Vibration Impact on Two Wheeler Rider

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Abstract— As we know that today's generation is very fast generation everyone wants to done their work in very less time, today everyone has its own two wheeler, people uses two wheeler generally because its dynamic nature. Now a day's millions of people prefer that the two wheeler is more easy to handle than four wheeler, as a economic point of view as well as to reach the destination in time due to traffic. The Impact of a whole body vibration on health of two wheeler rider is the main goal of study. For that the generalized approach is suggested by us in the given paper. Two wheeler rider system is appraised as a spring-mass damper system .The modelling and segmentation of the Two Wheeler Rider Body and two-wheeler will be done. An anthropomorphic data is used for the modelling of human body. The evaluation of mass & stiffness values of individual segment will also be carried out. Analysis of the model will be done and result we get in the terms of frequency response of human body and two wheeler for ideal operating condition. Also from these analysis we will definitely find that which part of human body is more affected due to the vibration.

Keywords: vibration, whole body vibration

I. INTRODUCTION

The motorcycle is one the primary vehicle for short-distance transportation Although most riders use motorcycles only for short-distance transportation, some people, such as postmen, deliverymen and some urban couriers use a motorcycle as the major vehicle for work. Consequently, many workers are mostly wish to experience high levels of WBV caused by motorcycle riding. Most motorcycles can be classified as a scooters (no clutch, sit-on riding) and motorbikes (with clutch, straddle 3riding). These motorcycles generally have engines of 125cc or smaller, are ridden on the shoulder or outside reserved lane of the road, and are convenient for accessing driving lanes. Our experience and observations indicate that a motorcycle can be ridden at an equivalent or slightly higher speed than a car in a metropolitan or urban area with heavy traffic. Riding a motorcycle raises problems not only about the traffic safety, but also about the health relating to WBV exposure. Previous studies have identified increased low back pain (Palmer et al., 1999), finger and shoulder symptoms (Mirbod et al., 1997), and a high rate of erectile dysfunction (Ochiai et al., 2006) among motorcyclists.

Experienced motorcycle riders assert that the, continual riding of a standard motorcycle for extended periods can result in not only the stress but also medical complaints. A motorcycle rider may encounter multiple shocks introduced from uneven road surfaces due to the irregularity such as potholes, humps and manhole covers. Previous studies have reported that the a driver's vibration exposure level depends on the road or the traffic conditions, vehicle characteristics such as the, weight, speed type seat, maintenance and engine size, and driver characteristics such as age, characteristics, experience, the sitting posture and body weight (Peitte and Malchaire, 1992; Ozkaya et al.,1994; Malchaire et al., 1996; Donati, 1998; Chen et al., 2003; Mansfield and Griffin, 2002). Numerous investigations have reported possible discomfort, musculoskeletal problems, muscular fatigue, reduced stability and altered vestibular function caused by WBV exposure (Seidel, 1993; Wasserman et al., 1997; Bongers et al., 1988; Griffin, 1998). Most previous evaluations of WBV exposure measured and analyzed the acceleration data in terms of ISO 2631-1 (1997). However, in ISO 2631-1 (1997) 4 Section 6.2.2, the applicability of a basic evaluation is limited for vibrations with crest factors ≤ 9. Additionally, ISO 2631-1 (1997) suggests that an alternative evaluation should be considered under conditions of transient shocks, particularly those that occur rarely.

II. LITERATURE SURVEY

Literature survey it is most important thing at the time of studying of any topic. this part contain the past studies, surveys, experiments related to that particular topic. Harale Shivraj. N Gyanendra Roy describe in this analysis the handle bar assembly is excited with acceleration which in between range of 0 to 200 Hz which is a operational frequency to evaluate the strength of mountings on handle-bar in vibrations. Using Altair solver code Bulk data Frequency response the analysis on handle bar assembly is carried out. Pre-processing of Model preparation done using Hyper Mesh and Post processing is done using Hyper View and Hyper Graph. The simulation results for Mirror mounting bracket and Headlamp mounting casing are taken which are correlated with the experimental results in which failure location and pattern is exactly matched. Further design modifications have been incorporated for Mirror mounting bracket and Headlamp mounting casing to meet the strength requirement.

