Zero head hydro turbine[26]

STATE AWARD

Nripen Kalita (40 years) lives with his wife, son and two daughters in Jiakur Village, Kukurmara in Kamrup district of Assam. Due to adverse economic conditions, he could study only up to the Higher Secondary Level. Nripen Kalita is an electrical/electronic mechanic by profession with an experience of about 15 years in repairing Televisions. He has a monthly income of around Rs. 3000.

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Scoutedby
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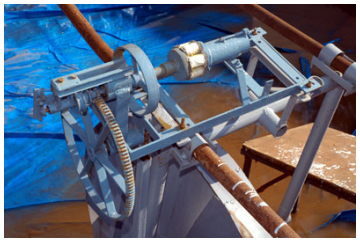

Genesis This idea first occurred to him 11 years ago when he tried to bring electricity to his own house. He worked on the basis that the conventional turbines have just 50% efficiency because of the uselessness of the upper blades, which have no mechanical output as it is a half-immersion version. Therefore he tried a full immersion turbine in which the blades were of half the area of those of the conventional device. But the mechanical output was found to be approximately twice the first version. Nripen then utilized this turbine in his generator cum pump in the river Kulashi with full submersion. At first he made the turbine with a bamboo frame and later he strengthened it with an iron one. He also increased the number of blades from eight to twelve. Nripen acknowledges that at first his family was not very interested in the idea, but later on encouraged him. He is proud to note that his neighbours have also benefited from his innovation.

He confides that making this turbine successfully has been a satisfying experience. This has also motivated him to pursue further ideas and he mentions that he is considering the development of an energy-related device. Remembering with gratitude the assistance offered by Mr. Diganta Kalita - who introduced him to GIAN- NE - Nripen calls him his best friend in his journey of innovation. NIF has filed a patent for the zero head water turbine.

The Innovation
Kalita has designed two variants of turbine and pump models. Initially in 1998-99, he had developed a water turbine using bamboo, for harnessing the flow energy from the river to pump water to his land. And later with the assistance from GIAN-NE, he has developed another version of the same turbine.

First model
The first model had a spiral offset arrangement of blades. In this the blade axis is perpendicular to flow direction. The offset arrangement of the blades provides constant thrust to the system. In conventional water wheels, the thrust is available only once when the blade is perpendicular to the flow direction. Whereas in his first model, the arrangement is similar to the multi cylinder crank arrangement in which the turbine will get thrust constantly from blades. The offset arrangement also provides sufficient clearance between the blades so that the floating debris will not

clog the blades. Since the path of the water takes a spiral shape from the entrance to the exit, the arrangement of blades acts as screw conveyor. This facilitates the debris to pass on from entrance to exit, which facilitates the smooth running of the turbine. The baffle operated pump, which acts as a submersible pump, facilitates the lifting of water. The cost of the complete system is only about Rs.3, 000 including labour cost which is quite affordable to small farmers.

Second model

The second model is an improved version in comparison with his first innovation. In this, the blades are arranged spirally and the axis of the turbine is parallel to the flow direction. This arrangement is superior in construction and operation. The spiral twist of the blades in addition to tapping energy from water provides vortex motion to the water at the exit. This feature is found to be novel as the kinetic energy of the water absorbed by the blades is regained by the water due to vortex motion. (By creating vortex in the direction of the flow, resistance will decrease i.e. water velocity will increase). In most of the existing turbines turbulence created by the wheel rotation affects the velocity considerably. This parameter is of importance when considering the performance of down stream turbines.

Working principle

The turbine is made up of steel foils with a rim where the blades are welded. The blades are welded in a four feet circular rim at an angle of 35°. The upper parts of the 12 blades are fixed in the circular rim that is four inches in width and the lower part of the turbine is fixed in an axle. A chain is fitted to the turbine axle and the drive gear. A frame is made to hold the turbine in running condition when the turbine is submerged in the water.The turbine is completely submerged below the flow of water (river). The linear kinetic energy of the water is used for giving rotational movement to the turbine. The water passing through the turbine forces the turbine to rotate with low speed but at a high torque. When the linear kinetic velocity of the water is two meter per minute the turbine starts to rotate with a speed of 20 rpm. A compound gear mechanism is used to convert the rotational speed of the turbine (20 rpm) according to the requirement. An armature coil (generator) is used to extract the electrical energy. A lever mechanism is used to control the generation of power by disengaging the driven gear where the shaft is coupled. A submersible

pump with guide blade is coupled in the turbine set for irrigation purposes. The driven gear with the help of a flat belt gives the required rotation of the pump for pumping water.

Advantages

Novelty lies in its portability and the fact that there is no need for a dam. Economically it is a better bet as construction and installation costs are minimal at Rs.8000, as compared to hydro-electric, steam or any other power plant where even a micro hydel generator costs at least Rs.40,000. The maintenance cost is also quite low compared to the conventional hydroelectric power plant. The efficiency of Nripen's machine is greater than 50%. It can also be set up anywhere be it plains or mountains. And of the greatest importance is the fact that the turbine has a very high potential in rural areas where electric power supply is not available.