1,185 service points across India. In its commitment to provide customers with cutting-edge global technology, Hyundai has a modern multi-million dollar R&D facility in Hyderabad. The R&D center endeavors to be a center of excellence in automobile engineering. In 2007, Hyundai started its support engineering centre with CAD/CAE teams in Hyderabad, India.
Hyundai expanded its engineering activities in India with Vehicle Engineering team in 2010. In 2011, Hyundai started its design activities at Hyderabad R&D Centre with Styling, Digital Design & Skin CAD Teams and Packaging team. Indian engineers are heavily involved in making of Indian vehicles like Grand i10, Elite i20 along with other Global cars.

5. PATEL HYUNDAI
(PATEL AUTOMOTIVE PVT. LTD.)

![Patel Hyundai Bhavnagar](image)

Fig. 1.3 (Patel Hyundai Bhavnagar)

One of the fresh and fast growing dealership of Hyundai motors in the state Situated in Bhavnagar district established in 2014 with sales in class qualified staff of 49 members to catters all car buying needs of customers. And in service department having highly skilled professional technician with the well equipped workshop includes special tools machines and safety precautions and other which deals with every problem precisely. Have around staff of up to 70 employees which includes Service manager, C.R. manager and team, bodyshop manager, service Floor supervisor, final inspector, spare part manager, service advisors, technicians and their helpers.
6. CAR MODELS OF HYUNDAI MOTOR COMPANY IN INDIA

Hyundai motor has currently ten successful car models with different variants according to systems, fuels and transmission in India.

Name: EON
Launched year: 2011
Category: Hatchback

Fig 1.4 (Eon)

Name: i10
Launched year: 2010
Category: Hatchback

Fig 1.5 (i10)

Name: i10 Grand
Launched year: 2013
Category: Compact

Fig 1.6 (Grand i10)

Name: Xcent
Launched year: 2014
Category: Sedan

Fig 1.7 (Xcent)

Name: Verna
Launched year: 2011
Category: Sedan

Fig 1.8 (Verna)
Name: i20 Active
Launched year: 2015
Category: compact SUV

Name: i20 Elite
Launched year: 2014
Category: Compact

Name: Creta
Launched year: 2015
Category: SUV

Name: Elantra
Launched year: 2011
Category: Sedan

Name: Santa Fe
Launched year: 2014
Category: SUV
CHAPTER-2

GARAGE LAYOUT
AND
ORGANIZATION CHART

- Workshop planning [Actual]
- Workshop planning [Modified]
- Posting Hierarchy
1. WORKSHOP LAYOUT

[ACTUAL]

The location of the Workshop is under ground, There are 5 electro-Hydraulic Lifts in service floor and 2 electro-hydraulic lifts in body shop and 1 Paint booth in body shop, In front office Sitting arrangement of service manager, C.R. manager, bodyshop manager, and other service department team are there, in store room sitting arrangement of store keepers and store manager, washing area is consist of robotic car washing machine. There is also a gate on rear of workshop which is not used for any purpose.

Fig 2.1 (Actual workshop layout)
Modified layout is consist of changes in location of engine room because of it was attached very closely to alignment system many circumstances were happening while using both things at the same time.

Washing area is replaced on the place of bodyshop and bodyshop is replaced to washing area by this change the gate on the rear side of workshop which was not used for any other purpose can use for after service delivery from where work can be run easily according to this modification.

The purpose for changing the place of store area the distance from all working lift will be same so somewhere it can reduce the working efficiency for workers.
3. **HIERARCHY OF INDUSTRY**

- **DIRECTOR**  
  (Mr. Manan Vaghani)

- **SERVICE MANAGER**  
  (Mr. Mohit Thakker)

  - **BODYSHOP MANAGER**  
    (Mr. Sudhir Kasotiya)
  
  - **C.R MANAGER**  
    (Mr. Rakesh Modi)

    - **CRM TEAM**

  - **STORE MANAGER**  
    (Mr. Amin Azad)

    - **STORE KEEPERS**

- **TRAINING INCHARGE**  
  (Mr. Ketan Prajapati)

- **FLOOR SUPERVISOR**  
  (Mr. Rajendrasinh Vala)

  - **FINAL INSPECTOR**  
    (Mr. Vimal Puranee)

  - **HEAD TECHNICIAN**  
    (Mr. Shahid Mahetar)

    - **TECHNICIANS**

      - **HELPERS**

Fig 2.3 (Hierarchy of industry)
CHAPTER-3
EQUIPMENTS

- Hand tools
- Power tools
- Major Machines
- Special tools
1. HAND TOOLS USED IN INDUSTRY

SPANNERS

FIX SPANNER
A one-piece wrench with a U-shaped opening that grips two opposite faces of the bolt or nut. This wrench is often double-ended, with a different-sized opening at each end. The ends are generally oriented at an angle of around 15 degrees to the longitudinal axis of the handle. This allows a greater range of movement in enclosed spaces by flipping the wrench over.

COMBINATION SPANNER
A double-ended tool with one end being like an open-end wrench or open-ended spanner, and the other end being like a box-end wrench or ring spanner. Both ends generally fit the same size of bolt.

RING SPANNER
A one-piece wrench with an enclosed opening that grips the faces of the bolt or nut. The recess is generally a six-point or twelve-point opening for use with nuts or bolt heads with a hexagonal shape. The twelve-point fits onto the fastening at twice as many angles, an advantage where swing is limited. Eight-point wrenches are also made for square-shaped nuts and bolt heads. Ring spanners are often double-ended and usually with offset handles to improve access to the nut or bolt.

Price:
Ring spanners: 250-500 Rs.
Combination spanners: 300-1000 Rs.
Fix spanners: 200-800 Rs.
PLIERS

NOSE PLIER
Needle-nose pliers (also known as pointy-nose pliers, long-nose pliers, pinch-nose pliers or snipe-nose pliers) are both cutting and holding pliers used by artisans, jewelry designers, electricians, network engineers and other tradesmen to bend, re-position and snip wire. Their namesake long nose gives excellent control while the cutting edge near the pliers' joint provides "one-tool" convenience. Because of their long shape they are useful for reaching into small areas where cables or other materials have become stuck or unreachable with fingers or other means.

SIMPLE PLIER
are a type of Pliers used by electrician and other tradesmen primarily for gripping, twisting, bending and cutting wire and cable. Linemen's pliers owe their effectiveness to their pliers design, which multiplies force through leverage. Lineman's pliers have a gripping joint at their snub nose and cutting edge in their jaw. Line. The two handles precisely joined with a heavy-duty rivet that maintains the pliers' accuracy even after repeated use under extreme force on heavy-gauge wire. Lineman's pliers usually have grips for better handling than bare metal handles; the grips may also provide insulation for protection against electric shock when working with live circuits.

