

# Effect of current on a moored finite floating elastic plate

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## 1. INTRODUCTION & OBJECTIVE

A great deal of work has been done in the last few decades on wave-structure interaction issues, mostly using linear water wave theory. Our study investigates the intricate relationships among oblique waves, moored finite plate, ocean current and porous bottom. Numerous engineering applications, such as coastal protection, maritime buildings, and marine renewable energy systems, depend on an understanding of these interactions. Floating elastic plates function as a straightforward model for enormous floating constructions and sea ice. Two-dimensional finite plate solutions were obtained by Meylan & Squire [1] and Newman [2] using integral-equation formulations. Taking into account variations in bottom topography, Karmakar & Soares [3] discussed the scattering of oblique waves by a moored finite floating elastic plate. Muniyappan & Mohanty [4] studied the oblique wave interaction of finite floating elastic plate in the presence of current and rigid bottom considering clamped edge conditions. The solutions mentioned above were all in the frequency domain.

The time-dependent motion of a floating elastic plate has been examined by several researchers. In Davys et al. [5], Squire et al. [6], the infinite extent problem was discussed in relation to moving loads on ice. The Fourier transform is used to solve this problem because of the uniform expanse of ice. Using a variational approach and the Rayleigh–Ritz technique, Meylan [7] addressed the forced vibration of a finite floating elastic plate. Meylan [8] determines the time-dependent vibration of a floating elastic plate under the action of a transient force. However in the above studies impact of ocean current and porous bed is neglected.

The objective of study is to discuss wave motion in the presence of moored finite is studied both frequency and time domain considering ocean current and porous bottom. Using monochromatic incident wave forcing, wave scattering is studied and using the Gaussian forcing applied at one edge of plate, time-dependent vibration of a floating elastic plate is studied.

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## 2. RESULTS & HIGHLIGHTS OF IMPORTANT POINTS

The study focuses on the wave motion in the presence of the moored finite floating elastic plate and porous bottom in both the frequency and time domain. Oblique wave scattering due to incidence of wave on the moored finite floating elastic plate under the effect of current is studied in the frequency domain considering bottom to be porous. Analytically, using the eigenfunction expansion method the velocity potential and surface elevation are derived. The reflection and transmission coefficients are then obtained and the energy balance relation is verified for the accuracy of results. Further, the time domain simulation of forced floating elastic plate is discussed. The force is applied on one edge of the plate and using the proper edge conditions the frequency domain solutions are derived. Then using Fourier transform, time domain solution is derived from the frequency domain solutions.

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