



ANDRITZ HYDRO

Company Presentation by Edwin Walch

Romania Hydro Power Energy Summit, February 20th, 2014

The ANDRITZ GROUP

Overview

Company

- ANDRITZ AG, Graz, Austria (Group headquarter)
- ANDRITZ is listed on Vienna Stock Exchange (Prime Index - ATX)
- More than 220 production and service sites worldwide
- Employees: approx. 23,900 worldwide as of September 30th, 2013

Key figures 2012

- Order intake: 4,924 MEUR
- Sales: 5,177 MEUR
- Net income (including non-controlling interests): 242 MEUR
- Equity ratio (as of end of 2012): 20%

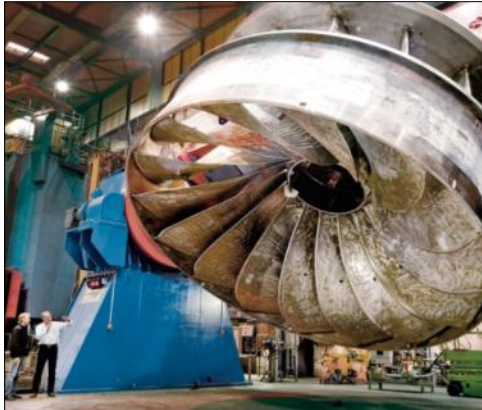
Products and services

Plants and services for hydropower stations, the pulp and paper industry, the metalworking and steel industries, and the solid/liquid separation in the municipal and industrial sectors



Company Profile

A world market leader in most business areas



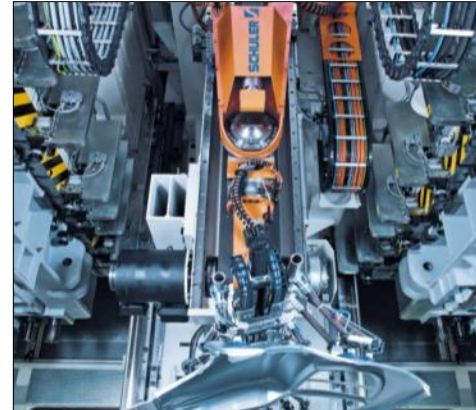
HYDRO
35-40%*

Electromechanical equipment for hydro-power plants (turbines and generators); pumps (e.g. for water transport and irrigation); turbo-generators for thermal power stations



PULP & PAPER
25-30%*

Systems and equipment for production of pulp, paper, tissue, and board; energy boilers; production equipment for bio-fuel/biomass; plants for production of nonwovens and plastic films



METALS
25%*

Presses for metal-forming; systems for production and processing of stainless steel, carbon steel, and non-ferrous metal strip; industrial furnaces; resistance welding equipment




SEPARATION
10%*

Equipment for solid/liquid separation for municipalities and various industries; systems and equipment for production of animal feed pellets

* Average share of ANDRITZ GROUP's total order intake

ANDRITZ HYDRO



ANDRITZ HYDRO is a global supplier of electromechanical systems and services ("From Water to Wire") for hydropower plants. The company is a leader in the world market for hydraulic power generation.

