

TASHKENT

Ist-International Congress on Modern Sciences

May 10-11, 2022



SciUz
Science Uzbekistan



PROCEEDINGS BOOK

EDITORS:

Prof. Dr. Xayrulla PULATOV

Assoc. Prof. Gulbaxar TAVALDIEVA

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AXIAL DEFORMATIONS DETERMINATION OF STORAGE TANKS FOR LIQUID SUBSTANCES

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ABSTRACT

Reservoirs could be used as: drinking and technical water storage of industrial enterprises, settlements, water supply systems, poultry farms; liquid mineral fertilizers storage; water reserve for irrigation, also in greenhouses; molasses storage, sunflower oil storage; technological tanks in water and wastewater treatment; tanks for fish farming, overflow tanks for swimming pools (Fig. 1.).



Fig. 1. Storage tanks for liquid substances.

Storage reservoirs for liquid substances could be exposed to technogenic seismic effects, which could lead to liquid splashing, tank destruction and losses of valuable filler [1,2]. In order to increase the strength characteristics of tanks and extend their service life, it has been proposed to apply new composite materials of tanks with different nano-inclusions [3,4].

To determine the deformation of storage tanks for liquid substances, the static analysis of cylindrical shells of different materials has been performed. Nanocomposites with aluminum matrix with steel spherical inclusions and with steel and carbon fiber inclusions have been considered [5,6].

Next, the cylindrical shells made of different materials have been considered. It has been assumed the shell length was equal to $L = 1,2$ m, its radius was $R = 1$ m, and the thickness $h = 0,01$ m; the shells were filled with liquid (water) to the level of $H = 1,0$ m. Shells with the rigidly fixed bottom under gravitational conditions with acceleration $g = 9,812$ m / s² have been considered. Fig. 2 shows the finite element grid and axial deformations of these shells.

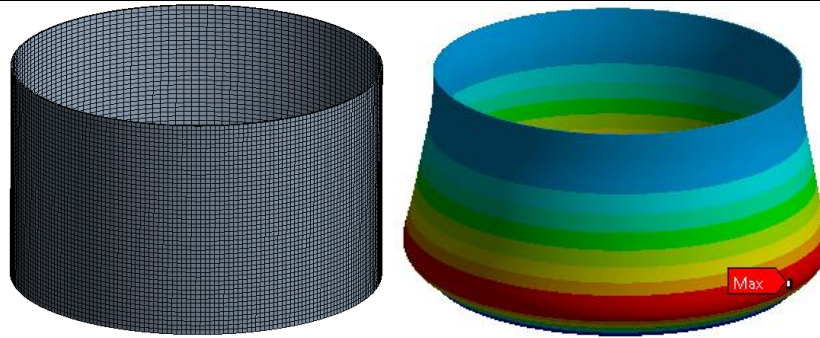


Fig. 2. Finite element model of the tank

There 13,865 finite elements have been selected for the calculations. The further increase in the elements number did not lead to the significant change in the results.

Table 1 shows the axial deformations for aluminum and various composite materials.

Table 1. Axial deformation

Material	Aluminum	Composite, steel balls	Composite, steel fibers	Composite, carbon fiber	Composite, steel spheres
Axial deformation, *10 ⁻⁶ m	11,484	9,449	9,4638	14,467	14,177

Axial strain calculations have been performed for various composite materials with inclusions in the form of steel balls, steel fibers, carbon fibers and steel spheres. The smallest deformations for the considered materials correspond to the composite with steel balls inclusions.

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