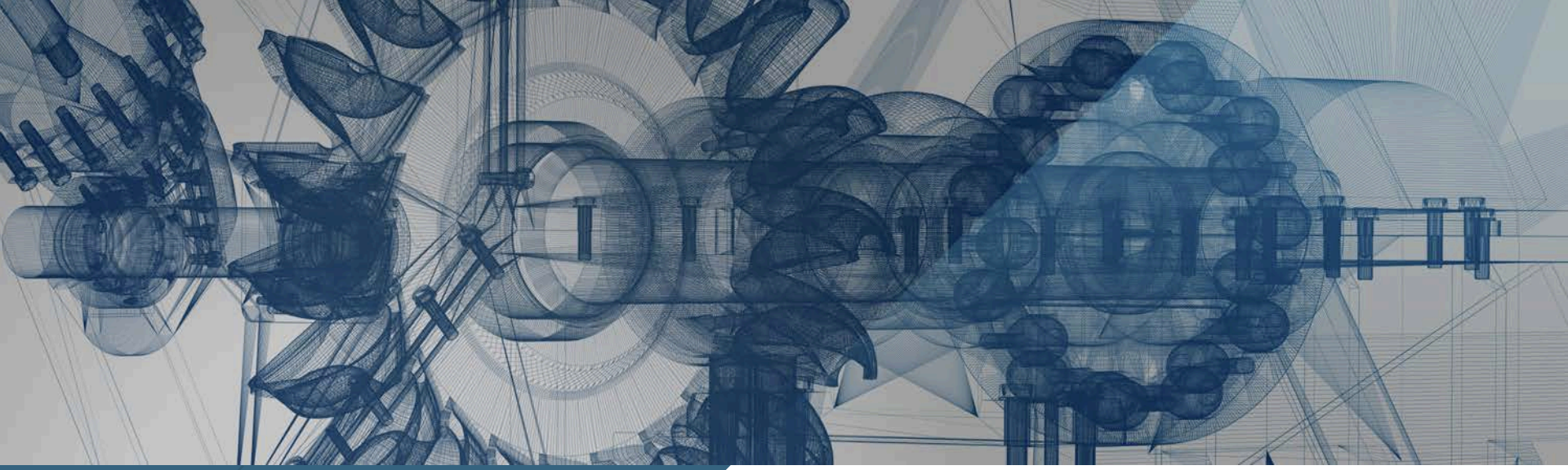


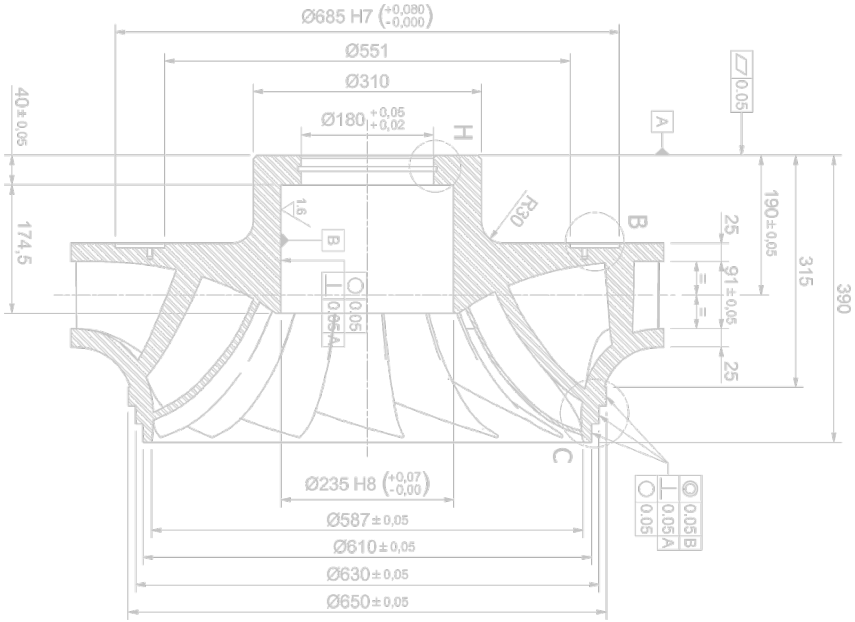
# 45

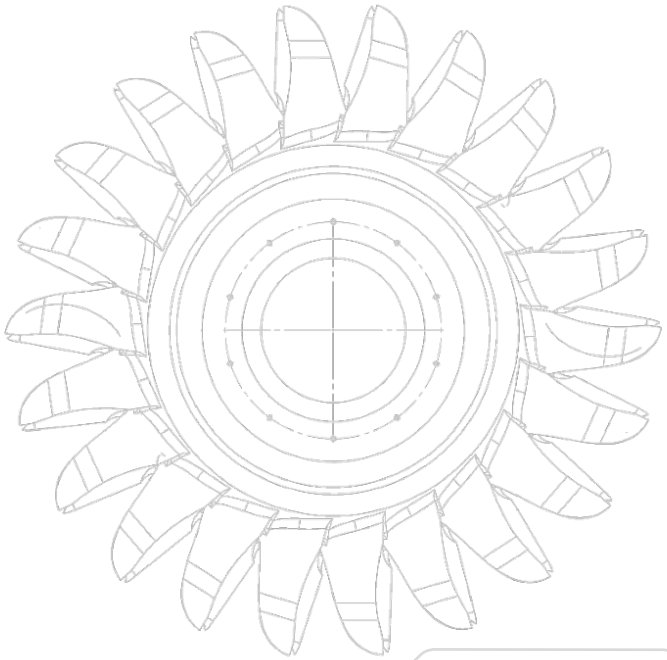
/ ENGINEERING /

Hydropower consultants | R&D management | Mechanical engineering

# ABOUT US

**45 Engineering** is a hydropower plants consulting company. We provide **professional advice** to technical design firms, investors, turbine manufacturers, plant operators and banking companies. We can develop **technical due diligence** to determine the value, remaining useful life or interventions to be carried out on a hydropower plant to bring it back to the maximum efficiency as well as the costs calculation for O&M. We develop detailed maintenance plans and monitor the state over time. Our app **HPP Design** is our tool to help you choose the best hydraulic turbine for hydropower plants.

