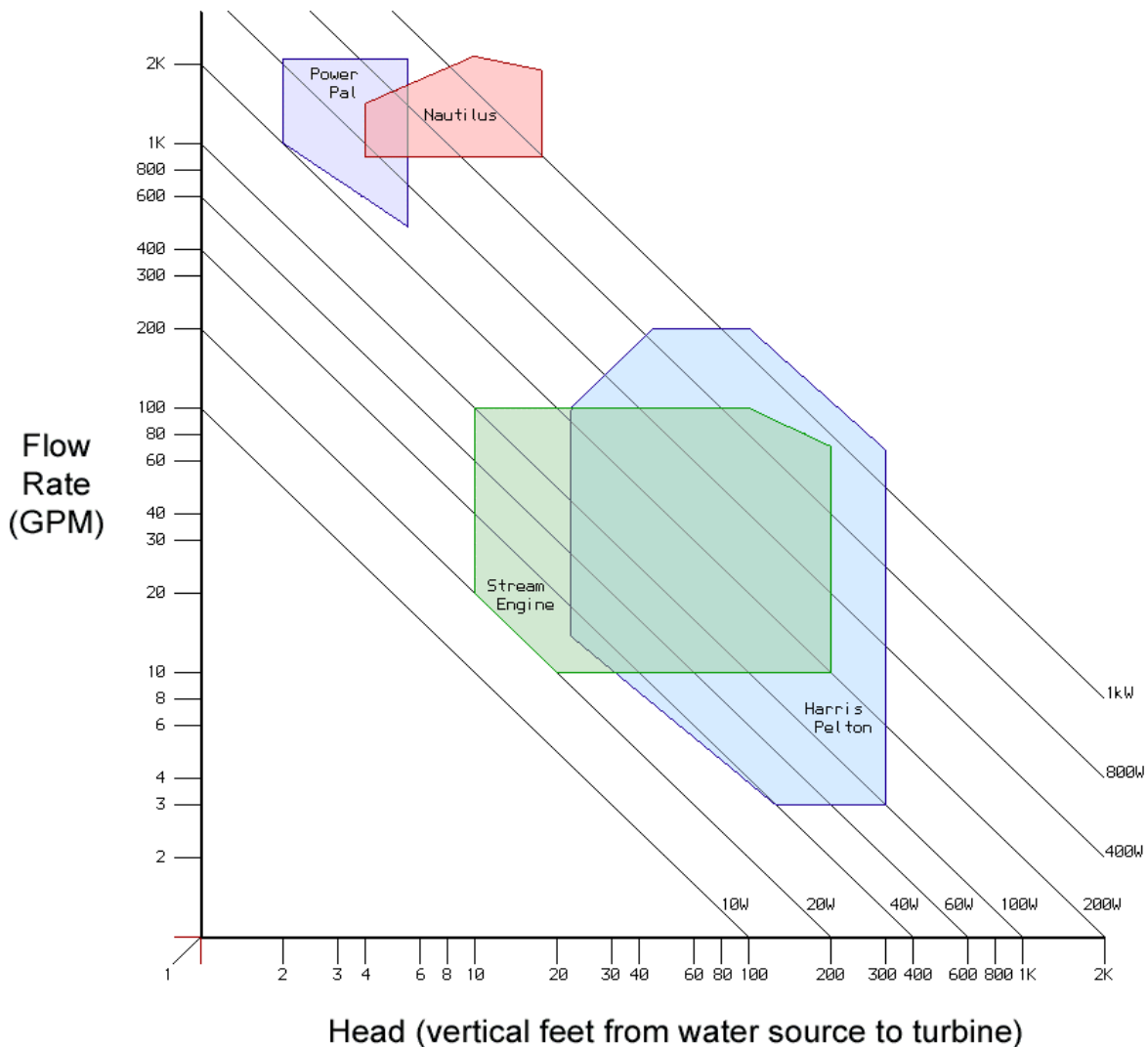


Appendix 6: Choosing the Right Turbine

A graphical representation of the power output of the hydro turbines in our product line is shown below. Once you have determined your site's head, flow, and your household power requirements, you can use this graph to assist in determining which turbine suits your situation. It is important to note that this is a logarithmic graph and thus the scale is not linear. You can find the power output on a third axis at 45 degrees to the flow and head axis. Power generated from any hydro turbine is a function of the amount of head and flow available.

