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STUDY OF ANALYSIS OF BUS PASSENGER SEAT: A REVIEW

MR. PREETAM R. NIMKAR¹, PROF. S. M. FULMALI², DR. R. R. GAWANDE³

1. PG Scholar, Department of Mechanical Engineering, Bapurao Deshmukh college of Engineering & Technology, Sevagram Wardha.
2. Assistance professor, Department of Mechanical Engineering, Bapurao Deshmukh college of Engineering & Technology, Sevagram Wardha.
3. Associate professor, Department of Mechanical Engineering, Bapurao Deshmukh college of Engineering & Technology, Sevagram Wardha.

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Abstract: Passengers comfort is not being studied seriously in Indian bus. Travelling in Indian condition cannot be compared with developing countries because of the external factors like road condition, vibrations, sudden jerks, climatic conditions etc. So it is important to design the comfortable seat for drivers as well as for the passengers. Since from last few decades, it is observed that various passengers travelling almost daily more than 35km facing various muscle skeleton injuries. One of the survey suggest that the major health problems are Foot cramp back pain, stiff neck problem, Headache and eye strain common in drivers and passengers of Indian bus . The main reasons for all the injuries are the improper design of seat. Present research is divided in two parts. First, to conduct survey amongst the passengers, examine the travel time factor, and seat discomfort. Second is to design and recommend best possible alternatives of seat with the aid of advanced design tools like CAD CAE and seat frame failure is a major problem facing for MSRTC workshop supervisor

Keywords: CAD, passenger seat, FEM, MSRTC Bus in India etc

Corresponding Author: MR. PREETAM R. NIMKAR



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INTRODUCTION

A large number of passengers every day use public transport buses in India not only in the cities but also in rural areas. Hence, buses are a popular mode of travelling in India. Although there are standards available for evaluation of ride comfort in vehicles but none of them Consider the effects that vibrations have on particular passengers' activities, [1]. There are many factors in this environment that will disturb passenger's activities. Some of the main sources of disturbance are noise and vibrations generated from the bus itself. A pilot study conducted on passenger comfort reports useful responses to the questionnaire survey and helps to evaluate the ride comfort on their activities [2].

Today's era is marching towards the rapid growth of industrialization. The faster is your transport; more is your profit is today's thinking. Hence comfort is an attribute that today's consumers demand more and more. The seat has an important role to play in fulfilling these comfort expectations. Seating comfort is a major concern for drivers and other members of the work force who are exposed to extended periods of sitting and its associated side effects.

Most of the research findings concerning industrial and office chair design can be applied to automobile seat design. However, there are several important considerations unique to the mobile environment of vehicle that should influence design recommendations. In particular, the control locations and sight line requirements serve to constrain postures to a greater extent than in most other seated environments. Safety concerns dictate that the driver be alert and continually responding to changing road conditions, and be positioned in such a way that the occupant restraint systems offer maximal protection in a crash. [3]

2.0 LITERATURE REVIEW

Alem and Strawn [4] designed and evaluated an energy absorbing truck seat for a 5 ton military truck for increased protection from landmine blasts. The automotive industry strongly encourages this research in the field of objective comfort assessment, especially dedicated to the seat and the related postures. Driver posture is one of the most important issues to be considered in the vehicle design process regarding not only the car and the user but also the experimental conditions

Chang et al. [5] developed a practical method for measuring seatpan and seatback contours and a graphical presentation for visual evaluation. Seat designers can use this method for evaluating seat comfort such as support, fitness and accommodation.

Sam Brook, et al. this paper deals with the design and development of an ergonomic data measurement system for driver-pedals interaction. The work focuses in particular on the

actuation of the acceleration and brake pedals, and aims to support the development of a deeper understanding of the factors influencing the driving comfort associated with the right leg. A validation exercise involving a series of test drive events confirmed the system capability to record meaningful objective comfort data which can differentiate between driving postures and styles.

Cho and Yoon [6] developed a biomechanical model of humans on a seat with a backrest for evaluating the vehicular ride quality.

Rakheja et al. [7] developed a model to study the seated occupant interactions with seat backrest and pan, and biodynamic response under vertical vibration.

Wang et al. [8] studied the role of seat geometry and posture on the mechanical energy absorption characteristics of seated occupants under vertical vibration. The results show that the absorbed power quantity increases approximately quadratically with the exposure level by the person. The results also reveal that the absorbed power is strongly dependent upon the individual anthropometry variables such as body mass, fat and mass index. But there is no real proof of the variables given.

Computer-aided engineering (CAE) methods such as finite element analysis and simulation techniques have also been used to study and to develop vehicle seats.