Rebecca Wolfgang, et al. studied that Long term exposure to WBV is a verified risk factor for the degenerative changes in the spine, subsequent back pain, and other adverse health effects. The haul truck drivers working at the surface mines are exposed to whole-body vibration for prolonged periods. The Thirty-two whole-body vibration (WBV) measurements were gathered from the haul trucks under a range of normal operating conditions. The Measurements which are taken from 30 of the 32 trucks fell within the health guidance caution zone defined by ISO2631-1 for an 8 hours exposure daily. This daily exposure increases the risk of long term health effects, and particularly back injury. The Systematic WBV calculations taken by mine sites at frequent intervals are required to provide an understanding of the causes of elevated vibration levels and hence determine appropriate control measures.

This might be comfortable by the availability of accelerometers within consumer electronic products.

Jaimon Dennis Quadros, et al. studied, that the idealized operating conditions of the human body. The Prolonged exposure to specific frequencies of vibration may have effects on certain segment of the body. Their analysis has already, show that for the given test vehicle and human body model, the ideal operating speed for HERO HONDA SPLENDOR vehicle on the terrain of the specified amplitude for given input is nearly about the 49.66 kmph

S. Agostoni et al.research work has developed with the aim of investigating motorcycles ride comfort. the Particular attention was mainly aimed on the handlebar, because this component is directly comes in contact with driver. A wellgrounded, fine, repeatable methodology is developed with the proposed view of designing a (TMD) Tuned Mass Damper which is capable of

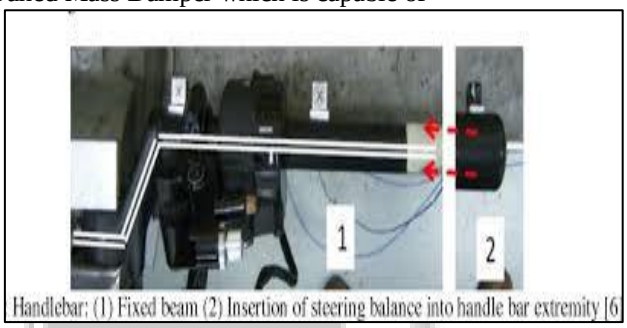


Fig. 1: Handlebar: (1) Fixed beam (2) Insertion of steering balance into handle bar extremity

Absorbing the vibrations, i.e. one which is capable of the reducing the vibrations transmitted to the driver via the handlebar. The steering balances which is placed at the extreme ends of the handlebar of all regular motorcycles is the starting point which is chosen for this methodology.

Yuichi Sugita, Junji Yoshida, Yusuke Itahashi., studied the engine input force to reduce a brush cutter handle vibration. Then the updation in centrifugal clutch structure to control the input force done without changing the engine structure itself. In the beginning, the vibration of a brush cutter was measured and the main factor of the large vibration was considered. Result indicate that the large first order vibration generated by the inertia of the crank-piston system was found to be the main factor. Subsequently, at the left handle of the brush cutter operational TPA was applied to find out the input force main contributing direction to the handle i.e. horizontal or vertical. As the result, it was identified that the engine input force along the horizontal direction mainly affecting the handle vibration than the force along the vertical direction. Then, approach towards the reduce a horizontal input force by using the unbalancing the clutch to reduce the handle vibration has tried. The result indicated that by applying the weight for unbalancing by considering the contribution of the input force in each direction, brush cutter handle vibration could be reduced very effectively. Many persons examined that the practical measurement of vibration occurring on two wheeler vehicle which are very dangerous when it is transmitted to human body through thigh, footrest, seat &handle. So calculating the vibration level occurring in the vehicle should be helpful and some of the steps to reduce the effect are taken. In this paper from the vibration's point of view different aspects of the riding vehicle on smooth and uneven road they will come to know that.

III. VIBRATION

It is defined as the oscillation of a body about a reference position and can be described in the terms of amplitude and frequency. The factors like a, design, damping, attenuation, resonance and so many more have a great influence on the exposure characteristics and into the intensity levels of vibration exposure experienced by machine operators. Three main points which are plays an important role to decide effects on the health in respect of exposure to vibration are

1) The amount of vibration exposure that results in no adverse health effects
2) Dose-response relationship means, the relationship between severity of the ill-health effects and the amount of exposure
3) The latent period, i.e. the time gap between first exposure and appearance of symptoms Vibration also can be classified based on the target on which it effects as hand arm vibration and whole body vibration.