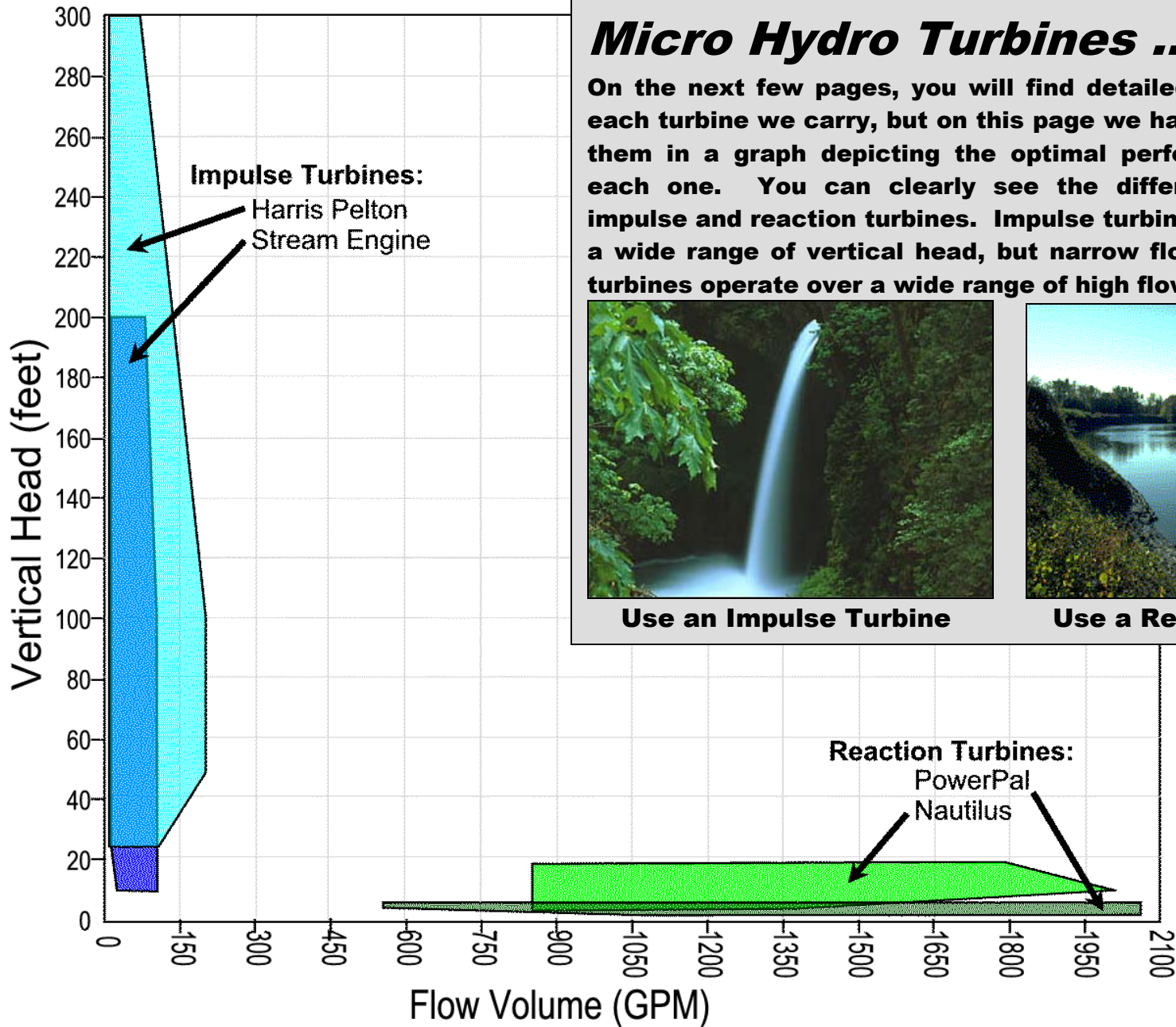
$$\text{Net Head (ft) X Flow (GPM) / 10 = Output Power}$$

Effective Operating Parameters for Various Water Turbines showing relation of head and flow to expected power output of each



Micro Hydro Turbines ...

On the next few pages, you will find detailed information about each turbine we carry, but on this page we have included most of them in a graph depicting the optimal performance ranges for each one. You can clearly see the difference between the impulse and reaction turbines. Impulse turbines can operate over a wide range of vertical head, but narrow flow range. Reaction turbines operate over a wide range of high flow, but low head.



