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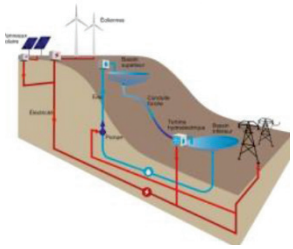
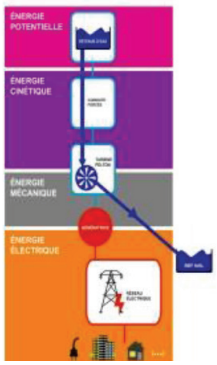
Systems & Renewable energies

Hydrelec 300

Schematic diagram



Energy transformaton



Hydrelec 300 : Hydroelectric power plant, 250 W

This power station is the reduced model of a hydro-electrical power station driven by a Pelton turbine. It is composed of all the components needed to simulate a river with a penstock pipe and the production of electrical energy through a Pelton turbine.

Didactics hydroelectric plant is geometrically similar representation of the actual plant. The hydraulic quantities and electrical powers are reduced in order to be compatible with the infrastructure and equipment of training centers and universities.
The operation, behavior and setting methods are nevertheless similar to what occurs in the real system.

The components of the educational system such as the turbine and generator are directly from the industrial world and are commonly used in real micro hydro projects.

How does an hydroelectric power plant operate?

- This system shows the contextualization of a Pumped Storage Power plants (PSP), identical to dams situated in “Grand’Maison » in Isère and “Lac noir » in Vosges (France).
- It allows the students to apprehend the installation, commissioning fo a frequency variator, to master the control part, with approaches similar to real industrial world.

Training levels:

ISCED 2011 : **level 3, cat 35** (upper secondary education ; vocational) **;**
level 4 (post secondary but non-tertiary education)**;**
level 5 ; cat 54 & 56 (tertiary education ; general and vocational)

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Hydrelec 300 : Operating part – Front

Capacitance sensor for water level

Headbay 85-Liter tank

Measuring centre

KTP 700 HMI

Emergency stop Default lamp

Chain of energy

Filling stop

Vizualisation of the water level

Tailbay 130-Liter tank

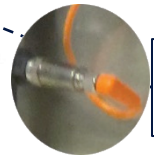
4 castors (with brake)

Control cabinet

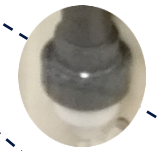
Schematic diagram

Conduite Forcée 0 à 4 bar

Pressure controller output 4-20mA / 0-10Vdc



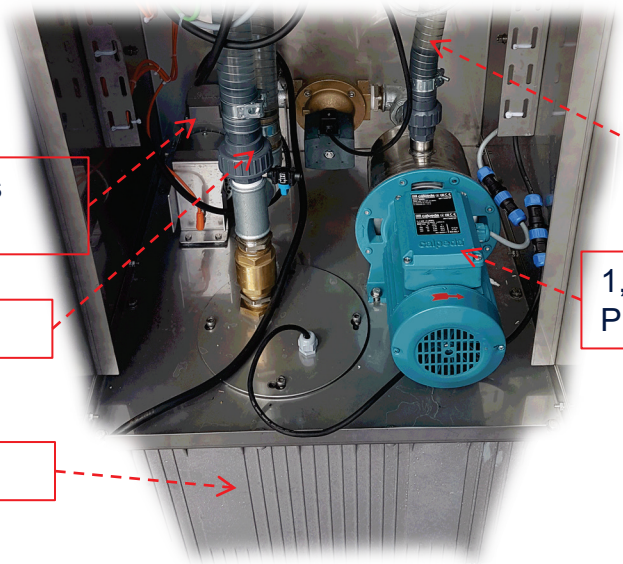
Flowmeter with pulse output, 45 Hz/msec



Injector (nozzle)

