

Three dimensional flow modelling for design of fish ways, Finland

Maalismaa and Raasakka hydro power plants tailrace flow model, 2013

Fortum made a model for the client of the hydro power plants tailrace flow for optimal design of the fish ways to improve migration of fish.

Power plant: Maalismaa Hydro Power Plant

Location: Yli-li, Finland

River: li river

Power output: 39 MW

Heat: 18.3 m

Power Plant: Raasakka Hydro Power Plant

Location: li, Finland

River: li river

Power output: 64 MW

Heat: 21 m

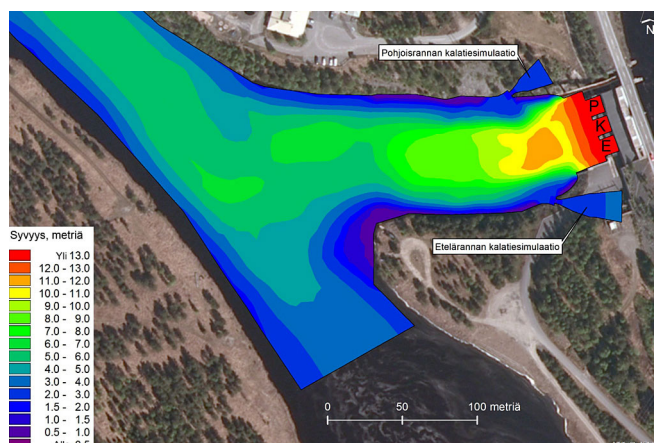
Customer: Finnish Game and Fisheries Research Institute

Services: three dimensional flow modelling for optimal design of fish ways and for fish research

Description of the project

Fortum did a flow model for two hydro power plant tailraces for placement of fish ways for Finnish Game and Fisheries Research Institute. The study was done with three dimensional Mike3D FM-model. Fortum did the flow modelling at the inlets of the fish ways and at other tailrace flows at Raasakka and Maalismaa power plants. With this modelling, the water that flows to the fish ways intakes and the additional pumped water to attract fish can be evaluated. At Raasakka HPP there are two fish ways on both sides of the power plant, and they were studied on how attractive they are for the fish. At Maalismaa HPP the best possible placement for a fish way was studied.

In the flow model the variables affecting the flows were studied: depths of the tailraces, velocities of the flows, alternation on the water levels, flows to attract fish and the placements of the turbines suction inlets. Based on the modelling the most attractive flow for the fish was analyzed and the fish ways can be build according to these information. Also other variables affecting flows were taken in consideration to attract fish to the fish ways; places and directions of the fish way inlets, differences in the fish way and power plant flows depending on the time of the year and the time of the day, and ways of using the turbines of the plant. The client studied the attractive conditions for fish with fish positioning and flow modelling.



Results

Fortum's flow modelling was used to study the flow conditions of the hydro power plant tailraces and the fish way inlets, and the attractiveness of the flows at fish ways for fish. Based on this information the fish way and power plant use and the placement of fish ways can be optimally design to increase mobility of migrants in the river. The information is also used to study fish behaviour.

Fortum's modelling helped us in an excellent way to examine the effects of different flow alternatives on the migrants' ecology choices and behaviour in different depths of water.

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