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A Real Time Engine Oil Monitoring System for Diagnosis of Lubricant using IoT Network

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***Abstract**: In the modern days, Internet of Things (IoT) is smart communicating approach and creates an energetic impression in future of automobile industry. The advancement of IoT innovation in each field can be joined with the rising occasions setting off a requirement for a superior human way of life and its applications are vast and innumerable. One such application can be implied for the automobile industry to real time monitor the engine lubricant because in India, automobile mechanics still use conventional techniques of engine lubricant supervision. So in this paper, we present, an IoT technology based a real time Engine Oil Monitoring (EOM) System for diagnosis of engine lubricant. The main objective of this research paper is to reduce the human effort and to provide a smart sensing approach in automobile industry for maintaining real time engine oil conditions. EOM system is designed with the help of Arduino Nano with sensor devices named as Light Dependent Resistor (LDR) sensor for oil quality, LM35-Temperature sensor for temperature and Ultrasonic Sensor for oil level measurement in engine. Real time testing results shown in the connected display unit and experimental results of proposed EOM system using IoT network provides an efficient diagnosis results. EOM system is working properly that is observed in the experimental analysis section for two different scenario such as 10W-50 4T Scooter Engine Oil-Honda Activa 125 (1L) and 10W-30 Synthetic Engine Oil for Petrol Cars (3.5 L).*

***Keywords**: EOM System, Sensors, LED Display, Ultrasonic Sensor, LDR, Engine Oil, IoT Network.*

I. INTRODUCTION

The Internet of Things (IoT) is viewed as an innovation and monetary tendency in the worldwide data industry after the Internet [1]. The IoT innovation is a wise systems administration strategy which associates every computational gadget to the Internet to trade data and imparting through the data detecting gadgets as per concurred information transmission conventions. Now days, IoT technology achieves the goal of intelligent monitoring, identifying, locating, tracking, and managing of all things. It is an extension and expansion of network based on the internet, which expands the way of communication between human to human, human to things and things to things [2].

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Engine oil quality measurement in real time is one of the major issues find in automobile industry mostly in developing countries. The main reason is the lack of automatic monitoring system from the continuous use of engine. So, in this research work, we introduce the concept of IoT based a real time Engine Oil Monitoring (EOM) system for diagnosis of engine lubricant [3] and their architecture is shown in the Fig. 1. The architecture of EOM system consist of three different phases named as Data Sensing, IoT based Transmission and Monitoring [4]. The phases of EOM system is described in below section one by one.

- ***Data Sensing:*** This is used to sense the oil condition during the working of the engine in real time. Light Dependent Resistor (LDR) sensor used to check the visibility of lubricant, ultra-sonic sensor to measure the depth of lubricant in the vehicle tank and temperature sensors are used to sense the oil condition with respect to time [5]. These electronic sensors having better sensing capacity and helps to improve the interactive with the physical environment of developed IoT-based EOM system. The data collected by the sensors has to be stored and processed intelligently in order to derive useful inferences from it.
- ***IoT based Transmission:*** In second phase, we develop an IoT network for communication purpose to transmit the oil condition for monitor via computational devices like mobile, computer, laptop etc. Bluetooth, RFID, Wi-Fi and ZigBee are used as a medium for the data transmission from transmitter to receiver [6].
- ***Monitoring:*** It is a observing and checking steps of lubricant condition during the progress to ensure the quality of lubricant over a period of time.

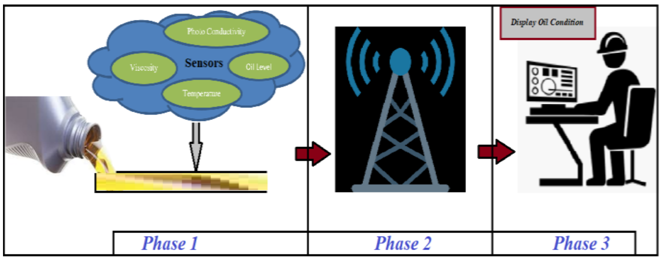

Fig. 1. Architecture of IoT based EOM System [2]

Fig. 1 illustrates the architecture of IoT based EOM system for automobile industry, where the number of electronic sensor deices are denoted by green circles is deployed in the phase 1 that is used to sense the oil condition in terms of raw data.

After that, wireless or wired medium is used in second phase for the transmission of raw data, then in last phase a software in integrated with computational devices to monitor and display the exact condition of the lubricant with intelligent interaction. The major aim of this research is to reduce the effort of human because in conventional approach lots of time consumed by mechanics [7]. The comparison between conventional engine oil monitoring system and designed EOM is described in the Table 1.