TONGUE AND GROOVE PLIER
also known as adjustable pliers, Multi-Grips, tap or pipe spanners, gland pliers are a type of slip-joint pliers. They have serrated jaws generally set 45 to 60 degrees from the handles. The lower jaw can be moved to a number of positions by sliding along a tracking section under the upper jaw. An advantage of this design is that the pliers can adjust to a number of sizes without the distance in the handle growing wider.

Price: all 1000-1200 Rs.

Fig 3.2 (Nose, Simple, Groove pliers).
HYDRAULIC JACKS

A jack is a mechanical device used as a lifting device to lift heavy loads or to apply great forces. A mechanical jack employs a screw thread for lifting heavy equipment. A hydraulic jack uses hydraulic power. The most common form is a car jack, floor jack or garage jack, which lifts vehicles so that maintenance can be performed. Jacks are usually rated for a maximum lifting capacity (for example, 1.5 tons or 3 tons).

Price: 3000-6000 Rs.

JACK STANDS

One unique design feature of the Jackpoint Jackstand is the open front. This feature allows the jack stand to fit around floor jacks while the jack is supporting a vehicle. To compensate for this opening, Jackpoint Jackstands use varying wall thicknesses to evenly distribute load throughout the jack stand base and eliminate stress hot spots. The contoured, interlocking pad and base design. The bottom of the pad is angled to match a parallel angle in the top of the base.

Price: 1300-1400 Rs.

ADJUSTABLE WRENCH

The most common type of adjustable wrench in use today. The adjustable end wrench differs from the monkey wrench in that the gripping faces of the jaws are displaced to a (typically) 15 degree angle relative to the tool's handle, a design feature that facilitates the wrench's use in close quarters. The modern adjustable end wrench was invented by Johan Petter Johansson of Bahco.

Price: 300-400 Rs.
HAMMER

A hammer is a tool or device that delivers a blow (a sudden impact) to an object. Most hammers are hand tools used to drive nails, fit parts, forge metal, and break apart objects. Hammers vary in shape, size, and structure, depending on their purposes.

Hammers are basic tools in many trades. The usual features are a head (most often made of steel) and a handle (also called a helve or haft).

Fig 3.6 (Hammer)  Price: 300-600

Most hammers are hand tools, but there are also many powered versions, called power hammers (such as steam hammers and trip hammers) for heavier uses, such as forging.

Some hammers have other names, such as sledgehammer, mallet and gavel. The term "hammer" also applies to other devices that deliver blows.

PUNCH

A punch is used to mark the center of a point. It is usually used to mark the centre of a hole when drilling holes. A drill has the tendency to "wander" if it does not start in a recess. A centre punch forms a large enough dimple to "guide" the tip of the drill. The tip of a centre punch has an angle between 60 and 90 degrees. When drilling larger holes and the web of the drill is wider than the indentation produced by a centre punch, the drilling of a pilot hole is usually needed. An automatic centre punch operates without the need for a hammer.

Price: 50-100 Rs.

ALLEN KEYS

A wrench used to turn screw or bolt heads designed with a hexagonal socket (recess) to receive the wrench. The wrenches come in two common forms: L-shaped and T-handles. The L-shaped wrenches are formed from hexagonal wire stock, while the T-handles are the same hex wire stock with a metal or plastic handle attached to the end. There are also indexable-driver-bits that can be used in indexable screwdrivers.

Price: 250-500 Rs.
An internal socket-head screw design. The cross-section resembles a star. Commonly used in automobiles, automated equipment, and computer components as it is resistant to wrench cam-out and so suitable for use in the types of powered tools used in production-line assembly.

**SCREW DRIVERS**

A screwdriver is a tool, manual or powered, for turning (driving or removing) screws. A typical simple screwdriver has a handle and a shaft, and a tip that the user inserts into the screw head to turn it.

Price: 1200-1400 Rs.

The shaft is usually made of tough steel to resist bending or twisting. The tip may be hardened to resist wear, treated with a dark tip coating for improved visual contrast between tip and screw—or ridged or treated for additional 'grip'. Handles are typically wood, metal, or plastic and usually hexagonal, square, or oval in cross-section to improve grip and prevent the tool from rolling when set down. Some manual screwdrivers have interchangeable tips that fit into a socket on the end of the shaft and are held in mechanically or magnetically.

A screwdriver is classified by its tip, which is shaped to fit the driving surfaces—slots, grooves, recesses, etc.—on the corresponding screw head. Proper use requires that the screwdriver's tip engage the head of a screw of the same size and type designation as the screwdriver tip. Screwdriver tips are available in a wide variety of types and sizes. The two most common are the simple 'blade'-type for slotted screws.
TORQUE WRENCH

A torque wrench is a tool used to apply precisely a specific torque to a fastener such as a nut or bolt. It is usually in the form of a socket wrench with special internal mechanisms. It was invented by Conrad Bahr in 1918 while working for the New York City Water Department. It was designed to prevent over tightening bolts on water main and steam pipe repairs underground.

A torque wrench is used where the tightness of screws and bolts is crucial. It allows the operator to measure the torque applied to the fastener so it can be matched to the specifications for a particular application. This permits proper tension and loading of all parts. Torque wrench measures torque as a proxy for bolt tension. Inaccuracy due to inconsistent or uncalibrated friction between the fastener and its mating hole. Measuring bolt tension (indirectly via bolt stretch) is actually what is desired, but often torque is the only practical measurement which can be made.

Price: 8000-9000 Rs.

BENCH VICE

A vise or vice is a mechanical apparatus used to secure an object to allow work to be performed on it. Vises have two parallel jaws, one fixed and the other movable, threaded in and out by a screw and lever. An engineer’s vise, also known as a metalworking vise or machinist’s vise, is used to clamp metal instead of wood. It is used to hold metal when filing or cutting. It is sometimes made of cast steel or malleable cast iron, but most are made of cast iron. An engineer's vise is bolted onto the top surface of a workbench, with the face of the fixed jaws just forward of its front edge. The vise may include other features such as a small anvil on the back of its body.

Price: 700-6500 Rs.
BIG AND SMALL TOOL KITS

The Big size tool kit of 24 piece tools which includes 18 Box spanners, 1 Long and 1 short distance, 1 T-Tommy, 1 Ratchat, 1 universal joint and a special 20.5 mm box spanner. The small tool kit of 46 piece which includes box spanners, distance long and short and a flexible distance also available, 1 universal joint, box spanners and some types of Allen key attachments is also available.

BOX SPANNER
A hollow cylinder that fits over one end of a nut or bolt head. It may include a handle, if it does not then it is often just referred to as a socket and is usually used with various drive tools to make it a wrench or spanner such as a ratchet handle, a tee bar (sliding tommy bar) bar or a knuckle bar (single axis pivot). It generally has a six-point, eight-point or twelve-point recess, may be shallow or deep.

