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A REVIEW ON RESEARCH TREND IN ECONOMIC AND REAL TIME FUEL CONSUMPTION RATE COMPUTING BY DIGITAL MILEAGE METER

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ABSTRACT

Design of "ECONOMIC AND REAL TIME FUEL CONSUMPTION RATE COMPUTING BY DIGITAL MILEAGE METER" is intended to developing effective and economic mileage meter that can actively display fuel mileage of a vehicle and display it on screen and various related parameter. This device can be added as an enhancement to existing running automotive system too, which works on carburetor or even on running system with fuel injection technology. The mathematical calculation done by human to manually check the mileage of a vehicle can be automated with the implementation of this device. Also, the probable distance travelled by the vehicle corresponding to the amount of fuel in the fuel tank can also be estimated .

Keywords: Throttle Body Calibration, Mileage Meter

I. INTRODUCTION

Fuel mileage in vehicle refers to the relationship between the distance travelled by an automobile to the amount of fuel consumed. In the current scenario of hike in fuel prices, most of the vehicle drivers seek for economical fuel consumption. Moreover in today's world fuel saving is an important factor. For a developing country , where people are more obsessed with mileage of a particular vehicle. In conventional fuel mileage calculation method, the result are obtained by two successive refueling of the tank and also by the in vehicle parameters.The drawback of this process is that the results obtained will be after a day or two and also it is time consuming.

The fuel economy displayed by passenger vehicles and attempts to connect vehicular fuel consumption to such easily measurable parameter as vehicle speed, and throttle position.

Observation will be used to propose a formulation for predicting fuel consumption under different driving phases when the vehicle speed, acceleration and throttle position are known.

In spite of the recent financial crisis, global oil demand has steadily increased, largely due to rapid motorisation taking place in developing countries, in particular in countries with rapidly growing economies, such as Brazil, China, India and others. Oil demand growth is primarily driven by growth in the vehicle population, especially private passenger vehicles, as well as total vehicle distance travelled . Controlling the energy demand and greenhouse gas (GHG) emissions from personal vehicles has become a major challenge. Curbing vehicle population growth, reducing travel demand and improving vehicle fuel efficiency are three key elements to

reducing overall oil demand. A wide variety of approaches to address these three areas have been introduced in different parts of the world.

Most industrialized countries have established programmes to address transportation related GHG emissions. Fuel economy programmes and GHG emission targets, either

Mandatory or voluntary, have proven to be among the most cost-effective tools in controlling oil demand and GHG emissions from motor vehicles (An and Sauer, 2004).

The United States was the first country to establish fuel economy standards for passenger vehicles after the 1970's oil crisis. However, standards have remained unchanged for nearly a quarter century from the early 80s to late 2000s, while other countries - especially European countries, Japan, and recently China and the State of California of the US - have moved forward, establishing or tightening GHG or fuel economy standards. In recent years, recognizing the threat of climate change and potential oil shortages, efforts to further strengthen vehicle standards have been intensified globally, including a series of efforts by the Unites States.

Fuel economy programmes include both numeric standards and fiscal incentives to improve the energy efficiency of individual vehicles per unit of distance traveled. In today' stechnology-driven world, new technologies offer great promise to drastically improve vehicle fuel economy. Realizing such technological promise is contingent on strong policy. Technology development also responds to price. Relatively high oil prices, for example, have provided an incentive for manufactures and consumers to build and buy smaller and more fuel efficient cars.

Fiscal incentive programmes have improved fuel economy or reduced fuel use, Especially when implemented in combination with standards. Incentives can be directed at improving the efficiency of the vehicle fleet, through variable registration fees or taxes, or by limiting vehicle use, through fuel taxes and road use fees. Table 1 summarizes major approaches to reducing automobile fuel consumption and GHG emissions from light-duty vehicles.

Vehicles and the automotive industry are changing at an extremely fast pace from all Perspectives, including technology innovation and deployment, the development and Implementation of governmental standards and regulations, industry structural shifts and consumer choice. Many technological innovations require new thinking regarding how to measure and rate vehicle energy efficiencies and GHG emissions.

