



5. INTERNATIONAL FOOD, AGRICULTURE AND VETERINARY SCIENCES CONGRESS

17 - 19 March 2023

Kafkas University, Kars, Türkiye

PROCEEDINGS BOOK (VOLUME-2)



EDITORS:

Prof. Dr. Tarkan ŞAHİN
Ass. Prof. Mükremin ÖLMEZ



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CONTENT

CONGRESS ID	1
SCIENTIFIC COMMITTEE	2
PHOTO GALLERY	3
PROGRAM	4
CONTENT	5

PROCEEDINGS BOOK (Volume-2)

Kave KOOREHPAZ	1
TREATMENT PROTOCOLS OF BENIGN PROSTATIC HYPERPLASIA IN MALE DOGS	
Murat GÜLMEZ, Kübranur YILDIZ BAYHAN, Sefa ÜNER	2
EFFECTS OF PASTEURIZED SHEEP'S MILK USE ON PRODUCTION AND MATURATION OF SIIRT HERBY CHEESE	
Elif YAGANOGLU, Caner YERLI	3
EFFECTS OF PASTEURIZED SHEEP'S MILK USE ON PRODUCTION AND MATURATION OF SIIRT HERBY CHEESE	
Christian Chapa González, Jazmin Cristina Stevens Barrón	4
USING NANOTECHNOLOGY TO ENHANCE NUTRIENT BIOACCESSIBILITY	
Margherita-Gabriella De Biasi	5
BIOACTIVE PEPTIDES OF PLANT ORIGIN	
Andrey Shepel	6
EFFECT OF DOSE OF MINERAL FERTILIZERS ON HYBRIDS SUNFLOWER PRODUCTIVITY IN NON-IRRIGATED CONDITIONS OF SOUTHERN UKRAINE	
Adnani M, El Hazzat N, Msairi S, El Alaoui MA, Mouden N, Selmaoui K, Benkirane R, OuazzaniTouhami A, Douira A	7
EFFECT OF CHICKPEA SEED TREATMENT WITH TRICHODERMA ASPERELLUM IN THE CONTROL OF FUSARIUM EQUISETI, THE CAUSAL AGENT OF ROOT ROT	
A. Rezaoui, L. Ibouzindine, A. Elhamzaoui, M. Y. El Brouzi, A. El hessni, A. Mesfioui	8
PROTECTIVE EFFECTS OF MELATONIN AGAINST OXIDATIVE STRESS CAUSED BY IRON CHRONIC ADMINISTRATION COMPARED TO EDTA CHELATOR	
Ivan Pavlovic	9
COCCIDIOSIS OF PET DOGS IN BELGRADE AREA DURING 2021	
Najoua Mouden, Amina Ouazzani Touhami, Benkirane Rachid, Karima Selmaoui, Douira allal	10
COMPARATIVE PATHOGENIC CAPACITY OF THREE FUNGAL SPECIES ONTO DETACHED LEAVES OF SABRINA STRAWBERRY VARIETY	
Muhammad Ijaz, , Arslan Ahmed, Muhammad Umar Javed, Nauman Zaheer Ghumman, Hamza Rasheed, Farwa Anwaar, Syed Faizan Ali Shah	11
MOLECULAR INVESTIGATION OF ENTEROTOXINS IN METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS ISOLATED FROM BOVINE MILK AND OCCUPATIONAL DAIRY WORKERS IN PAKISTAN	
Vitalii Sapunov, Oleh Marenkov	12
MORPHOBIOLOGICAL CHARACTERISTICS OF THE REDTAIL CATFISH PHRACTOCEPHALUS HEMIOLIOPTERUS (BLOCH & SCHNEIDER, 1801)	