ANDRITZ HYDRO

Organization

ANDRITZ HYDRO

Central Functions

Large Hydro



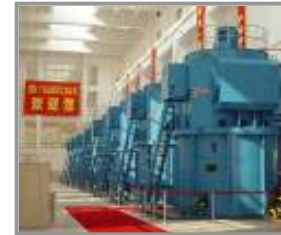
Compact Hydro



Service & Rehab



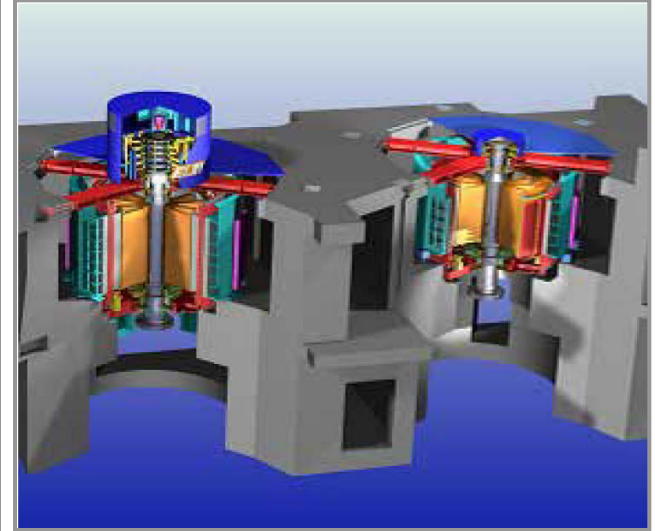
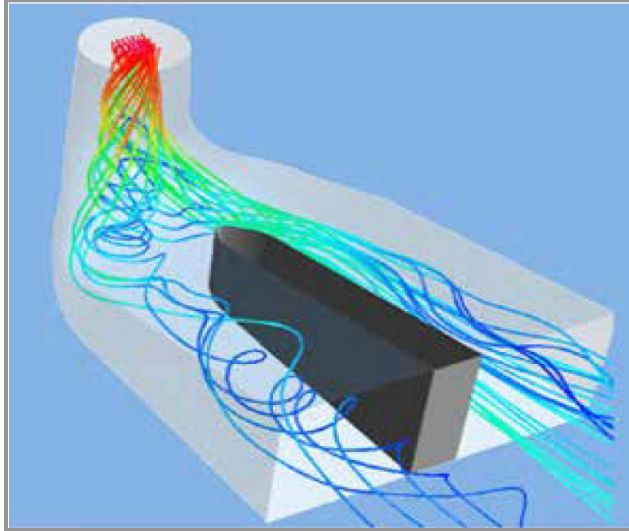
Pumps



Generator Turbo



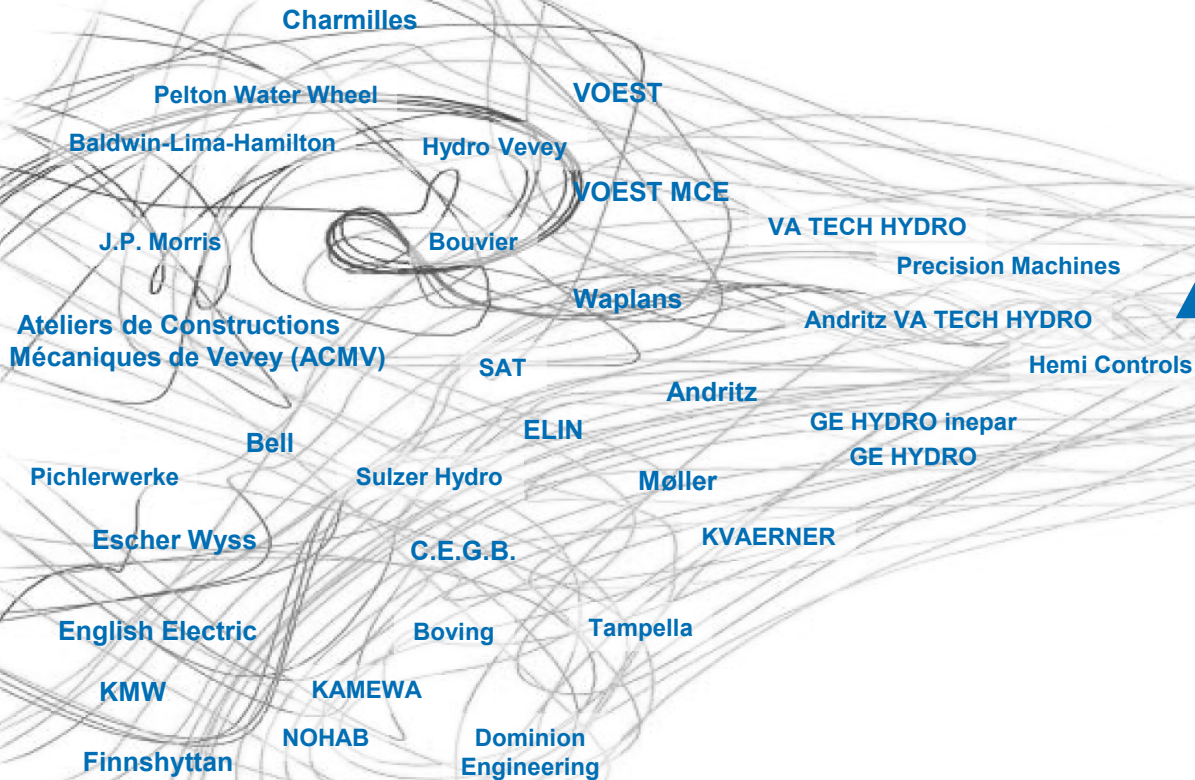
Our Experience



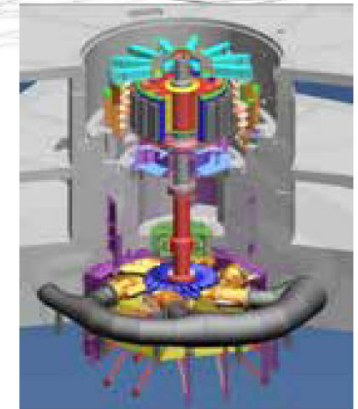
- **More than 170 years of turbine experience**
- **Over 30,000 turbines (more than 400,000 MW) installed**
- **Over 120 years of experience in electrical equipment**
- **Complete range up to more than 800 MW**
- **Leading in service & rehabilitation**
- **World leader for Compact Hydro**

