Electric Power Steering- EPS

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Abstract:- Electric power steering is new technique for automobiles. Due to the low efficiency of traditional hydraulic power steering system, EPS is used as an alternative. In this paper we defined the basic construction, working theory and design of electric power steering system. Steering system has been optimized in EPS. Mechanical linkage has been replaced by pure electronically controlled steering. So the design of power steering system is become more simple and friendly by using EPS technique. EPS proved its benefits in automobiles over traditional hydraulic power steering systems.

Keywords: Electronic control unit (ECU), sensor and motor. Steering mechanism, EPS (Electronic Power Steering System)

I. INTRODUCTION & WORKING OF RELATED IMPORTANT COMPONENT

Steering For Driving:- Elsewhere on this site you can learn about all the other stuff that makes a car go and stop, so this page is where you'll learn about how it goes around corners. Car steering system was developed in 1758 by Erasmus Darwin, father of Charles Darwin, in a paper entitled "Erasmus Darwin's improved design for steering carriages--and cars". It was never patented though until 1817 when Rudolph Ackermann patented it in London, and that's the name that stuck.

Basic Components:- There are four basic components used in maximum car steering system. Column assist type, the pinion assist type, the direct derive type and rack assist type are main forms of EPS system according to position of the assist motor. The efficiency of EPS system is more the hydraulic power steering system. Because in HPS system fuels or power continuously supplied to derive the hydraulic pump, but in case of EPS system fuels supply when needed only. Basic components of EPS are:

- Torque Sensor
- Actuators
- Rotational angle sensors
- Data communications
- Vehicle speed sensor
- Steering ratio

Fig. – Basic components of EPS

Ratios: Steering ratio is defined as the ratio between turn of the steering wheels and turn of the wheels. Both turn will be calculated in degrees. To turn the steering wheel more, we have to apply high steering ratio and to turn the steering wheel less, a lower steering ratio is required. High steering ratio is more complicated as compare to lower steering ratio.

Working Principal Of EPS:

EPS system is more light and smaller as compared to conventional steering system. So many components are eliminated in EPS system constructions.

- Depending upon wheel position and vehicle speeds, Electronics control unit determine the assist power required to transmit the torque to the wheels of the car.
- EPS motor applied a forced that’s required for reducing torque by rotating steering gear.
- In case of fail-case mechanism, if sensors detect any ECU problem then EPS disconnect power from the motor.
Electronics control unit design:

EPS ECU involves following devices like A/D converters, microcontrollers, motor derive circuit and regulated power supply.

Three sensors provide three analogue information with the help of A/D converters. After this microcontroller performs the necessary action on the basis of information provided. ADC algorithm is used to derive ESP system:

- The EPS is enabling, when the sensor’s output is at high level and disable if output is low.
- When the vehicle speed sensors detect the speed over 40km/hr, then the EPS turn off.
- PWM=0, if voltage rating 2.5v is sensed by torque sensor.
- Wheels will be rotate in right direction if voltage rating less than 2.5v.
- Wheels will be rotate in left direction, if voltage rating more than 2.5v.
- When the current rating is sensed more than 51Amps, ESP will disable.

Benefits of EPS:

- Construction and design of EPS system is simple and easy as compare to conventional power steering systems. Only battery connection needed for the work output.
- There is no need of any messy hydraulic connections.
- Smaller and light weight structure due to elimination of many components such as valve, pumps, sparks etc.
- Mechanical drag reduced in EPS design structures.
- Design of EPS system is based on fail-safe consideration.

II. CONCLUSION

In these systems “Active control” as it is known as constant feedback from sensors in the Car to the control unit, which calculates sophisticated computer algorithms. This allows the steering system to react to the road, the weather and even the type of driver, and provide assistance to the front or rear road wheels independent of direct driver input. Active steering produces enhanced steering response, stability & handling improvements to the vehicle without impacting the base steering feel.

REFERENCES

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