Use an Impulse Turbine

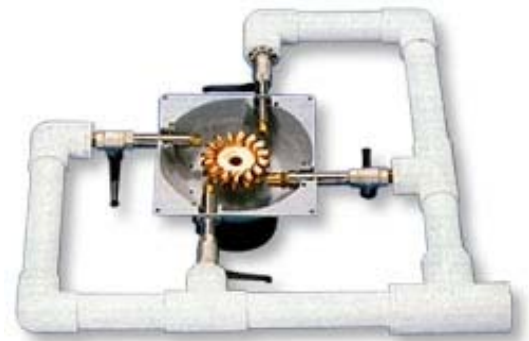


Use a Reaction Turbine

ABS Alaskan Inc. introduces ...

The Harris Pelton

Hydro Turbine



- **Can produce over 1.5kW of power**
- **Operates most efficiently on high head (above 25ft)**
- **Effective operation with ultra low flow (3GPM and greater)**
- **Reliable, year-round electricity at low cost**

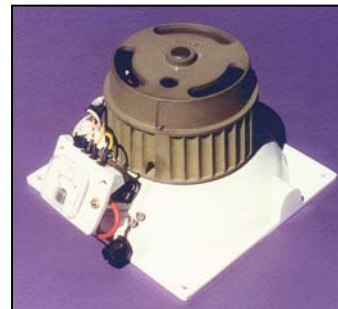
Water is collected upstream from the turbine and channeled in a pipe down to the turbine location. At the turbine, the water passes through a nozzle, where it accelerates, strikes the turbine runner, and turns a brushless permanent magnet alternator.

These turbines need very little water flow to run efficiently and produce significant power output. The standard configuration uses one nozzle, which is sized to match the water supply. Additional nozzles can be added (up to 4) with a maximum flow at each nozzle of 30 GPM.

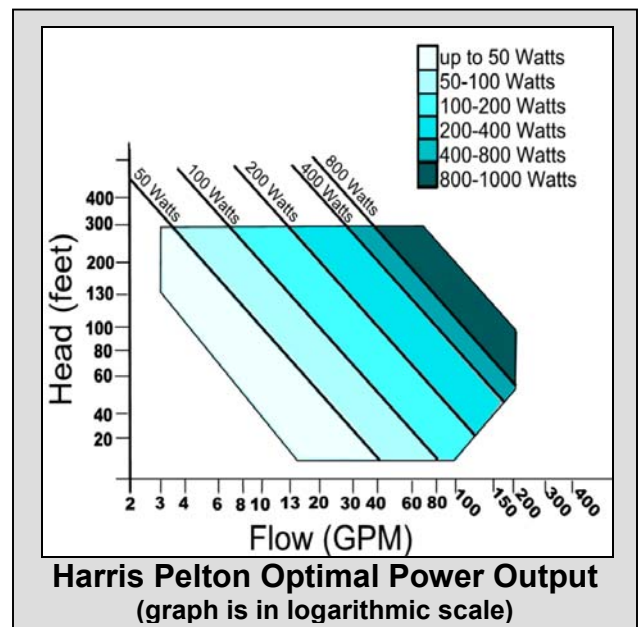
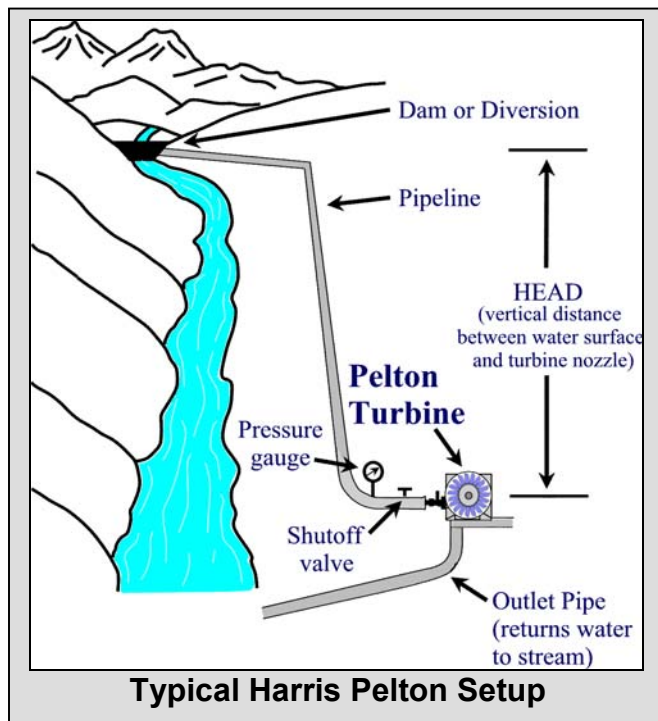
Typically, the turbine generates DC electricity – 12volt, 24volt or 48volt – which is then either stored in a battery for future use or used directly to power DC appliances. An inverter can also be incorporated into the system to convert the DC electricity to standard household AC electricity.