Verver et al. [9] used a finite element (FE) model of the human buttocks to predict the static pressure distribution between human and seating surface by its detailed and realistic geometric description. A validation study based on volunteer experiments shows reasonable correlation in pressure distributions between the buttocks model and the volunteers. Both for simulations on a rigid and a soft cushion, the model predict realistic seat pressure distributions.

Hix et al. [10] developed engineering methods and expertise in the area of truck seat modeling to capture the effects of seat dynamics on ride quality.

3.0 OBJECTIVES OF THE PROJECT

The main objectives of this project are as follows

- Modeling of Bus passenger seat using CAD software like PROE.
- Analysis of Bus passenger seat back supporting joint at maximum loading condition.
- Modeling of modified design of Bus passenger seat
- Analysis of modified design of Bus passenger seat
- Calculating the various parameter of available on back supporting joint.

- To validate the solution by FEM analysis using ANSYS software.
- Study of vibration transmitted to seat from bus
- Failure of back supporting joint due to overloading, vibration & inconvenient material.

4.0 What is Comfort?

No widely accepted definition of comfort has been agreed upon in the ergonomics literature (de Looze et al., 2003). In many studies, comfort and discomfort are studied as two ends of a continuous spectrum. It is assumed that as comfort increases, discomfort decreases. Likewise, it is assumed that when discomfort increases, comfort decreases. Comfort, on the other hand, was associated with feelings of well-being and the positive aesthetic impressions of the chair. Additionally, feelings of discomfort increased with time during the workday (Helander & Zhang, 1997).

Comfort is strongly associated with muscular strain rather than other issues such as intradiscal pressure or the imitation of the natural spine curve while standing (Vergara & Page, 2002). Furthermore, static muscular effort is the main cause of short term lumbar and dorsal pain (Vergara & Page, 2002). This finding supports the impact of postural fixity, the buildup of lactic acid in the muscles due to static postures, on perceptions of comfort and its implications on chair design. In a study by Reinecke, Hazard, and Coleman (1994), they write, "The positive effect of small movements around a posture to reduce muscular strain has already been considered by chair manufacturers, who produce chairs with flexible backrests." The use of flexible back materials, such as mesh, may also promote small movements around a posture. Attention to chair design may therefore reduce the occurrence of static muscular effort, resulting in increased overall comfort.

The perceptions of comfort while sitting may also be significantly influenced by the anthropometric dimensions of the user, which determines the fit of the chair. While a small sized chair would be a bad fit for an individual with large dimensions, it would be appropriate for a person of small stature. Various issues may arise from inadequate person-chair fit, such as the compression of soft-body tissue that restricts blood supply. Any instance of poor person-chair fit where the chair is too big or too small may result in such compression of the body (Wright, 1993). In a study by Helander et al., subjects of a smaller stature disliked large chairs because the seat pan was too long and the lumbar support was too high. Likewise, larger individuals disliked the small chairs for the opposite reasons (Helander et al., 1987; Helander & Zhang, 1997). The variations in perceptions of comfort across subjects could therefore be related to their anthropometric dimensions.

Research has shown that some of the main factors that affect seating comfort are seat-interface pressure distribution, whole-body vibration and pressure change rate. Proper lumbar support is a necessary and fundamental requirement for any well-designed chair. Objective techniques to assess chair comfort necessitate the use of a sensing layer that may change the fundamental characteristics of the chair itself depending on its structure and materials

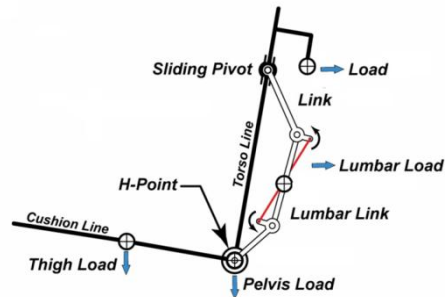


Figure 4.1: Forces acting on seat

5.0 Reason for selecting project?

Maharashtra State Road Transport Cooperation (MSRTC) Passenger Buss has cause failure of passenger seat frame and supporting joint as shown in Fig:5.1 & 5.2

This failure occurs with a few months from date of manufacturing of buss and due to this passenger causes accident & this is one of major problem facing to MSRTC workshop supervisor due to improper design or material selection of seat frame.



Fig: 5.1



Fig: 5.2

6.0 CONCLUSION

The aim is to solve MSRTC workshop problem of seat failure of bus passenger; keeping this in mind we have started the project work. We have planned to design the new seat and reduced the existing problems in the seat by using CAD and FEM.

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