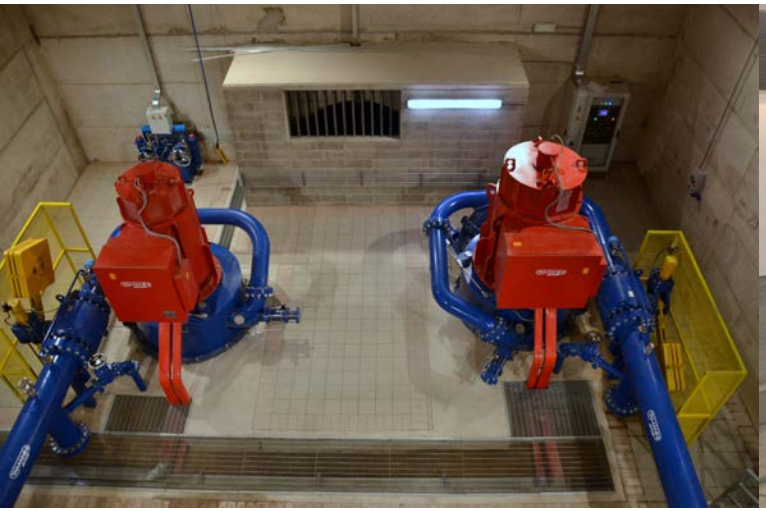


# WHAT WE DO

## Mechanical Design of Hydraulic Turbine: Pelton, Francis, Kaplan and Archimedean Screw

Starting from the **project data** (head and discharge), we decide the design path to finalize the geometry of the conduct and the blade using **CFD technique**. Once the hydraulic design has been completed, the machine has to be industrialized taking into account all the mechanical parts of the machine assembly, the production technologies, costs, production times, structural checks and fatigue tests. Finally, the ***executive design*** is drawn up with the definition of the BOM, working methods and applied tolerances.



