Analysis and construction of measurement device

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Abstract: Vibration analysis of some of the test machine equipment requiring special construction measuring devices, where the main criterion is the weight, stiffness and universally of the product. Special design must comply particular requirement of universal use, i.e. possibility of loading in different directions without disassembling equipment under test. The product should not affect his vibration measurements of machine equipment.

Keywords: analysis; dynamics; construction; measurement; vibration.

1 Introduction

Measuring device has been designed according to the requirements of a weldment. It has been suggested several variants. Subsequently, the chosen one variant for production. Measuring device was manufactured and subjected to testing. The test results are listed in the following chapter.

2 Construction and analysis

In this chapter, the authors discuss the different types of structures designed test fixtures. When structuring is primarily taken into account manufacturability in accordance with not only fit together with a source of excitation signal (hydrodynamic pulsator) but also to the actual test piece. These considerations have been proposed 3 variants, which differed from each other dominantly (Fig.1,Fig. 2 and, Fig.3). Each of these originally designed was subjected to a dynamic virtual analysis of the obtained results describing natural frequency and corresponding shapes of oscillations (Fig. 4, Fig. 5, Fig. 6).

2.1 Construction

The construction was realized three variants. The first variant of structure have been proposed from the viewpoint of ease of production and ease of installation (Fig. 1). This first option, however, almost all the natural frequency of the experiment conducted.

a) measuring devices

b) measuring devices by measuring machine equipment

Fig. 1: Design of measuring device – design 1.

For this variant was derived second option. The difference between these two was the addition of the reinforcing shoulders. These arms should not result in a worse fit together with an experienced sample. Positives were the reduction in weight of the total composition based on weight reduction of anchor plates and increase the stiffness of the whole structure. Said modified structure is shown in Fig. 2.

a) measuring devices

b) measuring devices by measuring machine equipment

Fig. 1: Design of measuring device – design 2.

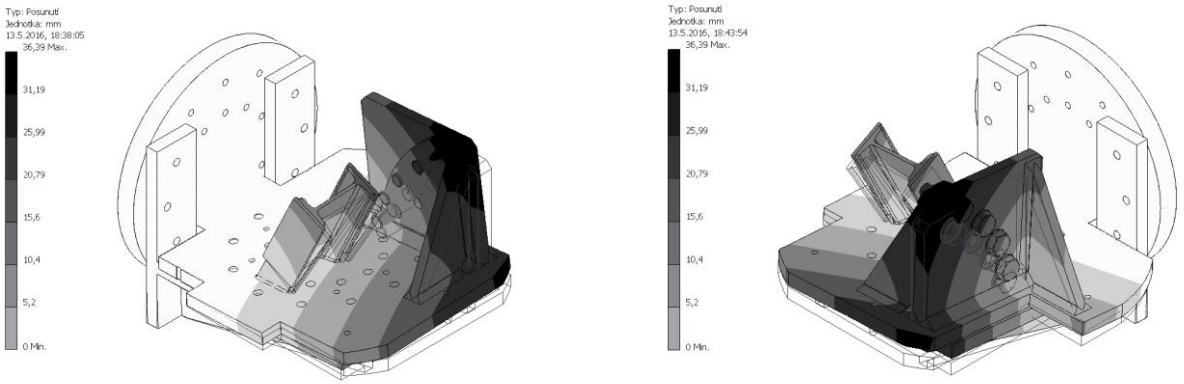
For the previous two versions, a third variant, in which was eliminated ballast weight plates and made better placement of reinforcing shoulders. Reinforcing shoulders had a large effect of increasing the overall rigidity of elimination at reducing the total weight of the test fixture. Innovative resulting structure is shown in Fig. 3.

a) measuring devices

b) measuring devices by measuring machine equipment

Fig. 1: Design of measuring device – design 3.