RATCHAT
The ratcheting mechanism allows the nut to be tightened or loosened with a reciprocating motion, without requiring that the wrench be removed and refitted after each turn. Typically, a small lever on the ratchet head switches the wrench between tightening and loosening mode.

T-TOMMY
A type of handle which is used to apply torque a sliding handles which can be easily fitted in any attachment.

UNIVERSAL JOINT
It is a joint which allows to bend tools attached on it to 90 degree angle, its advantage is we can use any socket wrench in the deep in inclined angles where other tools or hand cannot be reached.

DISTANCE BAR
this tool used only to cover distance where normal socket wrench or ratchet cannot move or used properly it have grooves where T-tommy and ratchet can easily attached and used freely without any obstacles.
FILLER GAUGE

A feeler gauge is a tool used to measure gap widths. Feeler gauges are mostly used in engineering to measure the clearance between two parts.

They consist of a number of small lengths of steel of different thicknesses with measurements marked on each piece. They are flexible enough that, even if they are all on the same hinge, several can be stacked together to gauge intermediate values. It is common to have two sets for imperial units (typically measured in thousandths of an inch) and metric (typically measured in hundredths of a millimeter) measurements.

Price: 160-350 Rs.

Fig 3.14 (Feeler Gauge)

A similar device with wires of specific diameter instead of flat blades is used to set the gap in spark plugs to the correct size; this is done by increasing or decreasing the gap until the gauge of the correct size just fits inside the gap.

LOCKING PLIERS

Locking pliers are pliers that can be locked into position, using an over-center action. One side of the handle includes a bolt that is used to adjust the spacing of the jaws, the other side of the handle (especially in larger models) often includes a lever to push the two sides of the handles apart to unlock the pliers. "Mole" and "Vise-Grip" are trade names of different brands of locking pliers. Locking pliers are available in many different configurations, such as needle-nose locking pliers, locking wrenches, locking clamps and various shapes to fix metal parts for welding. They also come in many sizes.

Price: 300-370 Rs.

Fig 3.15 (Locking plier)
WASTE OIL DRAIN TANK

This is a equipment which is used at the time of when oil has to been replaced the old oil is drain into the tank the funnel of the tank can be adjusted according to working condition and 20 gallon oil can be reserve in the tank, there is a pipe and the valve from where if we blow the high pressure air in it the waste oil in the tank came out in this way we also can empty the tank when necessary.

Fig 3.16 (Waste oil drain tank)

FILES

A file is a tool used to remove fine amounts of material from a workpiece. It is common in woodworking, metalworking, and other similar trade and hobby tasks. Most are hand tools, made of a case hardened steel bar of rectangular, square, triangular, or round cross-section, with one or more surfaces cut with sharp, generally parallel teeth. A narrow, pointed tang is common at one end, to which a handle may be fitted.

Fig 3.17 (File)

ENGINE CRANE

An engine crane (also referred as engine hoist) is a common repair tool used in vehicle repair shops to remove or install gasoline or diesel engines in small and crowded vehicle engine compartments. It uses a heavy cantilevered support structure to hold the engine in mid-air so that the mechanic can carefully connect or disconnect fragile hoses and wires on the engine to the frame of the vehicle.

Engine cranes are typically mounted on large casters so that an engine can be lifted straight up out of an engine compartment and then rolled away from the immobile vehicle frame.

Most engine cranes are equipped with a telescopic boom which can be extended to reach engine blocks located further into the engine compartment. At the end of the
boom there is a grab hook where lifting chains, slings or a load leveler can be attached for lifting purposes.

The engine crane is commonly used in combination with the engine stand so that the removed engine can be rotated in midair to provide access to underside surfaces of the engine.

![Engine Crane Diagram](image)

**TRANSMISSION STAND**

This equipment is used to lay down the transmission assembly at the time of gearbox overhaul or any other to install clutch bearing, hydraulic mechanism operated by foot pedal or by handle and oil resistant wheel. Can easily adjust the height by the valve as same as hydraulic jack but used for heavy purpose.

![Transmission Stand](image)

**T-SPANNER**

The name T spanner is because of its construction and looks used to open and tighten the small bolts in the place where other spanner and hand cannot be reached, their handle are quite thin, available in 8mm, 10mm, 12mm, 14mm, also provided rubber on the handle for the better grip.

![T-Spanner](image)
2. POWER TOOLS USED IN INDUSTRY

BENCH GRINDER

A bench grinder is a type of bench top grinding machine used to drive abrasive wheels. A pedestal grinder is a larger version of a bench grinder that is mounted on a pedestal, which is bolted to the floor. These types of grinders are commonly used to hand grind cutting tools and perform other rough grinding.

Depending on the grade of the grinding wheel it may be used for sharpening cutting tools such as lathe tools or drill bits. Alternatively it may be used to roughly shape metal prior to welding or fitting.

A wire brush wheel or buffing wheels can be interchanged with the grinding wheels in order to clean or polish work-pieces.

![Bench grinders](image)

**Fig 3.21 (Bench grinders)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding disc diameter</td>
<td>150 mm</td>
</tr>
<tr>
<td>Grinding disc widths</td>
<td>20 mm</td>
</tr>
<tr>
<td>Grinding disc bore</td>
<td>20 mm</td>
</tr>
<tr>
<td>Rated power input</td>
<td>350 W</td>
</tr>
<tr>
<td>Weight without cable</td>
<td>10 kg</td>
</tr>
</tbody>
</table>

Table-1 (Specification of bench grinder)
ELECTRIC HAND GRINDER

An angle grinder, also known as a side grinder or disc grinder, is a handheld power tool used for cutting, grinding and polishing.

Angle grinders can be powered by an electric motor, petrol engine or compressed air. The motor drives a geared head at a right-angle on which is mounted an abrasive disc or a thinner cut-off disc, either of which can be replaced when worn. Angle grinders typically have an adjustable guard and a side-handle for two-handed operation. Certain angle grinders, depending on their speed range, can be used as sanders, employing a sanding disc with a backing pad or disc. The backing system is typically made of hard plastic, phenolic resin, or medium-hard rubber depending on the amount of flexibility desired.

Fig 3.22 (Hand grinder)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power input</td>
<td>750 W</td>
</tr>
<tr>
<td>No-load speed</td>
<td>11000 rpm</td>
</tr>
<tr>
<td>Disc diameter</td>
<td>0 mm</td>
</tr>
<tr>
<td>Length</td>
<td>270 mm</td>
</tr>
<tr>
<td>Width</td>
<td>73 mm</td>
</tr>
<tr>
<td>Height</td>
<td>100 mm</td>
</tr>
<tr>
<td>Weight without cable</td>
<td>1.8 kg</td>
</tr>
</tbody>
</table>

Table-2 (Specification of electric hand grinder)
DRILLING MACHINE

Portable Universal Radial Drilling Machine is required to drill, core drill, ream, counter bore and tap holes of different sizes up to dia. 50 mm having accuracy up to H7 grade and surface finish up to 1.6 Microns (Ra), on different components of Electrical Machines. This machine shall be used for drilling and reaming angular holes in various components as well as pinning/dowelling holes after assembly/testing of turbo generators.

