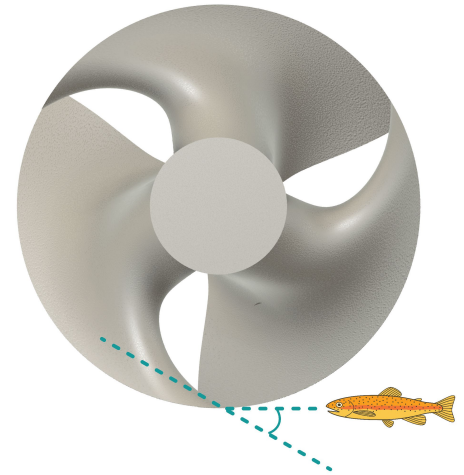
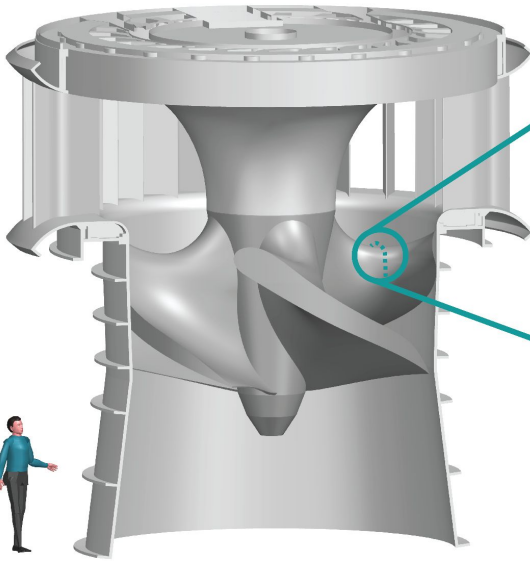




Natel High-performance, FishSafe™ engineering

Restoration Hydro Turbine Design

Natel Energy is a California-based engineering and technology company specializing in the hydraulic design of high-performance FishSafe™ turbine runners. Natel's patented FishSafe™ [Restoration Hydro Turbine \(RHT\) designs](#) feature thick, forward-swept blades that allow fish to pass safely through the turbine (eliminating the need for fine screens, large bypass fishways, or other compromise solutions). By enabling safe fish passage at the same speed and power point as conventional turbines, FishSafe™ RHTs allow for straightforward equipment replacements with little to no change in civil works or generator specifications.



Thick, slanted runner blades reduce the likelihood and severity of a strike during fish passage.

Broadly applicable

Propeller, Kaplan, & Francis-style designs for plants up to 40 m (130 ft)