Table-I: Conventional and Proposed EOM system Comparison

Comparison Factors	Conventional System	EOM System
Oil quantity measurement	Manual and estimated	Automatically and according to condition of lubricant.
Oil test time	Manual and take about 10 to 20 minutes	Automatically and take about less than 1 minutes.
Quantity estimation	Approximately	Automatically when needed
Oil heath	May be more degraded	Not dangerous
Costs	The cost of conventional system is high	Reduce the use of the labor, so the cost is low
Power consumption	High	Low

This research article presents an EOM system for real time diagnosis of lubricant using IoT network and the contribution is given follows:

- Design a model for EOM system by monitoring lubricant visibility, depth and temperature etc. using the concept of IoT network with sensors.
- LDR, ultra-sonic and temperature sensor are deployed in the oil flow path to monitor lubricant health condition over a period of time.
- To validate the designed EOM model, we calculate the Oil Quality (PPM) with respect to the covered distance by Activa 125 and Petrol Engine Car.

Implementation procedure of an EOM system for engine oil monitoring using IoT network in described in this Sect. 1 of this research article and the remaining research paper is organized as, In Sect. 2, survey of existing related works and Sect. 3 describes structure of EOM system. Sect. 4 presents the experimental results and analysis. Finally, Sect. 5 presents the conclusion and future scope.

II. BACKGROUND SURVEY

We present the survey of existing work related to the engine oil monitoring based system using different approaches followed by the researchers. Where, we conduct a survey based on the different approaches like wear particle condition monitoring, viscosity monitoring, oil physical, electrical, turbidity or chemical properties based monitoring, real time based monitoring using IoT and various sensors such as temperature, ultra-sonic, LED, LDR etc. ***Zhu et.al [2]*** described a model using the oil health monitoring, diagnostic and prognostics and it known as wear particle condition monitoring based system. There a comprehensive review of available lubrication oil conditioning techniques are analyzed and categories into four parts such as electrical, physical, chemical and optical. Sensing technique and characteristic of each solution is evaluated with properties and there is comparison in between them. Various oil condition monitoring sensing techniques for various performance parameters like TAN/TBN, water content, wear particle count, flash point, viscosity etc., are studied. ***Jakobe et.al [3]*** proposed the technique to find out the viscosity of lubricating oil using micro acoustic viscosity sensor and measuring the viscosity of various engine oil of cars and fresh oil samples. Viscosity dependence on temperature and other material in the lubricating oil samples. Viscosity increase due to the soot contamination in oil. The sensor is based on the vibration of probe of sensor and get oscillation waves curve from there the viscosity value be demonstrated. On board automotive lubricants conditioning by given viscosity sensor from 40 °C to 150 °C will be evaluated with graph. ***Paul et.al [4]*** introduced the condition monitoring method for lubricating oil, the technique is based on capacitance and ultrasonic based method for finding or detecting the wear debris and analyses the physical properties of lubricating oil. As it was found that both method can detect particle size of 44.5μm in diameter. Ultrasonic method detects wear debris by scattering of waves leads to decrease in ultrasonic intensity in the oil. Capacitance method uses two capacitor and the change in oil properties during operation is just in between the capacitance plate and its dielectric properties changes as oil degrades. This two method are also used for examine the viscosity and pH of the oil. ***Agoston et.al [5]*** used the micro acoustic sensors to investigate the value of viscosity of lubricating oil. This sensor probe have different rheological domain consider in measurement of result. Measuring viscosity with or without additives in oil is subjected to like an artificial aging process. This sensing devise have thin piezoelectric quartz disk which is excited electrically excited by thin conditioning electrode which is on both side of the disk. As the micro acoustic viscosity sensor use the Thickness Shear Mode (TSM) of micro acoustic quartz resonator have a resonating frequency 6 MHz have 4mm electrode with 8mm of disk diameter, which was fully immersed in samples so that both of the disk faces are in contact with the lubricants. ***Kenna et.al [6]*** studied and performed research on flash point of engine oil. With use of Pensky Marten flash point test (Closed cup test) is performed at various temperatures and data is collected. Flash point is used to distinguish between flammable liquids like petrol and combustible fluid like diesel. Depends on the data a liquid whose flash point is less than 37.8 or 60.5 °C temperature (100.0 or 140.9 °F) are term as flammable , or if flash point above given temperature classified as combustible. The flash point is also used for finding the contamination in lubricating oil. ***Pérez et.al [7]*** presented the real time oil monitoring technique based on the permittivity of lubricants. As oil get degrades while during operation there needs of condition based maintenance is needed to find the most appropriate oil replacement.

