INNOVATION MEASUREMENT DEVICE OF CAR SEATS

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Abstract
The comfort of sitting on car seats depends on many parameters and the people sitting on it are different. Every person is different, behaves differently, and feels different. We will put such an original-man on a unique car seat and want it to suit everyone without distinction. Then we need to require the car seat to adapt to the person sitting on it, preferably automatically. That is why we are testing a car seat in real-life conditions in the car, i.e. under the conditions of simultaneous multi-axis loading. The content of this article is the innovation of car seat measurement equipment in laboratory conditions. The existing device allows only the vertical movement of the car seat to realize. The aim of the innovation is to complement the device so that the horizontal movement of the car seat can realize simultaneously with the vertical movement.

Key words: *car seat; testing; multi-axis loading; human; hard dummy.*

INTRODUCTION

Testing of car seats in laboratory condition is done according to the relevant standards (*Standard JASO B407-87: Test code of seating comfort for automobile seats*). There are a number of these standards, and each of them conforms to a certain automobile seat load regime. Also important is the interaction of the car seat with the human, which depends on the comfort of sitting and the level of fatigue after a long car ride. Aim of this article was to provide new method and new testing laboratory equipment for testing of cars seats of loading hard dummy.

MATERIALS AND METHODS

The existing testing device complies with the standards prescribing only one-axis vertical movement of the car seat. So, only with the vertical loading in the "z" axis. Fig. 1.

