Remote HydroLight

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Afghan Built Water Turbine Tested In Norway Achieves 78.6% Efficiency

Remote HydroLight, a hydropower developer in Afghanistan, is pleased to announce that one of their standard production cross flow water turbines was tested at the Waterpower Laboratory of the Norwegian University of Science and Technology, Trondheim, Norway (see photo below). They wrote 2 theses [1, 2], you can receive these two reports by contacting Remote HydroLight. This is the first time a water turbine, manufactured in Afghanistan, was officially tested in a professional hydraulic laboratory. Remote HydroLight is grateful to all those that helped complete this important work on behalf of the Afghan people and local hydropower industry. Remote HydroLight's goal is to transfer technology to local workshops to help the Afghan people develop and benefit from the most reliable, low cost, renewable energy available.

Waterpower Laboratory of the Norwegian University of Science and Technology

The analysis and testing of the crossflow turbine was independently (no involvement by Remote HydroLight) performed by the graduate students: Ms. Eve Cathrin Walseth and Mr. Sven Olaf Danielson and under the guidance of University professors who have done extensive testing on other turbines. The maximum efficiency recorded was 78.6% at the turbines optimum operating point. These test results verifies that the Remote HydroLight turbine (also known as the IAM[3] turbine) performs very favorably to other published results[4]. This is due to careful rotor, nozzle, and valve design using many sources of published research to optimize the turbines performance. The

researchers have installed transparent side plates and used high speed video to find ways to improve the turbines already excellent performance. They showed that the water does not interfere with the shaft at the correct turbine speed. This same standardized turbine design has been introduced and adopted by the majority of Afghan hydropower workshops over the last 10 years. The family of turbines locally known as TMT[5] (1-14 kW electrical output), HKT [6] (8-55 kW electrical output), and PT[7] (36-120+ kW electrical output); are simple to build, very reliable, and now demonstrate exceptional efficiency while keeping the purchase cost the lowest in the industry….as much as ⅓ - ½ of similar performance turbines. Many labor saving features were included in the design to help local workshops produce a high quality turbine at a reasonable price without compromising efficiency.

Two PT-645 turbine rated at 65kW each electrical output located at Daste Riwat, Panjshir.

If you have any questions please email Remote HydroLight at hydro@remotehydrolight.com

References:

[1] ” Virkningsgradmåling av Cross-Flow turbin”, av Eve Cathrin Walseth og Sven Danielsen, 2008, Report no. EPT-P-2008-16 and EPT-P-2008-71, Institutt for energi og Prosessteknikk, Kolbjørn Hejes vei 1A, 7491 Trondheim-NTNU, Norway.

[2] ”Investigation of the Flow trough the Runner of a Cross-Flow turbine”, Eve Cathrin Walseth, 2009 Master thesis at Departhment of Energy and Process Engineering, NTNU.

[3] International Assistance Mission, Kabul, Afghanistan, started work on an appropriate technology crossflow water turbine for Afghanistan in 1998. To date approximately 2000 of the IAM turbines

have been built by private Afghan workshops. Remote HydroLight continues to utilize the IAM turbine due to it being the most suitable for Afghanistan's conditions. See www.iam-afghanistan.org

[4] Skat T-7 states 70% efficiency in their T-7 Original Drawing (no test results available, only guess?).
Skat T-12 original as published measured 65% peak efficiency in tests at Stuttgart University, (Germany) according to Entec publication "Crossflow Turbine T-13".
Skat T-13 (T-12 modified 1998) measured 73% peak efficiency in tests at Stuttgart University (Germany) using an improved rotor and 30mm rotor center shaft according to Entec publication "Crossflow Turbine T-13".
Entec T-15 measured 76% peak efficiency in tests at Stuttgart University (Germany) according to www.entec.ch.
U.S. Department of Energy crossflow turbine rated at 336 kW measured 79% efficiency at full flow according to Hydro Review, August 1991.
Web sites of some manufacturers state up to 85% peak efficiency for large crossflow turbines, however, independent tests are not available. See www.ossberger.de and www.cink-hydro.com. Experience shows that higher flow turbines produce higher efficiencies. It is possible that the HKT and PT could have a peak efficiency of over 80% with flows above .5m³/s.

[5] TMT (Traditional Mill Turbine) uses a .27m rotor diameter. and is built in bo widths from .03 to .5m. This turbine was specially designed to fit the many traditional stone water mill sites in Afghanistan which usually have a gross head of 4 – 8m and flow rates of .1 to .3 m³/s. This turbine uses a 40mm bearing ID.

[6] HKT (Hindu Kush Turbine) uses a .34m rotor dia. and is built in bo widths from .070 to over 1.0m. This turbine has a 50mm bearing ID. This turbine is recommended when flows are over .3m³/s and electrical output is over 8 kW.

[7] PT (Pamir Turbine) uses a .34m rotor dia. and is built in bo widths from .15 to 1.2m. It uses a 75mm bearing ID. Due to using a heavy duty bearing, belt drive is allowed from both sides of the turbine thus simplifing transfering shaft power to the alternator.