The Restoration Hydro Turbine (RHT) is a hydroelectric turbine combining high performance, safe fish passage and a short draft tube for simple civil works.

Unique fish friendly blades are optimized for low head between 2 m - 10 m (6.5 ft - 33 ft), eliminating the need for fine fish screens thus increasing total plant efficiency while reducing both upfront and operations and maintenance costs.

Single units have capacities from 32 kW to 1,400 kW; with plans to extend to larger units over time. Civil works are simplified due to compactness and availability of configurations such as pit, radial-inflow open forebay, and Z type.

How it Works

The low number of blades reduces the likelihood of a strike. Large, blunt leading edges create a pressure wave and a local low velocity zone in advance of the runner blade (a fish-saving pressure field), gently decelerating fish and safely transporting them around the blade. The low number of blades further reduces the likelihood of fatal strike. Slanted blade tips reduce the relative strike speed, allowing higher runner rpm and reducing generator cost. The runner has the same high efficiency as a well-designed conventional propeller blade. Variable speed and variable wicket gates enable a double-regulated efficiency curve. The turbine has been designed to enable survival of >99% of fish less than 300 mm in length (such as salmon smolts), despite a compact runner diameter of 1m - 3m, enabling simple project logistics.

Key Advantages

- Fish friendly: >99% safe passage of fish <300 mm at 7 meters head
- Short draft tube: 50% shorter draft tube vs conventional Kaplan turbines
- Low cavitation risk allows turbine placement above tailwater
- Compact: delivered as a pre-engineered water-to-wire solution
- >90% efficiency
Form Factor and Applications

Restoration Hydro Turbines can be installed in a range of settings, including retrofit of existing turbines (for low-cost compliance with environmental requirements, or to improve output of old units), existing non-power dams, irrigation canals, and run-of-river new stream reach developments.

The RHT is available in 3 different configurations:

- **Axial-flow pit turbine**: both short, open-flow intakes, and pipeline configurations
- **Radial-inflow open-flume** vertical or horizontal turbine: ideal for low-cost, low-head projects, and drop-in retrofits of old low head Francis turbines
- **Z-turbine**: for 6m-10m head, allows very compact powerhouse, and low cost turbine

Operating Range

RHT turbines are available with runner diameters from 0.55 m to 3.2 m. Units below 2 meters in diameter can be deployed at up to 10 meters of head, with larger units available at lower head ratings; the D3.2 can operate at up to 5 meters of head.

Power Takeoff & Regulation Configurations

Natel’s RHT is available in several different regulation configurations. The correct selection for your project will be driven by flow and head operating characteristics.

- Regulation Options:
  - With or without adjustable wicket gates
  - With or without variable speed

Performance

- Turbine hydraulic efficiency: 90-92%
- Safe fish passage: >99% for fish <300 mm