Pelton

Hydrelec 300 : Operating part- Back



300-W asynchronous generator

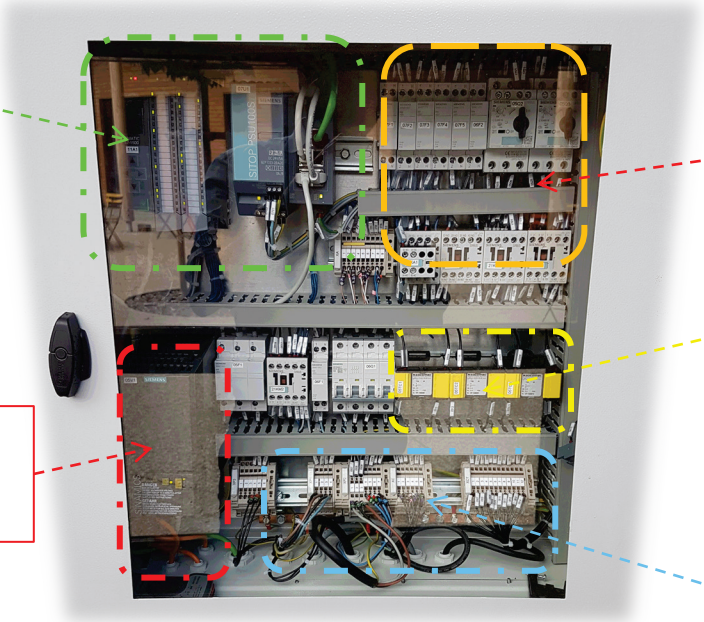
Pumping conduct

130-Liter tank

Penstock

1,1-kW hydraulic pump
Pressurisation from 0 to 6 bar

Hydrelec 300 : Control part – Control cabinet



PLC:
S7-1512 C

Variator:
G120 type, 1,1 kW,
controlled byProfinet

Electric distribution and protection

Measuring center

Screw terminal

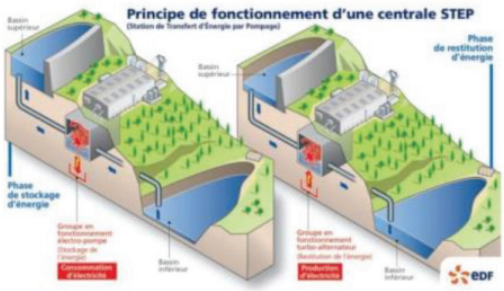
Hydrelec 300 : Measuring center, PAC 3200 type from Siemens

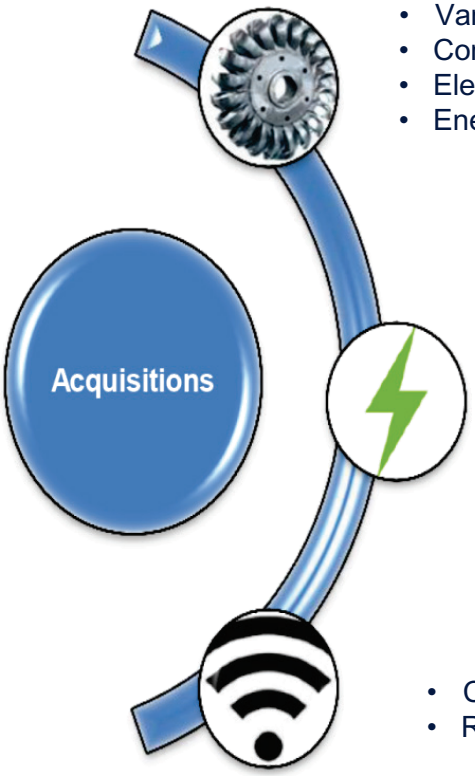
Functions

- ✓ Voltage,
- ✓ Current,
- ✓ Power,
- ✓ Power factor,
- ✓ Frequency,
- ✓ Minimum and maximum values,
- ✓ Energy efficiency
- ✓ Average power
- ✓ Energy counter for S0 signal
- ✓ Runing time meter
- ✓ Distortion factor, voltage/current,
- ✓ Control of 6 measures

Hydrelec 300 : Pedagogical documentation

- ✓ **Diagrams**
- ✓ **Videos**
- ✓ **Tutorial**
- ✓ **Practicals**





- Various processes for energy transformation
- Converting hydraulic energy to electric energy
- Electric reversibility, connected to the network
- Energy autonomy in islands

- Electrical protection of workers in a power plant
- Energy sizing
- Energy quality (harmonics) and electric performance (line sizing)
- Effects and influence of a polluting load

- Control and regulation
- Remote control managment

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