The machine shall be suitable for drilling in components of Ferrous and non-ferrous metals like Carbon Steel, alloy steel, cast steel, cast iron, Bronze, Copper, Aluminum and similar other materials.

![Fig 3.23 (Drilling machine)](image)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power input</td>
<td>500 W</td>
</tr>
<tr>
<td>No-load speed</td>
<td>2600 rpm</td>
</tr>
<tr>
<td>Power output</td>
<td>250 W</td>
</tr>
<tr>
<td>Weight without cable</td>
<td>1.5 kg</td>
</tr>
<tr>
<td>Rated speed</td>
<td>0 - 1610 rpm</td>
</tr>
<tr>
<td>Drill spindle connecting thread</td>
<td>1/2&quot;-20 UNF</td>
</tr>
<tr>
<td>Chuck capacity</td>
<td>1 - 10 mm</td>
</tr>
<tr>
<td>Impact rate at no-load speed</td>
<td>41600 bpm</td>
</tr>
</tbody>
</table>

Table-3 (Specification of drilling machine)
PNEUMATIC AIR GUN

Air blow guns attach to air lines for the manual actuation and/or control of air discharge. They are used primarily for debris removal and purging, non-contact part cleaning and drying, and general laboratory or industrial applications. Most air blow guns are made of plastic or metal and include an ergonomic grip or handle. A steady stream of compressed air is delivered through a sturdy metallic nozzle. Air blow guns that are equipped with an internal fail-safe pressure mechanism shut off automatically if the gun is dropped or the lip is blocked. Integral pressure relief valves are used to blow off excess pressure before discharge.

Fig 3.24 (Air gun)

PNEUMATIC IMPACT WRENCH

An impact wrench (also known as an impactor, impact gun, air wrench, air gun, rattle gun, torque gun, windy gun) is a socket wrench power tool designed to deliver high torque output with minimal exertion by the user, by storing energy in a rotating mass, then delivering it suddenly to the output shaft.

Impact wrenches are widely used in many industries, such as automotive repair, heavy equipment maintenance, product assembly, major construction projects, and any other instance where a high torque output is needed. For product assembly, a pulse tool is commonly used.

Compressed air is the most common power source for impact wrenches, providing a low-cost design with the best power-to-weight ratio. A simple vane motor is almost always used, usually with four to seven vanes. Impact wrenches are available in all sizes and in several styles, depending on the application.
Fig 3.25 (Impact wrench)

<table>
<thead>
<tr>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handle type</td>
<td>Pistol</td>
</tr>
<tr>
<td>Net Weight</td>
<td>7 KG</td>
</tr>
<tr>
<td>Square Drive</td>
<td>4 Spline</td>
</tr>
<tr>
<td>Max. Torque</td>
<td>3790 Nm</td>
</tr>
<tr>
<td>Blow Per Min.</td>
<td>1020</td>
</tr>
<tr>
<td>Noise level</td>
<td>102 db</td>
</tr>
</tbody>
</table>

Table-4 (Specification of pneumatic impact wrench)
4. MACHINES USED IN INDUSTRY

TYRE CHANGER

A tire changer is a machine used to help tire technicians dismount and mount tires with automobile wheels. After the wheel and tire assembly are removed from the automobile, the tire changer has all the components necessary to remove and replace the tire from the wheel. Different tire changers allow technicians to replace tires on automobiles, motorcycles and heavy-duty trucks. New tire and wheel technology has improved certain tire changers to be able to change a low profile tire. The tire changer has two foot pedals. The left pedal is called the clamp control pedal, a three position pedal that opens and closes the rim clamps.

Price: 50,000-60,000 Rs.

Motorcycle tire changers are less sophisticated than passenger cars and light truck or heavy-duty tire changers because they deal with smaller and lighter tires and wheels. Motorcycle tire changers mainly provide a simple bead loosening system and rim clamps powered manually. Certain motorcycle tire changers can accommodate wheel diameters as small as 10” and wheels at least 1-1/2” wide.

Price:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Power</td>
<td>1.1 Kw</td>
</tr>
<tr>
<td>Air Requirement</td>
<td>8 – 10 bar</td>
</tr>
<tr>
<td>Internal Rim Clamping</td>
<td>12” – 23”</td>
</tr>
<tr>
<td>External Rim Clamping</td>
<td>10” – 20”</td>
</tr>
<tr>
<td>Bead breaker tire width</td>
<td>3” – 15”</td>
</tr>
<tr>
<td>Maximum Tire Diameter</td>
<td>41”</td>
</tr>
</tbody>
</table>

Table-5 (Specification of tyre changer machine)
Wheel alignment, sometimes referred to as breaking or tracking, is part of standard automobile maintenance that consists of adjusting the angles of the wheels so that they are set to the car maker's specification.

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). Alignment angles can also be altered beyond the maker's specifications to obtain a specific handling characteristic. Motorsport and off-road applications may call for angles to be adjusted well beyond "normal" for a variety of reasons. All new vehicles leave the factory with their alignment checked and adjusted.

Price: 2-3.5 Lakhs

Usually the technician paints the heads of the adjustment hardware to show it has been set, also to show if it has moved later on. It is advisable to do the alignment of the car after the first 5000 km, since all the suspension gets set. Failure to do this may result in the camber and toe specifications drifting outside the manufacturer's limit. This may lead to vehicle pulling and tire wear. To reach that mileage, wheel alignment must be checked every 10,000 km. Any severe driving incidents, or changed suspension components would also warrant a check.

| Wheel size | 12”-24” |
| Tyre Diameter | Unlimited |
| Track width | 48”-96” |
| Wheel base | 79”-180” |
| Power requirement | 120/230 volt |

Table-6 (Specification of Wheel alignment machine)
TWO POST HYDRAULIC LIFT

It is used to raise up four wheeler vehicles to any comfortable working height up to 6 feet. Leaving head room for complete under chassis access, ideal for muffler repair, rust proofing operation, transmission repair and any other free calling repair condition. It is operated by electric motor of 2.2 kW, it can be lift up to weight of 4000 kg (4 Tons), Power supply for this machine is 400 volt/50Hz and the lifting time taken by the machine is 55 seconds and lift down time is 1 minute.

