Ride Comfort Analysis Of Two Wheeler

Pranav C. Pande[1], S.L.Shinde[2]
Department of Mechanical Engineering
[1]PG student, SKNSITS Lonavala-410401.
[2] Assistant Professor , SKNSITS Lonavala-410401.

Abstract- *Ride tuning of Suspension is a challenging, time consuming and involve huge money expenditure . It has huge influence on quality of suspension systems and thus on business. Defining suspension parameters means finding optimum value of spring rate and damping. Currently suspension design parameters damping is decided through subjective feel of riders. The expert riders drive vehicles on different tracks and based on subjective feeling they tell the modifications expected. The main problem with this method is it is merely subjective and varies from person to person involves huge cost and time still the output is not assured.*

Human Vibration can be used as a tool to judge the ride comfort of vehicle and thus in turn defining optimum value of damping in shock absorber. In this paper we will be discussing about methodology adopted to judge ride comfort analysis of two wheeler. The same methodology can be adapted for four wheeler ride comfort study. Vehicle seat vibration through seat pad accelerometer, shock absorber displacement through LVDT and subjective feel of rider in analyzed together to take call for optimum value of damping for best comfort and stability of vehicle.

Keywords- Ride comfort, seat vibrations, Human Vibration, LVDT for shock absorber displacement.

I. INTRODUCTION

Human vibration is defined as the effect of mechanical vibration on the human body. During our normal daily lives we are exposed to vibrations of one or other sort e.g. in buses, trains and cars. Many people are also exposed to other vibrations during their working day, for example vibrations produced by hand-tools, machinery, or heavy vehicles.

Sound can be music to the ear or irritating noise, human vibrations can may be pleasant or unpleasant. We enjoy, and even create pleasant vibrations when we run, dance or take a trip on the merry-go-round, but we try to avoid exposing ourselves to unpleasant vibrations such as travelling on a bumpy road or operating hand-held power tools.

II. OBJECTIVE OF WORK

Our objective of project is to establish a standard methodology for ride comfort evaluation for Two Wheeler.

To generate optimum design parameters for redesigning the shock absorber.

To define a standard objective methodology to do ride comfort study of vehicle and compare two or more design objectively.

III. METHODOLOGY

In this paper, establishing standard methodology for ride comfort evaluation and getting optimum design parameters for shock absorber design.

- Data Acquisition will be done using Human Vibration analyzer on different vehicles with design settings of shock absorber.
- Vibration data will be analyzed and ride comfort index will be calculated for each design parameter setting.
- With further detail analysis of acquired data, correlation between optimum design parameters and ride comfort index will be established.
- Simulation correlation was done at the last using MATLAB software, to have proper validation of acquired data.

Tracks Used for Testing:

- City Plus Speed Braker
- Country
- Highway
- LAHF(Low amplitude High Frequency)

Actual Instrumentation Setup:

Fig: Set up of instruments

IV. EXPERIMENTAL PROCEDURE

To perform analysis of comfort we need to measure acceleration at the interface between the occupant and the seat. For this we mounted seat pad accelerometer on vehicle seat.

Steps:

1. Start the vehicle.
2. Attain the required speed.
3. Check the odometer for distance.
4. Start the reading.
5. Record the data.
6. Save the reading.
7. Repeat step 1-6 for three different design on same vehicle.
8. Tabulate the reading in Excel sheets for different readings and calculations.