Close-up of the Harris Pelton Turbine runner



The Harris Pelton Hydro Turbine



ABS Alaskan, Inc. introduces ...

The Stream Engine Hydro Turbine

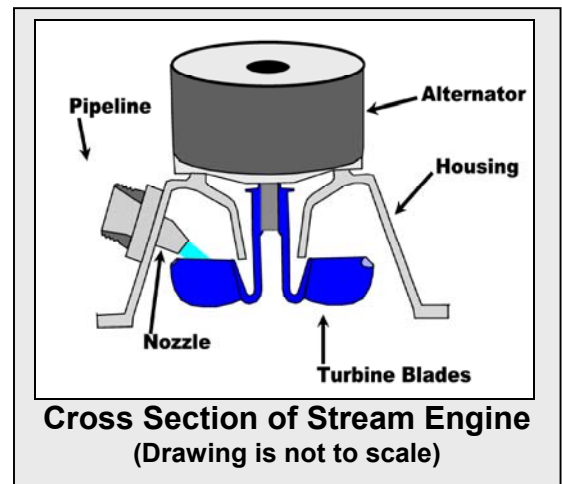


- **Can produce over 1kW of power**
- **Operates efficiently on low head (down to 5 ft)**
- **Easy installation and low maintenance**

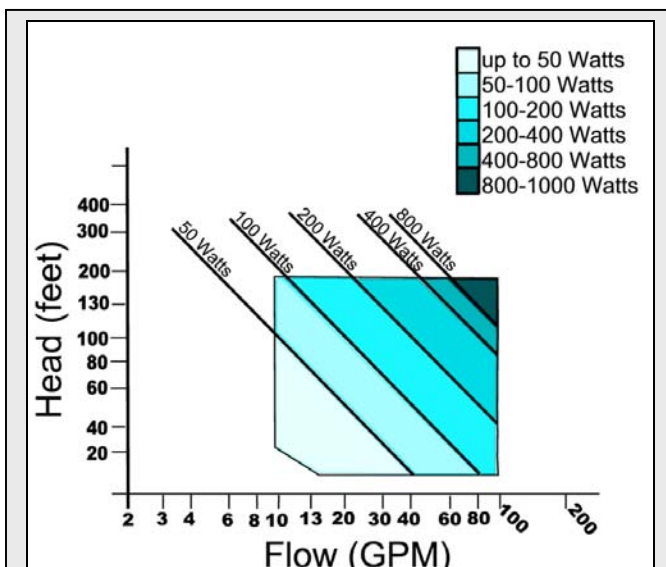
Water is collected upstream from the turbine and channeled in a pipe down to the turbine location. These turbines don't need a lot of elevation change to run efficiently and produce significant power output.

This means you'll get about the same amount of power from 6ft of head and a flow of 400GPM as from a flow of 6GPM and 400ft of head.

The Stream Engine has a brushless permanent magnet alternator driven by a 'Turgo' runner. In micro-hydro applications, the Turgo style runner is better suited to higher flow rates than the 'Pelton' runner, due to a design more efficient at removing large quantities of water from the system with minimal losses from back pressure.



The standard configuration uses two nozzles, which are adjusted on-site to match the water supply. These turbines generate DC electricity – 12volt, 24volt, or 48volt – which is then either stored in a battery for future use or used directly to power DC appliances.



**Stream Engine Optimal Power Output
(Graph is in logarithmic scale)**



The Stream Engine with the Turgo runner housed in the white casing, the permanent magnet alternator on top and the controller in the foreground (silver box)

ABS Alaskan, Inc. introduces ...