Our History

More than 170 years of experience and knowledge in the field of hydropower generation



ANDRITZ
Hydro



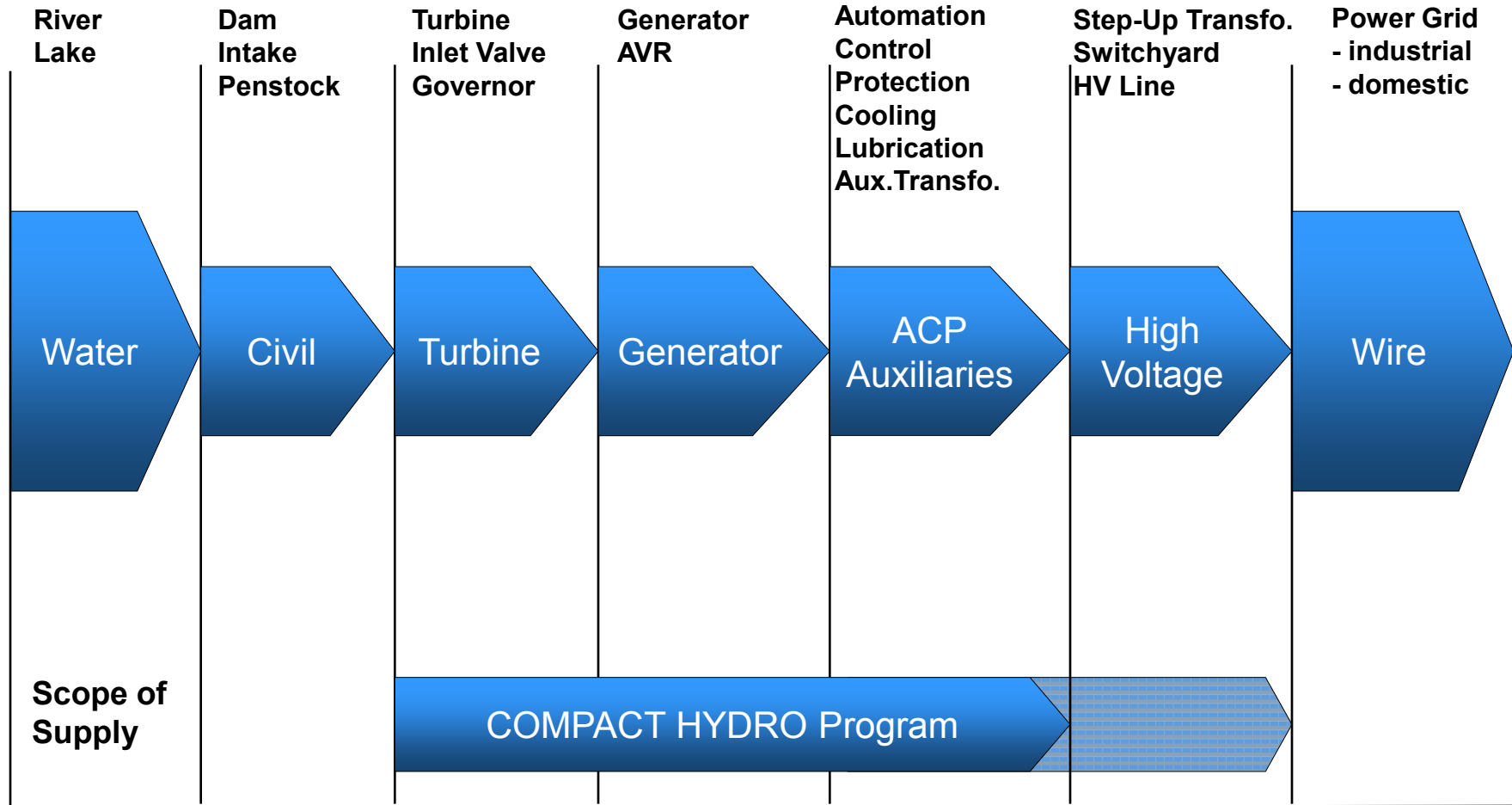
ANDRITZ
Hydro

COMPACT HYDRO

is a global supplier of turnkey electromechanical equipment and services “Water to Wire” for hydropower plants of small and medium size with outputs up to 30 MW per unit.

