Acoustic Radiation from an Infinite Cylindrical Shell with Periodic Lengthwise Ribs

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Abstract : The vibroacoustic behavior of an immersed infinite cylindrical shell with periodic lengthwise ribs has been studied in this paper. The motions of the shell are described by the Donnell equations. Each lengthwise rib is modeled as an elastic beam. The motions of the bulkheads are decomposed into the longitudinal motions and flexural motions. The analytical expressions of the shell motions can be obtained through circumferential mode expansion, Fourier Transform and periodic boundary condition in the circumferential direction. Furthermore, the far-field radiated pressure has been obtained using the stationary phase. The analysis of wavenumber domain shows that periodic lengthwise stiffeners in the circumferential direction can produce flexural Bloch waves. The dominant feature in far-field pressure amplitude is the resonance of the supersonic components of the flexural Bloch waves in the circumferential direction.