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Investigating the effect of road roughness on automotive component

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ABSTRACT

Suspension systems are one important part of automotive chassis that impact the level of passenger comfort and vehicle aerodynamics is clearly. So, a good suspension design is considered all vehicle designers in automotive industry. Suspension systems are composed 4 main components such as springs, shock absorbers, suspension mechanism and its interface of connections that its mainly tasks are isolation of a car body from road roughness to comfort passenger travel and establish a permanent contact between tire and road conditions to the proper performance tire is in motion. Therefore, suspension testing that has a direct impact on passenger safety and comfort is essential and important. Given the high cost and time of testing should be used different ways to study it.

This paper presents used a quarter car model in according road classification **ISO 2631-1** is achieved road roughness as PSD function in a constant speed of car by using Matlab Code. in continually, study effect of random vibration and variable amplitude loading (**VAL**) on the suspension system performance. Finally, has been studied tire adhesion to the ground.

1. Introduction

Engineers have recognized for over one hundred fifty years that metals will fail in fatigue. Contemporary fatigue analysis came to life within the eighties once in-vehicle load measuring became obtainable with analysis code and inexpensive computers. In automotive design, durability analysis of parts supported experimental assessments is long and valuable, therefore analytical approaches that embody restricted variety of element verification tests have gained a lot of attention [1]. The analytical approach combined with a restricted variety of element testing reduces design cycle time as a result of reduced testing, permits cheap analysis of changes in geometry, material, loading and producing method through performance simulation, and at last provides analysis techniques for product optimization and failure analysis [2]. The FEM has become a robust tool for the numerical solution of a good varies of engineering problems [3].

Results are vital in calculative and confirmative safe part lifetimes. Within the past, durability analysis was for the most part the province of investigating. In classic structural analyses, failure predictions are only supported the material strength or the yield strength [4].

High-speed road identification may be a technology that began within the 1960s once Elson Spangler and William Kelly developed the mechanical phenomenon profilometer at the overall motors science lab. Some users still decision high-speed profilers by their early name: GMR profilometers.

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In the past period of 10 years, identification instruments became the daily tools for measurement of roughness. The majority of states currently own road profilers. A considerable body of information exists for the field of profiler style and technology [5].

2. Surface roughness

Since the discovery of contemporary cars, quantification of road roughness has been interest. Path of travel's profile may be a two-dimensional slice of a road surfaces, taken on associate degree unreal line. Fig. 1 shows longitude and lateral profiles on a paved surface. Profiles taken on a receptor show the elevation changes in during of the road, whereas longitudinal profiles show the roughness.

Profilers are devices accustomed measure road profiles. There are a unit many varieties of profilers and that they disagree by the resolution, the interval of measurements recorded, and therefore the speed at that the profiler is ready to take measurements. A profiler works by combining a reference elevation, a height relative to it reference and longitudinal distance [5]. A device, known as a rod and level, forms a basic profiler shown in Fig. 2.

The level provides the peak reference, and therefore the reading from the rod is that the elevation modification relative to the reference. The longitudinal measurements between the rod and therefore the level area unit enamored a measuring instrument or a laser. The rod and level may be a static methodology as a result of the instruments does not seem to be moving when taking measurements.

Inertial profiler was developed in sixties by General Motors Research Laboratories that made high-speed profiling possible [5]. An accelerometer is mounted on a moving vehicle and measures the vertical acceleration. The provided data can be processed by a computer. By using an inertial reference height, the elevation change of the accelerometer in the vehicle may be defined. A laser transducer measures the roughness of the road. Combining the data from accelerometer, transducer and the vehicle speed, high-speed profiling is possible. The development of the inertial profiler made monitoring of large road networks possible.

Since the early 1970s different models have been performed to describe road profiles. Advanced technologies allow obtaining comprehensive data to analyze road profile. An example is the laser profilers. In sampling intervals of about 50 mm is now possible to get high speed profiling with very high resolution. These data can be coupled with the vertical

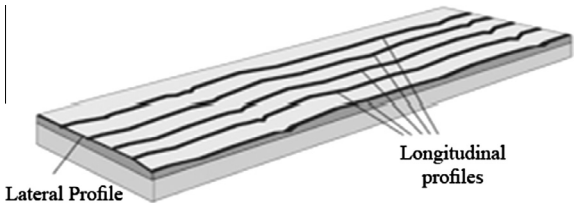

Fig. 1. Road profile [5,6].

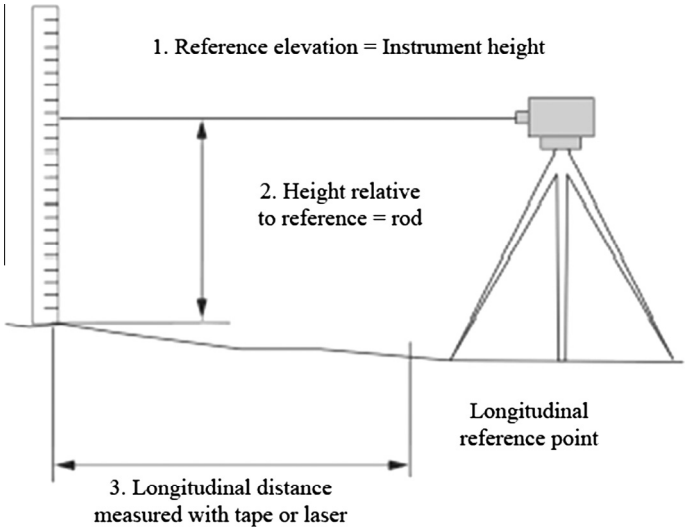

Fig. 2. Rod and level [5,6].