Oil quality sensor which are based on Marginal oscillator to find the dielectric losses at high frequency. Electronic design procedure is opted at low cost, effective sensor implemented to find out the accurate result. Based on the concept of the turbidity, ***Kumaresan, et al [8]*** have conducted a research in which a model is developed and designed for finding the quality of engine oil .For this three engine oil sample of 4T 10W30 has been taken and at every 1000 km the sample is taken and also LED is used to indicate condition of oil by indicate colors .With use of microcontroller to control the LED and signals coming from turbidity sent to PIC microcontroller for giving indication whether the quality of engine oil change or not. ***Mandekar et al [9]*** in this article they developed a model based on IoT in which it monitor the distribution of transformer oil earlier it monitor by manual. Various parameter like oil level, temperature, current, voltage, viscosity of transformer oil is monitoring at real time with the sensor and in this system temperature and viscosity monitoring based on AVR microcontroller and with interfacing the required component the user develop application program on embedded c in which controller continuously reading the above parameter and display at LCD. The result of this thesis is based on IoT platform, if any changes in the predefined set of data there is signal via message or internet. ***Raja kumar et al [10]*** designed an IoT based system which determine the adulteration of milk with use of various sensor like , gas sensor, salinity sensor and milk level sensor are used .Developing and designing the apparatus based on real time monitoring of spoilage of milk and turn out to a healthy product. The result is based on IoT which give indication via internet mail or message about the quality of milk and also provides card to customer to accessing the milk diaries. ***Goyal et al [11]*** developed and designed an IoT based wireless control system which monitor and control various parameter of induction motor in real time. In this a module of sensors has been used to monitor different parameter like current, voltage, temperature and speed using microcontroller for analysis and display. If any of parameter goes beyond the set value the parameter is analyzed and visualized with Arduino Uno microcontroller which sends to relay at transmitting ends and cut out the motor supply***. Besser et.al [12]*** investigated the influence of bio-fuels on the engine oil steadiness. The author used two fully framed engine oils were artificially changed in a novel laboratory modification device as well as evaluated in a chassis dynamometer test bench. The author found that the amount of anti-wear additive (ZDDP) during artificial alteration dropped down to a low level of 20 to 30%. ***Zolkapli et.al [13]*** developed a sensor unit which has LED and LDR placed in a vertical alignment and fixed inside a Perspex material block. The author performed the test to predict the mileage of the vehicle with respect to contamination of the engine oil while using with across the different kilometers.

After analysis of existing researches, we conclude some important point regarding to development of an EOM system which helps to short out existing problem in the field of the automatic engine oil monitoring system. In the existing work major problems are listed as:

- Unable to decide, whether oil quality is degraded
- Failed to find out the exact depth of oil in the tank
- Can't decide exact lubricant condition to maintain their health status
- Response time of existing model is not up to acceptance.

To solve these type of existing problems, we presents an EOM system in this research paper that are presented in following folds:

1. Firstly, study the existing properties based on condition monitoring process is done
2. After that the selection of oil parameters like Photoconductivity, temperature, oil level etc. is performed using the sensors.
3. For data acquisition in EOM system, microcontroller is used with Arduino
4. Data Processing and analysis is done after the acquisition of data
5. Assemble & deploy the coding on the microcontroller which helps to control the oil
6. To integrate the IoT with developed EOM system to retrieve real time data from sensor and transmit from one source to another source

The structure and methodology of proposed EOM system is explained in the next section of this research article with working description of the used components.

III. STRUCTURE & METHODOLOGY

This section of research article described the basic structure of EOM system and we consider the two different scenario for the real-time data collection from the fresh & aged engine oil sample named as:

1. *10W-50 4T Scooter Engine Oil-Honda Activa 125 (1L)*
2. *10W-30 Synthetic Engine Oil for Petrol Cars (3.5 L)*

Used Hardware: To implement EOM model, we are going to use the concept of software and electronics hardware which is following:

1) **Real-Time Oil Data Collection using Sensors:** To collect the engine oil sample [19], we are using a set of sensors like:
   a) LED & LDR Sensor: It is used to ensure the quality of engine oil. Where, a white color LED is used with small LDR or Photo resistor sensor [20]. ***b) Temperature Sensor:*** LM35 temperature sensor is used in the proposed EOM system and it is a temperature measuring device having an analog output voltage proportional to the temperature [20].
   c) Ultrasonic Sensor: It is one of the best ways to sense proximity and detect engine oil levels with high reliability.
2) **Microcontroller Unit (MCU):** It is used in EOM system to control the integrated components like sensors, display unit, IoT network etc.
3) **IoT Network:** It is refers to a collection of interconnected sensor devices that communicate with other devices without the need for human involvement.
4) **Display Unit:** It is used to display the achieved results and simulation status of EOM system.

The brief description of each components of EOM system is given in the below section with pictorial representations. The proposed EOM system using IoT network consists of several steps during the implementation and the procedures of EOM system is shown in the Fig. 2.

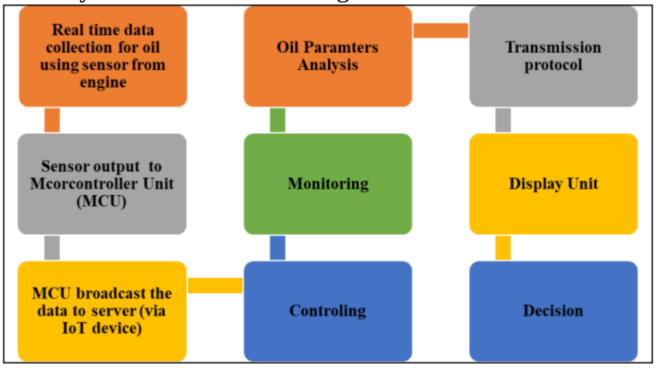

Fig. 2. Flow of Proposed EOM System

Component used during real-time engine oil data collection: To collect the real-time engine oil sample data, we are using a set of sensors like:

