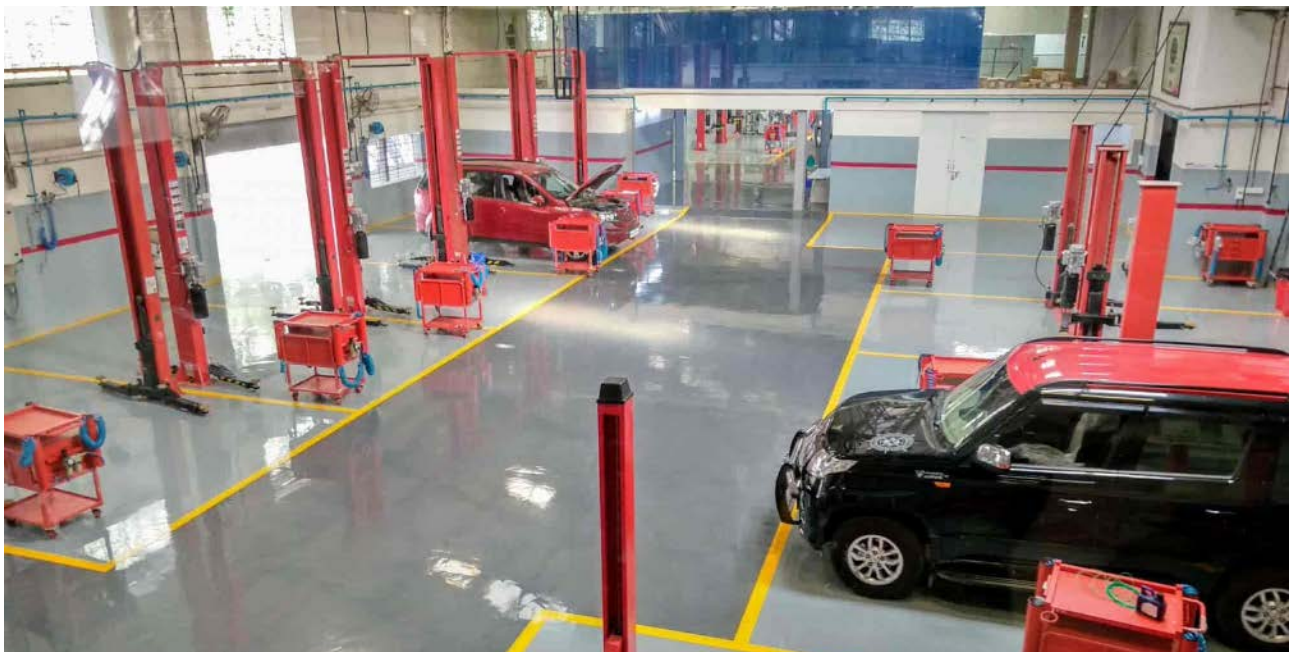

Internship Report

NBS International, Mumbai

September 2021

Vedant Chavan (Common App ID - 28611071)



Summary of Internship

Interned under service engineers and mechanics to understand how a car is serviced, what kind of tools are used for servicing, practical issues in different car parts like engine, transmission, suspension etc. how are they are dismantled and how the cars are repaired for certain operating problems. I also got to intermingle with technicians to appreciate how on the job experience has taught them nuances of car technology despite having formal engineering education

