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High-precision test table for vertical and horizontal vibration

In the field of architecturally demanding concrete surfaces and delicate construction elements made of special materials, e.g. with an epoxy portion, extensive development projects are frequently necessary in order to determine the influence of the possible vibration parameters during the concrete compaction. High-precision test tables, with which these parameters can be accurately predicted, are used for this.

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The processing of wet concrete and similar building materials almost always involves vibration in order on the one hand to compact the medium to the greatest possible extent and, on the other, to create a closed, even surface. The problem is that the parameters of the vibration process in complex production plants are too numerous and are superimposed on one another. The optimisation of the process is only possible to a limited extent once a plant has been built.

For this reason, building material and construction element manufacturers use special vibration tables in order to be able to optimise the subsequent vibration process beforehand. According to experience the following questions are to be clarified:

- Horizontal or vertical vibration or both?
- Normal frequency or high frequency vibration?
- What influence does the vibration time have?
- What influence does the selected amplitude have?

These four questions alone already open up a wide range of combinable possibilities. Therefore it is meaningful to create a vibration facility for the necessary test series that enables the defined setting and demarcation of each parameter. The superimposition of effects and vibration conditions otherwise makes an evaluation of the results difficult if not impossible.

Figure 1 shows a vibration test facility, as was developed for a special project for the product development of extremely thin-walled elements. Due in this case to the very low dead weight of the concrete product combined with a large surface, absolutely monodirectional oscillations in a horizontal or vertical direction must be generated. The monodirectional oscillations are produced by two synchronising vibrators moving in opposite directions.

The oscillations introduced into the test table must run precisely through the centre of gravity of the total mass. There is otherwise a danger that the products manufactured in the test will exhibit different wall thicknesses of several millimetres over the surface. The assessment of the individual parameters is then only possible to a certain extent. Vibration tables in production plants are usually mounted on full rubber elements, whereby both the geometry and the hardness of the rubber elements have a serious influence due to the large tolerances. In the example illustrated, therefore, bellows cylinders were used as vibration isolators, which additionally make the lifting and a lowering of the table surface possible.
In an unloaded condition, this test device is designed so as to allow the use of frequencies between approx. 20 and 60 Hz that are adjustable in a horizontal direction and frequencies between 40 and 100Hz that are adjustable in a vertical direction. Due to the adjustability of the unbalanced mass, which is decisive for the amplitude, different defined characteristic curves can be tested in both dimensions. In order to obtain the ideal oscillatory movement, a balancing mass that needs to be determined must be bolted to the underside of the vibrating table mass for each test load that is tested on the test table. An eight-fold bore hole pattern can accept steel plates for this purpose.

Conclusions

Before the introduction of a new manufacturing method for the mass production of cast building material elements, it is advisable to examine the influence of the vibration parameters. The use of special vibration tables can thereby give rise to decisive optimisations.

FURTHER INFORMATION

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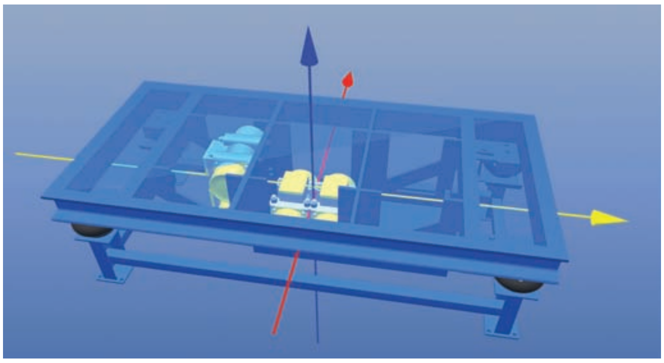

Fig. 1: Test vibration table with high-precision oscillation axes

Fig. 2: Final acceptance and functional testing