CONFERENCE

PROCEEDINGS BOOK

ISPEC GLOBAL CONGRESS ON INTERDISCIPLINARY SCIENCE AND SCIENTIFIC RESEARCHAPRIL 27 APRIL 3 MAY, 2026 ROME, ITALY

2026

Editors

Prof. Dr. Tünay KARAN

Prof. Dr. Seyithan SEYDOŞOĞLU

ISPEC GLOBAL INTERDISCIPLINARY SCIENCE AND SCIENTIFIC RESEARCH CONGRESS (ISPEC-GISRC)

Date: 08.03.2026

Liberty Publishing House
Water Street Corridor New York, NY 10038
www.libertyacademicbooks.com
+1 (314) 597-0372

adopted by Mariam Rasulan

ISBN: **979-8-89695-434-7**

ISPEC GLOBAL INTERDISCIPLINARY SCIENCE AND SCIENTIFIC RESEARCH CONGRESS (ISPEC-GISRC)

APRIL 27 - MAY 3, 2026 / ROME, ITALY

CONFERENCE

PROCEEDINGS BOOK

(Abstracts & Full Texts)

EDITORS

Prof. Dr. Tünay KARAN

Prof. Dr. Seyithan SEYDODOŞOĞLU

Cover Design: Hatice ÜSTÜNDAĞ

ISBN: **979-8-89695-434-7**

ENVIRONMENTAL PROTECTION FROM TECHNOGENIC OBJECTS UNDER EARTHQUAKE AND EXPLOSION EFFECTS

Olena Sierikova, D.Sc.
National Scientific Center "Hon. Prof. M.S. Bokarius Forensic Science Institute" of the Ministry of Justice of Ukraine, Kharkiv, Ukraine
ORCID: 0000-0003-0354-9720
Olexander Yevsiukov, Candidate of Pedagogical Sciences
National Scientific Center "Hon. Prof. M.S. Bokarius Forensic Science Institute" of the Ministry of Justice of Ukraine, Kharkiv, Ukraine
ORCID: 0000-0002-3554-8848
Elena Strelnikova, D.Sc.
A.M. Podgorny Institute for Mechanical Engineering Problems NAS of Ukraine, Kharkiv, Ukraine
ORCID: 0000-0003-0707-7214
Kyryl Degtyariov, PhD
A.M. Podgorny Institute for Mechanical Engineering Problems NAS of Ukraine, Kharkiv, Ukraine
ORCID: 0000-0002-4486-2468

Preservation of ecological balance and safety of the population is becoming an integral part of society sustainable development. In the context of global climate change, increased seismic activity and the threat of terrorist acts and military influences, technogenic objects, objects of critical infrastructure, are becoming potential sources of environmental disasters.

Earthquakes can cause infrastructure destruction, which leads to pollution of air, water and soil. Explosions, in turn, can cause not only instant physical destruction, but also the possibility to spread pollution over a long distance. This threatens not only the surrounding area, but also the population health.

Thus, the development and implementation of measures to protect the environment from the likely negative consequences caused by earthquakes and explosions is becoming critically important in the context of preventing environmental disasters. A systematic approach to risk assessment, engineering solutions, and environmental monitoring can significantly reduce the likelihood of negative impacts. This, in turn, contributes not only to environmental conservation, but also to ensure human life and safety.

The aim of this paper is to study the effectiveness of tuned liquid dampers to mitigate structural vibrations under loading. The tuned liquid dampers have been considered as rigid tanks, partially filled with liquids. The tank is rigidly connected to an elastic structure. The developed numerical model incorporates the interaction between the structure and the tuned liquid damper. The structure has been assumed as a single degree of freedom system. To obtain the fundamental frequencies of tuned liquid damper, the boundary element method has been used. The novelty of the proposed method consists in analyze the mitigation of structure vibrations equipped with tuned liquid damper.

Single degree of freedom elastic system equipped with tuned liquid dampers, designed to control oscillations induced by external loads, liquid mass has been considered. The tuned liquid dampers absorbs energy by moving the liquid within the tank in opposition to the structure's response to dynamic loads. Figure 1. illustrates this concept schematically, showing the motion of the liquid relative to the structure.

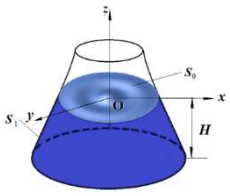

Fig. 1. Structure with Tuned Liquid Damper

A comparison of numerical and analytical results from (Raynovskyy 2020) for l=0 (axisymmetric modes) for different modes k has been provided in Table 1.

Table. 1. Axisymmetrys sloshing frequencies, Hz, L=0.

k	**Conus**
	Numerical solution
1	5.3534
2	7.8068
3	9.6034
4	11.1044
5	12.4246
6	13.6180

The results demonstrate the accuracy of the proposed numerical method.

The sloshing frequencies of conical shells have presented in Table 2.

Table 2. The sloshing frequencies of conical shells

k	**Conus**
	Numerical solution
1	5.3534
2	7.8068
3	9.6034
4	11.1044
5	12.4246
6	13.6180

The results demonstrate the accuracy of the proposed numerical method. The sloshing frequencies of conical and cylindrical shells are different, but this difference decreases as the frequency number increases [1,2].

The method is based on the use of singular integral equations to find the frequencies and vibration modes of the tuned liquid damper. The effective numerical procedure is elaborated to numerical estimation for the singular integrals.

It has been established that the use of the proposed liquid damper leads to a significant reduction in the vibration amplitude of the elastic element over the entire load range examined. The liquid dampers implementation will allow the development of effective practical solutions to ensure the stability of buildings and critical infrastructure facilities and reduce environmental threats under the influence of seismic loads, military explosions, and emergencies.

Keywords: environmental protection, earthquake, explosion, tuned liquid dampers.