Day 1 – Orientation to various sections of car service centre

A service centre is divided into

Customer interaction area

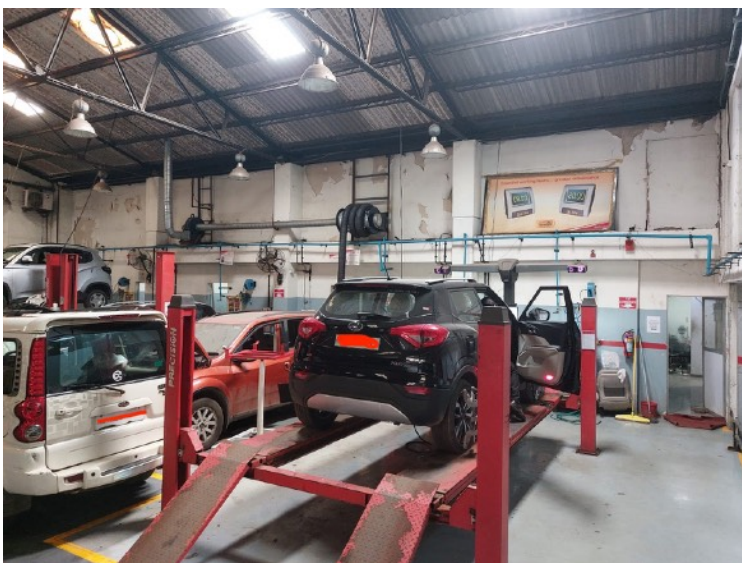
Customers register their complains. And a job sheet is created. Then the customers car is taken for inspection. After inspection a quote is given to the customer for the cost of the servicing that will be needed.

Quick service area



All mile stone services take place here for services such as 5,000km; 10,000km; 50,000km as well as minor problems which can be finished within 3hrs.

Wheel alignment area

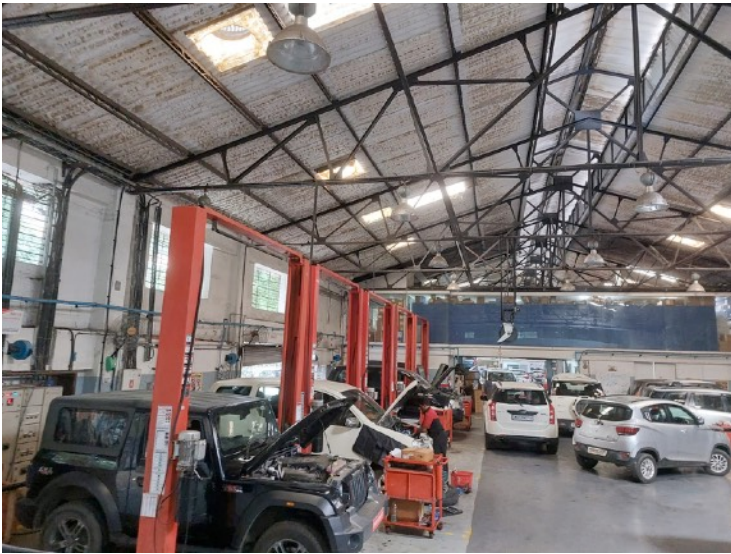


Used to measure the alignment of the cars wheels. They clamp on a reflector to the wheel to help measure the angles of the tire. The angles are measured with the help of camera which emits light. This light is not visible to naked eye. The light is then reflected from the reflectors put on each wheel. The light reflects back to the camera. The cameras with the help of computers calculates the degree and displays it on a screen. There are three types of angles which are measured which are caster, camber and toe. If there is any misalignment a specific part must be replaced

Car air conditioning fixing section

A machine is used to fix a/c cooling and other problems with all in the car. This is done with the help of a machine.

Major repairs area



In this area major repairs are done some of which are:-

1. Transmission repairs
2. Engine major parts repair
3. Suspension repairs

Painting booth



Painting car body panels is done here with help of special

Body work area



If a car does under an accident and there are dents in the body panels then they are fixed in this area

Warehouse for parts

Spare parts are stored here for all repairs that take place in the service centre

Electrical room

To store car batteries for charging incase are needs it.

Important Tools storage room

Tools which are used to open unique parts of a specific car model are kept here. These parts are rarely need to be opened.

