

Modular Measurement Platforms

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Abstract. Weighing measurement platforms are devices designed for weighing goods in warehouses, production halls and other closed and open facilities. The subject of the analysis was a series of weighing platforms being an alternative to the structures currently offered on the market, qualitatively new in terms of specific and added features.

CONSTRUCTION AND TECHNOLOGICAL SOLUTIONS FOR MEASURING PLATFORMS

Weighing measurement platforms are devices designed for weighing goods in warehouses, production halls and other closed and open facilities. The subject of the analysis was a series of weighing platforms being an alternative to the structures currently offered on the market, qualitatively new in terms of specific and added features.

The measuring systems used in weighing devices are manufactured based on a series of different types of solutions, different in terms of the work method and the way the measurements are performed. The platforms are made of structural and stainless steel and operate on the basis of measuring systems of steel and stainless steel strain gauge beams. Platform constructions are manufactured from commercial structural elements joined in the welding process and protected by surface-active paints.

RESEARCH OBJECT

A large-size measuring platform dedicated to industrial applications with dimensions of 1250 x 1250 mm was adopted for the research. The platform was designed as a spatially oriented frame support structure made in screw technology in accordance with patent applications [5-7]. The construction was supported on two C-shaped construction profiles with dimensions of 50 x 45 x 8 mm made of S235JR material (weight of elements 21.8 kg). Inside the C-shaped profile the strain gauge beam measuring elements were placed. The support plate was made of deep-drawing sheet with dimensions of 1260 x 1260 mm and a thickness of 3 mm made of S235JR material (plate weight 37.1 kg).

NATURE OF THE RESEARCH

Static structural analysis of the platform was carried out. The research program included:

- stiffness and strength assessment of the measuring platform structure in accordance with the recommendation of standard [6],
- the nominal load on the structure equaled $F_n=30000$ N,
- the possibility of overloading the structure to value of 150% that is $F_o=45000$ N was accepted,
- the load was applied to the upper surface of the platform,
- it was assumed that the force F_o will act on the surface of the cylinder with the base diameter of 1000 mm,
- the load F_o was implemented in the form of hydrostatic pressure.

The elastic-plastic steel S235JR in accordance with PN-EN 10025 norm, material was adopted for the analysis. Numerical simulations of the construction work were performed. Figure 3 shows the distribution of reduced Huber - Mises stress for a force of 4500 kg: a) the coating model a complete top view, b) the coating model a complete bottom view, c) a coating model of a support sheet, top view, d) a coating model of a support sheet, bottom view.

Summary

A series of modular truss weighing platform constructions has been designed. Prototype solutions were analyzed and tested. The developed solutions are characterized by: frame truss design; modular platform design; reduction of welding technology to the detachable screw connections; application of commercial shaped profiles with an open cross-section; designs up to 40% lighter than solutions available on the market; adapted for production in semi-automatic and / or automatic industrial manufacturing; prolonged period of operation; structurally open solutions; lower cost of production, operation, transport; supporting using, mounting, packing, storing; possibility of implementing durable industrial anti-corrosion protection.

The characterized structures are the first solutions on the market that enable the repair and modification of components during operation. The effect was obtained thanks to, among others, unification of functional elements in the full range of types and profiles. Designed measuring platforms are dedicated to use wherever there is a need for unusual construction, individually tailored design, where there is no ready-made mass-produced device. In particular for use in the food, meat and fish processing industry. This system is the only one available on the market that allows to design and build a weighing platform and / or technological line exactly as the customer needs. The solution is complemented by an original data acquisition and visualization system intended for a mobile platform based on logic microcontrollers.

In summary a series of measuring weighing platforms with dimensions from 300x300 mm →2000x2000 mm was designed. Prototype platform solutions 600x800, 800x800, 1250x1250, 1500x1500 were created and a technology of manufacturing and production of a series of platforms was developed. Platforms prototype solutions have been verified in the area of the approval guidelines for use. Operational and service guidelines were formulated and the concept of packaging, storage and transport was developed. The world's first modular composite core platform has been designed and manufactured.

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