Compact Hydro

“Water to Wire” (W2W) Concept



Compact Hydro

Application range

- The range of products and services is developed from low to high head applications and covers a head ranging from 2 up to 1,000 meters with a unit output up to 10 MW for Axial and up to 30 MW for Francis and Pelton.
- The range of products includes in addition to the turbine itself, all or part of the electromechanical equipment within the powerhouse such as generator, inlet valve, governor, controls, switchgear, transformer.



Head:	$H \leq 35 \text{ m}$
Output:	$P \leq 10 \text{ MW}$



Head:	$H \leq 300 \text{ m}$
Output:	$P \leq 30 \text{ MW}$

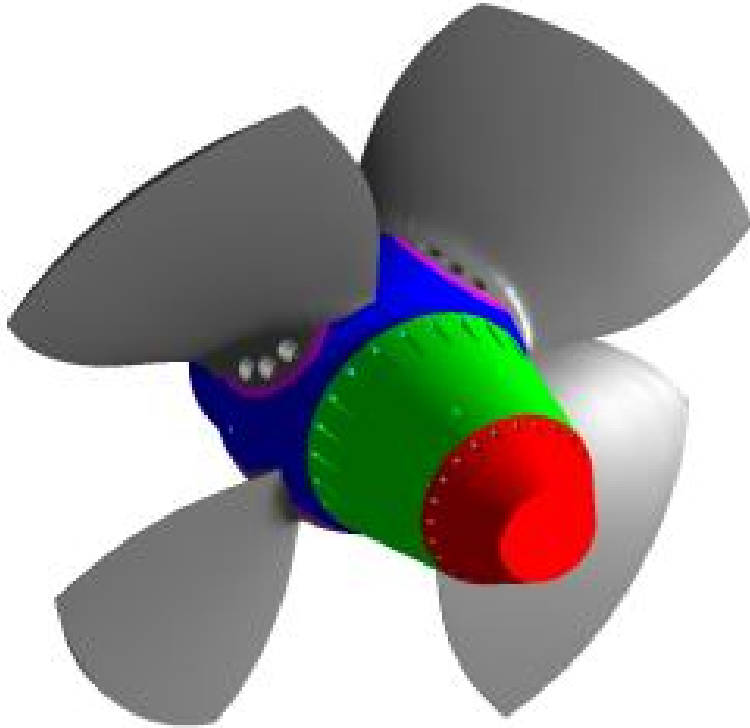


Head:	$H \leq 1,000 \text{ m}$
Output:	$P \leq 30 \text{ MW}$

COMPACT HYDRO

Axial Turbines

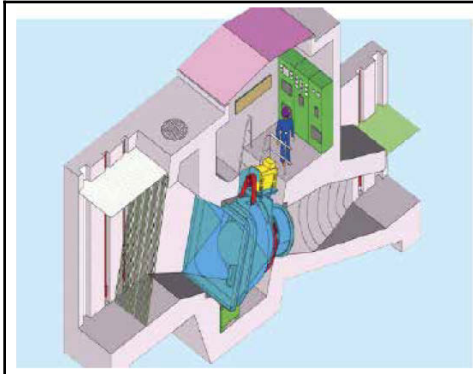
Head:	$H \leq 35 \text{ m}$
Output:	$P \leq 10 \text{ MW}$



- Horizontal, vertical and inclined shaft
- 3 - 6 blades
- Model tested runners in ANDRITZ laboratories
- Single or double regulation
- Direct coupled generators or with speed increasers enabling high speed generators
- Various configurations to fit the site conditions (Belt- or Bevel Gear Bulb, PIT-Type, Compact Bulb, EcoBulb™, vertical Kaplan, S-Type and CAT-Turbines)
- Simplified interface with concrete structure
- Compact power house arrangement