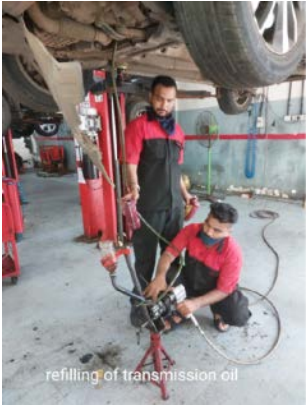
Key Observations

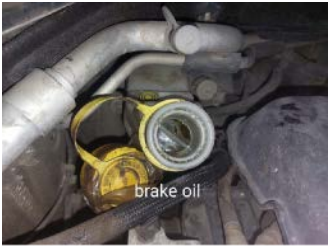
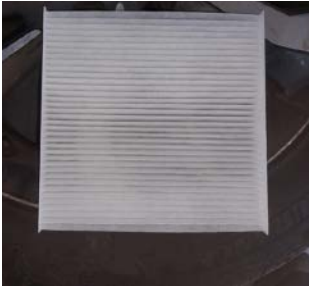
There is separate section in the service centre to do different type of activities. The division of a service centre into different subsections helps it to function smoothly and efficiently. Each subsection has different set of equipments and people with different skills. The equipment in different sections is suitable for servicing types of car models.

Day 2 – Participated in servicing of car after 50,000 kms

There is standard process of checking and changing parts. The technician opens job card and creates a check list of tasks.

Key steps	Pictorial View
Basic checks • Checking of lights • Checking of wipers for proper functioning • Check if doors and boot door is closing and opening properly • Check the working of the windows	
Open the bonnet Oil changes • Checking & refilling of engine oil • Oil filter change	 engine oil refill
• Lift the car • Remove engine and transmission oil from the bottom of the engine	

• Check the movement of wheels • Check the shock absorbers for leaks • Check underbody for damage	
• Remove tyres • Refill the transmission oil • Bring the car down	 refilling of transmission oil
• Remove old brake pads. • Push the brake piston to its original position.	 brake piston  wornout brake

• Change and refill brake oil • Place new brake pads • Put the tires back on the car • Pump the brake oil by pressing the brake	 
• Change air filter • Change a/c filter	 

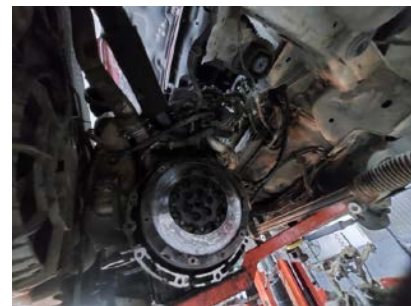
Key Observations

After 50,000 km a there is a need to change its brake pads as they get worn out. All the fluids are used by the car are to be changed such as : Brake fluid, engine oil, transmission oil, power steering oil. Understood the process of basic checks, changing brake pads and changing different fluids/oils in a car.

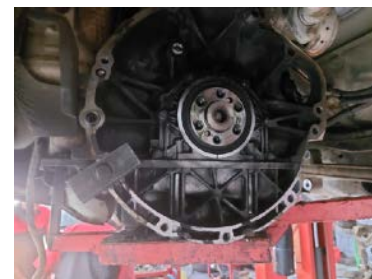
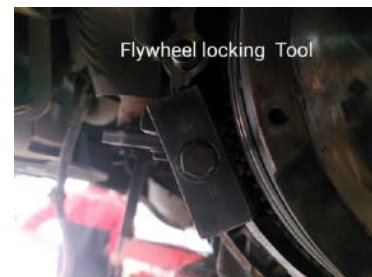
Day 3 – Participated in Clutch and fly wheel replacement

Key Steps	Pictorial View
• Lift the car up • Remove the front wheels as the car is front wheel drive • Remove the suspension • Remove the front axle	 The top photograph shows a close-up of the front suspension components, including the coil spring, shock absorber, and control arm. The bottom photograph shows the front axle assembly, including the steering knuckle and control arm, being removed from the car's chassis.
• Put the car down • Put the clamp on diagonally to prevent the engine falling on the under side of the car	 The photograph shows the engine and transmission assembly of a car. A red clamp is visible, used to secure the engine and transmission to the chassis to prevent them from falling.
• Lift the car	
• With the help of other coworkers hold the engine • Remove the engine partially • Tighten the clamp	

- Remove the gear box
- Replace Clutch sleeve cylinder placed outside the gearbox
- Remove clutch



- Place a flywheel locking tool to help in the removal of the flywheel
- Unscrew the bolts
- Remove the flywheel
- Replace the new flywheel



• Screw in the bolts • Place the new clutch in position • Put the gear box back in place • Place the engine back in place	 
• Put back the front axle and suspension back on the car • Put the front wheels back on the car • Replace the clutch master cylinder • Clutch master cylinder helps in providing oil to the clutch sleeve to help move the clutch for gear shifting	

Key Observations

Clutch gets worn due to excessive use and not releasing it after shifting gears. Changing clutch and fly wheel takes about 3 hours. When you replace a flywheel and clutch you also have to change the sleeve cylinder and clutch master cylinder. Changing all these parts is also very expensive. Therefore one must take care of their car by using the clutch properly. Job sheet is opened for each activity. Parts to be replaced and technician assigned is always noted down.

