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Wheel Alignment Process

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Abstract

Wheel alignment is important to increase tyre life drivers comfort and for safety purpose. Michelin vehicle wheels causes adverse effect on vehicle which leads to uneven wear of tires may sometimes lead to skidding while driving and also affects the overall mileage of vehicle by consuming more power. Disbalance cause creation of noises and effects overall riding experience. This paper discusses the methods of wheel alignment and different experiments that are done for wheel alignment process.

Keywords: Caster, Camber, Toe in, Toe out, Wheel alignment

Introduction

Wheel alignment is important for a vehicle as it may cause disbalance while driving may lead to skidding and results in an uniform wire of tyres at edges. Wheel alignment process includes checking of three things i.e;

1. Toe
2. Caster
3. Camber

Toe: we see a form front of vehicle it must be parallel to one another in straight line but sometimes due to the shock of rock or by accident tires may get damage and cause problems like toe in or toe out. To in is case where will tends to move inside towards each other and toe out is the case in which tyres tends to move outward. To in is called positive toe and toe out is called as negative toe. Toe in causes feather edging type of wear and toe out causes reverse feather edging of tyre. Toe in leads to wear of tyre on outside edge, were toe out leads to to wear of tyre at inside edge.

Caster: Caster is called as tilting of steering in front or in back direction. Front wheel is generally fitted back to give positive caster. Castor if is in front with reference to ideal acceptable range is termed as negative caster and that in back is termed as positive caster. Perfect caster angle gives comfort and directional control to driver. Defect in caster may be caused by Rock shock which may lead to give light feeling of steering because of one steering or suspension parts.

Camber: It can be observed when a person stands at front of vehicle. It is the angle between normal line that passes from the middle of the tyer to the wheel plane. Tilting of wheel at top is called positive camber and in bottom will be called as negative camber. At some point of time wheels can be positive as well as negative

camber on both axes. Most of the times above mentioned things are check but sometimes there may be defect in steering Axis inclination (SAI). Tyre surface should be in full contact with ground to avoid an even wear of tyre. This can be checked using scrub radius which should be equal in all tyres and have equal amount of contact with road surface.

This process can be done using computerized method. Car is brought on platform and lifted using pneumatic Jack. Census are attached on all the wheel disc. Automatically census records caster camber and toe angle. If any defect occurs in recording instrument all of them will be adjust by tightening or losing tie and push rods.

One of the case study was done on Toyota premio which is 1650 CC vehicle. This was used for travelling and as a good carrier. It was recorded for a year, every four months or after completion of 5000 km wheel alignment was checked. It was found that adjusting caster camber and two after every four months show great impact on tyre life. This was good which results in increase in tyre life give better performer and safety of suspensions assembly. It was recommended to check wheel alignment every 4000-5000 kms.

Some use machine vision based system. Vehicle was lifted on pneumatic Jack at about 0.8 m distance. Four columns near wheel has two QXGA resolution ½ inches CMOS camera with LED light (NRI 800nm) wavelength. Will was marked by markers below circular outer line using camera and light shows the deflection was calculated and if any misalignment occur was adjust it by adjusting pushrods.

A company named Android studio develop software Nexus tabled which was used in a small all device connected to the wheel which gives alert to the driver of a vehicle about any misalignment. This device cost about 50.9 5 dollar. Hardware things in this device where 3 Axis accelerometer (two major position of wheel in three dimensions), Bluetooth low energy microcontroller (which collects data from accelerometer), USB programming shield (to load and modify program), 3.3 volt button cell battery. When device is connected to wheel driver is is asu drive vehicle on straight path by which device measures X Y and Z coordinates of wheels does we can find if our will is misaligned or not if will is Miss a line it gives alert to the user.

Experiment on wheel alignment inspection was done by using three point cloud monitoring. For this process kinect camera developed by Microsoft in which will is set as region of interest and coordinates is found and compared with the cloud point so that proper wheel balancing can be done if will is mis aligned. Kinect camera module consists of a IR projector(640×480p), IR monochrome, CMOS Camera and RGB camera. If wheel has reflective surface then the the will is covered with Matte adhesive film. Image of wheel is taken and it undergoes noise reduction process. Current point obtained by sensor are compared to the cloud points. It misalignment occurs it can be seen on the screen if alignment is in positive direction it will show red colour and if in negative direction it will show blue colour. Based on this wheel are aligned by adjusting pushrods nuts.

A series of experiment was done on a light motor vehicle to see effects wheel alignment on vehicle speed and braking. It experiments where done each on both aligned and misaligned wheels. Speed of vehicle was kept in range of

20-90 km/hr, range of travel was 8km and weight of vehicle and three persons in vehicle was 1305kgs and 195 kgs respectively. After checking amount of fuel consumption it was found that aligned vehicle consumes will lesser fuel than that of missal and vehicles.

Braking test was done on smooth and rough road conditions. Vehicle was allowed to attend speed of 40 km/hr. 6 experiments where done with number of breaking 0, 20, 40, 60, 80 and 100 times. Fuel required on smooth road was less than that on rough road. They found that fuel consumption depends on the factors like alignment of wheel speed of vehicle and number of times the brakes were applied.

Effects of misalignment:

1. Un - uniform wire of tires
2. Skidding
3. More power consumption
4. Decrease in mileage
5. Noise and balancing problem
6. Driver is not comfortable while riding
7. Edge wear of tyre

Conclusion

Misalignment causes and effects tires life and vehicle. So having proper alignment of vehicle is important which adds life to tyre gives confidence to driver while driving and vehicle gives proper mileage as well as our assembly will be good for longer period of time.

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