IV. WHOLE BODY VIBRATION (WBA)

It as a generic term used when the vibrations of any type of frequency are transferred to the human body. Human expose vibration through a contact surface that is in a mechanical vibrating state. Generally, in day-to-day life, human expose many different types of vibrations. That could be driver's seat, a training platform and many more. It is nothing but, a one type of occupational hazard, which is particularly after years of exposure.

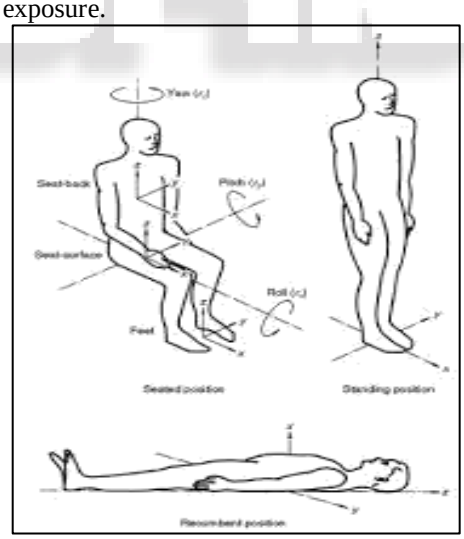


Fig. 2: Basic centric axes of human body

When a high frequenced vibration above 50Hz enter through the hands occupational safety problems may arise. Exposures and limits have been already estimated in ISO 5349-1 for hand-transmitted vibration.

V. METHOD FOR MEASURING VIBRATION

I kept searching on the different technique to measure the vibration because after the all my project a lot depend upon the fact that how effectively and efficiently I can figure out the vibration occurring on the body of vehicle. So after

reading lots of research papers on vibration measurement I came to know that there few techniques available to measure the vibration should be discussed here and why I choose a particular technique to last extent is discussed here in this chapter On the basis of technique used I found four different techniques to measure the vibration. They are as follow: Optical method, Ultrasonic method, Interferometer method, Accelerator with FFT method

A. Optical Method

The obtainability of the high speed sepcialized cameras has enabled three-dimensional (3D) vibration measurement by stereography and digital image correlation (DIC). It is just proposed to identify the model properties by utilizing the domain-wise responses which are captured by a DIC system. The fully field measured data are highly replicated, but the application of an image processing using the functional transformation which enables the extraction of a small number of a shape features without any type of significant loss of the information from the raw DIC data.

B. Ultrasonic Method

The ultrasonic torsion converter transforms the sinusoidal power signal into the mechanical twist oscillations and injects torsion waves into one end of the load train. The ferroelectric ceramic layers generate shear oscillations of sufficient magnitude, if the stimulation frequency is equal to the resonance frequency of the converter, i.e. if the half wavelength of the generated torsion waves are coincides with the length of the converter. All components of the load train must be designed appropriately to allow the formation of a standing wave at the resonance frequency of the ultrasonic torsion converter, which is 20 kHz in the present case. The design of the ultrasonic torsion load train is based on principles described by Mori and Uno and the actual realization using titanium alloy Ti6Al4V to manufacture the components.

C. The Digital speckle pattern interferometry (DSPI)

The Digital speckle pattern interferometry (DSPI) which is a method generated by Interferometery Method it is a technique that full field, non-contact, non-evasive and almost real time method to measure the different types of vibrations of structures DSPI is a faster in performing operations and less sensitive to the environmental disturbance than the holography. In the DSPI technique, the speckle pattern is formed by illuminating the surface of the object by laser light. The object wave is reassembled on the photosensitive part of the CCD camera where it is allowed you to interfere with an in-line reference beam. The interfertile of the two different states of the object are grabbed and subtracted.

