

Abstract

To provide a better understanding of how frazil ice deposits on trash racks at water intakes, the phenomenon was video recorded at two hydropower plants and in a refrigerated laboratory flume.

Ice initially accumulates on the upstream face of the bars, and it progresses then to the upstream sides of the bars. The frazil ice layer grows in all directions, and it finally bridges over the spaces between bars. The ice blockage starts at the upper part of the rack and progresses downward. The head losses across each intake, which are observed continuously at the plants, illustrate the degree and importance of ice growth.

A mathematical model can be used to predict patterns of ice deposition that correspond to the observed results. Such a model must include a hydro-dynamic part for viscous flows and a particle trajectory model. Some models neglect the term for force due to pressure gradient in their calculations of a particle trajectory because the particles had larger density than the surrounding fluid. Ice particles have almost the same density as the water and simulated results showed that this term, caused by the pressure gradient, is the dominant force that counter the momentum of the particles when they move in the region close to the obstacle.

Sammanfattning

Isformationer och isbildningar kan förorsaka svårigheter i regioner med strängt klimat.

Kravisbildning kan leda till tillväxt av istäcken, som i sin tur kan ge upphov till hängdammar med översvämningsskador som följd.

En matematisk modell kan användas för att förutsäga mönstret för kravistillväxt.