Fig 3.28 (2 Post hydraulic lift)

Price: 7 Lakhs Rs.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting capacity</td>
<td>4000 kg</td>
</tr>
<tr>
<td>Lifting time</td>
<td>55 Sec</td>
</tr>
<tr>
<td>Motor Power</td>
<td>2.2 KW</td>
</tr>
<tr>
<td>Power supply</td>
<td>400 V/50 Hz</td>
</tr>
</tbody>
</table>

Table-7 (Specification of 2 post hydraulic lift)
WHEEL BALANCING MACHINE

is a universal wheel balancing machine with excellent features and a solid structure. It comes with a digital display and can balance both steel wheels as well as alloy wheels.

![Wheel Balancer](image)

Fig 3.29 (Wheel balancer)

Price: 90,000 Rs.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancing accuracy</td>
<td>1g</td>
</tr>
<tr>
<td>Cycle time</td>
<td>5 – 8 sec</td>
</tr>
<tr>
<td>Rim width</td>
<td>1.5” – 20”</td>
</tr>
<tr>
<td>Rim diameter</td>
<td>10” – 30”</td>
</tr>
<tr>
<td>Wheel diameter (max)</td>
<td>850mm</td>
</tr>
<tr>
<td>Wheel weight (max)</td>
<td>65 kg</td>
</tr>
<tr>
<td>Power supply</td>
<td>230V, 1ph, 50Hz</td>
</tr>
<tr>
<td>Balancing speed</td>
<td>&lt;100 rpm</td>
</tr>
</tbody>
</table>

Table-8 (Specification of wheel balancer machine)
5. SPECIAL TOOLS USED IN INDUSTRY

OIL FILTER WRENCH

A metal band that is attached at both ends to a handle. The looped band is placed around the filter and the handle is turned anticlockwise, which puts tension on the band, causing it to grip the filter, a metal or plastic cup that is shaped much like a sock. The cup is placed on the end of the filter, which engages the knurling. A socket or wrench is then used to loosen the filter.

Fig 3.30 (Oil filter wrench)

PISTON RING INSTALLER

The piston ring compressor is a special tool that is specifically designed for compressing the piston rings when a piston is re-installed. This is accomplished by opening the piston ring compressor enough so that the piston will slide into the opening. Then the rings compress by tightening the tool so that it is snug around the piston. The piston ring compressor can be tightened by turning the adjustment arm clockwise, and loosened by turning the adjustment arm counter-clockwise while holding the release spring. It is important to lubricate the piston ring compressor as well as the cylinder bore with oil before attempting to push the piston down into the cylinder.

Fig 3.31 (Piston ring installer)

SHOCK ABSORBER SPRING PULLER

The spring puller is a special tool used to compress the spring of strut either at the time of suspension overhauling or at the time of replacement of shock absorber mounts and new shock absorber. The use is only to compress the spring at the time of suspension part installation.

Fig 3.32 (Shocks puller)
CHAPTER-4

PARTICULARS OF
PRACTICAL EXPERIENCES IN INDUSTRY

- Testing of Automobiles

- Major vehicle repairs

- Faults and Remedies

- Maintenance and Preventive Maintenance
1. TESTING OF AUTOMOBILES

BATTERY VOLTAGE TESTING

A battery tester is an electronic device intended for testing the state of an electric battery, going from a simple device for testing the charge actually present in the cells and/or its voltage output, to a more comprehensive testing of the battery's condition, namely its capacity for accumulating charge and any possible flaws affecting the battery's performance and security.

Fig 4.1 (Battery voltage tester)

VOLTAGE TESTING BY MULTIMETER

A multimeter or a multimeter is an electronic measuring tool that is a combination of several tools in one unit. It usually includes ammeter, voltmeter, and ohmmeter. Digital multimeters are sometimes called DMM too. Modern multimeters can be used to measure electrical quantities other than current, resistance and voltage. For example, they can be used to measure frequency, capacitance, Hz and temperature.

Fig 4.2 (Multimeter)
A.C TEMPRATURE MEASURING

The device which is used to measure temperature of air conditioning system in vehicles passenger compartment, it measures in the parameter of degree Celsius, it consist of a display where temperature is shown and there is steel needle which is interconnected with it and to measure the temperature we have put that needle into the A.C Vents.

![A.C testing device](image)

Fig 4.3 (A.C testing device)

DIAGNOSIS SCANNING SYSTEM

An automotive scan tool is an electronic tool used to interface with, diagnose and, sometimes, reprogram vehicle control modules.

There are many types from just as many manufacturers, from simple code readers to highly capable bi-directional computers with programming capabilities. The scan tool is connected to the vehicle's data link connector and, depending on the particular tool, may only read out diagnostic trouble codes or DTC's (this would be considered a "code reader") or may have more capabilities. Actual scan tools will display live data stream (inputs and outputs), have bi-directional controls (the ability to make the controllers do things outside of normal operations) and may even be able to Calibrate/program modules within certain parameters. However, a typical scan tool does not have the ability to fully reprogram modules because it requires a pass-through device and specific software.

![Diagnosis scanner](image)

Fig 4.4 (Diagnosis scanner)
2. MAJOR VEHICLE REPAIRS

ENGINE OVERHAULING

The procedure in which engine is removed from his place, disassembled, cleaned, inspected, repaired as necessary and tested using factory service manual approved procedures. The procedure generally involves honing, new piston ring installation, new bearings, new gaskets, oil seals etc this whole concept is known as Engine Overhauling.

Under follow details are about engine which is overhauled during working experiences:-

Vehicle name: Verna fluidic
Engine type: Diesel CRDi
Configuration: Four cylinder inline
Displacement of engine: 1399 CC
Vehicle Driven: above 100,000 KMs

The reason to be engine overhauled is due to Bended connecting rod and overheating of the vehicle.

Equipments used for this procedure are:

- Ring spanners
- box spanners
- pneumatic impact wrench gun and Air gun
- T-spanners
- Torque wrench
- tool kits
- Screwdrivers
- Allen keys

Under written are the detail steps for engine overhauling:-

First of all we have to do all overall diagnosis of the engine practically and technically with the help of diagnosis scanning machine. There are some small jobs before undertaking any big works like to remove engine oil, after removing engine oil from the reservoir, remove front bumper assembly and

Fig 4.5 (engine removed from mounting)
Front radiator and inter cooler assembly.

Removing front live axle connection from gearbox (Front engine front wheel drive vehicle), battery assembly, air filter assembly, diesel filter, electronic control module coupler disconnecting are also done.

Fig 4.6 (Removal of engine assembly with Hoist)

Afterwards engine is removed from there both sides rubber mountings with whole gearbox assembly, engine is wrapped with the chain and removed from the engine compartment with help of portable engine Crane.