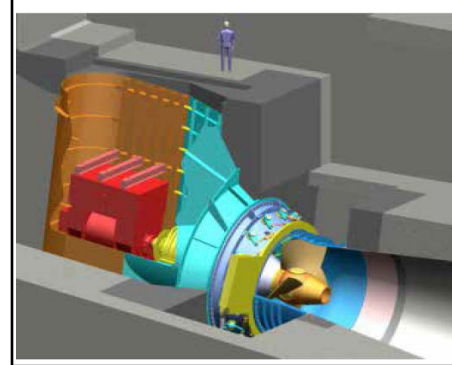
COMPACT HYDRO

Turbine Types for Low Head Applications



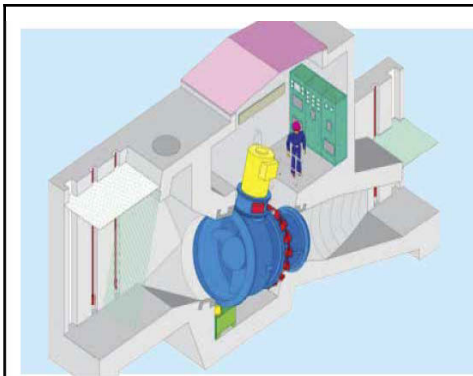
Head : up to **5 m**
Discharge : up to **25 m³/s**
Output: up to **0.6 MW**

BELT DRIVEN BULB TURBINE



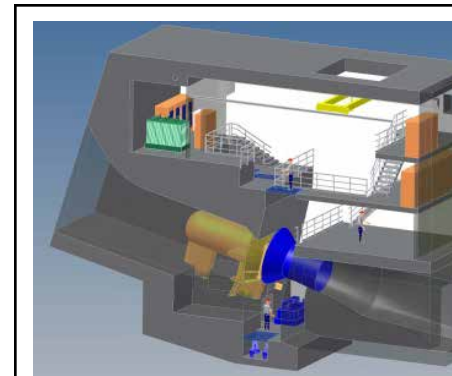
Head : up to **12 m**
Discharge: up to **100 m³/s**
Output: up to **10 MW**

COMPACT PIT



Head : up to **12 m**
Discharge: up to **45 m³/s**
Output: up to **2.6 MW**

BEVEL GEAR BULB TURBINE

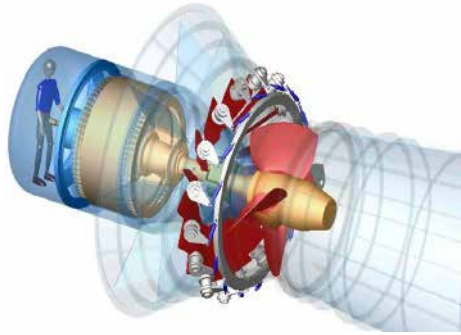


Head: up to **18 m**
Discharge: up to **100 m³/s**
Output: up to **10 MW**

COMPACT BULB

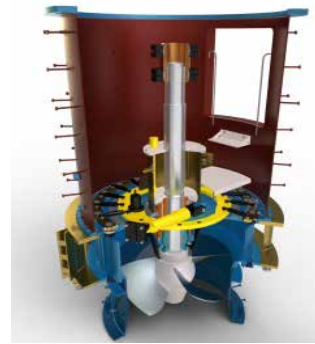
COMPACT HYDRO

Turbine Types for Low Head Applications



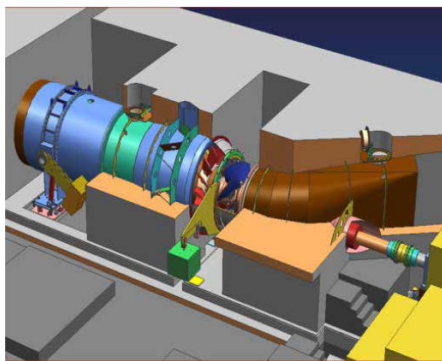
Head : up to **20 m**
Discharge : up to **100 m³/s**
Output: up to **5,0 MW**

ECO BULB TURBINE



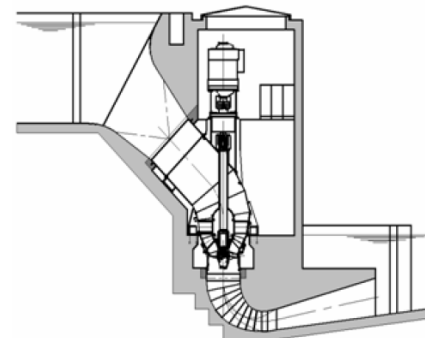
Head : up to **18 m**
Discharge: up to **80 m³/s**
Output: up to **10 MW**

