

Three Phase Four Wheel Steering System

(1) Jeetesh Kushwah (2) Divya Bhilwar

*B.E. Students, Department of Automobile Engineering,
Madhav Institute of Technology and Science,
Gwalior, Madhya Pradesh, INDIA.*

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ABSTRACT

A four-wheel steering system is used in light motor vehicles to improve manoeuvrability. In the Two-wheel steering system, the front two wheels follow the steering wheel and the rear wheels do not play any role in this system, it is also called a front-wheel steering system. In the four-wheel steering system, the wheels follow the steering and can be rotated either left or right according to the requirements. The system works in three modes, in phase, counter phase, and zero rotation. These modes help the system to reduce the turning radius while turning. The counter phase reduced the radius while the vehicle is in turn motion and in phase reduces the radius in sliding motion. This system reduced the oversteer and understeer of vehicles.

I. INTRODUCTION

Four-wheel steering (4WS) is a very advanced technology that is used in the new generation vehicles, More efficient than the two-wheel steering (2WS). This technique can improve the steering mechanism in vehicles. This technique was developed in Automobile Industry. This method is used to help the steering to take an effective turn.

Four-wheel steering, 4WS is also known as the all-wheel steering and rear-wheel steering. This is not the four-wheel drive in which all four wheels of a vehicle are powered. It is a four-wheel steering system in which steering steers the rear wheels during turning manoeuvres. It improves the Handling during turning and taking the Pass.

In four-wheel steering, the Rear wheels turn with the front wheels to increase the stability of the vehicle. The rear wheels move in the opposite sense to the front wheels at low speed, and at high speed, both the front and rear wheels move in the same sense. With this method, the turning radius of the vehicle is reduced which helps the vehicle to park and Lane change at high speed and corner at low speed.

II. BACKGROUND THEORY

One of the most effective steering, all four wheels are used for the steering purpose of this type of steering system. In two-wheel steering or front-wheel steering, the only front wheels turn towards the left or right, and the rear wheels stay in their neutral position and do not turn. So normally this type of system is not been the preferred choice due to many complications of conventional mechanical four-wheel steering systems.

In modern technology, the modern 4WS system is of fully electronic steer-by-wire system. The system consists of equal steer angles, for both front and rear wheels and the steering angle is adjusted by this inreal-time. For production purposes, the complex 4WS system hasn't been created. All the models that have been created and experimentally tested successfully. The idea behind the 4WS system is that a vehicle all four wheels are steering the vehicle. The purpose of this 4WS system is too quick response, and effective results, neglect the complexity and prevent the accidents.

III. PHASES OF 4-WHEEL STEERING

In the four-wheel steering system, the front wheels, as well as rear wheels, can be rotated simultaneously. There are mainly two types of steering.

The front and rear wheels are steered in the same direction, which is very useful in lane changing, during this process the front and rear wheels are parallel to each other. During turning the vehicle, the vehicle, the rear wheels steered in the direction opposite to the front wheels. This steering system reduces the turning radius and space required by the vehicle.

The Quadra steer is the system that gives full-size vehicles manoeuvrability or greater ease while driving a trailer at low speed. It improves the handling, control and stability at a higher speed. The four-wheel steering works mechanically with the help of linkages and the system utilizes a

manual manipulator to control and direct the articulation of the rear wheels.

(3.1) Positive Phase

In the positive phase, all wheels turn in the same direction. With the help of this drive, the centrifugal force is reduced on turning at high speed. The phase works at high speed and it prevents the vehicle from skidding.

(3.2) Negative Phase

In the negative phase, the rear wheels turn in the opposite direction to the front wheels. This phase works at low speed. The system helps the vehicle to turn in minimal space.

(3.3) Neutral Phase

In this type of phase, the rear axle does not move either clockwise or anticlockwise, but only the front Axel moves. The rear wheels are unmoved. This is the most common drive that we see in our daily life in all four-wheelers.

ADVANTAGES

- Vehicle's straight-line stability is increased at high speed.
- At low-speed vehicle's turning radius and tight space manoeuvrability is reduced.
- At high speed the centrifugal force is reduced on turns.
- It prevents the vehicle from skidding at high speed on wet and slippery road surfaces.
- Less tyre wear.
- Improves the stability in lane changing at high speed.
- The vehicle's cornering behaviour becomes more stable and controllable at high speed.

DISADVANTAGES

- Without power steering it cannot be applied.
- The initial cost is high.
- The crabbing effect is increased while driving the vehicle.

APPLICATIONS

- With the four-wheel steering system we can turn the vehicle at a crossroad or other junction where the roads intersect at 90 degrees or a tighter angle.
- The four-wheel steering system helps the vehicle to park easily with less turning radius than the two-wheel steering system. As a result, the vehicle is turned in a small radius at parking.

- On narrow roads the four-wheel steering system reduced the rotation of steering wheels, making them easier to turn the vehicle.
- The system helps to steer the vehicle in very less space in Ghats sections.
- In U-Turns.

IV. CONCLUSION

The four-wheel steering system is very useful in vehicles, from which we overcome all problems and we get the necessary desired output. It is also very useful at low speeds, to turn the vehicle in very less space or at tighter angles. Thus the four-wheel steering system has got steering response, cornering capability, straight-line stability, low-speed manoeuvrability and lane changing. It is very advantageous over the conventional two-wheel steering system. Four-wheel steering is complex and expensive. Currently, the cost of a vehicle with a 4WS system is more than for a vehicle with a conventional 2WS system. From time to time the four-wheel steering is growing in popularity and it is likely to come in more and more new vehicles. As the system becomes more commonplace the cost of 4WS will drop.

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