הטכניון – מכון טכנולוגי לישראל **הפקולטה להנדסת מכונות**

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ד' 31.08.16 (כז' באב, תשע"ו), בבניין דן-קאהן, קומה 0, אודיטוריום 1, 11:30.

יוצא: מאור פריד

מנחה: פרופ' אולג גנדלמן

על הנושא:

Nonlinear Liquid Sloshing in Partially Filled Tanks: Modeling, Exploration and Mitigation

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

Liquid-filled tanks are widely used in various branches of engineering, including nuclear, process and aerospace industries, for storage of chemicals, gasoline, water, and different hazardous liquids. Dynamic stresses in such tanks develop due to various external effects that might lead to strongly nonlinear or even impact-like sloshing regimes, such as high-amplitude oscillations and hydraulic impacts. In such cases, excessive stresses can impair or even destroy the tank structure; however, storage tank design regulations in the USA, Japan and different European countries are based only on linear sloshing model. Moreover, the vast majority of them even neglect the tank shell and foundations vibration and their elastic behavior. Therefore, the knowledge and the ability to predict and describe those hazardous sloshing regimes and their interaction with the containing vessel elastic vibration modes using analogues dynamical models, and to assess the associated applied stresses in the first stage, and the ability to minimize or mitigate them in the next stage are crucial for safe design and operation. In addition, the equivalent dynamical models should be as simple and informative as possible in order to serve engineers for more accurate and well-founded equipment design and operation regulations.

In this research we suggest equivalent mechanical system of elastic partially-filled liquid vessel that describes the main dynamical features and regimes relevant for assessment of interaction stresses applied on the tank inner walls. Verity of nonlinear sloshing regimes reported in literature is described and explained using asymptotic tools. The hydraulic impacts are modeled by high-power potential and dissipation functions, and their relation to the traditional restitution coefficient is studied. Analytic relation between the system parameters and degrees of freedom (DOFs) and the mechanical stresses applied on the tank critical section due to arbitrary ground excitation is obtained. We establish the relationship between the properties of the suggested models and response patterns of the sloshing systems, that are observed in experiments. Finally, numerical optimizations of Tuned Mass Damper (TMD) and Nonlinear Energy Sink (NES) are performed using novel mitigation evaluation criteria.

בברכה,

שרון אמיר

מרכז הסמינרים