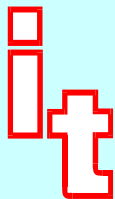


Fish Friendly Turbines

Dr. Drona Upadhyay

IT Power



Power

Hydroenergia 2006

Crieff, Scotland

June 2006

Background

- Early turbine designs
- New legislations require fish protection
- Considerable SHP potential in the UK
- Scheme approval rate - fisheries concerns
- Causes of fish injury in turbines - research findings

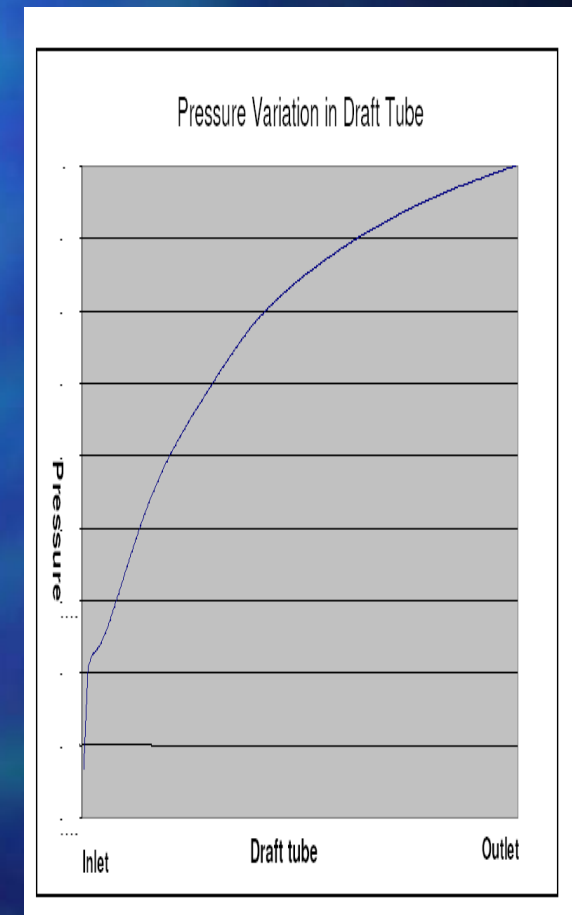
Research Approach

- Existing siphon-type turbine used as baseline
- CFD - performance and flow data e.g. pressure & shear
- STRIKER - fish mortality prediction



CFD Analysis

- Qualitative and quantitative information
- Pressure and other flow data (e.g. figure on right)
- Performance
- Establishes reference for comparison



Fish Injury Prediction

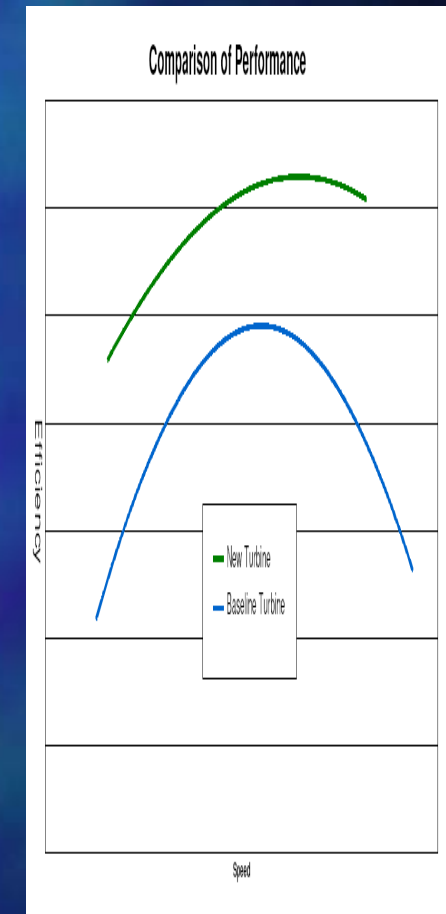
- STRIKER - a proprietary software
- Predicts fish injury rates
- Prediction categorised into size of fish
- proportion of injury mechanism also predicted
- Reference for comparison

Modified Turbine Design

- “Problem areas” identified from baseline turbine
- Design changes identified
- CFD used as an iterative tool to optimise design
- Performance and Fish survival rates show encouraging results

New Design Results

- CFD and STRIKER of new design options
- Performance not affected (e.g. figure on right)
- Fish survival rates improve
- Cost increase compensated by reduction in cost of screening



To sum up...

- Environmental concerns esp. fish welfare affecting SHP development
- Research project focussed on improving existing low head turbine design
- A baseline turbine modelled using CFD and fish injury prediction models
- Improvement in performance and fish injury achieved for conceptual design

THANK YOU



Hidroenergia 2006

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