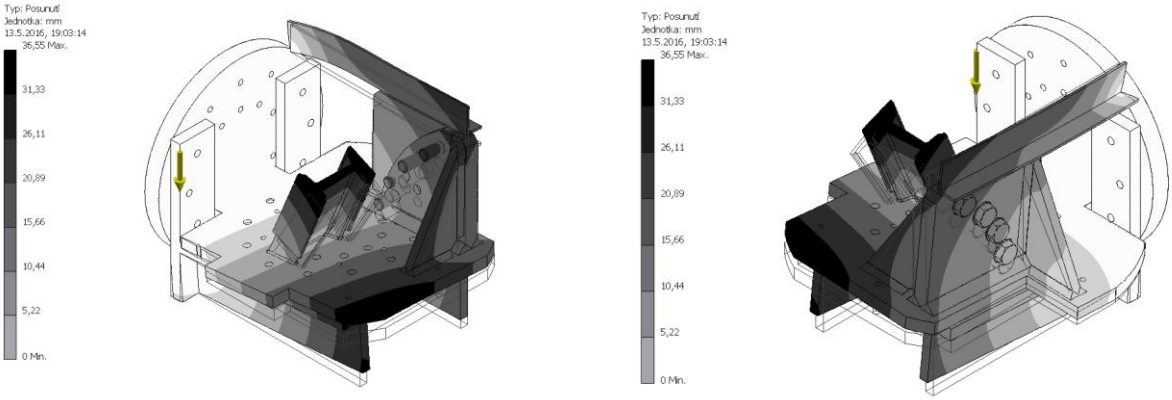
All three types were subjected to structure a virtual analysis of the listed exemplary results shape natural frequencies with the greatest variations in the individual preparations.



a) measuring devices

b) measuring devices by measuring machine equipment

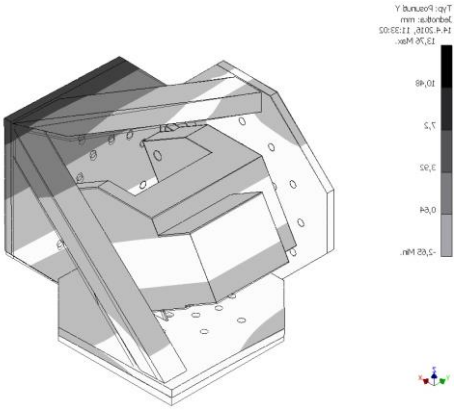
Fig. 1: Design of measuring device – design 1.



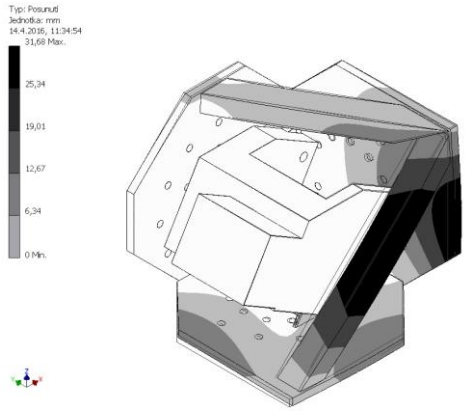
a) measuring devices

b) measuring devices by measuring machine equipment

Fig. 1: Design of measuring device – design 2.



a) measuring devices



b) measuring devices by measuring machine equipment

Fig. 1: Design of measuring device – design 3.

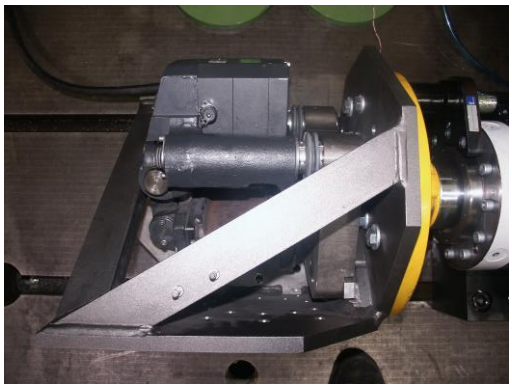


Fig. 4: Preparation of measurements with device.

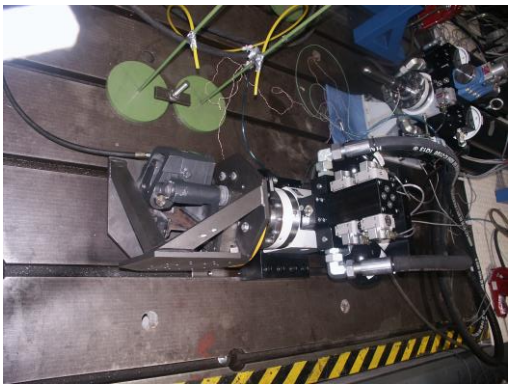


Fig. 5: Preparation of measurements with device and machine equipment.

3 Conclusion

M The latest variant of the structure was chosen as the most suitable. Drawn up according to the product of said structure was implemented and then on were made to the planned experimental tests. Real preparation is shown in fig. 7. Measured vibration values that are limited by the standard [1] are presented in an article in the Proceedings of the authors J.Petřík and A. Lufinka.

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