V. EXPERIMENTAL DATA

REGULAR

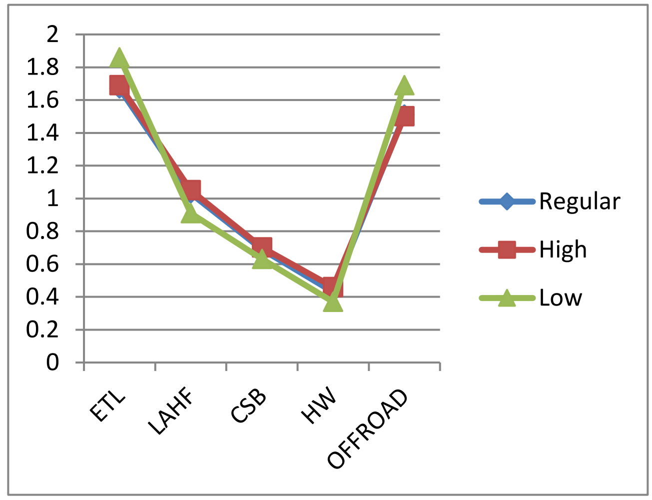
		T0 {TO}	T0 {FRO}	AVG (T0)	T0 {TO}	T0 {FRO}	AVG (T0)	T0 {TO}	T0 {FRO}	AVG (T0)	VTV	VTV	AVG	Duration	Dura
SR.NO	TRACK	RMS	RMS	RMS	VDV	VDV	VDV	MTVV	MTVV	MTVV					
1	ETL	1.74	1.60	1.67	5.79	4.85	5.32	3.013	2.366	2.69	2.08	1.91	2.00	0.15	0.
2	LAHF	1.02	1.03	1.03	4.19	4.31	4.25	1.4925	1.6555	1.57	1.09	1.09	1.09	1.15	1.
3	CSB	0.68	0.70	0.69	7.79	5.96	6.87	3.3805	2.4775	2.93	0.80	0.81	0.80	4.26	4.
4	HW	0.41	0.45	0.43	2.16	2.58	2.37	0.811	1.009	0.91	0.46	0.50	0.48	1.31	2.
5	OFFROAD	1.52	1.49	1.51	7.16	6.96	7.06	2.877	2.594	2.74	1.65	1.12	1.39	1.26	1.

HIGH DAMPING

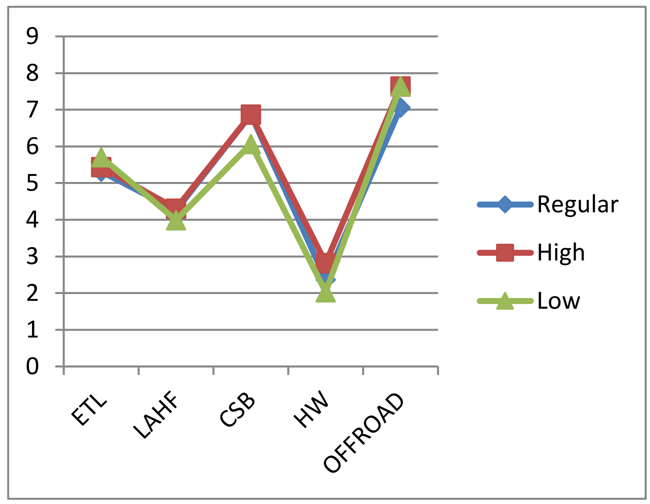
		T1 {TO}	T1 {FRO}	AVG (T1)	T1 {T1}	T1 {FRO}	AVG (T1)	T1{TO}	T0 {FRO}	AVG (T0)	VTV	VTV	AVG	Duration	Dura
SR.NO	TRACK	RMS	RMS	RMS	VDV	VDV	VDV	MTVV	MTVV	MTVV					
1	ETL	1.59	1.79	1.69	5.07	5.81	5.44	2.7475	6.095	4.42	1.85	2.07	1.96	0.15	0.
2	LAHF	1.03	1.07	1.05	4.241	4.375	4.31	1.563	3.126	2.34	1.11	1.13	1.12	1.12	1.
3	CSB	0.67	0.73	0.70	7.20	6.53	6.87	3.083	6.166	4.62	0.80	0.83	0.82	4.30	4.
4	HW	0.46	0.46	0.46	2.69	2.94	2.82	1.346	2.692	2.02	0.54	0.54	0.54	1.57	2.
5	OFFROAD	1.44	1.56	1.50	7.60	7.67	7.64	2.8445	7.328	5.09	1.58	1.73	1.65	1.55	1.

