ABS Alaskan, Inc.

2130 Van Horn Road, Fairbanks, Alaska 99701 • (907) 452-2002
166 E Potter Drive #2, Anchorage, AK 99518-1363 • (907) 562-4949
297 SW 41st Street 13M, Renton, WA 98055 • (425) 251-5745
Email: abs@absAK.com
NEW ! ! ! ! VISIT US ON OUR WEBSITE NEW ! ! ! !
absAK.com

ES&D HYDRO TURBINES
LH1000 – Stream Engine – Water Baby

Power Output
All ES&D Turbines use permanent magnet alternators. The PM alternators all produce **3-phase, AC electricity (power)**. These turbines are designed to be used with battery-based systems only. Do not operate these turbines as AC direct systems.

Power System Components
Components supplied with the turbine -
1) The Alternator – the alternator produces the 3-phase AC electricity
2) The Rectifier – the rectifier converts the 3-phase AC electricity to DC electricity

Components **not** supplied with the turbine –
1) The Wiring – The wire carries the electricity (power) from the turbine alternator to the balance of the DC system (battery, etc). The wire must be sized correctly for the type of electricity being transmitted (DC or 3-phase AC), the voltage, the amount of current (amperage) it is to transmit, and the transmission distance. If the power is DC, you need two wires – a positive and a negative. If the power is 3-phase AC, you need three wires. With 3-phase AC, all three wires have the full system voltage and all three transmit power, but the current (amperage) is distributed equally over the three wires.
2) The Charge Regulator (Controller) – Hydro turbines are like wind turbines in that they are what I call "active power producers". When the water is flowing and the hydro turbine is spinning, it is producing power. And that power has to be used or damage to the hydro turbine will result. The function of the Charge Regulator is to ensure that all of the power produced by the hydro turbine is used – first by the electrical load, then in recharging the battery (but not over-charging of the battery), with any excess diverted to a secondary electrical load, where it is consumed. The Charge Regulator has to be a "diverting" style and have sufficient current capacity to handle all of the current the hydro turbine is capable of generating.
3) The Transformer – There are two sizes of transformers available, a 400 watt capacity (TRN-400) and a 1000 watt capacity (TRN-1000). The Transformer (which is available as an option for either the LH1000 or the Stream Engine), steps down a higher 3-phase AC voltage to a lower 3-phase AC voltage. The Transformer, which is located in the system at the end of the distribution line (but prior to the Rectifier) steps the 3-phase AC power down to an AC voltage equivalent to the system voltage. It is necessary when transmitting the power at a voltage higher than the system voltage (i.e. 120V transmission to a 24V system). The Rectifier then converts the 3-phase AC power to DC power. The Transformer can be used to

step down 120V, 240V, and 480V. However, consult with our technicians prior to a 480V installation as there are several considerations.

WARNING
120V, 240V and 480V power is potentially lethal. Only NEC approved equipment and qualified technicians should be used for the design, installation, and maintenance of such systems.

An option (if viable) to the Transformer is to use a PWM/MPPT Charge Regulator that can also function as a DC-DC converter and accept the higher input voltage (remember, though, that the voltage must be rectified to DC first).

Alternator Configuration
The LH1000 and Stream Engine use the same alternator. The Water Baby uses a smaller sized alternator, but the same style. Therefore, they all share the same configuration flexibility. Utilizing different wiring configurations (field configurable by a qualified technician), the alternator can produce either 12V, 24V, 48V, or 120V (remember, it's 3-phase AC).

The {Very} High Voltage Option (HV-OPT) is a factory re-wire (factory only) of the alternator. It is needed for the following situations:
a) either 240V or 480V (remember, it's 3-phase AC) voltage is required, or
b) 120V is required in the following situations:
    1) the LH1000 installation has less than 3 ft of head
    2) the Stream Engine installation has less than 100 ft of head

Low Voltage (12V, 24V, 48V) – Standard Configuration
If system is low voltage and the distance from the hydro turbine site to the balance of the DC system is minimal, use the standard factory DC turbine configuration and a DC Wire Loss Chart for determining wire size. The alternator wiring is configured for the desired voltage and a Rectifier (supplied with the turbine) converts the AC to DC. The Rectifier is incorporated into the turbine control so that DC power of the correct voltage is provided. You have a DC positive and a DC negative connection – very clean and simple.

Low Voltage (12V, 24V, 48V) – Externally Rectified
If the system is low voltage but the distance from the hydro turbine site to the balance of the DC system is far enough that wire loss becomes a concern, the Rectifier can be removed from the turbine control box and installed externally at the end of distribution wire. The voltage produced by the alternator is the same, but it is traveling as 3-phase AC to the rectifier so the current is distributed over three wires instead of one. This means that:
a) you can move three times the current (amperage) with the same wire size and distance; or,
b) you can move the same amount of current much farther with the same wire size; or,
c) you can move the same amount of current the same distance with much small wire size.

High Voltage (120V)
A high voltage unit is typically required because the power needs to be transmitted a long distance from the hydro turbine site.
1) The alternator is wired for 120V (3-phase AC) for easier transmission of the power.

2) If 120 VDC power is desired (a 120VDC battery system), the rectifier is typically installed at the end of the distribution line to convert to DC
3) If a lower DC voltage is required (12VDC, 24VDC, or 48VDC), one of two options must be used:
    a) a TRN-400 or TRN-1000 Transformer must be installed (prior to the Rectifier) to step down the voltage; or,
    b) a PWM/MPPT Charge Controller (after the Rectifier) that can accept and convert the 120VDC input to the lower DC system voltage must be used.

Very High Voltage (240V or 480V)

As stated previously, the {Very} High Voltage Option (HV-OPT) is a factory re-wire (factory only) of the alternator. It is needed for the following situations:

a) either 240V or 480V (remember, it's 3-phase AC) voltage is required; or,
b) 120V is required in the following situations:
    1) the LH1000 installation has less than 3 ft of head
    2) the Stream Engine installation has less than 100 ft of head

Use the TRN-400 or TRN-1000 Transformer to step the voltage down to a usable level and a Charge Regulator to regulate it.