



27- 28 OCAK 2024 / İSTANBUL

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# ULUSLARARASI MARMARA BİLİMSEL ARAŞTIRMALAR VE İNOVASYON KONGRESİ

27- 28 OCAK 2024 / İSTANBUL

KONGRE KİTABI



EDİTÖRLER:

Prof. Dr. Raghat N. JASSIM

Dr. Ledia KAZAZI





# CONGRESS ID

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## CONGRESS TITLE

**7. INTERNATIONAL MARMARA SCIENTIFIC RESEARCH AND INNOVATION**

## CONGRESS

## DATE AND PLACE

**27-28 JANUARY 2024, ISTANBUL/TURKEY ONLINE PRESENTATIONS**

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**INTERNATIONAL SCIENCE AND ART RESEARCH CENTER**

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**ISBN: '978-625-367-648-3'**

<b>AUTHORS</b>	<b>TITLE</b>	<b>NO</b>
Hüseyin Enis KARA Emine CAN	Digital Education Application For Occupational Health Awareness Among Students	744-745
Sibel ÇİLOĞLU Deniz Beste Çevik KILIÇ	“Sanat” Kavramına İlişkin Bilesem Öğrencilerinin Metafor Algıları: İzmir İli Örneği	746-756
Sibel ÇİLOĞLU Deniz Beste Çevik KILIÇ	Bilesem Öğretmenlerinin “Bilim” Kavramına Yönelik Metafor Algıları: İzmir İli Örneği	757-763
Yakup DURMUŞ Mehmet TAŞDEMİR Adem TAŞDEMİR	Investigation Of Secondary School Students’ Foreign Language Motivation And Attitudes In Terms Of Multiple Variables	764-774
Süleyman ÇELİK Zöhre KAYA	The Examination Of Separation Anxiety Perceived by Mothers of Preschool Children in Terms of Various Variables	775-788
Erdem BAYDIR Burak IŞIK Alp Er Ş. KONUKMAN	Optimization Of Energy Recovery In Heat Exchanger Networks Integrated With Organic Rankine Cycle	789-800
Ali Ihsan KAYA	Comparison Of Mechanical Properties Of Recent Reported And Traditional Natural Fibers	801-808
Ömer Emre UÇAKKUŞ Yavuz ERTEM Caner YALÇIN Rabia EDİS	Ensuring Traceability By Developing The R&D Center Management Program	809-810
Ömer Emre UÇAKKUŞ Caner YALÇIN	Investigation Of The Effect Of The Lubricant Volume On Friction Energy Occurs Between Tribo Pairs	811-812
Arzu AÇIKGÖZ Murat MAKARACI Reyhan CEYLAN Ömer Emre UÇAKKUŞ	Reducing The Carbon Footprint Of Shock Absorber Sub-Part Used In The Automotive Industry	813-815
Arzu AÇIKGÖZ Caner YALÇIN Rabia EDİS Ömer Emre UÇAKKUŞ	Production Of Rear Shock Absorber Body Connection Eye Ring Part With An Innovative Approach	816-817
Hasan ÇİFTÇİ	Sağlık Sektöründe Kişilerarası İletişim Yöntemleri	818-825
Mohammad ALAMGEER	A Perl Script Tool for Global Sequence Alignment	826
Lawal W. S. Alu S. O. Oloundare T. M. Salami M. O.	Assessment Of Tumeric (Curcuma longa) For Their Phytochemical Contents And Invitro Assay Of Their Antioxidant Potentials In Heat Stress Alleviation For Broiler Birds	827
AKPOVVO Samuel	Poor Standard Of Education And Its Implication To Education System In Nigeria	828
Kenneth Chinedu EKWUE CHIEF Mayah, EUNICE Obasi, HOPE ONYINYECHI Adejoh, AROME CHRISTOPHER	Challenges Facing Curriculum Implementation Of Business Education Programme In Colleges Of Education, Delta State	829
K. R. PADMA K. R. DON	Role Of Vitamin D In Fortified Food And Its Health Benefits In The Prevention Of Various Diseases	830
Matej BABIČ	3D Laser Cladding Of Metals	831
Hendri Hermawan ADİNUGRAHA NAFILAH Muhammad SHULTHONI Yusuf Agung SAPUTRA Lia Sofiatun NISA	Interesting Architecture Sheikh Zayed Mosque In Solo Indonesia	832-839
Elena SIERIKOVA Elena STRELNKOVA Kyryl DEGTYARIOV	Storage Of Liquid Hydrocarbons In Reservoirs Under Seismic Loads	840-842

## STORAGE OF LIQUID HYDROCARBONS IN RESERVOIRS UNDER SEISMIC LOADS

**Elena SIERIKOVA, PhD**

National University of Civil Defence of Ukraine, Kharkiv, Ukraine

**ORCID ID: 0000-0003-0354-9720**

**Elena STRELNIKOVA, Doctor of Technical Sciences**

A.M. Podgorny Institute for Mechanical Engineering Problems NAS of Ukraine, Kharkiv, Ukraine

**ORCID ID: 0000-0003-0707-7214**

**Kyryl DEGTYARIOV, PhD**

A.M. Podgorny Institute for Mechanical Engineering Problems NAS of Ukraine, Kharkiv, Ukraine

**ORCID ID: 0000-0002-4486-2468**

### 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. Pigulevskiy, 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. Pigulevskiy 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 nano-inclusions 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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