# WHAT WE DO

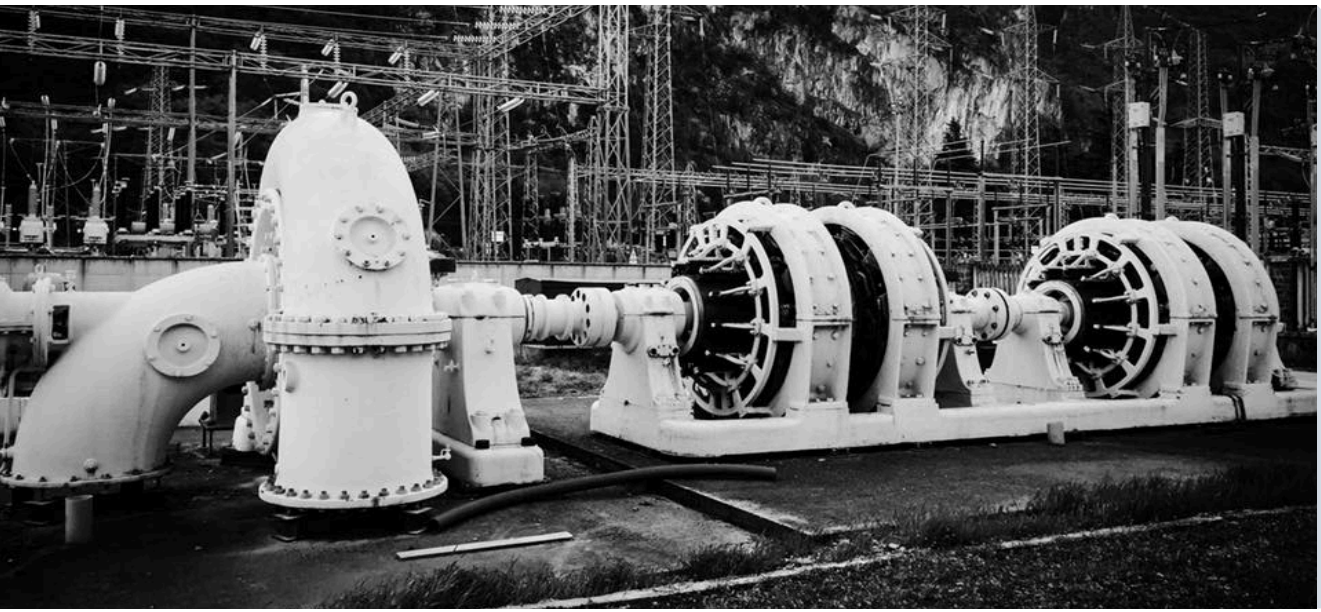
## Technical Due Diligence

We develop **technical due diligences** for hydropower plants to determine ***value***, ***remaining useful life***, ***O&M costs*** and actions to be carried out to bring back the plant to the maximum efficiency .