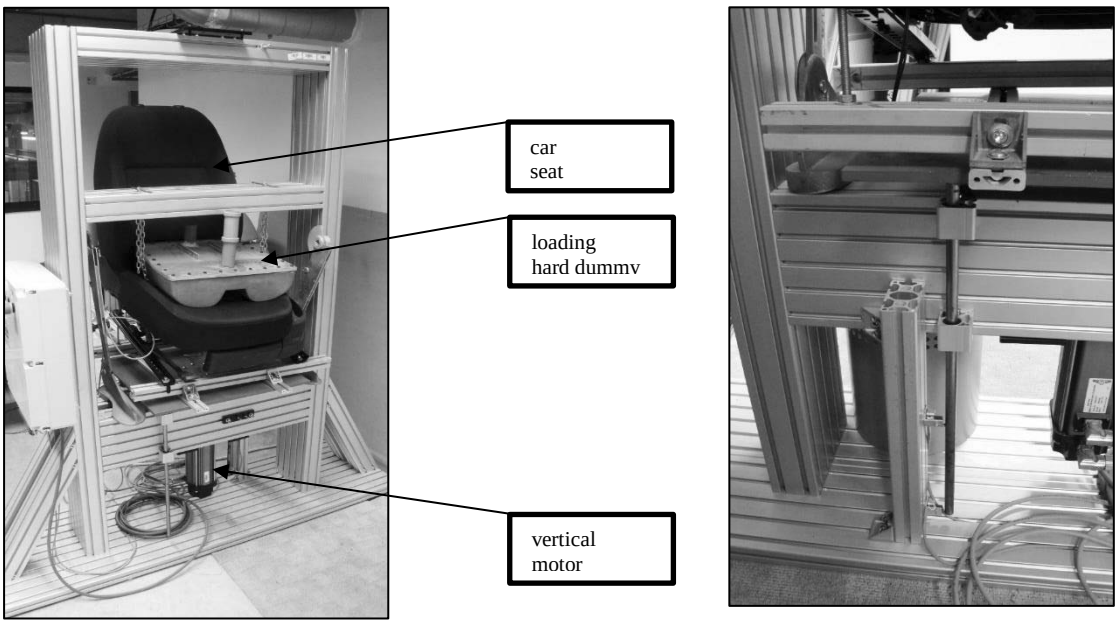

Fig. 1 Testing device

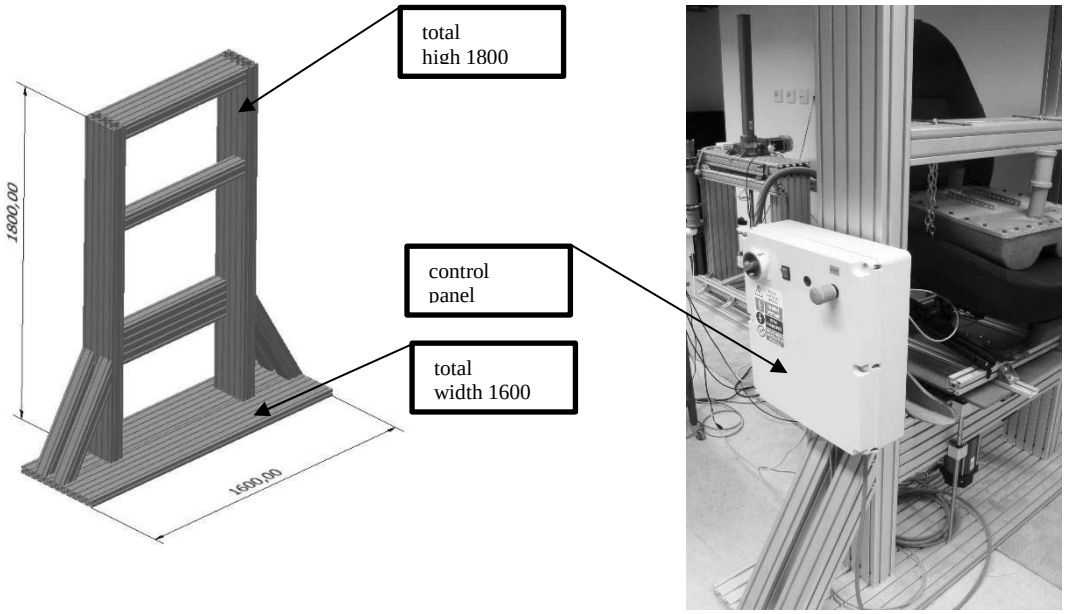

Fig. 2 Testing device control

Also its total height of the machine is limited to 1800 mm Fig. 2. To test full automobile seats with full load, this height needs to be increased. In addition, according to current standards prescribing car seat testing in laboratory conditions, it is necessary to add the horizontal movement of the seat during testing. When designing the test equipment upgrade, the working height was increased to 2400mm Fig. 3. For the new concept, a new vertical load management Fig. 4, the guide and the guide bearing have been reinforced Fig. 5, between which was placed the linear Servo motor Actuator series GSM40. Have been designed three variants of the horizontal guide Fig. 5-6. The first solution uses standardized elements of the item system. The other two solutions are based on the principle of vertical guidance with a movable profile or with a movable guide rod. The final price calculation of the device innovation leads us to a certain price economy and consequently to simplification of the whole innovated construction. Therefore, the cheapest price option was chosen.

