

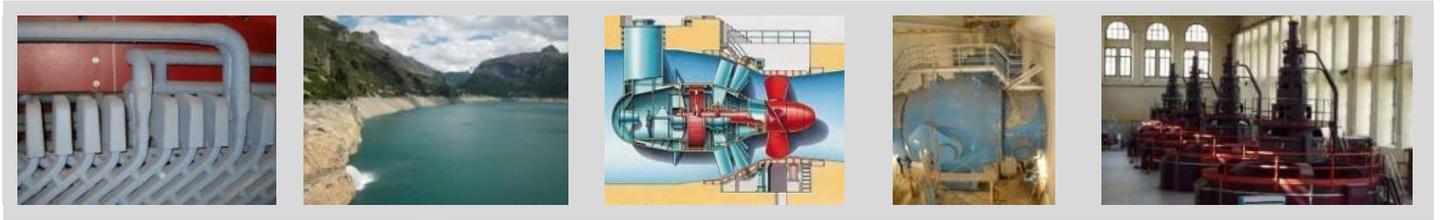
## > Applications on hydroelectric generators

### > When and why?

- New acceptance test or after works
- Assessment after overhaul
- Structure or pipe vibrations
- Alarm or malfunction

### > The results

- Mechanical and electromagnetic assessment
- Complete diagnosis of the shaft line
- Taking into account the operating conditions
- Early detection of faults



### > Diagnoses

- All types: Pelton, Francis, Kaplan
- Acceptance test on the installations in accordance with 10816-5 and 7919-5
- Mechanical, electrical and hydraulic fault diagnosis
- Electromechanical state assessment
- Torque and pressure pulsation measurement

### > Specific studies

- Analysing the dynamic behaviour of penstocks
- Monitoring the dynamic behaviour of the generators, torch phenomena...
- Correcting resonance phenomena using finite element calculations
- System for detecting the unscrewing of the Kaplan tube
- Experimental modal analysis of wheels

### > Turnkey protection and monitoring solutions

- Generator protection and monitoring system
- Sensor instrumentation: accelerometers, probes, air gap...
- Specific instrumentation engineering
- Consultancy, assistance and remote diagnosis

### > Electrical surveys

- Identifying alternator or network faults
- Analysing current modulations coming from the process or the shaft line
- Measuring the air gap with rotating sensor
- Corrective recommendations

### > Software / Application software

- DynamX® data acquisition and processing software
- Module dedicated to measurements and analyses on hydroelectric generators
- SysTeo® mobile monitoring system
- Specific development depending on customer request

#### DYNNAE

- > Vibratory analysis
- > Electrical analysis
- > Infrared thermography
- > Instrumentation and sensors
- > Software
- > Training



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## SOME REFERENCES

### Vibratory analysis, mechanical and electrical diagnoses, structure analyses

SHEM	Periodic vibratory monitoring and surveys on the generators since 1999
ANDTRIZ	Diagnoses abroad (Portugal, Greece, Albania...) Consultancy work
EDF CIH	Diagnoses in France abroad (Laos...) Consultancy work
CNR	Over 40 vibratory diagnoses on various installations since 2005 Assistance on protection systems
HYDROSTADIUM	Vibratory diagnoses on small power plants
SHEMA	Vibratory diagnoses on small power plants
CN'AIR	Vibratory diagnoses on small power plants
EDF DTG	Over 100 vibratory diagnoses since 2009
ONE (Morocco)	Diagnoses on two PSPS
ALPIQ (Switzerland)	Vibratory diagnosis consultancy work
MECAMIDI	Vibratory surveys on turbines
HYDRO EXPLOITATION (Switzerland)	Vibratory Assessments on Pelton turbines



### Instrumentation and monitoring

CNR	Supplying and commissioning twenty or so vibration protection systems on bulb turbine and vertical generating units. Defining, supplying and installing a system for monitoring the unscrewing of a Kaplan tube. Supplying and installing airgap sensors Defining, supplying and installing a system for monitoring vibrations on an acoustic scintillation frame
SHEM	Supplying and commissioning 12 vibration protection systems
EDF DTG	Supplies of sensors 1 Systeo license



### Software and hardware

ALSTOM	DynamX Licences used on site and in laboratory Specific developments
EDF DTG	DynamX Licences used on site and in laboratory Specific developments A CTMO with Adonis and Adonis FRF licence
HYDRO EXPLOITATION	A DynamX licence used on site and in laboratory
UEM	A DynamX licence used on site A CTMO with Adonis licence



### Intra-company or personalised training courses

ALSTOM	Diagnosis on hydro-electric generators, application on DynamX
CNR	Training courses of various levels for several agents Specific training relating to vibration protection
EDF CIH	Diagnosis on hydro-electric generators
EDF DTG	Training courses of various levels for several agents Diagnosis on hydro-electric generators, application on DynamX
HYDROEXPLOITATION	Diagnosis on hydro-electric generators, application on DynamX
HYDROSTADIUM	Training cycles
SHEM	Training courses of various levels for several agents
ONE MOROCCO	Vibration diagnosis training