After removing engine gear assembly from the engine compartment disassembling of engine and gearbox will be done, the gearbox assembly will kept at a safe place, and now disassembling of engine will be start. Firstly injectors, common rail, fuel lines are removed. Removal of flywheel and crankshaft position sensor After that starting motor assembly was removed. Gradually removals of oil filter assembly, Throttle body, intake manifold, exhaust gas recirculative system. Sensors like throttle positioner sensor, mass air flow sensor and O2 sensors also were removed, Removal of exhaust system (Exhaust manifold turbocharger etc).

Fig 4.7 (Dismantling Inlet and exhaust system)

Removal of timing belt, A.C compressor and belt, Alternator assembly Removal of head cover, timing chain cover, Removal of camshafts, camshaft clams. Removal of timing chain sprockets and timing chains, Alternator assembly was removed. Engine head was disassembled Crankcase was removed After removing big end bearing crankshaft came out. After removing the crankshaft piston came out with the connecting rods from block and all oil tensioners were removed. After all parts being disassembled all parts are going to be cleaned with diesel fuel intake manifold and exhaust manifold sealing surfaces. Be very careful not to gouge the cylinder head. Special gasket removal solvents are available. Remove all built-up scale from the coolant passages. Run a stiff brush through the various holes to remove deposits that may have formed in them. Run an appropriate-size tap into each of the threaded holes, to remove corrosion and thread sealant that may be present. If
compressed air is available, use it to clear the holes of debris produced by this operation. After the cleaning procedure refitting of engine parts are to be done.

Refitting of parts has been done after the cleaning procedure:

The new parts installed in refitting procedure of engine assembly are:-

<table>
<thead>
<tr>
<th>NEW PARTS</th>
<th>COSTS OF PARTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston rings</td>
<td>10000</td>
</tr>
<tr>
<td>Timing chain cover gasket</td>
<td>650</td>
</tr>
<tr>
<td>Gasket between engine head and block</td>
<td>465</td>
</tr>
<tr>
<td>Connecting Rod (1 piece)</td>
<td>10000</td>
</tr>
</tbody>
</table>

Table-9 (New parts installed with cost)

First of all starting of assembling parts will be started from Crankshaft. Clean the intermediate shaft bearing surfaces and the pressed-in bearing sleeves in the cylinder block. Lubricate the shaft, and slide it into the block. Refit the two bolts that hold the retaining plate to the block. The remainders of the parts are fitted in the reverse order of removal. Crankshaft - refitting and main bearing oil clearance check Crankshaft refitting is the first major step in engine reassembly.

It’s assumed at this point that the engine block and crankshaft have been cleaned, inspected, and repaired or reconditioned. Position the block upside-down. Remove the main bearing cap bolts, and lift

Fitting of piston and connecting rod.

Installation of piston and piston rings will be done, and to install piston ring in the block there is special tool used named Piston ring installer. Lubricate the piston and rings with clean engine oil, and attach a piston ring compressor to the piston. Leave the skirt protruding about 6 or 7 mm to guide the piston into the cylinder. The rings must be compressed until they’re flush with the piston. Rotate the crankshaft until the No 1 connecting rod journal is at BDC (bottom dead centre). Apply a coat of engine oil to the cylinder walls. With the mark or notch on top of the piston facing the front of the engine, gently insert the piston/connecting rod assembly into the No 1 cylinder bore, and rest the bottom edge of the ring compressor on the engine block.
Tap the top edge of the ring compressor to make sure it’s contacting the block around its entire circumference. Gently tap on the top of the piston with the end of a wooden hammer handle (see illustration) while guiding the end of the connecting rod into place on the crankshaft journal.

Fig 4.10 (Engine head)

Work slowly, and if any resistance is felt as the piston enters the cylinder, stop immediately. Find out what’s catching, and fix it before proceeding. Do not, for any reason, force the piston into the cylinder - you might break a ring and/or the piston. Refitting of oil tensioners.

Engine head chemically washed will be installed bolts will be tighten lightly with pneumatic impact wrench and tighten perfectly with the torque wrench by setting torque as per company suggested, new gasket will be also installed between engine block and engine head.

Camshafts were installed by fitting all camshafts clamps with pneumatic impact wrench and also tighten properly by the torque wrench.

After that two Timing gear sprockets are refitted first, after installing sprockets, chain is refitted the procedure to install chain is by matching the yellow permanent marking in the sprockets and chains. After the installation of chain, timing chain cover is refitted the new cover gasket will be installed by tighten bolts with impact wrench gun and torque wrench.

Refitting of engine head cover.

Refitting of intake manifold, Exhaust gas recirculative system and throttle body (MAF, O2, TP Sensors), oil filter assembly and exhaust systems (Exhaust manifold, Turbocharger etc).

Refitting of Alternator, A.C compressor and belt, starting motor.

Refitting of common rail connected fuel lines and installed injectors after cleaning on grinder’s wire wheel, Refitting of flywheel. After greasing the clutch release bearing gearbox casing also refitted.

After that whole assembly is again wrapped in the chain and lift by the portable crane and installed in the engine compartment at their both side mountings gearbox is also refitted to their mountings and at last the last step of refitting is crankcase the cleaned crankcase is fitted by applying sealant and tighten their bolts with impact wrench and applied torque by torque wrench new engine oil will filled into the engine.

Fig 4.11 (Piston, CR, Crankshaft)

Fig 4.12 (Overhauled engine)
After that air filter assembly, diesel filter lines will be connected electronic control module coupler also connected
Battery power connection will be also shut ON. And the final inspection did with the diagnosis scanning system. And after that the engine will be ready for running condition.

**SUSPENSION OVERHAUL**

Vehicle: i10
Fault: Front Suspension noise
Suspension type: McPherson Strut type front suspension.
Tool used: Impact wrench gun, Box spanners (17&19), Ring and fix wrench’s, shocks puller

First of all we have to remove the strut, removing the front struts is a simple affair. Disconnecting of ABS sensor, second remove the brake line from the strut.
Also have to disconnect the stabilizer linkages.
Then, undo the two bolts that connect the strut to the wheel bearing housing, as shown in figure.
Remove a nut at the diagonal point near engine compartment.
After that whole strut is been washed with water to remove mud and foreign particles.

Fig 4.13 (Removal of strut from wheel hub assembly)

In this whole repair procedure the special tool named “shock absorber pullers” are used to compress the spring.
Both the pullers are attached both side of the spring and force is applied by the impact wrench gun. After the spring compressed.

Undo the nut of suspension mounting on the top and remove the mounting.
After removal of spring and mounting, rubber boot was removed

Shock absorber main rod is lubricated with the grease and reciprocated 2-3 times for deep lubrication in the shock absorbers.
Now the whole procedure will goes in the reverse for assembling of parts.
Rubber boot will be reinstalled.
Spring with the pullers will be refitted and puller will be removed.
New mountings will be installed.  