Day 4 - Understanding CAN (Controller Area Network)

CAN communication is a serial data communication for real time application. It is a multiplex communication system with high communication speed. The ECU's and Sensors in the network are connected by two communication bus lines CAN high and CAN low. The communication happens based on the differential voltage of CAN high and CAN low. All the nodes (ECU's and Sensors) which are in the CAN network transmit and receive large quantities of data at high speed. The CAN has two terminating resistors of 120Ω each.

The following are the nodes in the CAN network :-

RPAS (Reverse Park Assist System)

Reverse Park Assist System is an aiding system, which assist the driver in the reverse gear while parking at a speed of less than 10 kmph.

On reversing the vehicle, system will detect the obstacle behind the vehicle within the sensing zone which cannot be viewed by internal rear view mirror or the outside rear view mirrors. The system indicates the driver with the distance and direction of the detected obstacle along with the alert sound, which is proportional to the distance. As the distance becomes smaller, the interval between the beeps becomes shorter.

RPAS system consists of :-

1. PAS ECU located in the left side of 3rd row seat.
2. Four PAS Sensors located in the rear bumper

Working of the Functionality

Start the Engine and engage the gear in reverse. RPAS image will get displayed in the infotainment system as shown below.



1. Bars in the zones will get ON according to obstacle direction (left, right or center) and as per the distance
 - If obstacle is in between 100 to 120cm - Bar 4 in that direction will be switched ON
 - If obstacle is in between 75 to 100cm - Bar 3 & 4 in that direction will be switched ON
 - If obstacle is in between 50 to 75cm - Bar 2, 3 & 4 in that direction will be switched ON
 - If obstacle is less than 50cm - All bars in that direction will be switched ON
2. Distance indicator is to display the distance of the closest obstacle. It will display the distance in multiples of 2cm, whichever is shortest. Distance indicator will display as STOP if any of the obstacle is less than 50cm from vehicle bumper.
3. Along with the display, a beep sound will come from driver side speaker. Frequency of the beep will increase if obstacle coming closer (crossing each zones) and the sound will be continuous if any of the obstacle is less than 50cm.
4. Turn the gear from Reverse to any forward or neutral, Display without the obstacle indication will be there for 5 sec or vehicle speed crossing 10kmph whichever is earlier.

SRS (Supplementary Restraint System)

The SRS is designed to provide protection for the driver and front passenger in addition to the primary safety protection provided by the seat belts and seat belt pretensioners.

The SRS system consists of:

- SRS control module located on the floor assembly near centre console
- Driver air bag module located in the centre of the steering wheel
- Passenger air bag module located above the glove box compartment
- Two thorax air bag modules located one each in driver and passenger seats
- Two curtain airbag modules located one each in across both side A and B pillars
- Two side satellite sensors located one each on both sides of the B pillar bottom
- Two seat belt pretensioners located one each on RH&LH B pillars

The airbag locations can be identified by 'SRS AIR BAG' embossed on the air bag module cover. The deployment of airbag depends upon the severity and direction of the frontal/side collision. This is done by the rapid inflation of a cushion by non-toxic gas that is generated and/or released by an inflator in response to an electrical signal from a collision detecting sensor inside the SR control unit for frontal collision or two side satellite sensors located one each on both sides of the B pillar. The inflated cushion helps to absorb the energy of the driver or passenger and prevent body contact with the vehicle structure.