The PowerPal

Propeller Hydro Turbine



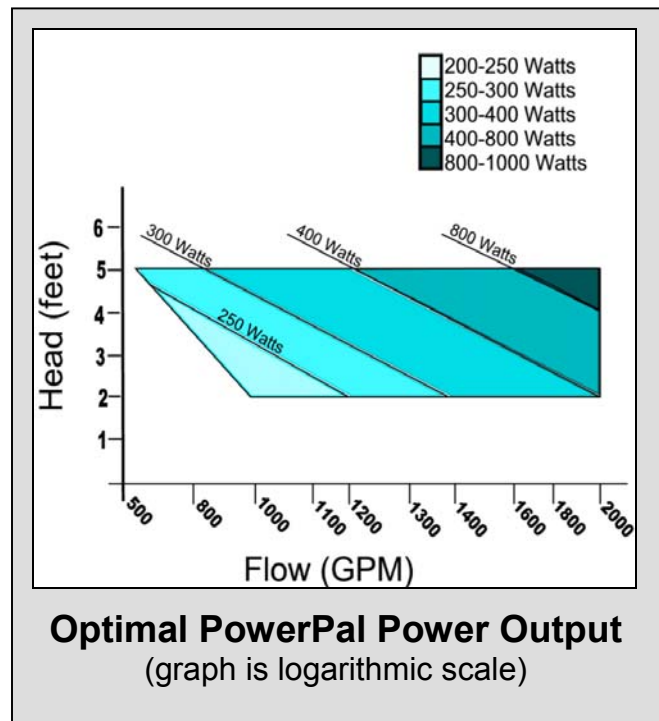
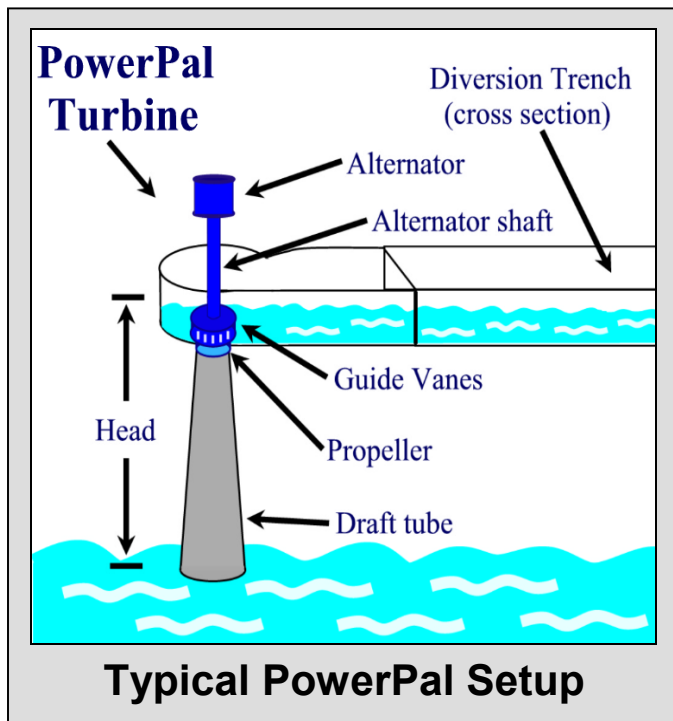
- **Power Production at 200W, 500W or 1000W (3 models to choose from)**
- **Operates efficiently on ultra low head (2 to 5ft)**
- **Designed for simple operation & low maintenance**

The PowerPal was designed for families in remote areas to produce power for their households easily and inexpensively. These units have been incredibly successful and today thousands are installed throughout the world.

The PowerPal is a propeller turbine whose small size and light weight allows it to be installed virtually anywhere. It is the perfect hydro turbine for slow moving rivers and streams. Small, natural waterfalls or dams provide the ideal setting for the PowerPal.

Water enters the turbine from the top and drops into the propeller, spinning the blades. It exits the turbine through a sealed draft tube that is submerged in the outlet water, creating suction and increasing power production.

It can be quickly and easily moved to a new location, or removed temporarily during flooding or other adverse conditions. The PowerPal is designed to operate on a head (vertical distance between inlet water surface and the outlet surface) of 2 to 5 ft.



ABS Alaskan, Inc. introduces ...

The Nautilus

Hydro Turbine



- **Produces over 3kW of power**
- **Operates efficiently on low head (4-18ft)**
- **High quality design with expected life of 50 years**

The Nautilus is a Francis-style turbine capable of tremendous power output in a compact design. It will power your home and shop for generations on as little as four feet of head. Water is channeled to the turbine via a 'Penstock', or large diameter pipe. The Nautilus is unique in that it uses both a 'closed' water diversion system prior to the turbine (providing substantial 'pressure head'), while also using a 'Draft Tube' from the turbine to the tail water (producing 'suction head').

