VEHICLE OVERTAKING ASSISTANCE SYSTEM

P. Prakash[1*], S.Sivaganesan[2], C.Dhanasekaran[3], A.parthiban[4]

[1]Assistant Professor, [2,3,4]Associate Professor Department of Mechanical Engineering, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, Tamilnadu, India
[1]*prakash1033@gmail.com

Abstract

This paper describe about disconnecting the air conditioning compressor and the dynamo for increasing the engine power while overtaking the vehicles in highway. The speed to overtake should be such that it does not put anyone at risk. Preferably done in lower gear (despite it being bad for few engine) - 3rd should be fine. The reason is that in lower gear, engine not only gets better acceleration but also quicker deceleration when step off the pedal. Quicker deceleration means that vehicle slows down faster and remains better in control so a small delay in braking will have much less risk if a situation arises where in suddenly a vehicle appears in front of the driving vehicle. The engine speed and power plays a important role in the overtaking, due to reduction of gear for overtaking engine speed gets decreases. If the engine power distributed to the wheels can be increased while overtaking it is much better for the drivers to overtake a vehicle without any risk (no need to shift down the gear from top). This theoretical design concept approach increased the engine power by reducing the power distribution to other parts other than wheel.

Keywords: overtaking assistance system, kick down switch, actuation relay, load

1. Introduction

From the past scenario , the accidents are mostly occur while overtaking a vehicle due to lack of communication between the vehicle , lack of speed and power, traffic, invisibility of road if it is large vehicle, lack of monitoring due to shift down the gear for getting high power and lack of space and time. For overtaking the over taker has to monitor the traffic, side mirror, front and back moving vehicle, space and time. If the engine power of overtaking vehicle is higher than leading vehicle, then there is a possibility of easy overtaking with less risk. The engine power can be distributed to the wheels while overtaking it is much convenient for the drivers during panic overtaking situations. The proposed idea is disconnecting the air conditioning system compressor and the dynamo while overtaking the vehicles in high way. The alternator and the air conditioning system carry the load from the engine while running, if these systems are able to deactivate, then the additional power can be supplied for running wheels. The extracted power reached on the wheels will provide more power to the vehicle to cruise during overtaking. The overtaking system consist of a kick down switch, it will be depressed by the driver when cruising speed required. The kick down switch will be activating the relay and the relay will disconnect the air conditioning compressor and the alternator. So the balanced power will be supplied to the driving wheels.

Antonio et al [1] described a fundamental concept for developing a messaging application with reliability of 99 percentage using sensor technologies and kinematic for safe overtaking and also mentioned the reason for unwanted accidents and traffic is due to communication lack because of that collision of vehicle followed by one by one. Geertje Hegeman et al [2] proposed advanced driver assistance system for overtaking in rural roads. For overtaking some task of subtask has to be prepared for decision taking such as lane changing from initial position to new one, passing, returning to its original lane, steering and monitoring, accelerating
and maintaining proper distance and judging speed, overtaking distance, space between the vehicle are followed in normal overtaking along with that integrated the ADAS system for safe operation.

**Corresponding author's email: prakash1033@gmail.com*

Ardalan Vahidi et al [3] reviewed the recent trend of research in development of driving assist system for avoiding accidents. Review concentrated on ACC, collision warning, collision avoidance system driver comfort, safety and traffic flow. AHS serves as a beneficial in production line by breaking the entire implementing barrier. José Santa et al [4] investigated a system for diminish overtaking risk with single lane but opposite directions, research focused on development of trajectory prediction and using sensor and HMI for avoiding chances of accidents. Wasudeo et al [5] made review on implementation of overtaking assistance system and concluded the comparison of various technologies used in overtaking assistance system with ADAS. Observed that overtaking is difficult in two way and two lane roads, particularly in India difficulty is very high for safer overtaking. Best system means it should suggest when to take overtake, steer the vehicle and apply brakes to the vehicle in real scenario. Geertje et al [6] made observation of different parameter before, during and after overtaking a vehicle in fifty different maneuvers on two lane rural roads with speed limit of 100 km/h. Analyzed at different speed the duration of overtake a vehicle and is recorded. Mentioned some driver not use indicator for overtaking. Mentioned average duration of overtaking is 7.8s plus or minus 1.9s but no difference in duration for the following overtaking strategy of accelerative, flying, piggy backing and 2+, from this clear that one system is enough for all the strategy. Dario et al [7] segmented the driver reaction before, passing and after overtaking and mostly average of 2-3 seconds for lane change. First when changing lane initially decrease the speed and increases the speed to top level until reaching the initial lane.

From the above studies noted that for overtaking high power and speed is needed but actually in some vehicles we have to shift down the gear and then shift gear to top level but if this concept is implemented no need to shift down the gear, For this acceleration pedal is pressed beyond certain limit for actuating the kick down switch. This overtaking system follows flying and acceleration strategy.