LDR Sensor: It is a Light Dependent Resistor and also known as a photo-resistor or a photo-conductor. It is a component that has a resistance with variation properties that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits and this type of optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits. So we used in EOM system to check the quality of engine oil based on their transparency. To design a LDR sensor, semiconductor substrate include as a basic materials named as the, PbS (LEAD-SULPHIDE), PbSe (LEAD-SELENIDE), InSb (INDIUM-ANTIMONIDE) which detect light in the infra-red range with the most commonly used of all photo resistive light sensors being CADMIUM SULPHIDE (Cds). Sometime LDR is also called as a Cadmium Sulfide Cell (CSC). The LDR sensor is denoted as given symbol and the used LDR sensor in EOM system is show in the Fig. 3.

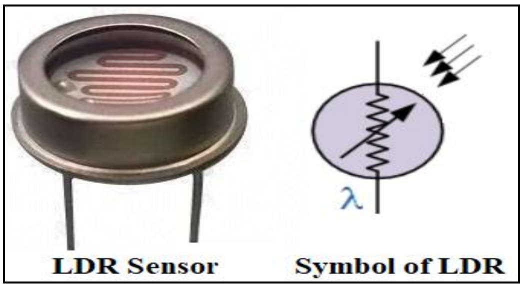

Fig. 3. LDR Sensor [13]

LM35 Temperature Sensor: LM35 temperature sensor is used in the proposed EOM system and it is a temperature measuring device having an analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry for temperature sensing purpose and the sensitivity of LM35 temperature sensor is 10 mV/degree Celsius and if the temperature increases, then the output voltage also increases. It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C. LM35 sensor gives more precise temperature output compare to other sensor like thermistor, so we used in proposed EOM system and the LM35 temperature sensor with pin description is shown in the Fig. 4.

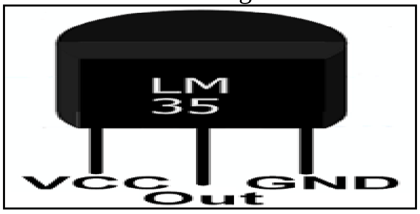

Fig. 4. LM35 Temperature Sensor [3]

Ultrasonic Sensor: It is one of the best ways to sense proximity and detect engine oil levels with high reliability and Fig. 5 show its image.

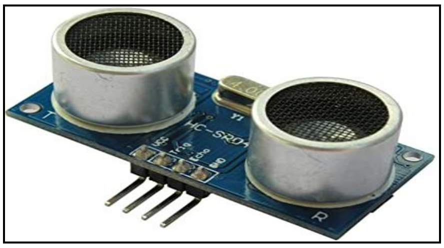

Fig. 5.Ultrasonic Sensor [9]

It is an instrument that is used to measure the distance to an object using ultrasonic sound waves. A transducer is used to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

MCU: MCU used to integrate the sensors devices and Peripherals with Microcontrollers is known as MCU and it is used to receive a data from sensor or to give signal to display the oil condition. In EOM model Arduino NANO is used as a MCU and it contains Wi-Fi shield itself to communicate wireless via ultrasonic sound wave, it need hotspot to connectivity. Arduino NANO is shown in the Fig. 6.

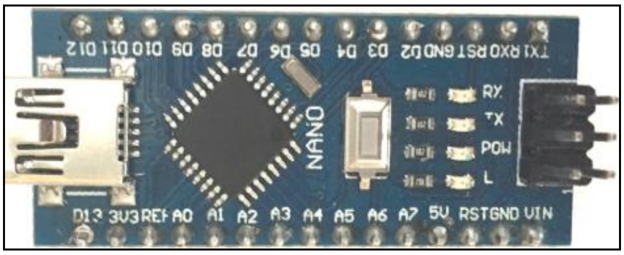

Fig. 6.MCU (Arduino NANO) [10]

The Arduino NANO board is designed in such a way that it is very easy for beginners to get started with microcontrollers and can used in any applications. This board especially is breadboard friendly is very easy to handle the connections.

IoT Network: In EOM system, IoT network is used establish a connection between the interconnected sensor and display devices that communicate with other devices without the need for human involvement. The IoT network infrastructures most similar to the wireless network in which lots of devices connected with the network using wireless medium and Fig. 7 shown the IoT network.

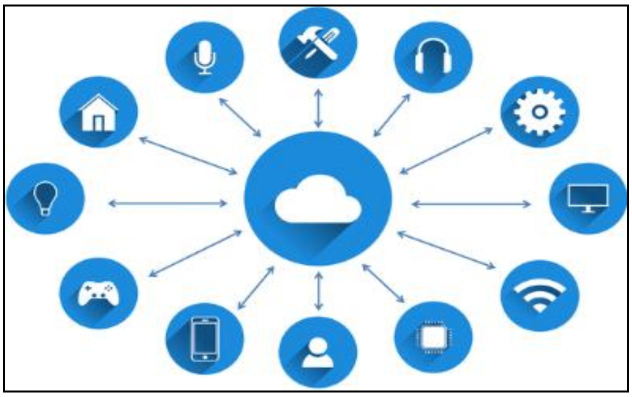

Fig. 7. IoT Network [6]

Display Unit: 16×2 LCD (Liquid Crystal Display) is used to display the achieved results and simulation status of EOM system. It is one of the latest inventions and is extensively used these days. From your cell phone to the large advertising display boards, the wide range of applications of these magical 16×2 LCD can be witnessed almost everywhere. The used 16×2 LCD type in EOM system is shown in Fig. 8.