Country/region	***Type***	***Measure***	***Structure***	***Test Method***	**Implementation**
United States	Fuel	mpg	Footprint-based value curve	US CAFE	Mandatory
California	GHG	g/mile	Car/LDT1	US CAFE	Mandatory
European Union	CO2	g/km	Weight-based limit value curve	EU NEDC	Voluntary for now, Mandatory by 2012

Japan	Fuel	Km/L	Weight-bin based	Japan 10-15/JC08	Mandatory
China	Fuel	L/100-km	Weight-bin based	EU NEDC	Mandatory
Canada	Fuel	L/100-km	Cars and light trucks	US CAFE	Voluntary
Australia	Fuel	L/100-km	Overall lightduty fleet	EU NEDC	Voluntary
Republic of Korea	Fuel	Km/L	Engine size	US CAFE	Mandatory

Source: Adapted and updated from Table 2 of Feng An and Amanda Sauer (2004). Comparison of Passenger Vehicle Fuel Economy Standards and GHG Emission Standards around the World .

II. RESEARCH AND DEVELOPMENT

- **Jaimon Chacko Varghese, Binesh Ellupurayil Balachandran(1)** fuel mileage indicator was mounted on the motorbike as per the design and was tested under various test condition. the design was based on a standard motorbike and was implemented on any motorbike with the variation only in program to learn the vehicle design and parameter . the device was working normally under the standard test condition and displayed different values of the mileage under different condition.
- **Sadeque Reza khan , Arifa Ferdousi, Siddique Reza Khan(2)** in this advanced control system is designed with the PIC microcontroller which can measure the level of fuel tank by using high tech ultra sound sensor and store data in to a data acquisition system. Paper is for avoiding fuel stealing from generator fuel tank which has become an alarming issue as the price of the fuel is touching sky high day by day. so to prevent this problem ,different sensor like capacitive sensor, WGM method ,ultrasound sensor etc are used.
- **Vinay Divakar(3)** this paper describe the existing fuel gauge technique being used in automobile i.e. the traditional fuel gauge system and the smart fuel gauge system and also discusses their operating principle and a comparison is done between two existing technique based on performance, complexity and cost of

development .some issue with respect to the exixting technique are identified and so a better alternate sensing technology has been suggested, describe and justified.

- **M.Alghadhi, A Ball, L.E Kollar, R. Mishra, T. Asim (4)** the paper has looked into the derivation of a methematical model for the calculation of the fuel consumption when applied to NEDC. In this we examines the fuel economy displayed by passenger vehicle and attempts to connect vehicular fuel consumption to such easly measurable parameter as vehicle speed, acceleration, gear and throttle position. A few driving phase were identified so that any drive cycle may be composed by three phase ; and methematical relationship have been fitted on measured data for each of the phase.
- **An. Feng Earley. R, Weiskel.L.G (5)** objective of this background paper is to provide an updated analysis on recent worldwide trends in vehicle fuel economy and GHG standards, identify best practices, and make recommendations for future policy making to ensure realistic, enforceable and agreeable mitigation strategies to reduce transportation energy use and associated GHG emissions in a cost-effective way.
- **Kumar suresh. J, Ganesan. V. , Mallikarjuna. J .M. (6)** In order to bridge the gap, this study, design and optimization of a throttle body assembly for a single-cylinder engine used in two-wheeler application has been analyzed along with the investigation of critical flow through various sub systems using computational fluid dynamics (CFD). To start with, the throttle bore and bypass passage diameters are calculated from the basic flow equations. Using CFD, best possible throttle shaft profile is arrived at, which will enhance airflow to the engine. The airflow rate for different throttle openings is predicted taking into account the distribution of main and bypass flow.
- **Alsemgeest et al (7).**have carried out simulation of time-dependent flow through throttle valve to determine flow mechanisms for various throttle plate angles and compared the results with hexahedral and tetrahedral meshes. from this the relationship between blade angle and frequency of oscillation has been found .comparisons have also been made between solution with tetrahedral unstructured meshes and hexahedral structured meshes .finally it has been found that adding a breather pipe to the throttle removes the oscillation entirely.
- **Chen and Chen (8)** analyzed small airflow rate at engine idling by using CFD analysis to aid throttle body design and to study tolerance effect on the estimated airflow rate.
- **Diego (9)** have carried out CFD analysis across carburetor venturi for small engines. They have concluded that overall discharge coefficient can be used to correlate the mass flow rate.
- **Huang and Kim (10)** Have carried out numerical simulation of flow around butterfly valve to investigate the physical phenomena concerned with the flow field. For their analysis, they assumed incompressible fluid flow past the butterfly valve at different valve disk angles with a uniform incoming velocity.
- **Pursiful et al** (11) have carried out time efficient throttle flow data collection method by using a sonic nozzle flow bench. They have measured air flow as a function of throttle angle and pressure in a manner analogous to on-engine dynamometer throttle flow characterization.
- **Ross et al (12).**analyzed throttle body flow by using sonic nozzle flow bench to measure air flow as a function of throttle valve angle and pressure, in a manner analogous to an engine dynamometer throttle flow characterization. He also discussed the throttle body flow modeling considerations.

