

INDEPENDENT HYDRAULIC TURBINE R&D LABORATORY



Turbine Model Testing of New / Refurbished Projects

Francis Turbine

Kaplan Turbine

Pelton Turbine

Reversible Pump Storage Turbine

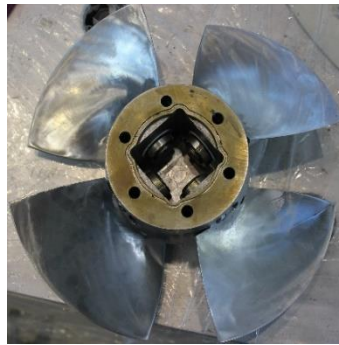
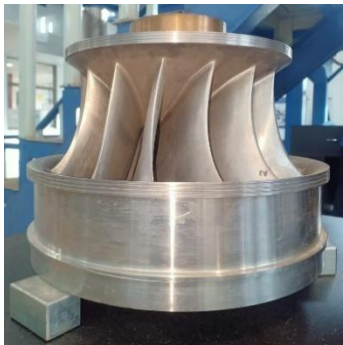
SCADA based Control

Overall uncertainty of $\pm 0.25\%$, Repeatability $\pm 0.15\%$

Main Hydraulic Performance & Additional Performance Test

Design Validation through CFD Analysis

Third Party Witness Consultancy/Support

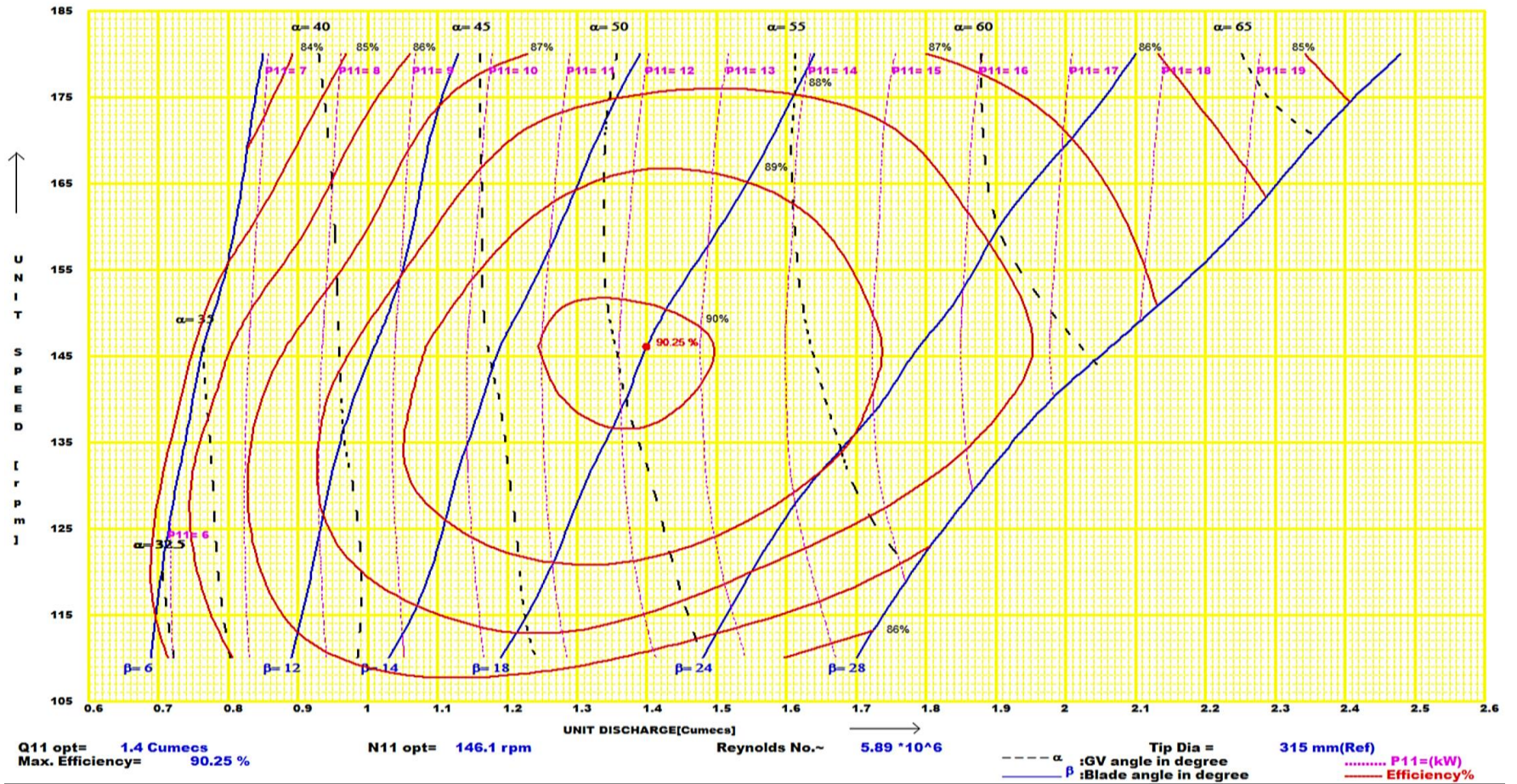


International Standards & Protocol

- A difference of 0.1% efficiency for a 100 MW unit shall be a loss of 173 million unit for life 40 years. At the rate of Rs 4 per unit this loss is Rs 69.2 Crore.
- Before turbine manufacturing, model testing of the turbine comprising of runner guide vanes, draft tube, spiral casing is tested in the laboratory so that design/guaranteed efficiency is achieved/validated.
- International Standard for model Testing is IEC 60193:2019 “Hydraulic turbines, storage pumps and pump-turbines–Model acceptance tests”, International Standard for laboratory is ISO/IEC 17025:2017 “General Requirements for the Competence of Testing and Calibration Laboratories”.
- Another international standard for measuring the efficiency in the power house IEC 60041:1991 “Field acceptance tests to determine the hydraulic performance of hydraulic turbines, storage pumps and pump-turbines”. This is just to validate the guaranteed values, however one can not do anything to improve the efficiency if model testing is not done in the laboratory.

Typical Hill-Chart of Kaplan Turbine Model

MODEL HILL CHART



Model test Conducted at Hydraulic Turbine R&D Laboratory HRED, IIT Roorkee

S. No.	Name of Project/ Unit Output	Customer	Type of Machine	Year of test	Remarks
1.	F99 Turbine Model (3 x 33.63MW)	VOITH	Francis	2018-19	Model Retested for Inter laboratory Comparison
2.	GPIRL, WRD Andhra Pradesh /APGENCO (6 x 16.15MW)	VOITH	Francis Pump	2019-20	Witness test conducted
3.	Peruvannamuzhy HEP, KSEB (2 x 3MW)	KBL	Horizontal Kaplan Turbine	2021-22	Witness test conducted
4.	Pazhassi Sagar HEP, KSEB (3 x 2.5MW)	KBL	Horizontal Kaplan Turbine	2022-23	Witness test conducted
5	Kishanganga HEP, NHPC (3 x 110 MW)	VOITH	Vertical Pelton Turbine	2022-23	Witness test conducted
6.	Shivsamudram HEP, KPCL (4 x 6 MW)	ANDRITZ	Francis Turbine	2023-24	As a third party witnessed model test on behalf of KPCL at Linz, Austria
7.	Chinnar SHEP, KSEB (2 x 12 MW)	FLOVEL	Vertical Francis Turbine	2023-24	Witness test conducted