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# Fault Diagnosis in BS6 Automobile Engines through On-Board Diagnosis

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**ABSTRACT:** On-board diagnostics, (OBD) is an automotive term that refers to a vehicle's self-diagnostic and reporting ability. OBD systems enable owner of vehicles or automobile repair technician to gain access to the condition of the various vehicle sub-systems. Modern motor vehicles are highly sophisticated machines that incorporate development in electrical, electronic and mechanical engineering. The traditional "trial-and-error" mode of diagnosis could no longer be efficient to meet up with the need for maintenance and repairs on such vehicles. Therefore, this probes a challenge to meet up with the technological trend, and hence it becomes imperative to adopt new mode of diagnosis with high efficiency on the new generation motor vehicles. To facilitate and enhance the early detection of faults and malfunctions related to emissions control components, different diagnostic tools like Launch X-431 and Autel Maxidiag (Elite Series) were used and from the research carried out and the various results obtained from the various diagnostics of some selected automobiles from German Make, American Make, and Japanese Make vehicles, the diagnostics results provided an appreciated feedback through the triggering of Malfunction Indicator Light (MIL) and thereby with the use of diagnostic scan tools, the failures and faults within the engine compartment were detected. It was evident that On Board Diagnostic has the capacity to facilitate and enhance the early detection of vehicle malfunction and faults related to emissions control components and as a result reducing high emissions caused by emission related malfunctions.

**KEYWORDS:** -fault diagnosis, OBD-II, Malfunction

## I. INTRODUCTION

Every automobile is equipped with an electrical instrumentation panel that is used as a driver information centre, formerly known as a dashboard. It contains various gauges and indicators that provide valuable information to the driver. Gauges provide scaled indication of the system condition such as distance, engine speed, vehicle speed, and fuel level. Whereas, the indicator lights supply information of something is being turned on or warn the driver about system malfunctioning problems. However, this instrumentation panel has limitation in providing more information on specific areas such as malfunctioning problems, trip information, scheduled maintenance reminder and data logging system. The information displayed on the dash board is retrieved from the electronic control unit (ECU) of the vehicle. The ECU that can provide this information normally has on-board diagnostic (OBD) software (known as a diagnostic management system). This management system performs diagnostic testing, record the result of the tests, and request the test fail actions.

On-board diagnostics, (OBD) is an automotive term that refers to a vehicles self-diagnostic and reporting ability. OBD systems enable owner of vehicles or automobile repair technician to gain access to the condition of the various vehicle sub-systems. The available diagnostic information through OBD has considerably been improved, as its introduction dates back to the early 1980s. The early versions of OBD simply illuminates a malfunction indicator light if there was any prevailing fault detected, but has no capability of further providing any information about the nature of the fault. The modern OBD systems have become more sophisticated and now adopt a standardized digital communications port to provide real time data in addition to a standardized series of diagnostic trouble codes, (DTCs), which allow one to quickly identify and repair malfunctions within the vehicle, as it provides almost complete control and also monitors parts of chassis, body and accessory devices as well as the diagnostic control network of the vehicle.

## **II. PROBLEM IDENTIFICATION**

An OBD scanner can immediately tell you the severity of the issue, and make sure you are not driving your car with major problems that can cause accidents.

The OBD system monitors, and can detect errors, across all aspects that impact engine performance. Some of the key aspects covered are:

- Fuel Systems
- Engine Misfires
- Emissions Control Systems
- Vehicle/Speed Idling Controls
- Computer Systems
- Transmission Systems
- Others related to vehicle body & chassis etc. such as Seat-belt, Airbags etc.

## **III. LITERATURE REVIEW**

As early as 1950, industrialized countries began to produce single detection equipment and performance debugging equipment for fault diagnosis and debugging of engines. After 1960, due to the increase in demand and the increase in the number of cars, there are some simple car maintenances, testing stations, and the application of more professional equipment, to solve the common problems of the car. With the development of economy, the development of automobile industry is particularly significant, and the old car repair technology, especially the traditional manual experience diagnosis, cannot meet the development needs at that time.

Some developed countries drew lessons from mature mechanical diagnosis and repair technology in other fields and apply them to automobile troubleshooting. After 1970, detection technology was developed that integrated automatic detection and control, data acquisition and analysis, result printing and other functions, and conducted out-of-car diagnosis for a number of functions of specific vehicles. In 1978, Sarna and Steyaert learned from the experience of the military industry and applied the fault diagnosis expert system to military automobile engines, obtaining a large amount of data. As the heart of automobile, the engine failure rate is very high, so the study of engine fault diagnosis has become a hot topic. More electronic control system technology has been applied to automobile fault diagnosis, and the development of fault diagnosis technology has become more refined and complicated.

After 1980, advanced on-board diagnosis system was put on the historical stage in developed countries, and many automobile manufacturers installed fault self-diagnosis function for their products. At this time, a fault diagnosis expert system was widely used as an advanced out-of-car diagnosis tool.

Wu et al. applied the super characteristics of neural network to engine fault diagnosis and automobile control system. People found that neural network has strong fault tolerance, large capacity, good learning performance, and super nonlinear mapping characteristics and can quickly find, classify, and diagnose potential faults.

