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ABSTRACT BOOK**

Edited by
Prof. Dr. Memet ŞAHİN

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ELECTROSTATIC PROTECTION IN OIL STORAGE SYSTEMS**Elena Sierikova, PhD**

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Ukraine[ORCID ID: 0000-0003-2475-5486](#)**Abstract**

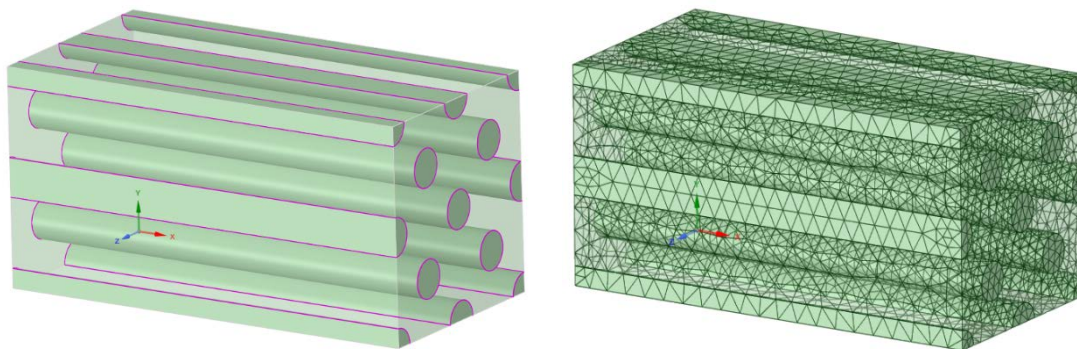
Storage tanks are responsible engineering constructions designed to get, store, release and account the oil and petroleum products. Tanks elements in operational conditions sustain significant changes of temperature, high pressure, vibration, seismic loads, uneven subsidence, and corrosion. The crucial issue today is to ensure the reliability of operation and trouble-free operation of oil storage systems. One of the main causes of explosions and fires in oil storage tanks (reservoirs) is the static electricity generated in the pipeline during the oil transportation.

As a result, electrostatic charges introduced into the tank together with the oil, creating an electric field and, accordingly, the conditions for the occurrence of a spark breakdown of the gas space above the oil surface. Issues of static electricity require careful research and justification for the introduction of new structures and materials in the transportation and storage of petroleum products. The formation of electric charges in petroleum products during their movement called electrification. Electric charges that are in the volume or on the surface of petroleum products called electrostatic. The strongest electrification manifested at high speeds of transportation through pipes. The importance of the processes of accumulation of electrostatic charges is especially great, as electrified materials are flammable liquids. Discharges of static electricity in flammable environments could cause explosions and fires.

It is important to create the new hybrid nanocomposite that effectively shields from electromagnetic fields, has high electrical conductivity and is mechanically strong. The paper treats the properties of composites and nanocomposites with disordered and ordered systems of carbon fiber inclusions, which could be used to neutralize static electric charges that occur in oil storage and could lead to emergencies. The series of nanocomposite materials based on epoxy matrix with carbon fillers of different placement methods has been studied. The

dependence of the strength characteristics of the nanocomposite material on the method of placing carbon nanofillers, as well as the level of filling the matrix with inclusions has been found and investigated with the help of the software package.

The matrices with the filler in the longitudinal and ordered form of carbon fibers according to the diamond scheme have been investigated. Carbon nanofibers have located along the entire length of the matrix, have the 1 nm diameter, the fibers direction coincides with the direction of one of the coordinate axes. The inclusions volume fraction from 0,025 to 0,25 has been analyzed. The calculated models of the nanocomposite with the volume fraction of inclusions equal to 0,2 have been presented on Fig. 1. [1–3].



a)

b)

Fig. 1. Representative cell (a) and finite-element (b) model of nanomaterial with ordered fibrous inclusions

As in the previous case, with fibrous partially ordered inclusions, the use of carbon fibers form as the filler demonstrates the increase in the strength characteristics of the material in the direction of the fibers. Compared with partially ordered fibers, the complete structured ordering further increased the strength properties in the main direction of the fibers, the difference was more than 29%, but underestimated the strength characteristics in the other two directions by 6-12%. Thus, the carbon nanofibers using allows to create the high-quality nanocomposite with pronounced orthotropic properties [1–4].

Outcomes

The results of research prove that the carbon nanofibers using could create the appropriate high-quality nanocomposite that could be used to neutralize static electric charges that occur in oil storage systems and could lead to emergencies.

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