Fig 4.14 (compressing spring by pullers)
Strut will be refitted, 2 nuts will tighten to connect the strut with wheel bearing hub. Tight the nut near diagonal point near engine compartment. Connect the stabilizer linkages, ABS sensor and Refit the brake line on the strut.

**CLUTCH OVERHAUL**

Vehicle: Sonata Embera  
Fault: Clutch plate wears out  
Clutch type: Diaphragm clutch

First of all some small works are taken out like removal of battery assembly, Air filter assembly, and Electronic control module. Front axle is also disconnected. After the removal of these parts now Gearbox assembly mountings are removed with the help of pneumatic impact wrench, box spanners and connections. Car is taken at the top by two posts lift so we can work under the vehicle.

![Fig 4.15 (Removed battery & air filter assembly)](image)

After the removal of mountings Bolts, Fork selector mechanism connections are disconnected and after that bolts are removed which connect the engine and gearbox assembly. Gearbox assembly is lifted down by using the support of transmission stand, Next Clutch assembly bolts are removed which attaches clutch assembly to flywheel. New clutch assembly is refitted before fitting the new clutch assembly, clean the corners of pressure plate is must to remove the chemical layer which can causes slippage during use of clutch operation.

![Fig 4.16 (Clutch assembly)](image)

After that Clutch release bearing is replaced, the bearing used to connect and disconnect the clutch from gearbox, before Installation of new bearing lubricate the bearing, Fork selector and around the shaft with grease for better response. Gearbox assembly bolts are refitted which connects gearbox with engine with the support of transmission stand. Transmission mountings are refitted, all other assemblies like battery, air filter assembly, Electronic control module reconnecting.

![Fig 4.17 (installed new bearing)](image)
INTAKE MANIFOLD AND EXHAUST GAS RECIRCULATIVE SYSTEM

SERVICE

Fault: Black smoke coming from the exhaust Pipe.
Vehicle: i20
Tool used: Big small tool kits, Screwdriver, Pliers

First of all dismantle the battery assembly, air filter assembly, disconnect ECM coupler, after that drain all the coolant, Disassemble the throttle body. Dismantle Intake manifold by removing 6 bolts of 12mm, dismantling of EGR is done by removing 2 bolts with intake manifold, disconnect by pass valve pipe and coolant pipe and EGR is taken out, undo the 2 bolts and separate EGR body and EGR valve.

Clean all the parts with the diesel remove all the stuck carbon sludge’s with brushes And after that clean it with water dried it with pneumatic air gun for fast drying. Clean the intake holes in head with dry cloth and refit intake manifold, assemble EGR body and EGR valve, refit EGR assembly by bolting 2 bolts with intake manifold, connect by pass pipe and coolant pipe, and refit throttle body. Refit all other assembly of battery, air filter, ECM connections and refill the old coolant if necessary replace the coolant also.

Fig 4.18 (Intake manifold)

Fig 4.19 (Exhaust gas recirculative system)
3. FAULT AND REMEDIES

- Fault: High fuel consumptions
  Remedies: Air filter replace.
  Tappet clearance setting.
  Fuel lines replace (if damaged).

- Fault: Black smoke
  Remedies: Exhaust recirculative system clean.
  Intake manifold service.

- Fault: Noise from wheels
  Remedies: Wheel bearing replace.

- Fault: Vehicle mishandling pulling at one side.
  Remedies: Wheel alignment.
  Wheel balancing.

- Fault: Steering problems
  Remedies: Electronic power steering motor greasing.
  New steering rank.

- Fault: Decreasing in braking performance.
  Remedies: Replacement of brake oil.
  Brake master cylinder.
  Brake pads.
  Brake liners and shoe.

- Fault: Suspension problems.
  Remedies: Replacement of stabilizer linkages.
  Stabilizer bush.
  Lower arms.
  Strut insulators.

- Faults: Air conditioning problems
  Remedies: Replacement of cooling coil.
  A.C filter.
  New A.C gas filled.

- Faults: Clutch Related problems
  Remedies: Replacement of
  Clutch plate.
  Pressure plate.
  Clutch release bearing.
4. MAINTENANCE AND PREVENTIVE MAINTENANCE

Classification of Services:
- Free Service
- Paid Service
- Running Repair Service

FREE SERVICES

1st Free service in 1000-1500 Kms
- All Oils and waters check and top-up
- Air filter and A.C filter clean
- All lights check
- All interior handle tight
- All door lubrication
- Washing

2nd Free service in 10,000 Kms
- Replacement of Air Filter, A.C Filter, Oil Filter
- Replacement of Engine oil
- All lights check
- Other fluid top-up
- All door lubrication
- Washing

3rd Free service in 20,000 Kms
- Replacement of Air Filter, A.C Filter, Oil Filter
- Replacement of Engine oil
- All lights check
- Other fluid top-up
- All door lubrication
- Wheel alignment and wheel balancing
- Washing

PAID SERVICE

After free services completed Car Customer have to pay for services which is called Paid service The rates of paid service is started with 1350 Rs. Paid service includes:
- All Lights check
- All Fluid water top-up
- All wheel brake service
- All door settings
• All door lubrication
• Suspension bolt tights
• Labour Charges will be cut on other Minor replacement procedures.

RUNNING REPAIR SERVICES
When customers have any complain and any major replacement procedure taken out then only vehicle is included in as running repair Running repair includes:
• Engine Overhaul
• Gearbox overhaul
• A.C System works
• Other

PREVENTIVE MAINTENANCE
Preventive maintenance describes the act of inspecting or testing the condition of car subsystems and servicing or replacing parts and fluids. Regular maintenance is critical to ensure the safety, reliability, drivability, comfort and longevity of a car. During preventive maintenance, a number of parts are replaced For e.g. Air filter, a.c filter, oil filter, fuel filter, timing belt, spark plugs, wheel rotation, wheel balancing and alignment etc. replacement are treated as a preventive maintenance. To prevent vehicle from the future major damages

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Item</th>
<th>Eon</th>
<th>Santro/</th>
<th>i20</th>
<th>Xcent</th>
<th>Verna</th>
<th>Santa Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Engine Oil</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Engine oil Filter</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Air Cleaner Filter</td>
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<td>20</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
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<td>30</td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>-</td>
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<tr>
<td>5.</td>
<td>Fuel Filter cartridge</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Spark plugs</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Timing belt</td>
<td>80</td>
<td>80</td>
<td>-</td>
<td>80</td>
<td>60</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Engine Coolant</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>10.</td>
<td>Brake &amp; Clutch Fluid</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Table-10 (Maintenance chart for Hyundai cars)

Above shown table is Replacement time interval (in 1,000 kms)’ for parts during periodic maintenance.
Time interval between any two consecutive services should be not exceeding more than 6 months or 10,000 kms whichever is earlier.
CHAPTER-5