2. Design Methodology and Working Principle

Most of the vehicles consist of engine, alternator, air compressor, acceleration pedal, battery and etc. In the overtaking system along with the conventional vehicle components additionally some components are equipped such as kick down switch and actuation relay.

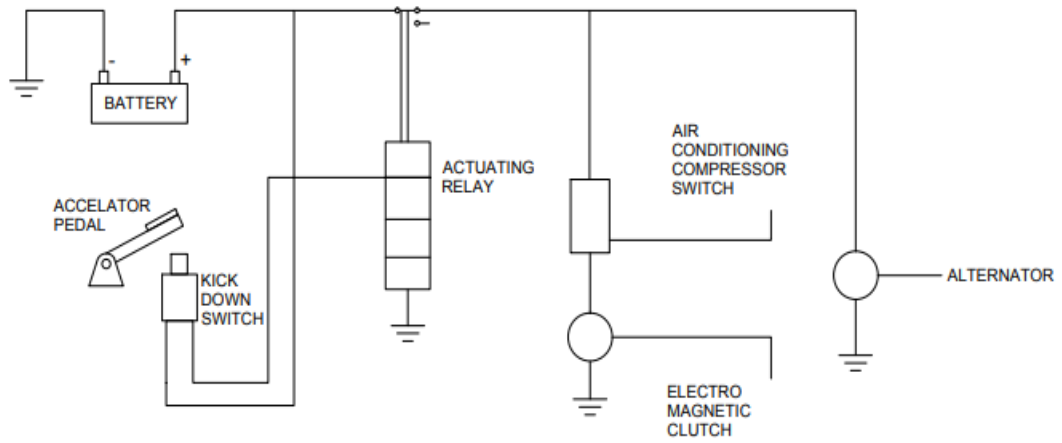

fig.2.1 Schematic design of overtaking assist

The 12 volt battery will be supplied with DC voltage to the air conditioning compressor and the alternator is shown in the figure. When the driver depresses the accelerator pedal, the kick down switch will get actuated, the DC 12 volt supply from the battery goes to the actuation relay then the actuation relay deactivates the alternator and the air conditioning compressor. The KW power which

is saved in the deactivation of both these system will be supplied to the driving wheels. By this way of technique overtaking power can be increased.

2.1 Solution Methodology

1. The driver meets with the panic overtaking situation in the high way.
2. The driver depresses the kick down switch placed below the acceleration pedal.
3. The kick down switch will be actuating the actuation relay.
4. The actuation relay deactivates the air conditioning compressor and the alternator.
5. Engine power saved due to the deactivation of the air conditioning compressor and alternator will be delivered to the driving wheels.
6. The vehicle gets picked up and overtakes the leading vehicle in front.

2.2 Engine Load Calculation

The following data are for maruti esteem engine,
Engine power = 85bhp
We have to convert bhp into KW,
1bhp = 0.745 KW
Therefore, engine power = 85*0.745 = 63.325 KW
Air conditioning compressor input power = 5 KW, refrigerant type R134a
Alternator power at charging = 4 KW
When alternator power and air conditioning power are in idle then the increased engine power is,
Total engine power = 63.325+5+4
Engine power = 72.325 KW
Where,
KW- Kilo Watt
bhp- brake horse power

3. Results and Discussion

3.1 Power Transmitted to Various Loads

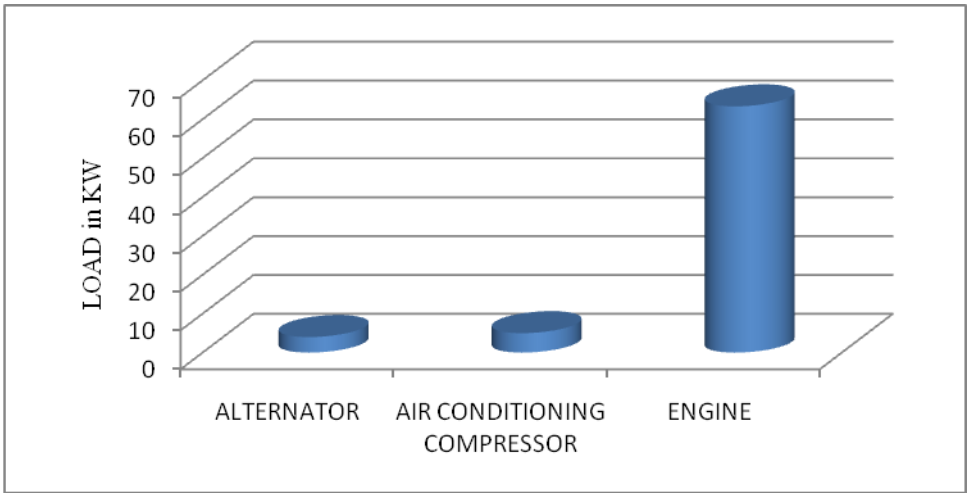

Fig. 3.1.1 power transmitted to various loads

When the conventional engine is operated major mechanical power transmission is shown in figure 3.1.1. Actually the power developed is not fully supplied to the wheels, it is distributed to various components such as engine, alternator (dynamo), air conditioning compressor and etc. while overtaking, over taker has to shift down the gear for getting high power because of that speed gets

decreases which leads to increased fuel consumption for overtaking and some careful monitoring also involved.