Fig. 8. 16×2 LCD Panel [9]

Real-Time Oil Data Extraction: In proposed EOM system, data extraction process is repeated for two different scenario mentioned in above section.

Data Extraction for Activa 125 Scooter 2019 Model:

Oil Used→ 10W50 Engine oil (1L)

Sample→ 10 samples (At different Kilometer Travel)

Data Extraction for I-10 Hyundai Car 2011 Model:

Oil Used→ 10W-30 Synthetic Engine Oil for Petrol Cars (3.5 L)

Sample→ 10 samples (At Different Kilometer Travel).

Above section well describe the used components with their images but we also use some electronic devices like Computer, Voltage Regulator (AMS1117), A-B Type, Tactile Switch, Jumper Wire, Wi-Fi (ESP 8266), White, LED Buzzer, Oil Pipe, Washer Pump (12V), Battery, 2 small buckets. The block diagram of EOM system using these components are given in the Fig. 9.

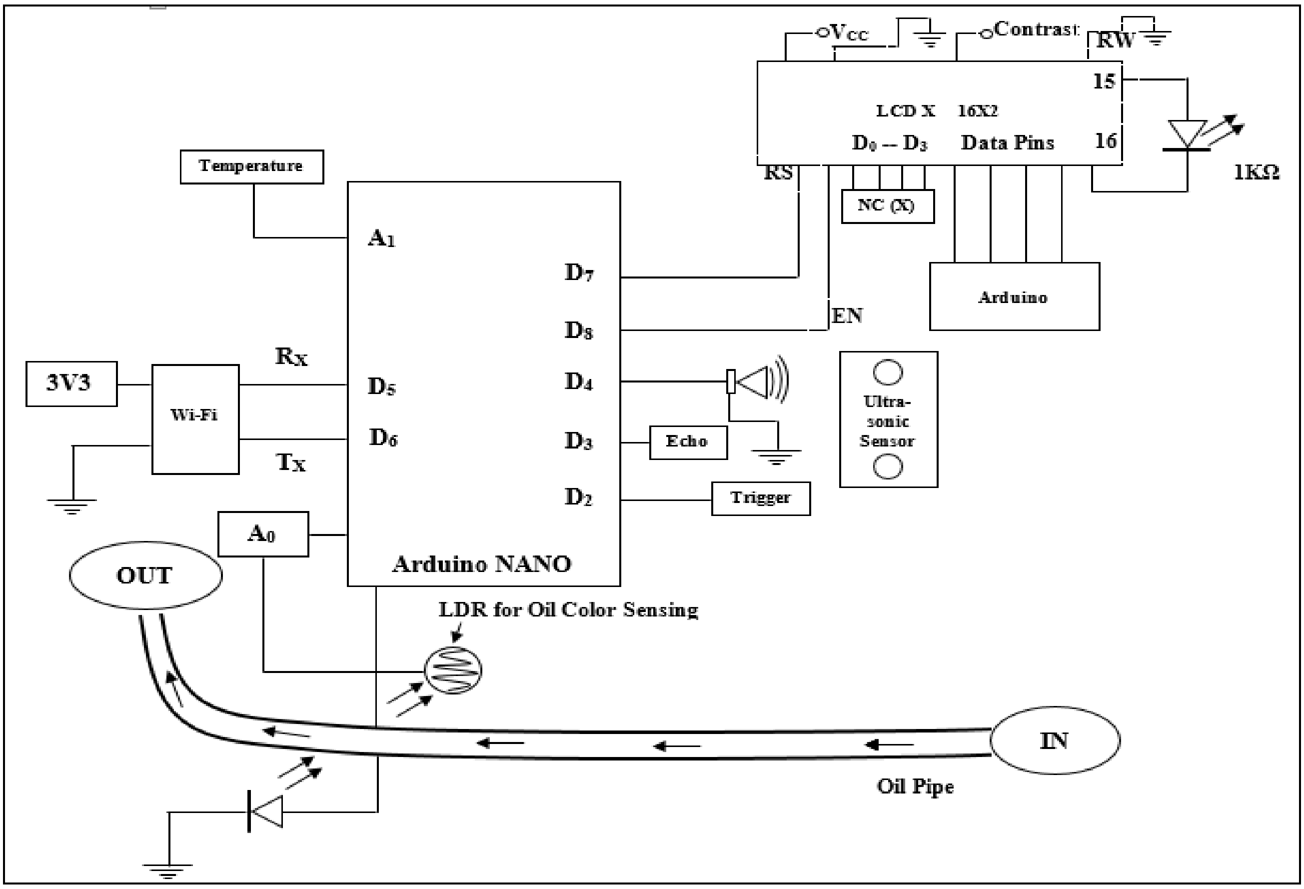

Fig. 9. Block Diagram of EOM System

Based on the block diagram, we developed an EOM system using the different components and software tools to simulate the model. Basically, we passes the engine oil through the oil pipe and one side of pipe LDR sensor is connected and opposite to LDR, a white LED is connected. If the condition of engine oil is good, then oil transparency is high and light emitted by LED is penetrated and fall on the LDR sensor. So LDR emitted less amount of light that means oil condition may be good. The real-time developed EOM system is shown in the Fig. 10.

