National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Slosh dynamics of base-isolated partially filled rectangular liquid containers with internal block
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Venue	: Departmental Seminar Hall (MN-238)
Date and Time	: 30 Jul 2025 (10.00am)
Abstract	: Ground-supported liquid storage tanks are the vital infrastructural applications used in water supply system, oil and chemical industries, sewage plants, and nuclear reactors that seek special attention to maintain their efficient functionality. Despite the consistent efforts to improve the dynamic performance of these structures against vulnerable earthquakes, many liquid containers have been damaged critically under severe earthquakes. As a result, these failures led to a significant loss of liquid content, causing undesirable economic losses and long-term environmental contamination. Since earthquakes are unpredictable and inevitable, the seismic safety of liquid storage structures is therefore crucial from the design point of view. With this motivation, this research employs different passive energy dissipation techniques like submerged internal block and base isolation for liquid containers. This study presents a novel contribution in the field of slosh dynamics by emphasizing different eccentric and concentric positions of a submerged block inside a base-isolated tank using LRB and NZB isolators. In addition, the overall seismic responses of different base-isolated tank systems are studied under the influence of near-fault earthquakes possessing directivity and fling step effects. Finite element models are developed based on linear and nonlinear potential flow theory to efficiently assess the impulsive and convective components of hydrodynamic pressure and base shear for different configurations of tank-block-isolation systems. The outcomes of this study demonstrate that the presence of internal block, implementation of base isolation, free surface nonlinearity, frequency content and near-field characteristics of earthquakes significantly influence the seismic behavior of liquid tanks and such factors have greater importance in an efficient earthquake-resistant design.