Vision of a small hydro research project from the owner’s point of view

Initial situation
End 1999

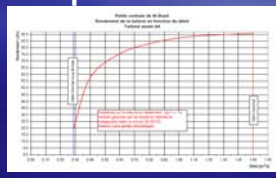
Controlled manually
216kW double Francis 26m
Efficiency
Relialability: excellent

SEARCH LHT

project

TARGET
End 2002

- Can bus based control with optical link with water intake
-330kW 8 blades Kaplan 1000rpm 27m
- efficiency
-100 000h maintenance free
-Final Budget: 700 000€



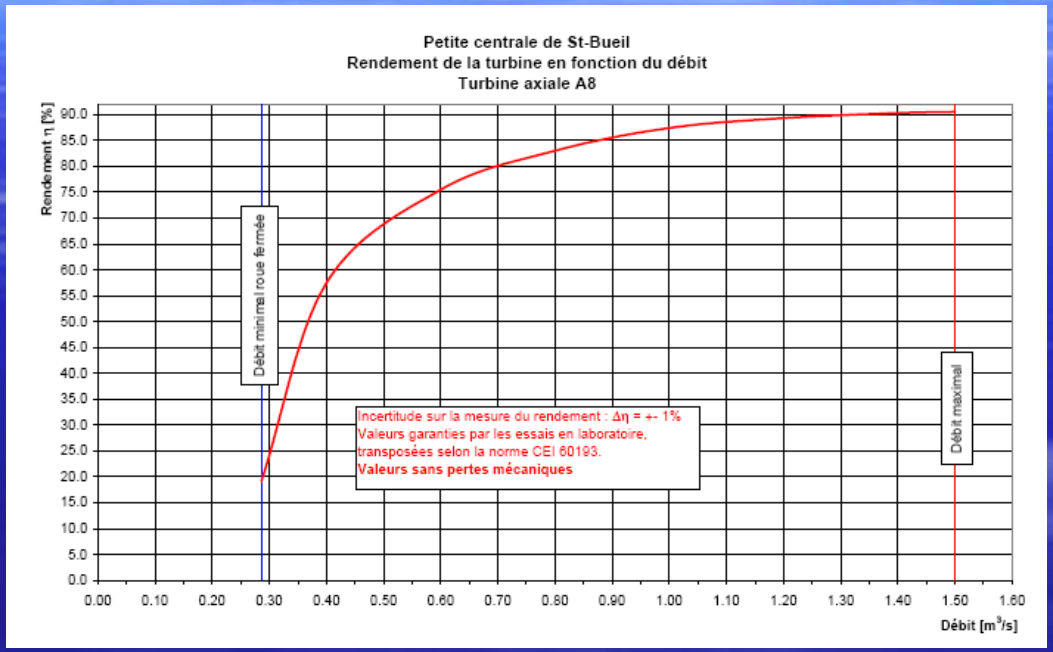
Time

- Researchers need time (for good)(Mhylab, EPFL INPG)
  - Flow modelisation (end 3003)
  - Laboratory tests (end 2003)
- Once research is over application starts
  - Lot of work, worries, problems for small companies
  - Turbine manufacturing: end 2004
  - Control system:
    - First operation (main functions february 2005)
    - Finished (2006)
- Conclusion
  - All partners need a lot of time
  - The owner must not be in a hurry (as usual owners)

Finance

- Initial budget: 480k€, UE funding 110k€ end 1999
- Only once researchers have finished precise budget is known (end 2003) +220k€ (building)
  - UE refused to contribute on those extra costs
  - ADEME accepted to contribute (thank's a lot)
- Insurance do not like prototype machines (but banks oblige to have comprehensive insurance)
- Once financial report issued for a period (6 months) payment by UE not before a year
- Contractual problems: for one manufacturer development cannot be contractualised
- Conclusion
  - To budget a cost for a demonstration site following a research, the usual 10% for miscellenious should be over quoted (over over)
  - Don't forget late payments from UE

EFFICIENTY of the TURBINE



Objective fully reached

Conclusion

- **Significant progress can be obtained on small hydro if proper research is funded**
- **Demonstration site results confirm completely results found by researchers**

RELIABILITY

- **After one year of operation**
  - **Turbine**
    - Water cooled bearing: OK
    - Clearance between blades and wheel mantle: OK
    - Capability for operation at very low power (10kW): OK
    - No cavitation
    - Weakness in wheel boss (insufficient fixing of levers axis): significant problem, repaired now
  - **Control Command (only minor items)**
    - Few bugs have been cured and to be cured
    - Industrial PC at water intake blocked (low temperature probably)
    - One restart of satellite internet connexion hub
  - **Global operability**
    - A bit more energy should have been put in commissioning
    - Operator need time to get familiar with the control system
- **Conclusion**
  - Initial objective for :
    - the turbine not reached yet, but reachable (we think)
    - The control system reached

Conclusions

- You have to be a special owner “to give” your site for demonstration for a research project:
  - Do it for pleasure, not money
  - Time should not be of importance for you
  - Give your confidence to research people
- It is hard for small manufacturer to get in a project like this one, they have to be thank for their efforts
- We are very pleased to have done it. Significant improvements have been proven
- Now, it is up to YOU, here, to apply all this work on your hydro sites :
  - For your Kaplan turbines
  - For your control systems

SEARCH LHT Partners

- Mhylab
- EPFL
- LEGI (INPG)
- Turbine manufacturer: THEE
- Control Command: SASSO
- Demonstration site in France SEER
- Demonstration site in Swizerland: Romande Energie