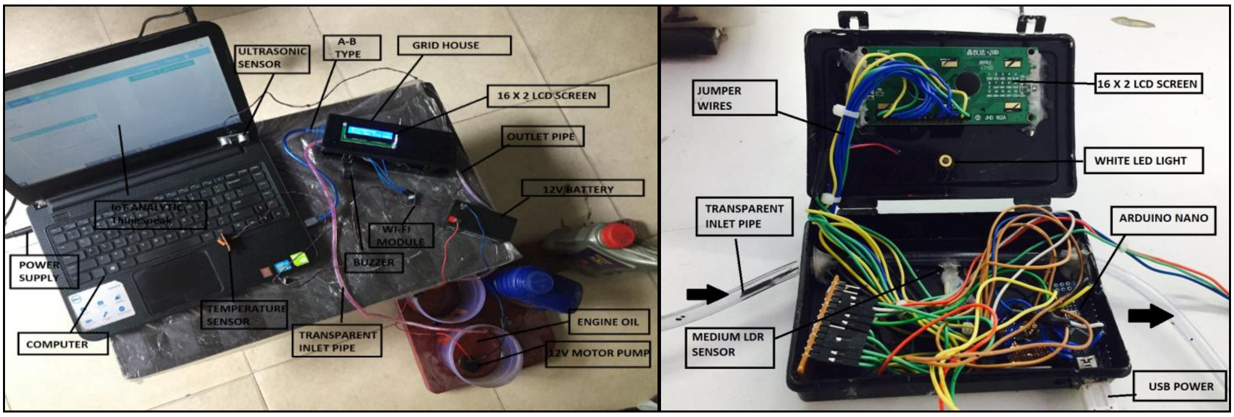

Fig. 10. Developed EOM System

The proposed EOM system working architecture is dividing into following different phases:

1. All sensor nodes are deployed and connect with Arduino NANO.
2. If the connection is available, the sensors sends collected information packets to Arduino NANO.
3. Here different types of sensors are used to sense different data like LDR to sense oil quality, LM35 temperature sensor to sense temperature and ultrasonic sensor to sense the oil level. All sensors start measuring the values after powered by batteries.
4. The sensors measured the values, these value stored in the hardware memory of MCU or Arduino NANO.
5. Depending on these stored value the MCU or Arduino NANO respond with specific action according to the engine oil conditions.
6. Then the MCU or Arduino NANO sends the oil condition in terms of information packets wirelessly to the display unit with the concept of IoT network and the Methodology steps of EOM system is illustrated in Fig. 11.

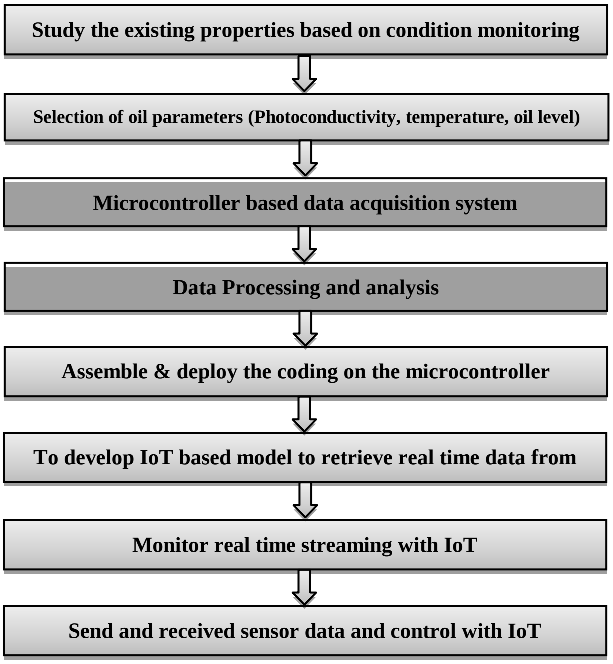

Fig. 11. Methodology Steps of EOM System

Several experimentation is being conducted to examine the oil condition based on the vehicle running status to overcome the limitations of existing model by incorporating LDR, temperature sensor, ultrasonic sensor, IoT network etc. The above methods and instruments is used to monitor the quality of engine oil based on running status, oil quality, oil level and temperature. Based on the above scenario, we tested the developed model using two different scenario and the simulation results of proposed EOM system is discussed in the next section of this research article.

