Comparative Analysis of Hydraulic And Electronic Power Steering System

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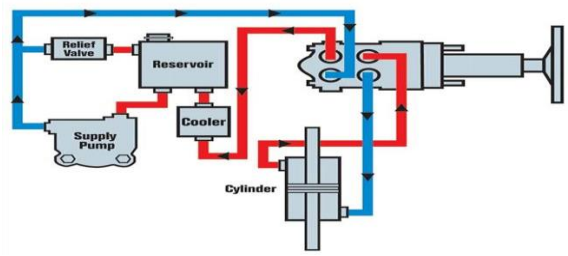
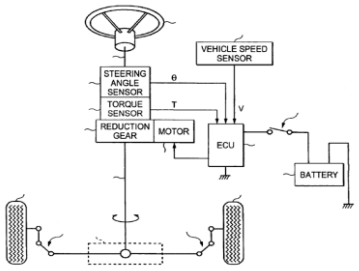
I. INTRODUCTION

Most vehicles in service today have front-wheel steering, although a few vehicles have been marketed with four-wheel steering. Thus, the bulk of this chapter will discuss the front-wheel steering systems to include the following: a discussion of the steering mechanisms available, including power-assisted steering.



(Fig:- HPS System)

The main components are reservoir, pump, control valve, relief valve, power cylinder, steering wheel, steering shaft, steering gear, pitman arm, tie rod. Reservoir supply fluid to pump and pump transfer it to relief valve with pressure, than to control valve. The control valve directs the fluid to power cylinder and than to reservoir.



(Fig:-EPS System)

An electric motor is mounted on either the steering column or steering gear usually a rack-and-pinion setup applies torque to the steering column, assisting the driver to turn the steering wheel. Sensors detect the position of the steering wheel and any input from the driver – hauling on the wheel to change the vehicle's direction. A control module applies assistive torque via the electric motor. If the driver is just holding the wheel steady, at the straight-ahead position, the system doesn't provide any assistance.

II.RESEARCH REVIEW AND IDENTIFICATION

Many researches have been done research effect of steering types on the performance of engine some of them researches are discussed here.

{1}Describe that the hydraulic steering system, large steering torque gained during rapid steering input is caused by the response lag of flow control valve, rapid reduction of cylinder volume and the connection of hydraulic line from pump to the cylinder. The pump noise and self excited vibrations are also remains, non eliminated totally.

{2}It was found that 3% of total loss of energy consumption in hydraulic steering system which is addition of over flow loss of pump 1.4%,system weight and efficiency loss from belt and pulley is 0.5% each and over flow loss by the flow control valve is 0.3%. For the electric power steering system there are issues of packaging, high power, steering feeling, cost, global supply.

{3}Concluded that improvement in fuel economy is greater for smaller engine vehicles. The results demonstrate that a 1% vehicle fuel economy improvement can be achieved in a vehicle with an electro-hydraulic power steering compared to a vehicle with hydraulic power steering.

Summary from Literature Review After a comprehensive study of the existing literature, a number of gaps have been observed in steering systems EPS is more efficient than HPS because HPS has issues of energy losses, more weight, more maintenance, response lag, low mileage. Whereas EPS also has issues of steering feels, high power, cost, global supply and so on.

EPS is comfortable on lightweight low powered vehicles and HPS is comfortable on multi axle or high powered vehicle.

Possible solutions in case of petrol engine to improve performance by using the sources which is utilizes the less engine power with required function this can be provided by

using Electronic power steering instead of Hydraulic power steering system which utilizes less engine power and gives better fuel economy.

III. PROBLEM DEFINITION

Now a day's automobile industry has been changed due to day by day innovations and researches. All innovation and researches directly or indirectly leads towards the fuel economy.

So for the fuel economy and comfort there are so many researches and innovation on steering system are on their way. I also choose this way for my research process.

In earlier days there a is mechanical steering system used which is eliminated by the use of hydraulic steering system and now a days EPS is in trend.

Current hydraulic power steering system with constant flow accounts for 3% in energy consumption.

EPS has issues such has packaging, high power, steering feeling, cost etc.

So comparison will done on both the system with different parameters on different surfaces comparison will done on santro car because it was using both, hydraulic steering and electronic steering system.

In above literature review many author discussed using electronic power steering instead of hydraulic power steering improves the fuel consumption and engine performance but no any research paper that measures the engine performance with both systems. Thus we decided to calculate engine performance with both the system.

After taking the measurements of the both system, combination of both system will done to reduce energy losses.

IV. CONCLUSION

From the experimental following conclusions are made.

1) Power consumption by hydraulic power steering is almost constant at every speed and does not affected by road condition.

2) Power consumption by electronic power steering is decreases as the vehicle speed increases.

3) Power consumption by electronic power steering is depending on the road conditions. On rough road power consumption increases due to higher road and tire friction. On concrete and bitumen road power consumption by the electronic power steering is almost similar.

4) Power consumption by electronic power after the speed of 50Km/hr is almost negligible because in electronic power steering motor cutoff is provided after that speed.

5) When comparing power consumption by hydraulic power steering and electronic power steering hydraulic power steering consumes more power than another system.

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