Bui Man Nghi, Nguyen Thi Hoai Ngoc, Dao Thanh Tam IMPORTANCE OF CULINARY CULTURE IN VIETNAMESE BELIEFS CASE STUDY: SOUTHWEST VIETNAM	137
Irina Plisko, Karina Kutsova IMPLEMENTATION OF PRECISION FARMING MEASURES BASED ON TAKING INTO ACCOUNT THE SPATIAL DISTRIBUTION OF NITROGEN COMPOUNDS IN ARABLE SOILS	138
Elena Sierikova, PhD, Elena Strelnikova, Doctor of Technical Sciences, Kirill Degtyarev, PhD DEFORMATIONS TREATMENT IN LIQUID HYDROCARBON RESERVOIRS	139
Elena Sierikova, PhD, Elena Strelnikova, Doctor of Technical Sciences, Yehor Kononenko, engineer LIQUID VIBRATIONS IN CYLINDRICAL AND CONICAL SHELLS WITH AND WITHOUT BAFFLES	143
Maria Khoteeva, Ptof. Varvara Getmantseva APPAREL DESIGN PERSPECTIVES FOR FARM ANIMALS	145
Kateryna Romanchuk, Svitlana Krylach OVERCOMPACTION OF THE ARABLE LAYER OF THE SOIL AND ADAPTATION OF AGRICULTURAL CROPS TO ITS MANIFESTATION	146
C.Rajeevi, Karthika Natarajan PERFORMANCE ASSESSMENT OF SUPERVISED MACHINE LEARNING TECHNIQUES FOR CLASSIFYING THE CHRONIC DIABETES DISEASES	147
Anna Kopiczko, Monika Lopuszanska-Dawid, Patrycja Widlak, Malgorzata Jusiakowska - Piputa SOCIAL, BEHAVIOURAL AND OTHER DETERMINANTS OF FOOD CHOICE AMONG EUROPEAN ORIGIN YOUNG WOMEN: THE RESULTS OF CROSS-SECTIONAL OBSERVATIONAL STUDY	156
Gupta Swati Sanjaykumar, Rishabha Malviya BIOMEDICAL APPLICATIONS OF 3D-BIOPRINTING TECHNIQUE: ADVANCES AND PROSPECTIVES	157
Chiriac Luiza – Silvia, Dumitru T. Murariu FUNCTIONAL GROUPS OF INVERTEBRATES ACCORDING TO TROPHIC PREFERENCE	158
Shylaja Jeyapaul, Dr. Raji Kaliaperumal FOOD PRACTICE AND BMI AMONG COLLEGE GIRLS: AN ASSOCIATION	159
Serghey A. Shapovalov FUNCTIONALIZED REAGENTS IN CHEMICAL ANALYSIS OF AGRICULTURAL SOILS	161
Rohan Srivastava, Saimah Khan BIOREMEDIATION: A SOLUTION TO DAIRY AND POULTRY WASTE DISPOSAL	162
Carmel Prins¹, Arunima K.M², D. Sreekumar, Veerasamy Sejjan⁴ ENVIRONMENTAL ENRICHMENT IN CAPTIVE BEAR ENCLOSURES	163
Mr. Anshul Jain GAMIFICATION OF SCIENCE COMMUNICATION: USING GAMES TO ENGAGE AND EDUCATE PEOPLE ABOUT SCIENTIFIC CONCEPTS	164
Olena Budiakova BIOECONOMY: A MECHANISM FOR SOLVING THE FOOD CRISIS	167
G. Kalaignazhal, K. Devadharshini, M.V.Silpa, V. Sejjan¹ DIFFERENT BIOMARKERS FOR QUANTIFYING HEAT STRESS REPOSE IN LIVESTOCK	170
Arunima K.M, Carmel Prins, D. Sreekumar V. Sejjan⁴ SHELTER MANAGERMENTAL STRATEGIES FOR PROTECTING GOATS FROM CLIMATIC STRESS	171