IV. RESULTS AND DISCUSSION

In this section, the experimental results of proposed EOM System using IoT network are discussed and the efficiency of proposed EOM system is evaluated on the basis of two different scenarios named as:

1) 10W-50 4T Scooter Engine Oil-Honda Activa 125 (1L)

This is the 1st scenario of our experiment for the developed EOM system to check the engine oil condition based on the completed distance, temperature and oil level.

Table-II: EOM System Tested Result for 10W-50 4T Scooter Engine Oil-Honda Activa 125

S. No	Sample (KM)	Oil Quality (PPM)	Temperature (^oC)	Oil Level (mm)	Status of oil	Indication (Color)
1	0	930	28	47	Good	Green
2	100	878	27	46	Good	Green
3	500	816	28	43	Good	Green
4	900	750	26	41	Good	Green
5	1300	650	27	38	Moderate	Yellow
6	1700	540	27	36	Moderate	Yellow
7	2100	416	26	34	Moderate	Yellow
8	2700	370	28	33	Degraded	Red
9	3000	300	29	31	Degraded	Red
10	3300	180	30	30	Degraded	Red

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Table II represented the tested simulation results of the proposed EOM System for 10W-50 4T Scooter Engine Oil-Honda Activa 125. For the experimental testing of EOM system, we consider the speed variation from the 0 to 3300 for the Activa 125 and monitor the status of engine oil in terms of Good, Moderated and Degraded and based on the these status indictor display the status with color Green, Yellow and Red respectively. The graphical representation of simulation results for Activa 125 is shown in the Fig. 12.

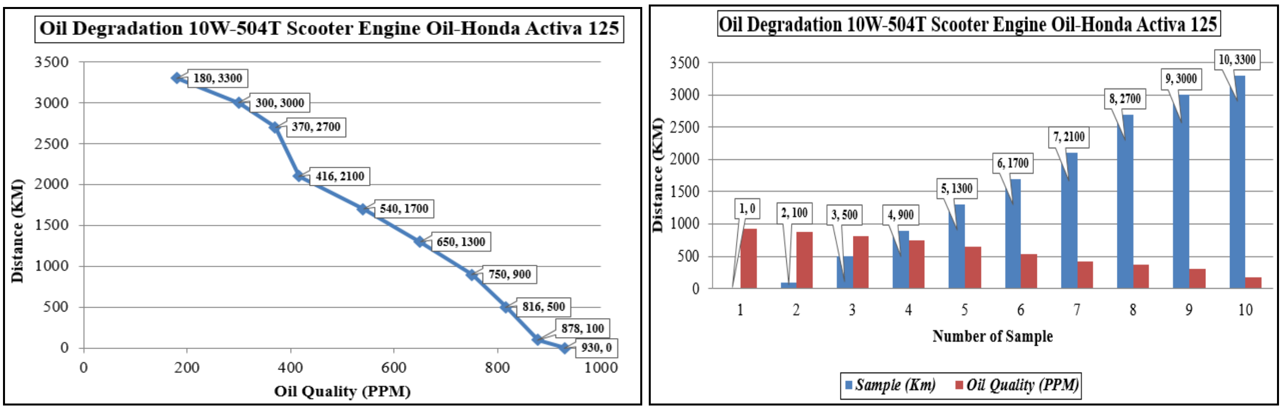

Fig. 12. Oil Degradation 10W-504T Scooter Engine Oil-Honda Activa 125

Based on the simulation for the 1st scenario such as EOM System for 10W-50 4T Scooter Engine Oil in Honda Activa 125 (1L), we check the quality of engine oil after complete the specific distance. Form the observation, the oil condition degraded after the completing distance above the 2100 KM by Active 125 CC engine. The engine oil quality is indicated for experimented results of EOM system for 10W-50 4T Scooter Engine Oil in Honda Activa 125 on the PPM and it shown in the Fig. 13 with three different color for three different engine oil condition for distance of 0 to 1000, 1000 to 2100 and 2100 to 3300 KM.