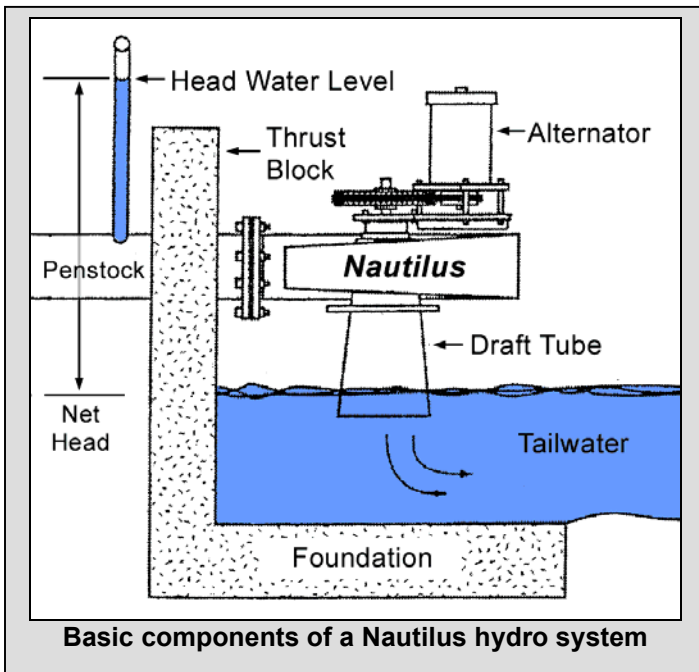


The Nautilus Turbine in action

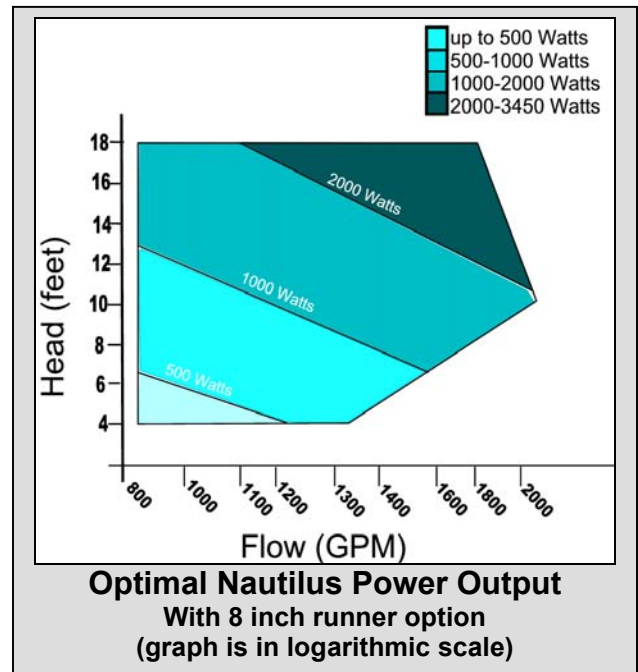
The Nautilus has an expected life of over 50 years. All components are made of laser-cut stainless steel to insure smooth water surfaces that will never rust. Massive taper roller bearings and carbon/ceramic face seals will last 7-10 years between refits.

The Nautilus can be disassembled and easily transported into the most remote areas as no single component weighs over 95 lbs. (44 kg.). The total assembled weight (without the alternator) is under 230 lbs. (105 kg.).

The Nautilus turbine is available with either an 8 inch (203 mm) or a 10 inch (254 mm) stainless steel runner. Using the 8" runner (shown in graph), 1800 GPM and 18 ft (5.5 m) of head will produce almost 3500 watts of power. With the 10" runner, 2100 GPM and 10 ft (3 m) of head will produce over 2200 watts of power.



Basic components of a Nautilus hydro system



Optimal Nautilus Power Output
With 8 inch runner option
(graph is in logarithmic scale)

ABS Alaskan, Inc. introduces ...

