National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Non-linear hybrid Eulerian-Lagrangian model for sloped wall liquid dampers to control wind-induced vibration of multi-degree of freedom structures
Speaker	: Prof. K. C. Biswal
Supervisor	: Dr. M. Gattu
Venue	: CE Seminar Hall
Date and Time	: 05 Aug 2025 (11:45 AM)
Abstract	: The conventional tuned liquid dampers (TLDs) with larger base dimension contains stagnant liquid mass at bottom corners that does not participates in vibration control rather adds extra mass to the structure. Hence, the present study numerically investigates the vibration control efficiency of the sloped wall TLD with a narrow base under wind excitations. The sloped wall tank's sloping wall enables more liquid to participate in sloshing, which increases the sloshing force in comparison to the conventional flat-bottom tank. The hybrid Eulerian-Lagrangian non-linear finite element scheme for the TLD and the linear spring-mass scheme for the multi-degree-of-freedom structure (MDOFs) are combined and employed for the numerical modeling of the present problem. Compared to the linear hydrodynamic response of the TLD tank, the obtained non-linear hydrodynamic response is closer to the existing experimental result, justifying the accuracy of the non-linear sloshing model. For the TLD with the non-linear sloshing model, the optimal tuning ratio is found to be significantly less than unity, whereas, by the linear sloshing model, the predicted optimal tuning ratio is almost unity. At the optimum tuning ratio, the dynamic behavior of the MDOF structure with coupled TLD is investigated under wind excitations at different floor levels, and it is found that the linear TLD model overestimates the vibration control effect.