HVAC (Heating Ventilation and Air Conditioner)

Car is efficiently equipped with dual air conditioning system with Fully Automatic Temperature Control (FATC). FAT maintains the cabin at customer desired temperature quickly as possible through automatically controlling blower speed, air distribution mode and fresh/recirculation mode to achieve the preset temperature set by the customer,. All the three rows are provided with air vents which are intelligently positioned to provide efficient cooling and heating for all passengers

The following are the major components of FATC

HVAC ECU

The HVAC ECU is the controlling unit which receives inputs from various sensors and controls the actuators to achieve the set temperature

In car Temperature Sensor

The in Vehicle sensor is inbuilt inside the HVAC ECU and is used to measure the cabin air temperature

Sun Load Sensor

Sun Load sensor is located on the instrument panel on the instrument panel and is used to measure the intensity of the sun light.

Fresh and Recirculation Actuator

The Fresh and Recirculation actuators is located on the top right of the HVAC unit and is used to control the air intake door based not the control signal from the HVAC ECU.

Mode Control Actuator

Mode Control Actuator is located on the LH side of the HVAC unit and is used to control the mode door based not the control signal from the HVAC ECU

Eva Sensor

Eva sensor is located on the RH bottom side of the HVAC unit and is used to sense the temperature on the evaporator outlet air.

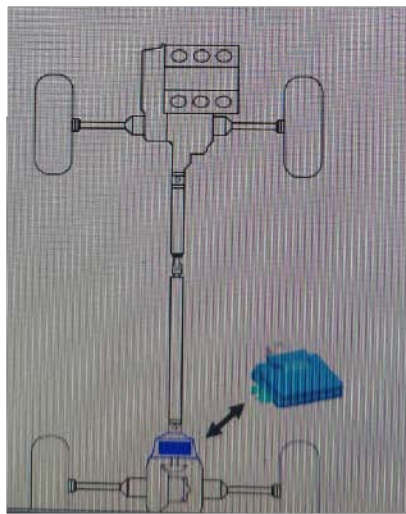
The HVAC ECU receives the following signals as input to achieve the set temperature by automatically

controlling the blower speed, air distribution mode and fresh/recirculation mode

1. In cabin temperature
2. Sun load intensity
3. Evaporator temperature
4. Engine Coolant Temperature
5. Ambient Temperature
6. Vehicle Speed

ITM (Interactive Torque Mangement)

The ITM includes the electronic control unit (ECU)) and an electro-mechanical wet clutch assembly. The ECU receives discrete electrical inputs as well as information from the vehicle CAN bus and calculates the appropriate torque distribution to the rear wheels. A pulse width modulated duty cycle signal is transmitted to the clutch assembly that corresponds to the appropriate coupling torque capacity. When the clutch assembly receives a duty cycle signal, an electro-mechanical clutch activates, transferring torque to the rear wheels. The function of the coupling system is to transfer a portion of the torque from the input to the output. The portion of torque transferred is actively controlled based on vehicle information collected by the system controller. The torque across the device can range from drag torque (Of/Initialization/Ready/Fault States) to full dutch capacity and can vary infinitely according to the control strategy and current state of the vehicle conditions (Active State)



ABS (Antilock Braking System)

Antilock Braking System is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps to maintain vehicle braking action and steering control. There is a four channel ABS , independently controlling each wheel with individual sensors monitoring the speed of each wheel.

ESP (Electronic Stability Program)

Electronic Stability Program recognizes critical driving conditions, such as panic reactions in dangerous situations, and stabilizes the vehicle by individual wheel braking and engine torque control intervention without pressing the brake pedal and acceleration pedal. ESP uses steering angle sensors and YAW rate sensor to determine the path that the driver intends to steer the vehicle and compares it to the actual path of the vehicle. When the actual path does not match the intended path, the ESP applies the brake of the appropriate wheel to assist in counteracting the condition of oversteer or understeer

Oversteer - when the vehicle is turning more than appropriate for the steering wheel position

Understeer - when the vehicle is turning less than appropriate for the steering wheel position

Whenever the vehicle is started, the ESP system will be in active mode. This mode should be used for most driving conditions.

Key Observations

CAN is the nervous system of a car. It consists of wires which reach out to different actuators and sensors to perform various functions in a car.

End of Report