The Neptune **Hydro Turbine**



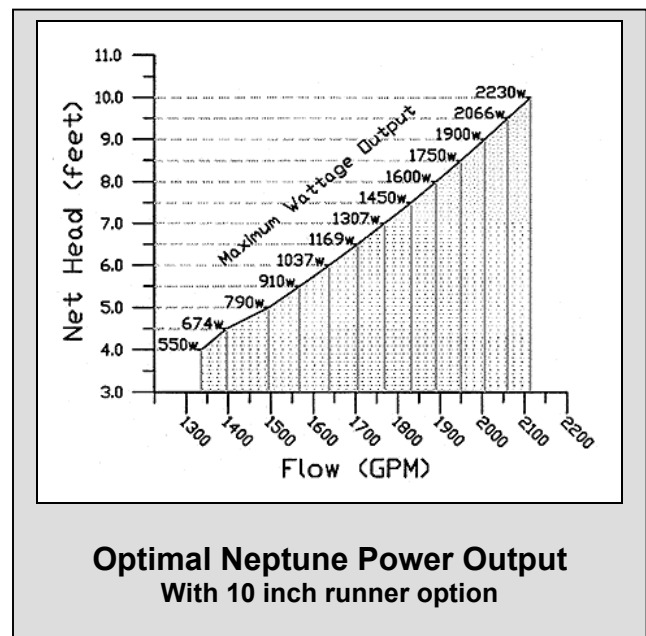
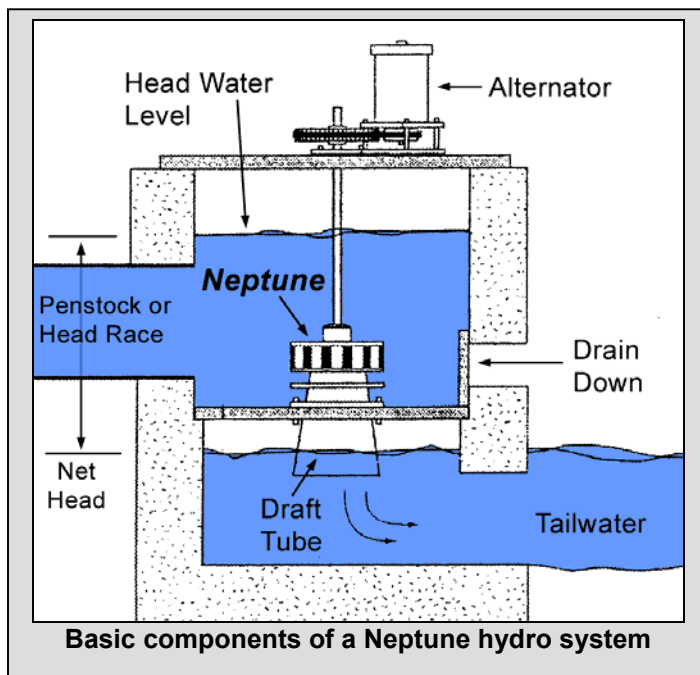
- **Produces over 2.2kW of power**
- **Very effective low head (3-10 ft) turbine**
- **High quality design and long service life**

The Neptune is a Francis-style turbine capable of tremendous power output in a compact design. It will provide power for generations on as little as four feet of head. It is essential the same as the Nautilus turbine, except that the water, whether channeled to the turbine via pipe or open canal, empties into an open chamber in the turbine. This 'open' water diversion system prior to the turbine means that the 'pressure head' is limited to the depth of the water directly above the turbine. Like the Nautilus turbine, it uses a 'Draft Tube' from the turbine to the tail water, also producing 'suction head'. The Neptune turbine is ideally suited for low head applications. For heads over 8 ft (2.5 m), the Nautilus turbine is recommended.

The Neptune has an expected life of over 50 years. All components are made of laser-cut stainless steel to insure smooth water surfaces that will never rust. Massive taper roller bearings and carbon/ceramic face seals will last 7-10 years between refits.

The Neptune can be disassembled and easily transported into the most areas. There are several permanent magnet alternator choices, available in both direct-coupled and timing-belt driven configurations, and with 24VDC, 48VDC, and high voltage DC output.

The Nautilus turbine is available with either an 8 inch (203 mm) or a 10 inch (254 mm) stainless steel runner. Using the 10" runner (shown in graph), electrical output will vary from 360 watts at 4 ft (1.2 m) of head and 1300 GPM of flow to over 2200 watts with 10 ft (3 m) of head and 2100 GPM of flow.



ABS Alaskan, Inc. introduces ...