INFORMATION ON COST REDUCTION AND SAFETY FEATURES

- Data of cost reduction
- Safety features in workshop
- Safety features in Hyundai vehicles
1. INFORMATION ON COST REDUCTION

CASE: 1
Fault: wear out of clutch plate
Replacement of Clutch and pressure plate
We had replaced Clutch plate and pressure plate if we see in the clutch assembly technically wear out is only in friction material (Clutch plate) so it is worth it to replace friction material (Clutch plate) but if not needed to replace pressure plate then by removing old rivet and installing new rivet in pressure plate from this procedure we can reduce the cost of repair, or if we do vice-a-versa that replace the pressure plate and install only new friction material as needed by removing and installing new rivet, in this way Overall cost of repair can reduce maximally

Fig 5.1 (Clutch plate)                           Fig 5.2 (Pressure plate)

Overall cost: 12000
After reduction: 7000-8000

CASE: 2
Fault: Unnecessary Vibration at the time of braking
Replacement of Brake disc and brake pads
We had replaced brake disc and brake pads, (brake pads were in good condition) but while operation vibration were isolated by replacing brake disc in this case if replacement of brake pads were not done then in this way costs can be reduce in overall repair

Fig 5.3 (Brake disc)                           Fig 5.4 (Brake pads)

Overall repair cost: 6000
After reduction: 3500
2. SAFETY FEATURES

SAFETY FEATURES IN WORKSHOP

In workshop there are safety equipment’s present in different section which is used at a time of emergency
- Fire extinguishers
- First-aid kit(hydrogen peroxide, antibacterial soap and bandages)
- Emergency stop button to turn off all electrical power to machines
- Fire alarm

In workshop there are some Safety rules to be followed by Technique and workers
- Have safety glasses and ear protection (if necessary while cutting, grinding, etc.)
- Wear strong shoes.
- Wear helmet
- Wear workshop cloths (provided by company)
- Keep hands away from moving/rotating machinery.
- Use hand tools carefully, keeping both hands behind the cutting edge.
- Report any damage to machines/equipment as this could cause an accident.
- Do not run in the workshop
- no smoking
- Clean tools and area of working after work
- Wear Gloves, it protects hands from cuts and splinters.

❖ Safety Precaution while A/C service

- Always wear gloves and use eye protection when handling refrigerant.
- Never open or loosen a connection before discharging system
- Avoid damage to refrigerant cylinder or container
- Refrigerant MUST NOT is allowed to come in contact with an open flame, electrical heater or very hot metal.
- Use recommended lubricant for A/C system and cap open components to avoid Moisture entry.
- Before connecting open fitting, always install new sealing rings and coat them with refrigerant oil.

Fig 5.5 (Safety equipments)

Before connecting open fitting, always install new sealing rings and coat them with refrigerant oil.
SAFETY FEATURES IN HYUNDAI CARS

AIRBAGS

- An airbag is a vehicle safety device. It is an occupant restraint system consisting of a flexible fabric envelope or cushion designed to inflate rapidly during a car collision.
- In Hyundai many cars comes with airbags as show in table fig.
- Types of airbag in Hyundai

DRIVER AIRBAG

- Drivers’ airbags or frontal airbags typically deploy from the steering wheel to protect the driver from striking other parts of the car in a frontal crash.
- Drivers’ airbags are designed to be used in conjunction with seatbelts and does not offer protection in the event of a side impact crash.
- In Hyundai, car comes with this airbag is mention in table

PASSENGER AIRBAG

- Passenger Airbag typically deploy from the dashboard to protect the passenger from striking other parts of the car in a frontal crash.
- In Hyundai, car comes with this airbag is mention in table

OTHER AIRBAGS

- Other airbags are Knee Airbag, Side airbag, Side torso airbag, curtain airbag which protect the driver and passenger from different injuries
- In Hyundai, car comes with this airbag is mention in table
- And number and types of airbag depends upon car variant.

Fig 5.6 (Airbags)
ABS- ANTILOCK BRAKING SYSTEM

- Anti-Lock braking System or ABS is a safety system which prevents the wheels on a moving vehicle from locking up (or cease while rotating) while braking. ABS offers improved vehicle control over dry and especially slippery surfaces by reducing the braking distance but it can also increase the braking distance in case of loose surfaces like snow, gravel etc.

- Ever since the invention of ABS, it has been evolving and the recent systems not only prevent wheel locking but also electronically control the front-to-rear brake bias, which we know as Electronic brake force system, Traction control system, Emergency brake assist or Electronic stability control.

TELESCOPIC STEERING SYSTEM

- Adjustable steering columns allow the steering wheel height to be adjusted to the driver’s preference, I-20, Verna, Santa Fe, sonata, Grand i-10 and Xcent And Elantra comes with adjustable steering column.

REVERSE CAMERA SENSORS

- Reversing cameras improves the rearward view and can assist drivers in detecting persons or objects in the path of a reversing vehicle (Figure).
- Reverse sensors detect the object in rear and beeps if you are about to hit something while backing up.
- I-20, Verna, Santa Fe, sonata, Grand i-10 and Xcent And Elantra comes with Reverse sensors.
SEATBELT AND SEATBELT PRETENSIONERS

- Seatbelt protect the driver and passenger from striking other parts of the car in an Accident.
- Wearing your seat belt is your best defense against injury or death in the event of a crash.
- Seatbelt comes in every car of Hyundai
- Pretensioners tighten and reduce slack in seatbelts to protect occupants from rapidly moving forward in the event of a crash
- I-20, Verna, Santa fe, sonata, Santro And Elantra comes with Pretensioners

HID HEADLIGHTS

- This innovative technology, which allows drivers to see, better by a brighter beam then conventional headlights, while consuming less energy because they provide a more intense illumination of the road
- Verna, Santa fe, sonata comes with HID Headlight.
CHAPTER-6
LIKEING & DISLIKING
AND
REFERENCES

• My liking and disliking about workplace

• References
MY LIKING AND DISLIKING ABOUT WORKPLACE

LIKES

- Very well ventilated workshop, which provides good air circulation
- Good working environment
- All are very helpful and cooperative at every mode
- Advance tools is provided for easy work and less time consumption
- the punctuality of the organization
- All works are done completely on time and precisely by every technician.
- The Machines, Instruments & Equipments use in workshop are also of Standard Quality.
- There are very good service advisors
- Management of organization
- Vehicle road test is been doned perfectly
- perfect Washing
- The service is done time to time.
- The customer gets her car time to time.

DISLIKES

- There is not enough head technician.
- Technicians are not getting sufficient salary.
- After servicing the car, the mechanic is not cleaning the space where he done the service.
- Vehicles were not distributed properly to every technician.
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