- **Song *et al (13).*** Have used metamodel to analyze the butterfly valve to optimize the design to reduce the weight. They have used orthogonal array method to perform the design of experiments.
- **Xue *et al (14)***.Have carried out fluid and structural analysis of large diameter butterfly valves. They have measured the flow performance for different opening angles. They have concluded that when the valve is closer to closing position, the flow is very turbulent.
- **Yoshihiro *et al (15).*** Numerically analyzed three-dimensional flow for different throttle openings, by using *k-e* turbulence model and pressure boundary conditions.
- **Wang et al (16)**. Have carried out here dimensional simulation of butterfly valve using a moving grid technique. They have studied the torque, flow and discharge coefficients.
- **Sood.R, Manjit.K, Lenka.H (17).**this paper describes design and development of low cost automatic water flow meter which supplies only required amount of water to the crops saving water as well energy. G1/2 hall effect water flow sensor is used as a sensing unit with a turbine rotor inside it whose speed of rotation changes with the different rate of flow of water. The hall effect sensor outputs the corresponding pulse train for frequency input to the microcontroller. the whole system comprises of AT89S52 microcontroller,G1/2 hall effect water flow sensor, relay optocoupler, a water pump , 5V supply ,LCD, keypad and some passive component .
- **Shuichi kosuge, Hiroshi, Hiroshi Arai, Hisatoshi Ohta (18).** Method and apparatus for indicating mileage corresponding to remaining fuel for vehicles includes a microprocessor connected to receive input signals respectively indicating a traveled distance and a consumed fuel quantity in a predetermined short period. During such time when quantity of fuel remaining in the tank is above a certain threshold level, the mileage corresponding to the remaining fuel is calculated by multiplying the remaining fuel quantity by a fuel consumption (Km/l) which substantially corresponds to the average fuel consumption during a period between two recent successive fillings of the fuel tank. After the remaining quantity of fuel has reduced below the threshold level, the value of the fuel consumption is updated by increasing the weight of the momentary fuel consumption which reflects the actual running condition. The microprocessor repeatedly calculates the mileage at predetermined intervals and the numerical value of the calculated mileage corresponding to the remaining fuel is displayed on a display unit digitally.
- **DILLI PRATHAP R, DASS R, UDHAYA KUMAR S (19).** This paper is intended to develop a low cost device that can actively display the variable mileage of automobile and simultaneously detect the consumption of alcohol of the driver and to prevent unwanted accidents.
- **Umesh P.Hade , Prof.A.R.Suryawanshi(20),** There are different mileage indication techniques used in automobile sector of vehicle. Mileage of vehicle depends upon the fuel consumed by the vehicle for travelling particular distance. It also depends upon the driving style of driver as well as road condition. Fuel consumption for travelling a particular distance is more while travelling vehicle in traffic, bad road condition and load on vehicle, so this indicates that the vehicle mileage also depends upon traffic condition and load on vehicle. Our paper shows the comparative study of different techniques to indicate mileage of the vehicle in real time. From current mileage and available fuel in the tank probable distance the vehicle will travel can be predicted.