3.2 After Actuating the Kick Down Switch Power Transmitted to Various Loads

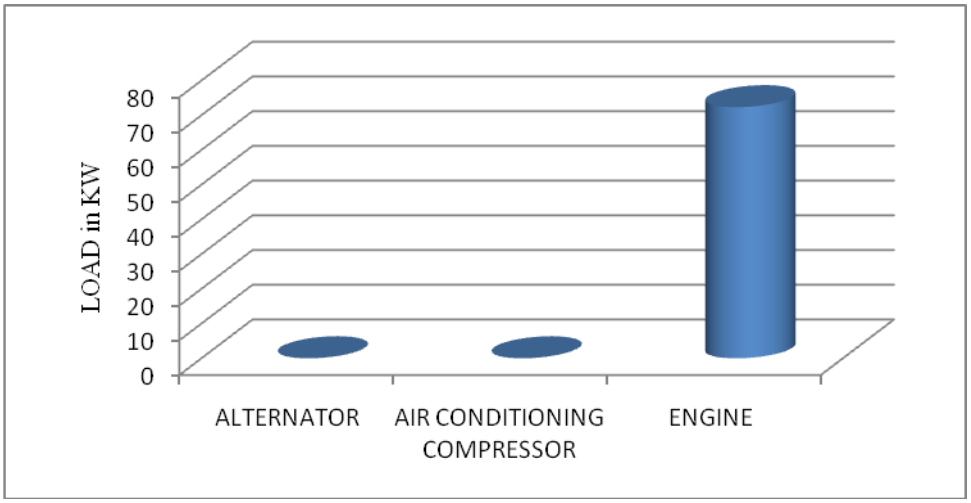

Fig. 3.2.1 after actuating the kick down switch power transmitted to various loads

After actuating the kick down switch power transmitted to various parts are shown in figure 3.2.1. From these it is clear that when the kick down switch is actuated that the relay disconnect the air conditioning compressor and alternator from consumption of load, because of that more power is supplied to the wheels. It is observed that, if we go for overtaking assistance system, somehow can save fuel for overtaking and less risk of overtake that is no need to shift down the gear from top to lower level

3.3 Advantages

Overtaking power can be increased

Fuel consumption increased due to down shifting in overtaking can be eliminated.

Convenient for the driver while over taking.

Kick down switch provides sporty effect in overtaking

3.4 Application

The system can be used in passenger cars.

It can be used in buses and trucks.

4. Conclusion and Future Work

Thus developed a design and fabrication of overtaking assist in Maruti Esteem engine. Based on the design and fabrication of overtaking assistance system power transmitted to the wheels has been increased. By implementing this approach it is evident that the engine power transmitted to the output power is increased by 15% of the normal power transmission. This assists the driver to run the vehicle with easy access while overtaking without reducing gear to lower level and helps in transferring the

power from the air conditioning when ever required and saves the fuel considerably than the normal way of overtaking.

This paper ideology can be implemented to the various automobile engines and industrial areas. Thus increasing the power in the engine, that power can be distributed to the wheels while overtaking it is much better for the drivers. It can avoid accidents while overtaking vehicles.

References

[1] Antonio S.S, Joaquim C, Ahmed Patel, Mona Taghavi, "Driver Assistance System towards Overtaking in Vehicular Ad Hoc Networks", The Ninth Advanced International Conference on Telecommunications, ISBN 978-1-61208-279-0 AICT (2013)

[2] Geertje Hegeman, Karel Brookhuis, Serge Hoogendoorn, "Opportunities of Advanced Driver Assistance Systems Towards Overtaking", EJTIR, vol.5, (2005) no. 4, pp. 281-296

[3] Ardalan Vahidi And Azim Eskandarian, "Research Advances In Intelligent Collision Avoidance and Adaptive Cruise Control", Ieee Transactions On Intelligent Transportation Systems, 1524-9050, Vol. 4, No. 3, September (2003).

[4] José Santa and Miguel Angel, "A Cooperative Overtaking Assistance System", IROS 2009 3rd Workshop: Planning, Perception and Navigation For Intelligent Vehicles. (2009)

[5] Wasudeo Shreeniwas Gurjalwar, "A Review On Vehicle Overtaking Assistance And Their Implementations", International Journal Of Science And Research (IJSR), ISSN (Online): 2319-7064, Volume 6 Issue 6, June (2017).

[6] Geertje Hegeman, Serge Hoogendoorn, Karel Brookhuis, Observations Overtaking Manoeuvres On Bi-Directional Roads, Advanced OR and AI Methods in Transportation. January 2005

[7] Dario D, Salvucci, Andrew Liu, "The time course of a lane change: Driver control and Eye-movement behaviour", Transportation Research Part F 5 (2002) 123–132