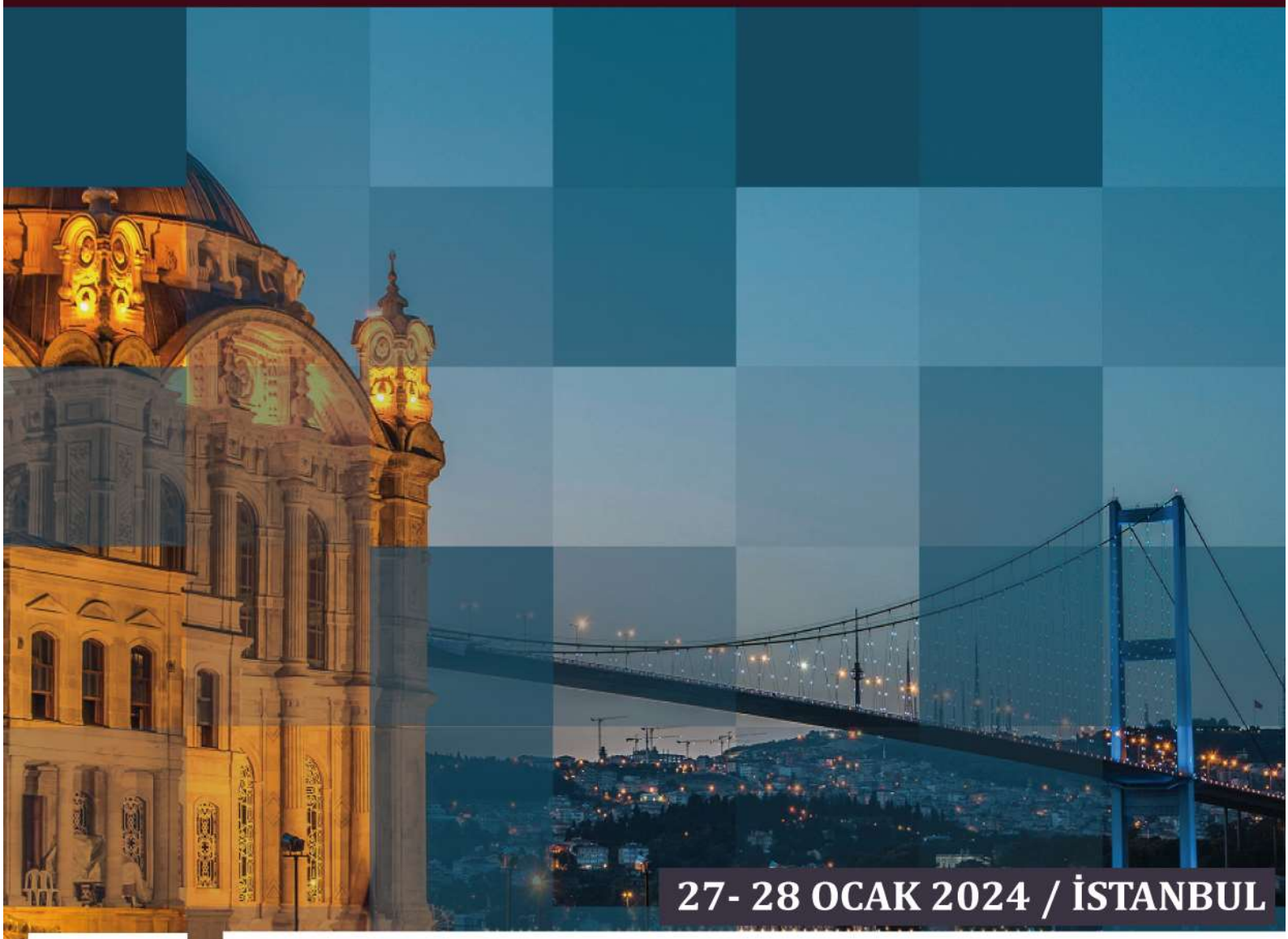

27- 28 OCAK 2024 / İSTANBUL

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STORAGE OF LIQUID HYDROCARBONS IN RESERVOIRS UNDER SEISMIC LOADS

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ABSTRACT

According to the results of recent seismological studies [1], it has been established that on the territory of Ukraine, including its platform part, there is a danger of local and strong subcrustal earthquakes with a magnitude more than 6 points on the MSK-64 scale.

P.G. Pigulevskyi, S.V. Shcherbina, I.Yu. Hurova and others considered earthquakes of natural and man-made origin in their research [2].

O.V. Kendzera, P.G. Pigulevskyi and Yu.A. Andrushchenko have considered industrial explosions with a magnitude >1.0 in their works. The magnitude of the most powerful explosions carried out in 2011–2020 in quarries and mines of the Kryvyi Rih iron ore basin was in the range of 2.7–3.5. It has been also investigated that with the increase in the number of technogenic seismic events, the number of natural earthquakes that occurred with a trigger delay began to increase as well [1].

Pre-disaster physical planning and related construction measures have been required, as well as pre- and post-earthquake risk management. Special attention should be paid to technogenic objects that can affect the state of the environment. Such objects are liquid hydrocarbon storage tanks.

Tank parks are the main place of storage of crude oil and oil products at oil refineries, transshipment and distribution bases, enterprises of road transport, railway, water and air transport. Accumulation of flammable and combustible liquids on a relatively small area of the tank park leads to an increase in environmental and fire hazards of such productions. The possible leakage of dangerous liquid and depressurization of tanks negatively affects the state of the environment.

As a result of soil pollution with oil, the following occurs: disturbance of the ecological balance in the soil system; change in the morphological, physical, chemical and biological characteristics of the soil and the structure of the soil profile; violation of the natural ratio between individual groups and fractions of soil organic matter; penetration of oil and oil products into underground water; decrease in soil fertility and occurrence of toxicologically dangerous situations. The main share of losses is the vapors of petroleum products during their storage. World statistics show that the loss of oil and oil products due to evaporation is from 0.5 to 1.7% of the total volume of processed raw materials, while in Ukraine they are much higher and amount to 3-7%.

Penetration of components of liquid fractions of petroleum products into the plant organism through the root system causes mutagenic reactions, morphogenetic and phenological deviations from normal development. With a further increase in the oil content in the soil, a significant oppressive effect or complete death of plants begins to appear. In the presence of ignition sources, ignition of spilled petroleum products, cloud burning, formation of explosive concentrations - explosion of gas vapors or fire outbreaks are possible.

In the authors' previous publications [3-6], the study of nanoinclusions of composite materials of various shapes, which increase the mechanical properties of tank materials, has been conducted. Seismic loads on sloshing of liquid hydrocarbons in reservoirs have been also considered in works [7,8]. These measures will reduce the risk of natural and technogenic seismic loads on liquid hydrocarbon reservoirs.

Keywords: environmental safety, hazardous liquid, seismic loads, storage tanks, petroleum products, sloshing, liquid hydrocarbon reservoirs.

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