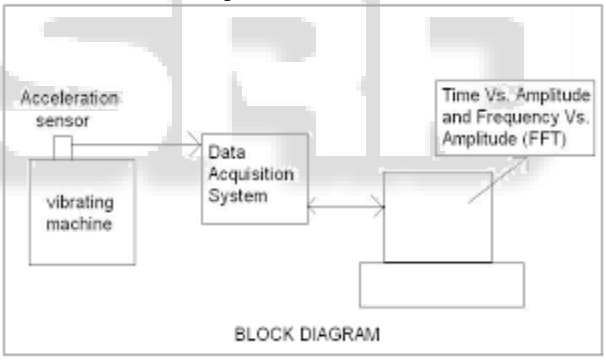
D. Accelerometer with FFT

The purpose of this system is to: 1. to gather the original field vibration data for the future use in the seat suspension system simulation research. 2. To have the means to analyzsse that the seating dynamics concurrently in three mutually perpendicular axes or not. In this way, the different interactions could be analysed in the each vehicle. The research effort could then focuses on the vibration mitigation in the axis of the highest influence (acceleration value).

VI. METHODOLOGY

The transducer is a one type of device which is used for producing an electrical signal from the form of energy, generally, it converts the mechanical vibration into the electrical property. For example, acceleration may causes the electrical resistance of the accelerometer to change. many meters can measure more than the one direction of vibration simultaneously; others are prohibited to making multi-axis assessments by sequentially measuring each direction. The Standards which are require tri-axial assessments to be made for both hand transmitted and whole body vibration. Therefore, a multilane meter is capable of measuring minimum three axes simultaneously can significantly the less time is required to test.

If a system is more flexible than the vibration a meter is required, then a modular data acquisition system can be prepared. Within a modular system, the output from the accelerometer is converted to a voltage signal using appropriate signal conditioning. This voltage is the property that the system can measure and analyze. Data-acquisition systems are usually computer based, although some stand-alone data loggers are available. These have the capability of sampling a voltage (i.e., the conditioned acceleration) at discrete time intervals such that the waveform of the voltage can be stored on a computer.



The stored waveform can be tested using any compatible software. Signal conditioning converts the output from an accelerometer into the voltage that can be measured by a data acquisition and analysis system. The output of the signal conditioning must be well matched with the data-accretion system. Once the faithfulled & calibrated signals from the accelerometers have been acquired, they must be processed to generate numerical indicators suitable for the purpose of the assessment. A frequency weighting will be almost every time be required, as will basic statistical descriptors. Depending on the application, frequency analysis may be carried out.

VII. CONCLUSION

As from the results and from the discussion I came to a conclusion that whenever we are riding two wheelers and when it is subjected to uneven surface of the road ir containing bumper or broken road it should be advised to slow down the speed of the vehicle so that we as well as vehicle remain safe from hazardous effect of vibration. this

regular prolonged exposure of human body to vibration may cause different types of syndrome like back injury, spondelysis, shoulder pain, hand induced white finger, drawiness, motion sickness, etc. As the vibrations transmitted to the rider through touch points like thigh, footrest, seat &handle are of two types like Hand Arm Vibration (HAV) and Whole Body Vibration (WBV)

REFERENCES

[1] Alcira Kojima', Norihiko Sakurai' and Jun-ichi Kislzigami" MOTION DETECTION USING 3D-FFT SPECTRUM" IEEE, Vol. No. 04 , Year 1993 ,Pg. No.213-216
[2] P. Holmlund*, R. LundstroK m, L. Lindberg, "Mechanical impedance of the human body in vertical direction" Applied Ergonomics, Vol. No. 31, Year 2000, Pg. No. 415-422
[3] H. Mayer, "Ultrasonic torsion and tension–compression fatigue testing: Measuring principles and investigations on 2024-T351 aluminium alloy" International Journal of Fatigue, Vol. No.28, Year 2006, Pg. No. 1446-1455.
[4] Saba Mirza, Priti Singh, Rajesh Kumar, A.L. Vyas, Chandra Shakher , "Measurement of transverse vibrations visualization of mode shapes in square plate by using digital speckle pattern interferometry and wavelet transform" , Optics and Lasers in Engineering , Vol. No. 44 , Year 2006 , Vol. No. 44 , Pg. No. 41-55

