

# Dynamic Stability of Structures Interacting with Generalized Flows

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In this talk an attempt is made to take a unifying look at the dynamic stability of such structures as railway tracks, pipelines and offshore platforms in interaction with, respectively, running trains, conveyed fluids/currents and ice flows. The latter three moving objects/media are referred to in the title of the talk as generalized flows.

The dynamic stability of a train-rail interaction is compared to that of a pipe conveying fluid. These two situations are similar being both related to the axial movement of the flow (trains and conveyed fluid) with respect to the axis of the structure. The physical reasons for the instability are discussed and compared to each other. Special attention is paid to the effects of the boundaries of the structure and continuity of the flow on the systems stability. Cross links are established between these two engineeringly different but phenomenologically similar situations.

The vortex-induced vibration of a submerged pipeline in a cross flow (marine current) is evaluated in comparison with the ice-induced vibration of a vertical offshore structure in contact with level ice. These phenomena are similar due to the normal incidence of the flows relative to the structure and due to the both spatial and temporal synchronization of the flows along the contact interface. The dissimilarities are related to a strong inhomogeneity of ice and its fracture process in interaction with the structure in comparison to a practically homogeneous character of sea water.

This talk is hoped to assist in transferring expertise from the relatively well-developed field of fluid-structure interaction to the fields of train dynamics and ice-structure interaction, in which the phenomena of instability has not been studied in detail as yet.