In 1989, Venkatusubramanian and Chen in the United States studied and designed the application of neural network in vehicle fault diagnosis to make vehicle diagnosis more intelligent. Compared with the traditional diagnosis method, intelligent fault diagnosis has the advantages of faster speed and online diagnosis, and the experimental analysis had proved the feasibility of applying neural network to fault diagnosis.

Sharkey et al. conducted a large number of studies and fault experiments on engines and proposed the diagnosis strategy of multineural network, which has more powerful diagnosis function and is far superior to the diagnosis of single-strategy expert system. In the early 1990s, multineural network diagnosis was further developed. The expert system of automobile fault diagnosis developed to the direction of multimodel and multiknowledge diagnosis, and the research objects were more extensive and popularized in more automobile systems.

Hamilton and Luupgraded the fault diagnosis system and developed the automobile suspension unit technology by studying the state monitoring and other technologies. Staszewski and Worden gave people a new understanding of automobile gearbox failure by using the neural network mode and special vibration signal extraction through specific recognition. The integrated diagnosis system for automobile brake system is a new technology developed by M L.



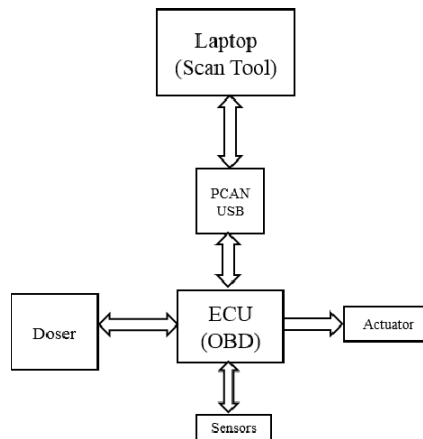
Smith for Eaton, which is applied to the diagnosis of the brake system. After regular integration with the fact data, the fact data and virtual diagnostic input information are interacted by neural network reasoning, which makes the fault diagnosis more perfect.

#### IV. METHODOLOGY

An OBD2 automotive scanner connects to the car's diagnostic port located in the driver area. They connect to a mobile app on your smartphone via Bluetooth or Wi-Fi. The app can read and interpret stored error codes. It can also delete error codes once the fault has been rectified.

In our project we test the different types of cars and identify their problems. The presence of the OBDII allows telematics devices to silently process information such as engine revolutions, vehicle speed, fault codes, fuel usage and more. The telematics device can then use this information to determine trip start and finish, over revving, speeding, excessive idling, fuel consumption, etc.

#### BLOCK DIAGRAM: -



#### V. COMPONENTS



#### VI. RESULT

After making this report, we analyze the above data and enhance the skill with the help of on-board diagnosis



**VII. APPLICATION**

- 1) On-Board Diagnostics and is a computer system inside of a vehicle that tracks and regulates a car's performance.
- 2) scan every diagnostic trouble code generated by your car's computer.
- 3) It can provide data about your car's air temperature, coolant, crankshaft and camshaft, position, road speed, and throttle as well as engine RPM.
- 4) It can help save you both time and money.

**VIII. CONCLUSION**

The OBD port still remains important to vehicle health, safety and sustainability.  
The below report is tested on Maruti Suzuki Celerio 2017.

Monitor Status and DataStream:

Diagnosis	Maruti Suzuki Celerio 2017	Mercedes E350d	Hyundai Verna
MIL Status	OFF	OFF	OFF
DTCs in the ECU	0	0	1
Readiness Completed	6	6	4
Readiness Not Completed	0	0	1
Readiness Not Supported	4	3	5
DataStream Supported	32	8	29
Ignition	Spark	Compression	Spark
Protocol Type	CAN	CAN	CAN
Fuel System 1 Status	CL	CL	CL
Fuel System 2 Status	---	---	---
Calculated LOAD Value	24.3%	25.9%	30.2%
Engine Coolant Temperature	154 <sup>0</sup> F	131 <sup>0</sup> F	93 <sup>0</sup> F
Short Term Fuel Trim – Bank 1	-0.8%	-0.8%	-9.4%
Long Term Fuel Trim – Bank 1	0.8%	0.8%	7.0%
Intake Manifold Absolute Pressure	8.7 in Hg	8.7 in Hg	11.1 in Hg
Engine RPM	700/min	0/min	1054/min
Vehicle Speed	0mph	0mph	0mph
Ignition Timing Advance for #1 Cylinder	11.5°	11.5°	7.5°
Intake Air Temperature	111 <sup>0</sup> F	111 <sup>0</sup> F	78 <sup>0</sup> F



Absolute Throttle Position	14.9%	14.9%	6.3%
Oxygen Sensor Output Voltage (B1-S1)	0.315V	0.315V	0.695V
Short Term Fuel Trim (B1-S1)	3.9%	3.9%	-15.6%
Oxygen Sensor Output Voltage (B1-S2)	1.275V	1.275V	0.455V
Short Term Fuel Trim (B1-S2)	99.2%	99.2%	99.2%
OBD Requirement	EOBD	EOBD	OBD1
Time Since Engine Start	33 sec	33 sec	90sec
Distance Travelled While MIL is Activated	0miles	0miles	0miles
Commanded Evaporative Purge	0.0%	0.0%	0.0%

From this above diagnosis report we found that in Hyundai Verna having problem in Crankshaft position sensor.

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