Low Damping

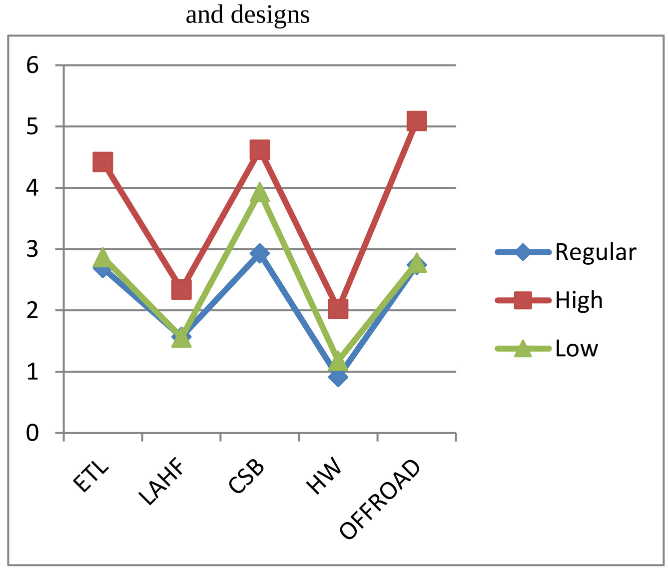
		T2 {TO}	T2 {FRO}	AVG (T2)	T2{TO}	T2 {FRO}	AVG (T2)	T2{TO}	T2 {FRO}	AVG (T2)	VTV	VTV	AVG	Duration	Dura
SR.NO	TRACK	RMS	RMS	RMS	VDV	VDV	VDV	MTVV	MTVV	MTVV					
1	ETL	1.95	1.77	1.86	5.24	6.19	5.71	2.506	3.2285	2.87	2.22	2.04	2.13	0.13	0.
2	LAHF	0.89	0.9255	0.91	4.078	3.90	3.99	1.714	1.409	1.56	0.97	1.00	0.98	1.20	1.
3	CSB	0.61	0.657	0.63	6.42	5.71	6.07	2.8445	5.012	3.93	0.73	0.77	0.75	4.35	4.
4	HW	0.36	0.38	0.37	1.9975	2.07	2.03	1.581	0.7745	1.18	0.44	0.43	0.44	1.41	1.
5	OFFROAD	1.71	1.66	1.69	8.13	7.18	7.65	2.8445	2.7165	2.78	1.90	1.83	1.86	1.19	1.



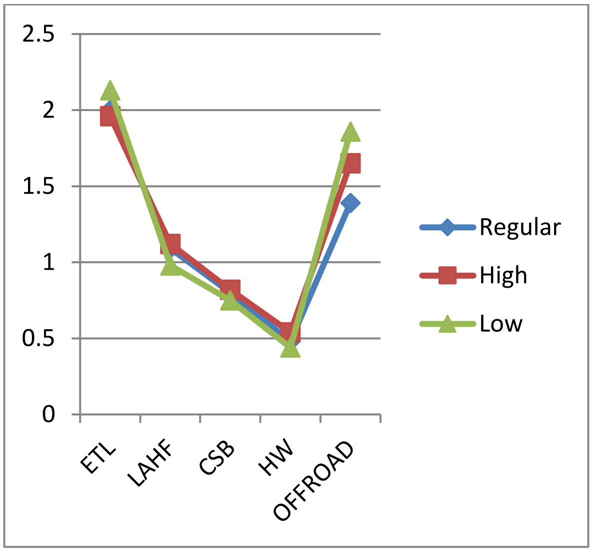
Graph of RMS Vibration for different tracks and designs



Graph of Vibration Dose value for different tracks and designs



Graph of MTVV for different tracks and designs



Graph for Vibration Total Value for different tracks and designs

VI. CONCLUSION

Measurement of Seat Vibration as per ISO 2631-1 and Measurement of shock absorber displacement give us objective way to measure comfort of vehicle. LVDT readings are taken for future study to predict stability of vehicle in objective way. Seat vibration data along with LVDT can help us giving complete solution for suspension tuning of vehicle.

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