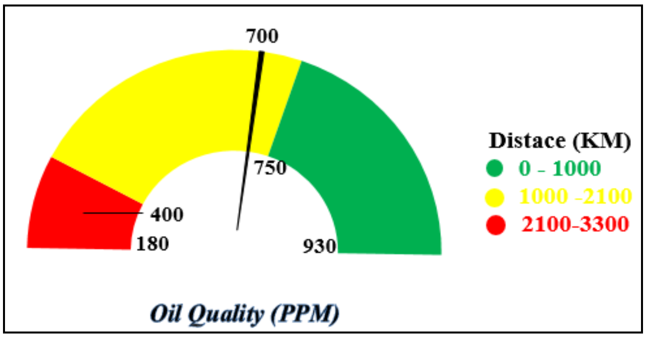

Fig. 13. Oil Quality (PPM) on Indicator

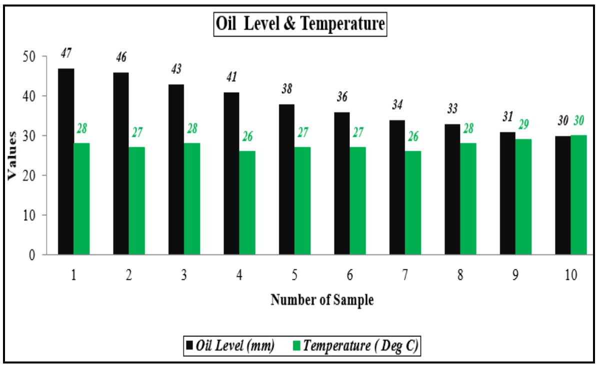

Fig. 14. Oli Level and Temperature Conditions

Above Fig. 14, represents the sensed temperature and oil level in the engine by using the sensor according to the travelling history and covered distance by Active 125 CC engine. If the covered distance is increases, then the oil level in the engine is decreases and also the oil quality degraded (from Table 2). We also consider the temperature factor in the degradation of engine oil in the Active 125 CC engine.

So, we can say that, the experimentation of EOM system is successfully evaluated with different conditions of Active 125 CC engine.

2) 10W-30 Synthetic Engine Oil for Petrol Cars (3.5 L)

This is the 2nd scenario of our experiment for the developed EOM system to check the engine oil condition based on the completed distance, temperature and oil level for petrol engine car. The experimental results of this scenario is briefly described in the below section with tabular and graphical representation. For the experimental analysis of 2nd scenario, we consider the distance range from the 10 to 15000 KM to check the engine oil conditions.

Table-III: EOM System Tested Result for 10W-30 Synthetic Engine Oil for Petrol Cars

S. No	Sample (KM)	Oil Quality (PPM)	Temperature (°C)	Oil Level (mm)	Status of oil	Indication (Color)
1	10	940	28	65	Good	Green
2	1000	880	30	63	Good	Green
3	2500	830	31	60	Good	Green
4	4000	780	33	62	Good	Green
5	6000	730	30	58	Moderate	Yellow
6	8000	650	31	59	Moderate	Yellow
7	10000	550	33	62	Moderate	Yellow

8	12000	440	28	60	Degraded	Red
9	13500	310	29	55	Degraded	Red
10	15000	160	30	50	Degraded	Red

Based on the simulation for the 2nd scenario such as EOM System for 10W-30 Synthetic Engine Oil for Petrol Cars, we check the quality of engine oil after complete the specific distance from 10 to 15000 KM and we observed the engine oil condition degraded after the completing distance above the 12000 KM by petrol engine car. Table 3 represented the tested simulation results of the proposed EOM System for 10W-30 Synthetic Engine Oil for Petrol Cars and the graphical representation of simulation results for petrol engine car is shown in the Fig. 15.

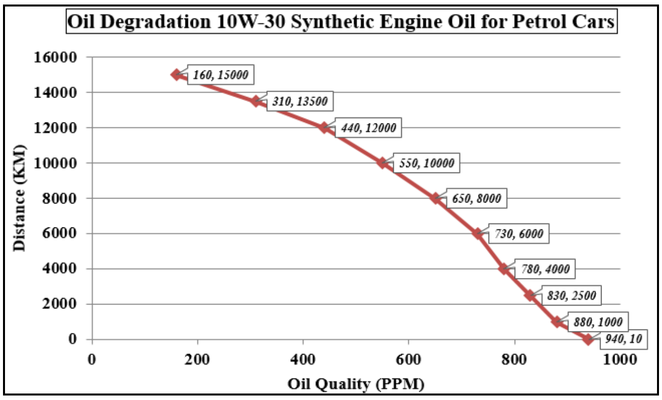

Fig. 15. Oil Degradation 10W-30 Synthetic Engine Oil for Petrol Cars

After the experimental analysis of proposed EOM system based on the quantitative and quality wise analysis, we observed that quantity of engine oil in active as well as in petrol car engine are successfully classified in terms of good, moderate and degraded conditions. For better result of quantification three sensor based EOM system is developed to increase the efficiency of system.

V. CONCLUSION AND FUTURE WORK

The technique used to design and implement an automated oil monitoring system in India is done in a conventional manner which is economically superior and imprecise resulting in minor difficulties and losses in automobile industry. In this paper, a real time EOM system for diagnosis of engine oil using IoT network is proposed and the experimental results show the better efficiency of model with the uses of cost effective and reliable sensor device for detecting the condition and level of engine oil according to the covered distance by vehicles. Developed EOM system is also able to successfully transmit the measured value using IoT network and displayed on smart devices display unit. EOM system is working properly that is observed in the experimental analysis section for two different scenario such as 10W-50 4T Scooter Engine Oil-Honda Activa 125 (1L) and 10W-30 Synthetic Engine Oil for Petrol Cars (3.5 L). Output resolution of the proposed EOM system is up to satisfactory level and also engine oil data can be remotely accessed with the help of IoT Network. In future trend of automated engine oil monitoring system, the concept of deep learning will be integrated as a classifier to train IoT Network based on sensor devices information to response fast in case of heavy vehicles.

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