VERTIKAL KAPLAN TURBINE



Head : up to **35 m**
Discharge: up to **80 m³/s**
Output: up to **10 MW**

S-TYPE TURBINE



Head: up to **35 m**
Discharge: up to **80 m³/s**
Output: up to **10 MW**

COMPACT AXIAL TURBINE

COMPACT HYDRO

Francis Turbines



Head: $H \leq 300$ m
Output: $P \leq 30$ MW

- Horizontal shaft
- Vertical shaft
- Model tested runners in ANDRITZ laboratories
- Compact power house arrangement
- Short installation time

COMPACT HYDRO

Project – Stave / Canada

**3 Compact horizontal
Francis Turbines**

Runner diameter: 1,250 mm

Head: 95.1 m

Output: 10,400 kW



COMPACT HYDRO

Project – Arroibar / Spain

1 Compact vertical Francis Turbine

Runner diameter: 1,180 mm

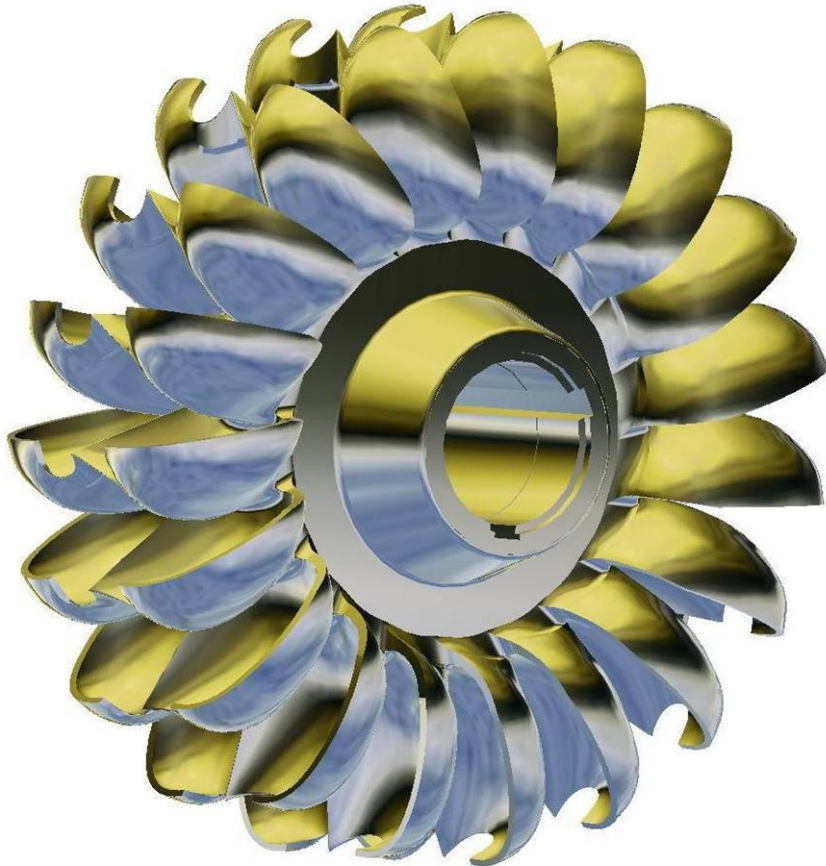
Head: 87.3 m

Output: 7,850 kW



COMPACT HYDRO

Pelton Turbines



Head: $H \leq 1,000$ m

Output: $P \leq 30$ MW

- **Horizontal shaft: 1 - 3 jets**
- **Vertical shaft: 2 - 6 jets**
- **Model tested runners in ANDRITZ laboratories**
- **High efficiencies at part load**
- **Low overpressure in the penstock**
- **Compact power house arrangement**
- **Short installation time**

COMPACT HYDRO

Project – Entroubles / Italy

**2 Compact 2 nozzles
horizontal Pelton Turbine**

Runner diameter: 721 mm

Head: 313.0 m

Output: 1,200 kW



COMPACT HYDRO

Project – Cobasel / Romania

**1 Compact vertical 4 nozzles
Pelton Turbine**

Runner diameter: 760 mm

Head: 87.5 m

Output: 580 kW



COMPACT HYDRO

Summary

Compact Hydro stands for:

- Complete line of turbine and electrical equipment up to 30 MW unit output
- Modular equipment design
- Low environmental impact
- Short period of project implementation
- Low investment cost and risk due to proven design concept

Compact Hydro

**More than 10,000 units of
Compact Hydro power plants supplied**



**Every week another three
Compact Hydro units start operation**



ANDRITZ HYDRO
Your partner for renewable and clean energy