2. Aim and Objectives

The aim is to research in the field of Pico Hydel Projects. Pico-generation is defined for the range of generation with capacity less than 20 kW of energy. In many developing countries, mountainous regions with low density of population and difficult terrain it is expensive and impractical for the central grid to reach the more inaccessible villages. In these regions there exist a significant proportion of numerous hydrological resources. These resources are however with relatively small head and volume flow rates which makes the use of conventional turbines impractical. Hence it needs a different approach to energy generation i.e. distributed energy generation. Conserving energy while exploring renewable, environmentally-friendly energy resources are critical to keep up with increasing energy demand. Small hydropower with its characteristics of being available worldwide is attractive for energy utilization.

The concern on the global environment puts emphasis on the development of environmental friendly methods to promote the sustainable development. Micro-hydro power is drawing more attention in these circumstances. Small and micro-hydro power projects are the appropriate options for generating electricity by using such water streams. The running cost of such plants is low but initial capital cost is relatively high. So, by reducing the equipment cost in micro hydropower projects, these can become more useful and popular feasible alternative. One of the easiest ways to reduce the equipment cost is the use of centrifugal pump in reverse mode and can be used as an alternative to conventional hydraulic turbine. Standard pump units when operated in reverse mode have a number of advantages over conventional turbines for micro-hydropower generation.

Any reduction in equipment costs will make the technology more accessible and acceptable. One approach to reduce the equipment cost is to use available standard pump unit as an alternative to conventional turbine. Pumps have the following advantages for micro-hydro compared with turbines:

- Pump and motor can be used as a turbine and generator set
- Pumps are available for a wide range of heads and flows
- Available in a large number of standard sizes
- Readily available
- Spare parts are easily available, Ease of installation and use of standard pipe fittings. Hence the objectives of the research would be:

1. Experimental investigation on the performance of radial flow centrifugal pumps as turbines, including study of overall performance, internal flow conditions.

2. Identify the critical areas in pump geometry that affect the turbine mode performance.

3. Study of interdependence of various variables and the effect of variables on performance of PAT.

4. Through CFD suggest simple, low cost geometric modifications and to study the change in performance through experimental investigations.
5. Optimize internal hydraulics in PAT, selection and development of the operating characteristics, overall system design, field implementation and evaluation.

6. Investigate the effect of impeller material on the performance of reversible-pump turbines.

7. To make suggestions for design improvements of PAT. To develop the complete system design of aPAT.