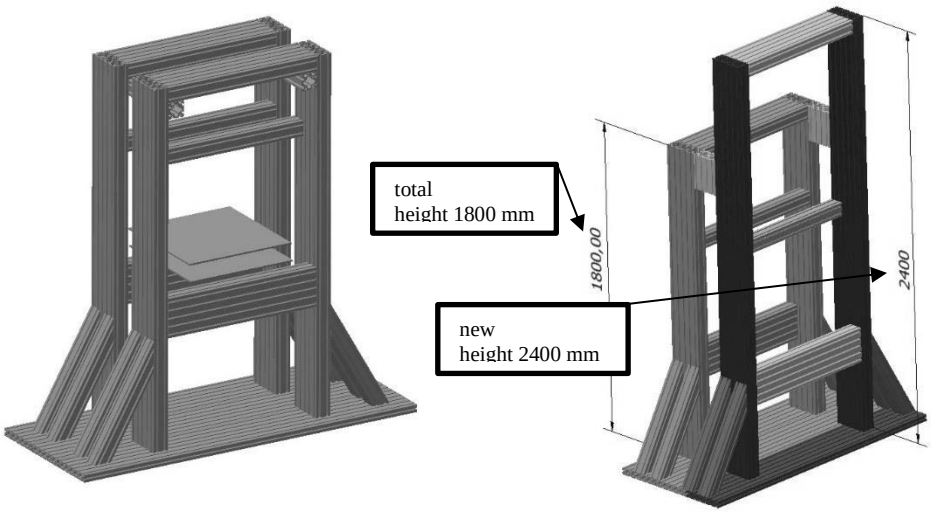

Fig. 3 New testing device

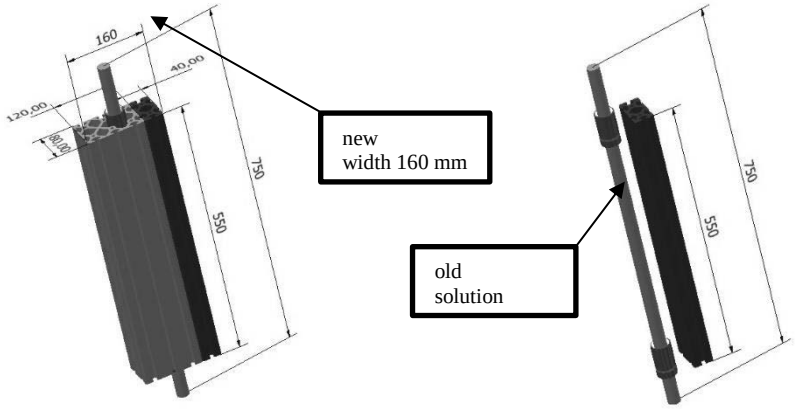

Fig. 4 Vertical movement

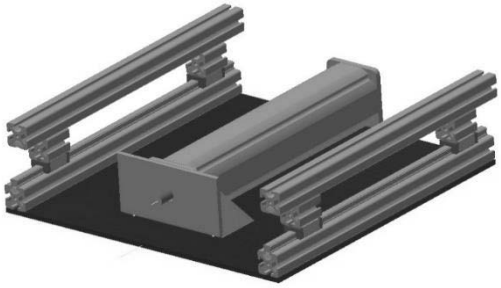

Fig. 5 Horizontal movement

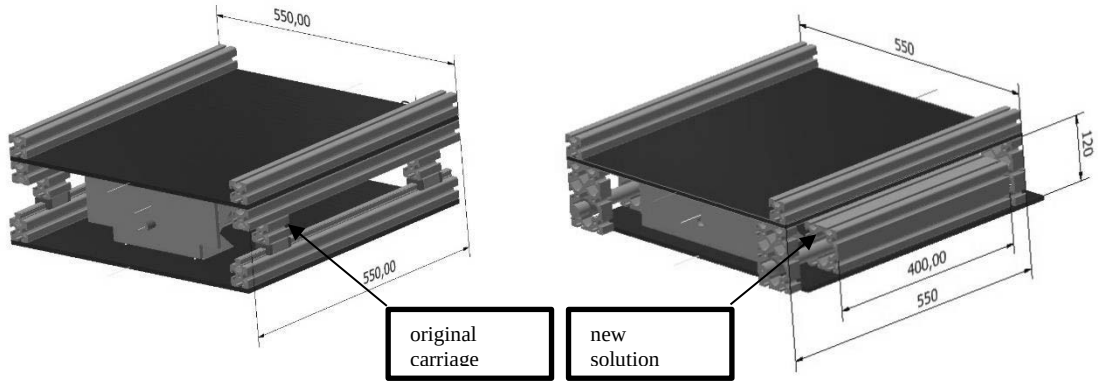

Fig. 6 Horizontal movement variants

For the new device will be designed completely new software Management and regulation in SW LabViev. Conclusions for innovation testing equipment, we can do based on measurements made on the TUL Hexapod device, which show the dependence on the methodise of loading the car seats Fig. 7. Dynamic and static loading in the vertical direction and at the same time by horizontal movement represent new conclusions and measurement results Fig. 8.