DEFORMATIONS TREATMENT IN LIQUID HYDROCARBON RESERVOIRS

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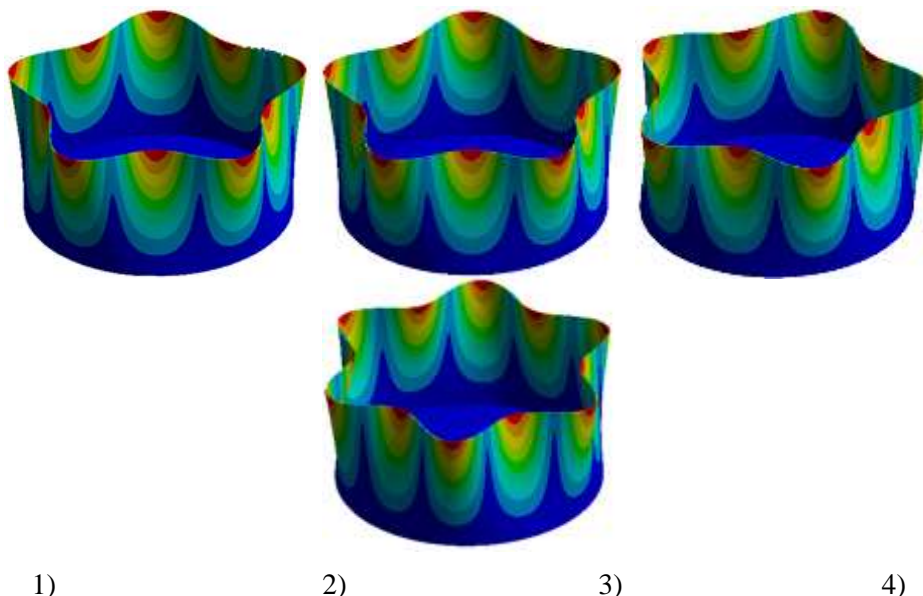
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ABSTRACT

In the paper, the problems of determining the frequencies and oscillations forms of structural elements have been investigated, taking into account the hydroelastic interaction. It has been noted that the basic correlations of the mechanics of a solid medium have been used to describe the motion of both an elastic structure and a fluid.

To calculate the vibration characteristics, we perform the following calculations [1-3]. First, we calculate the frequencies and oscillation forms of the elastic unfilled shell. A steel shell with fastening along the entire bottom has been considered [4-7].

Fig. 1 shows the oscillation forms of such an unfilled elastic shell.



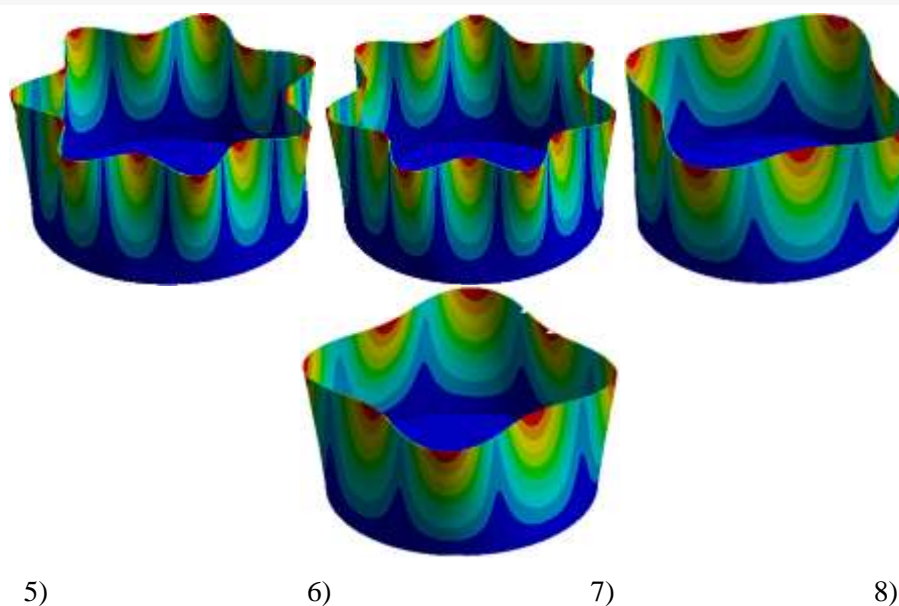


Figure 1. Oscillation forms of an unfilled elastic shell
 Table 1 shows the corresponding oscillation frequencies.

Table 1. Oscillation frequencies of the unfilled shell.