- **Min Goo Lee, Yong Kuk Park, Kyung Kwon Jung and Jun Jae Yoo(21),** This Paper proposed the estimation method of fuel consumption from vehicle information through OBD-II. We assumed RPM, TPS had a relationship with fuel consumption. We got the output as fuel-consumption from a vehicle RPM, TPS as input by using polynomial equations. We had modeling as quadric function and surface function with OBD-II data and fuel consumption data supported by automotive company in real. In order to verify the effectiveness of proposed method, 5 km road-test was performed. The results showed that the proposed method can estimate precisely the fuel consumption from vehicle multi-data. It was observed that the proposed models using instantaneous engine RPM, TPS and (RPM, TPS) can predict the fuel consumption quite well with the coefficient of determination were 76%, 88% and 71% respectively.
- **Deep Gupta, Brajesh Kr. Singh and Kuldeep Panwar(22),** There are many sensor based techniques available in the market to measure the liquid level and gives you a close idea of quantity of the liquid, however none can provide you an exact approximation of quantity as in cars by fuel meters what we get an idea of whether tank is full, empty, half full etc. The liquid level detector and optimizer play an important role in tanks to indicate the level of liquid of a particular density. In this paper we have proposed a technique to measure the amount of liquid available in tank. This device digitally displays the level of liquid inside the tanks using load sensor. The measurements are taken so the accuracy level is of 96.36%-98%. Thus it is an efficient device made by keeping in mind the petroleum thefts at the various petrol pumps at the time of filling of tanks.
- **Ti-Ho Wang , Ming-Chih Lu , Chen-Chien Hsu , Cheng-Chuan Chen , Jia-Dong Tan(23)** An imaged-based measurement system using a single digital camera and a circular float to measure fill levels in liquid tanks is proposed in this paper. By choosing the float in a different color from that of the liquid in the tank, pixel counts of the float in the image captured by the camera can be calculated with the use of chrominance filtering and thresholding techniques. Based on an established relationship between the pixel counts of the diameter of the float in the image and the photographing distance, the measuring system can effectively measure the liquid level based on the images captured. Because pixel counts of the float in the image are first determined for calculating the diameter of the float, a subpixel resolution during the measurement can be achieved. As a result, measuring precision as well as accuracy via the proposed system can be significantly improved.
- **A.Avinashkumar , U.Singaravelan , T.V.Premkumar , K.Gnanaprakash(24)** This project mainly concentrates about the indication of fuel level in two- wheeler tanks .Various other features like the distance can be travelled to the corresponding fuel ,is added with this arrangement which will explain the clear performance of the vehicle to the corresponding fuel.
- **Dr. Utkarsh Seetha, Poonam Sharma(25)** Reeling under an average AT & C losses of around 33%, it is quite impossible for power distribution sector to keep up the desired economic pace without major reforms in the Power sector, especially in Distribution. System Integrator has been working closely in Power distribution sector to address AT & C loss reduction, bring transparency, improve customer satisfaction and increase employee productivity through right convergence of IT & Automation. Technology innovation can only benefit the sector and system integration has major role to play in empowering the power distribution utilities. There is a huge need for specialized, customized and upgraded system solution for the power sector and

System Integration Power solutions can help utilities to make a significant leap in Field Automation and reducing their Aggregate Technical and Commercial losses. The objective of Meter Data Acquisition Solution Provider is to collect meter data of DT and consumer meters at desired frequencies remotely and make available for DISCOM operations.

- **Farrel.G,Buttler.Jr(26)** A gasoline mileage indicator system gives instantaneous mileage readings. A sending unit attached to a flowmeter in the fuel line provides a signal to a gauge which registers fuel flow. One disc calibrated in miles per gallon is fastened to the speedometer needle shaft, and another disc having an indicator is fastened to the shaft of the fuel flow gauge. The discs are aligned so that the indicator on the fuel flow gauge disc will point to the proper miles-per-gallon calibration on the speedometer disc.

III. CONCLUSION

A procedure for designing a throttle body required for fuel injection in spark ignition engine has been successfully arrived. In addition, design verification has been done with CFD analysis for maximizing flow rate through the throttle body and for arriving required opening of the bypass screw for driving accessories at idling conditions. Also, CFD analysis has been performed at different throttle opening positions to study the flow fields. Different techniques for mileage calculation of the vehicle are explained. Mileage calculation by using flow meter, electronic fluid value and high resolution fuel sensor can find the mileage accurately. These techniques can be used in automobile industry in future and can provide correct information about fuel consumption and mileage of the vehicle.

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