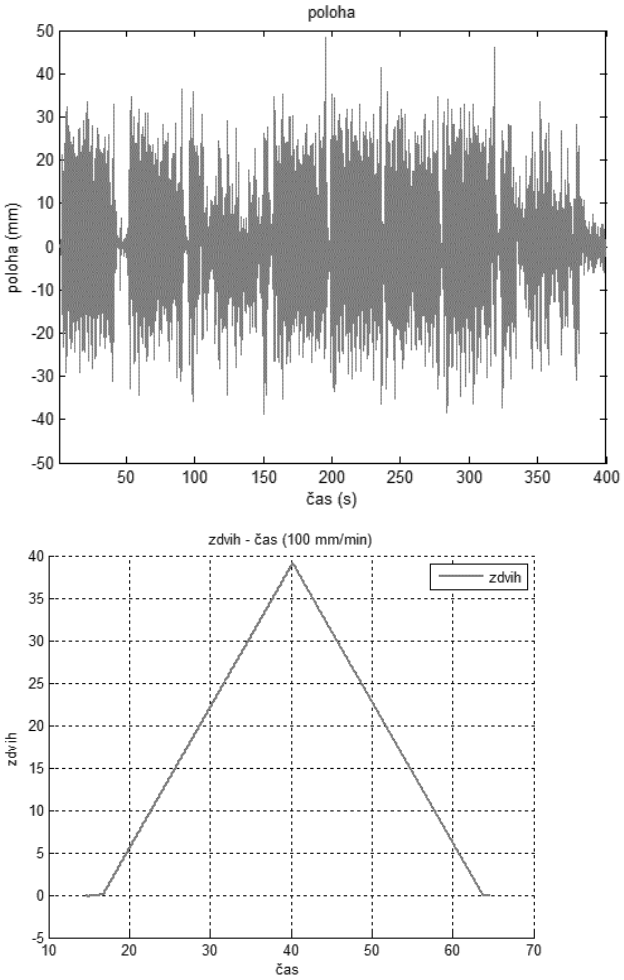

Fig. 7 Vertical and horizontal movement variants

By combining exactly defined dynamic loading cycles in both horizontal and vertical directions with static pauses over time, we obtain characteristics of the properties of automobile seats very close to the real loading in the car. Therefore, we can realize the loading very similar to real traffic in laboratory. The time dependent loading is presented, for example, in Fig. 8, where measured hysteresis characteristics-banana were. The first curve at the beginning of the measurement characterizes the state of the car seat before the fatigue effect. After 180 hours of loading, the comfort layer fatigue is evident, with a moderate load reduction with moderate stiffness decreasing during medium loading. In addition, the damping properties are diminished. Peak loadings are actually the same at finish loading time. When we measure transmission characteristics, there are even greater differences by varying the loading method. Fig. 8 shows the statically evaluated characteristics of 10 repeated measurements by the same conditions.

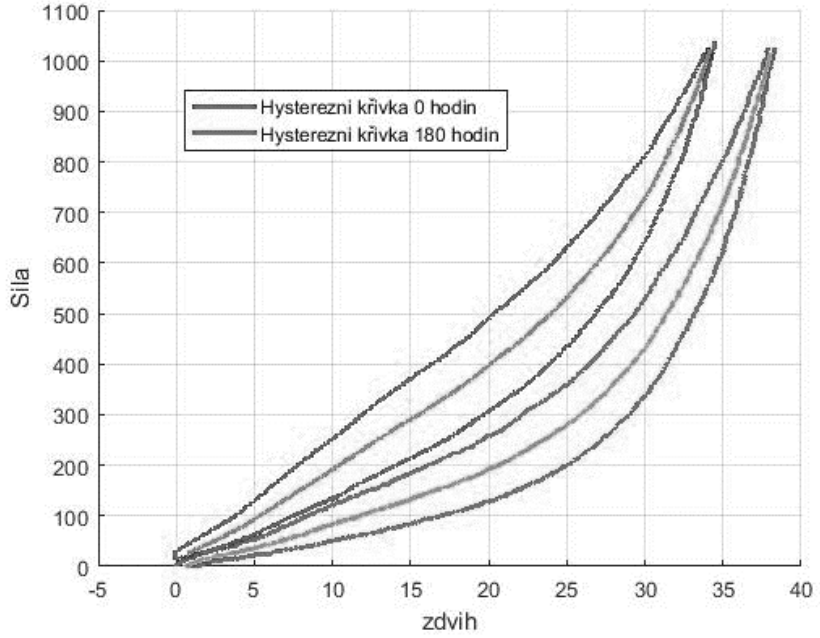

Fig. 8 Vertical and horizontal movement variants

RESULTS AND DISCUSSION

The new device allows to increase the working height from 318 mm to 981 mm Fig. 7. Realizes the possibility of vertical loading of the car seat up to 100 kg of load in the interval up to 100 mm, and at the same time it enables to realize horizontal movement of the car seat in the interval up to 50 mm. This corresponds to the current regulations for laboratory testing of automobile seats with load. The device is original, is not described in any literature, and corresponds only to the requirement of corresponding standards, which prescribe an independent testing signals in two orthogonal directions - the horizontal and vertical. This is original device on TUL.

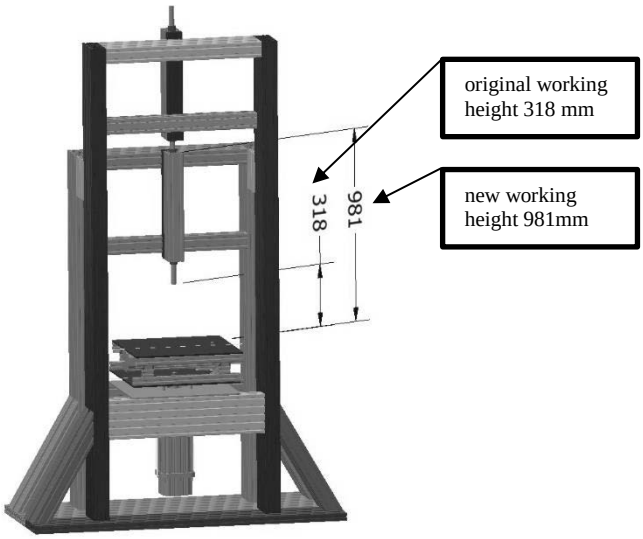

Fig. 7 Final design testing device

CONCLUSIONS

It was constructed universal testing laboratory device for laboratory testing automobile seats in the two directions of movement, both vertical and horizontal. This corresponds to the requirement of the current standard for determining the comfort of car seats. At the present, all structural elements are purchased and the installation of the equipment has been started.

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