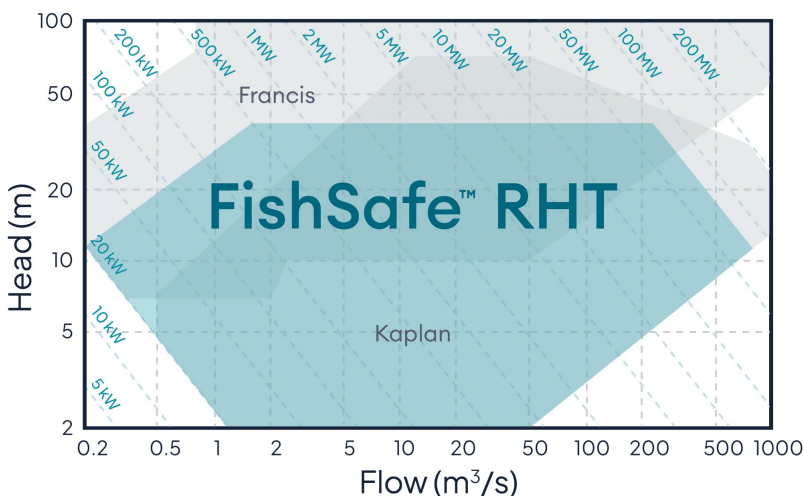
High performance

Peak hydraulic efficiency >90%

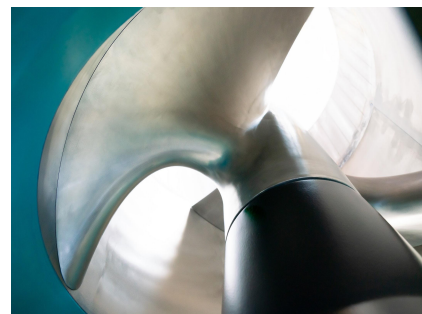
FishSafe™

98–100% fish passage survival

Working in partnership with OEMs that best fit customer needs to manufacture our designs, Natel can provide FishSafe™ propeller, Kaplan, or Francis-style RHT runners or turbines of any diameter for sites up to 40 m (130 ft) in head. FishSafe™ RHTs can be seamlessly integrated with existing civil works, providing the lowest cost option for meeting downstream fish passage requirements while simultaneously modernizing aging plants.



Read our **peer-reviewed journal articles** demonstrating safe downstream passage for eel, salmonids, and alosines.



By enabling 98–100% fish survival, Natel’s FishSafe™ turbines integrate the cost of improved environmental performance with the necessary cost of turbine upgrades, driving two to ten times accelerated return on investment on a plant owner’s capital expenditures and providing a lower total cost of ownership compared to conventional turbines with status quo fish passage mitigation measures.

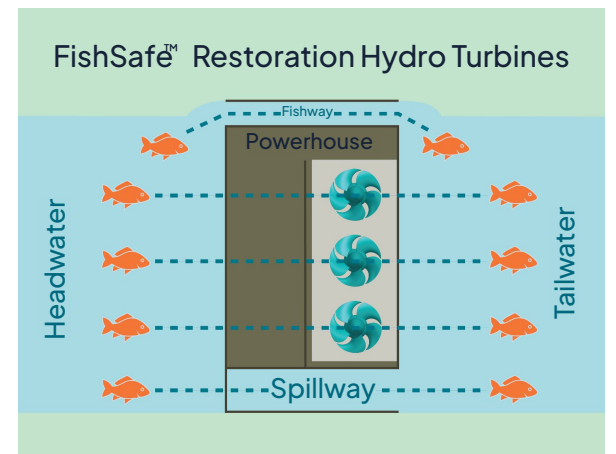
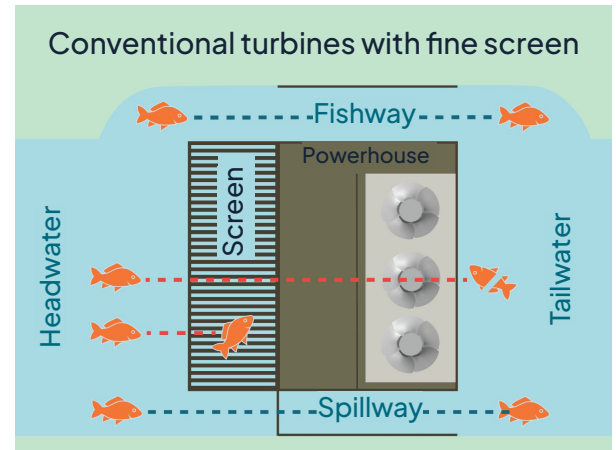
FishSafe™ turbines offer many economic advantages over conventional turbines with fine screens:

- **CapEx** to install FishSafe™ RHT ~50% CapEx to install fine screens and bypass fishway.
- **OpEx** to clean and maintain fine screening is all money saved with FishSafe™ RHTs.
- **Power generation:** up to 10% more with FishSafe™ RHTs due to avoided bypass flow and screening head losses. Plant maintains operational flexibility.

Read the **peer-reviewed journal article** comparing the cost of installing RHTs to the cost of traditional fish exclusion measures.



Contact us at info@natelenergy.com



FishSafe™ turbine runner design

Performance & fish passage lab testing

Design feasibility studies

Natel offers hydraulic design and analysis services that can include proprietary CFD simulations and lab-based performance and fish passage studies to provide detailed data to support clients in evaluating their sites for FishSafe™ turbines.

