R6482 – **Low head hydro power; low cost, low maintenance propeller turbines**
Theme: E2 – Renewable Energy duration: April 1996 - September 2000
Project Description:

A four-year project to develop, test and transfer the design of a propeller water turbine suitable for manufacture in small workshops in developing countries has recently been completed by Intermediate Technology Consultants and ITDG Latin America. The overall goal of the project is to contribute to the development of renewable sources of energy. The project will lead to improved access to, and efficient use of, domestic energy for many rural communities.

Market research identified a significant demand for propeller turbines capable of producing between 5kW and 25kW of electricity from heads of water of between 2m and 8m. The project produced a standardised propeller turbine design, together with the additional requirements of low cost and low maintenance. The turbine was manufactured and tested in Peru to verify the efficiency of the design.

The key features of the new design are considered to be:

- simplicity of design,
- robustness,
- use of standard shapes, sizes and off-the-shelf components
- maintainability,
- precise blade shape designed for high efficiency and operation without cavitation or 'rough' running, (requires accurate casting),
- location of the machine above maximum tail-water level,

The turbine design is suitable for the upper part of the low head range. Further design work could be done to cover the lower part of the range in the form of tube turbine configuration.

The prototype turbine was installed at 'Las Juntas' in the Amazonia region of Peru, near the town of Jaen. Electrification for the local community has been achieved using both a low and mid tension distribution grid..

The village community owns the scheme and has been involved from the beginning. The community contracted a small local enterprise to be responsible for management, administration, tariff setting, billing, operation and maintenance. Community representatives supervise its work and monitor its performance. The tariff is set in such a way that it covers ongoing operation and maintenance costs, allowing money to be put aside for larger future repairs.

Performance testing and optimisation of the turbine showed excellent performance. A manufacturers' information pack has been produced in Spanish and is currently being translated to include:

1. Complete set of part and assembly drawings

2. A manufacturing guide covering recommendations about purchase of materials, all cutting and machining operations.
3. The installation guide covers work in construction of foundations, anchoring and leveling the machine and installation procedures.

In its first 6 months of operation the 37 kW turbine at Las Juntas has led to: 6 micro-enterprises starting business due to the access to electricity: 2 tyre repairing workshops, one welding workshop, a rise husking mill , and two small restaurants and 2 more enterprises had purchased new equipment to take advantage of the electricity available (a pasta making machine and an electric petrol pump). In conjunction with this project a small health has been founded by the Thrasher foundation and the hydro plant has enabled this centre to be electrified.

Also, as a result of the Las Juntas installation, the workshop in charge of the manufacturing of the machine have won a contract to manufacture a low head 5 kW turbine for a private rural entrepreneur.

PHOTOGRAPHS

Photo 1: Turbine manufacturing

Photo 2: Turbine manufacturing

Photo3: Intake

Photo 4: Powerhouse

Photo 5: Evaluation and performance test test

Photo 6: Evaluation and performance

Photo 7: Evaluation and performance test test

Photo 8: Evaluation and performance

Photo 9: Training in management maintenance

Photo 10: Training in operation &

Photo 11 and 12: Training on installation of power meter and reading meter

Photo 13: Electricity for health service

Photo 14: Electricity for small business

Photo 15: Domestic use of electricity

Photo 16: Domestic use of electricity