The Niade

Hydro Turbine



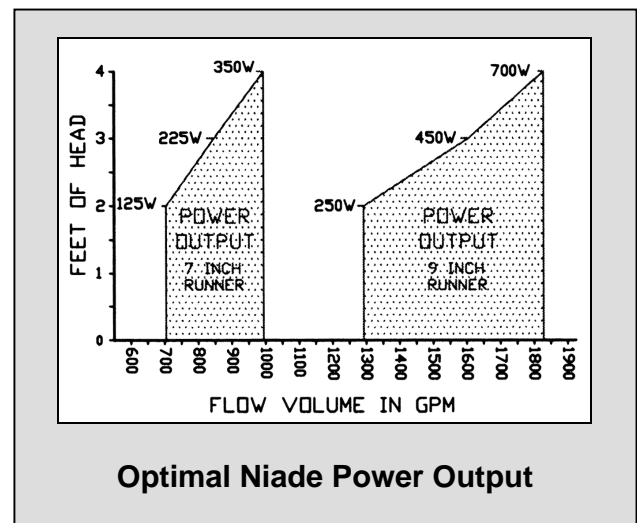
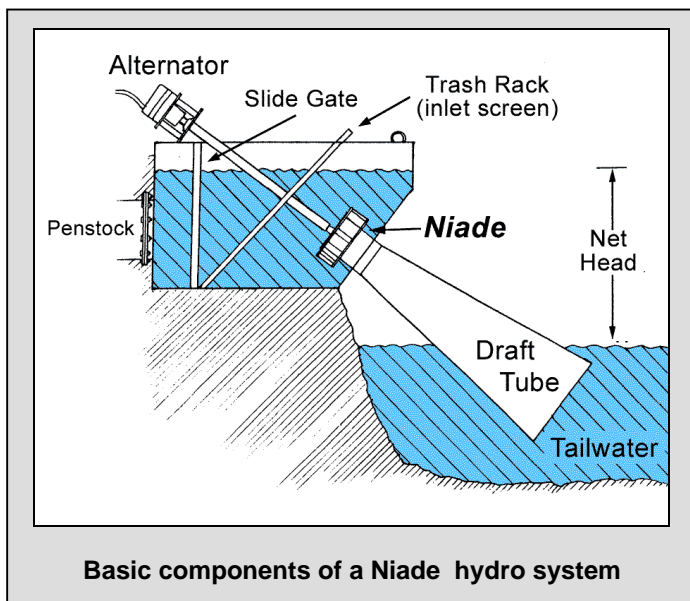
- 700 watts peak output (9 in. model)
- Produces power from 2 – 4 feet of head
- Shipped complete, easy install, no hidden costs

The Niade is an ultra-low head propeller style turbine in a complete housing for 'drop in' installation in almost any low-head site. Like the Nautilus and Neptune turbines, it uses a 'draft tube' from the turbine to the tail water, also producing 'suction head' to maximize output. The Niade turbine is the first micro-hydro turbine in the world to produce usable power with less than 4 feet of head.

The Niade is delivered as a complete package, including the cast-iron propeller turbine and housing, draft tube, slide gate (to shut off water flowing into the turbine), a protective trash rack/inlet screen and the alternator. The complete package is ready to install, with no hidden costs or extra accessories needed.

The Niade can be lifted with a small front-end loader, or even by hand with enough man power, weighing in at 300-400 lbs. It is a rugged, durable design, intended for user installation in nearly-level sites where other turbines cannot develop enough head to produce usable power. The Niade should be installed with the housing/flume level with the surrounding land, allowing the draft tube to angle downwards into the tail race excavation. After attaching the flume inlet to your installed penstock, and backfilling the excavation to stabilize the turbine, the Niade is ready to wire into your power system.

The Niade turbine is available with either a 7 inch or a 9 inch cast iron runner. Using the 9" runner, electrical output will vary from 250 watts at 2 ft of head and 1293 GPM of flow to over 700 watts with 4 ft of head and 1828 GPM of flow. With the 7" model, the Niade will produce from 125 watts at 2 ft. of head with 704 GPM flow, up to 350 watts with 4 feet of head and 994 GPM of flow.



ABS Alaskan, Inc. introduces ...

The Aquair UW ***Submersible HydroTurbine***



- **Produces up to 100W of continuous power**
- **No pipeline or diversion channel necessary**
- **Effective operation in as little as 18 inches of water**
- **Simple installation and low maintenance**

The AQUAIR UW is a propeller turbine of simple design and rugged construction. It was originally developed for use aboard seismic sleds towed behind oil exploration vessels. We like the AQUAIR UW because unlike other micro-hydro units where head, flow volume and nozzle pressure are factors, this unit simply requires fast moving water from a flowing stream, creek, river or sea.

The propeller is lowered into the water and held into place with a steady mount (not included). Power output is directly related to water speed, and at a flow of 6mph output will be around 60W, while at a flow of 9mph power generation will increase to 100W.

Water speed can be increased somewhat by use of a venturi pipe in the water upstream of the propeller, or by taking strategic advantage of the natural venturi effect created behind a large rock or submerged log.

The AQUAIR UW submersible generator is a rugged permanent-magnet low-speed high-output alternator sealed in an oil-filled waterproof housing.

It is ideally suited for use as an alternative power source for remote cabins when connected to storage batteries and an inverter. The AQUAIR UW Submersible Generator is warranted for three years.

