Establishment of Hydro Turbine Laboratory

THE PROPOSAL:

Alternate Hydro Energy Center (AHEC), Indian Institute of Technology (IIT), Roorkee is in the process of establishing an International Level Hydro Turbine laboratory.

Hydro turbine is generally a tailor made machine designed to suit particular site parameters. These designs need verification as they are based on theoretical/ empirical/ numerical methods. The real fluid flow phenomenon in the turbine is complex and more so being multiphase flow. The verification process can be carried out in a controlled environment such as by conducting investigations in a well-equipped laboratory. Further any research and development or analysis and remedy of any field problem essentially needs laboratory based investigations which are quite expensive.

Most of the large turbine manufactures have their own laboratories, however the others concerned with hydroelectric power cannot afford such big investments. Consequently many projects faced many surprises during operation. It further discourages entrepreneurs being attracted to hydropower projects which are already risk prone.

Furthermore, there are not many experienced/trained engineers/technicians available to operate the power plants optimally and safely so that the maximum power can be generated as well as the life of the equipment can be maximized. Training facility for hydro power is not available in India and the country lacks the hand-on experience of all aspects of small hydro projects. AHEC, IIT Roorkee is already equipped with a real time digital simulator for small hydropower plant operation and control first of its kind in the country. Addition of a hydro turbine Research and Development laboratory, with training facility, would further facilitate it to equip completely for giving a big thrust to hydropower development in the country. This is in line with the policy of the government to encourage and support harnessing of water resource for power generation.

OBJECTIVES:

The laboratory is being set up with the objective to support Indian industry to grow and compete in the International market in various aspects of hydroelectric power, namely -

1. Spearhead research and development activity in the country for hydro turbine.
2. Develop human resources for small hydropower, viz.
   -Entrepreneurs
   -Engineers
   -Plant operators
   -Researchers
3. Verification of designs and generation of design data
4. Validation of designs through CFD technique
5. Testing of almost all types of turbines
6. Witness tests on turbines as a neutral agency
7. Third party test as a neutral laboratory
8. Develop and validate flow-measuring techniques for use at site

The laboratory shall be providing training on:

- Functioning of various types of turbine components,
- Testing of turbines,
- Erection and commissioning checks
- Transient study and analysis
- Problem oriented tests and remedies
- Measurement method
- Profile measurement
- Calibration of instruments
- Special instrumentation and tests

GUIDING PARAMETERS FOR DESIGN OF LABORATORY:

- Good overall accuracy in efficiency measurement (target 0.25%) and repeatability (target 0.15%).
- Limiting the normal power consumption in the Laboratory to below 300 kW level.
- Meeting IEC 60193 requirements
- The rig should be flexible to accommodate as many types and designs of turbines.
- The test parameter to be stable

WHO ALL WILL BE BENEFITED:

Manufacturers- An independent laboratory will be available for verification of their designs. Pump manufacturers wanting to diversify can test their pump in turbine mode. New designs can be analyzed through CFD and improvement suggested can be further confirmed by conducting tests on model.

Entrepreneurs - can look for design and design validation support.

EPC contractors and Utilities: They can use it as a neutral agency for design verification. Also solutions can be provided to any site problem through CFD analysis or/and model testing. Suitable trained man power would be developed through proper training for optimal operation of their plants.

Consultants: They can bank on the laboratory for various data and expert advice on technical matters.

SUGGESTED RESPONSE FORMAT

1. Name of the Company
Whether private or public:
Address:
E-mail
Telephone
Fax:
Contact Person details:

2. Your interest? (Tick whatever is applicable)

S No	Activity	Yes/ No
2.1	Small Hydro Power,	
2.2	Medium Hydro Power,	
2.3	Large Hydro Power,	

3. Are you?

S No.	Activity	Yes/ No
3.1	Developers	
3.2	Construction company	
3.3	EPC or turnkey Construction Co	
3.4	Consultants	
3.5	Designers	
3.6	Procurement Consultant	
3.7	R&D organizations	
3.8	Offering Surveys and Investigations	
3.9	Operation and Maintenance of Plant	

4. If you are a supplier/manufacturer, are you offering?

S No.	Activity	Yes/ No
4.1	Hydraulic turbine (type and capacity)	
4.2	Generator	
4.3	Gear box	
4.4	Control panels	
4.5	Governor	
4.6	Penstock	
4.7	Gates and trash racks	
4.8	Transformer	
4.9	Switchgear	
4.10	Relays	
4.11	Meters	
4.12	CTs/VTs	
4.13	SCADA	
4.14	Batteries & Battery Charger	
4.15	Others (please specify)	

5. Likely use of the proposed laboratory by you?

S. No.	Activity	Yes/No
5.1	Develop human resources for small hydropower, viz.	
5.1.1	Entrepreneurs	
5.1.2	Engineers	
5.1.3	Plant operators	
5.1.4	Researchers	
5.2	Verification of designs and generation of design data	
5.3	Validation of designs through CFD technique	
5.4	Third party test as a neutral laboratory	
5.5	Witness tests on turbines as a neutral agency	
5.6	Testing of turbine model	
5.7	Testing of turbine prototype	
5.8	Testing of pump prototype	
5.9	Referring field problems to lab.	
5.10	Others (please specify)	
5.11	To develop and validate flow-measuring techniques used at site	
5.12	The laboratory shall also be providing training through	
	Functioning of various types of turbine components,	
	Testing of turbines,	
	Erection and commissioning checks	
	Measurement techniques	
	Transient study and analysis	
	Problem oriented tests and remedies	
	Profile measurement	
	Calibration of instruments	
	Special instrumentation and tests	

6. Will creating such a facility be useful for

You	very useful	useful	not useful
Indian Industry	very useful	useful	not useful