Form N	1	2	3	4	5	6	7	8
Oscillation frequency, Hz	109.07	109.07	110.63	110.63	129.95	129.95	132.15	132.15

Note that all oscillation frequencies are multiples, and different oscillation forms correspond to them. These forms make up the first system of basic functions for dynamic analysis. Next, oil sloshing in the above-mentioned tank has been considered. The oil density is 960 kg/m³, the sound speed is 1250 m/s, and the level of filling the shell with oil is 1 m. Table 2 shows the frequencies of oil sloshes in the casing. At the same time, the shell has been considered rigid.

Table 2. Sloshing frequencies, Hz

Form N	1	2	3	4	5	6	7	8
Oscillation frequency, Hz	0.6596	0.6596	0.8693	0.8693	0.9754	1.021	1.021	1.149

Fig. 3 shows the forms of free surface sloshes.

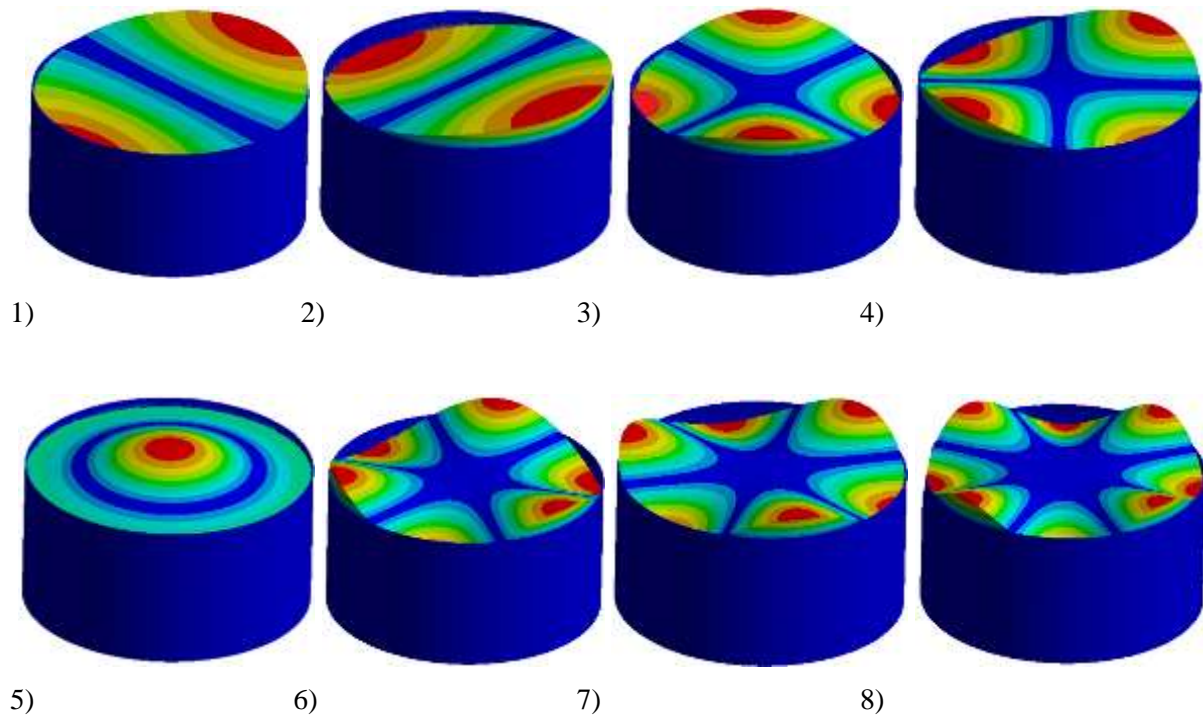


Figure 3 Sloshes forms of the free surface

We can see that the lowest frequencies correspond to neoseimic forms, namely the first harmonic. The axisymmetric shape corresponds to the fifth frequency.

Keywords: oscillation frequency, hazardous liquid, seismic loads, storage tanks, petroleum products, sloshing, liquid hydrocarbon reservoirs.

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