# WHAT WE DO

## Maintenance plans

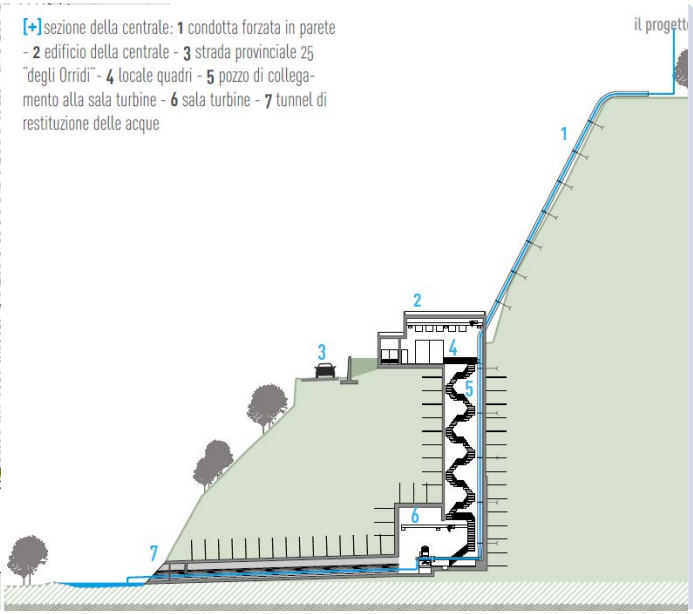
We support plant operators with **site inspections** and detailed analyses of the HPP in order to define ***daily, weekly, monthly and yearly*** activities to be carried out and the necessary spare parts needed to maintain the asset at its highest value. Periodically, we can assess the **plants conditions** and ***schedule ordinary*** and ***extraordinary activities*** in terms of budget and execution scheduling.



# WHAT WE DO

## Electromechanical Design

We support investors to conduct the analysis of **hydraulic data** and set the **optimal combination** of turbines to install in order to **maximize the investment**. We can perform transient analyses on the plant for water hammers calculation or studying hydraulic and electrical instabilities. We further prepare ***detailed technical electromechanical specifications*** for public or private tenders.

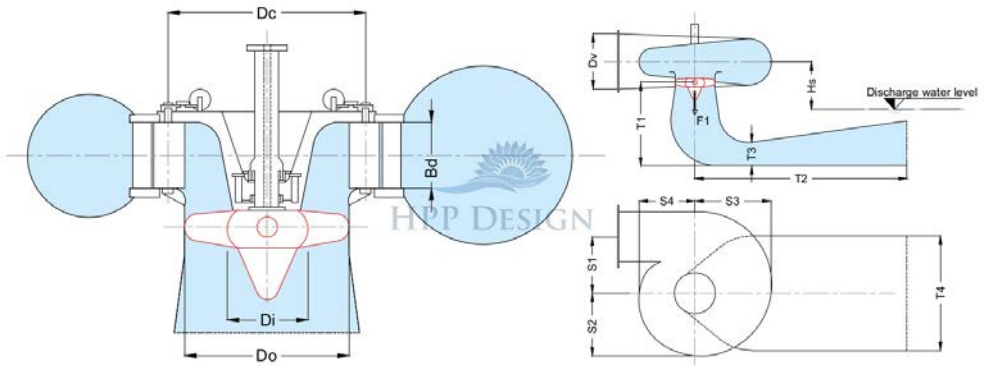



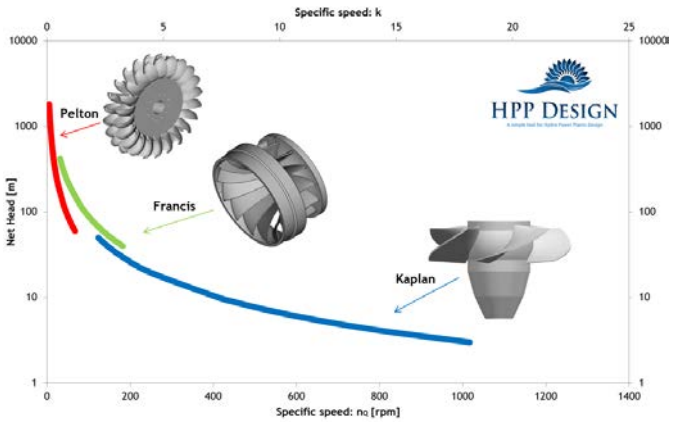
# HPP-Design

We have developed a web-app for **hydropower plant designers**: HPP-design.
By using only two input data, head and discharge, HPP-Design **automatically chooses and sizes,** among Pelton, Francis, Kaplan, Archimedean Screw and Cross Flow turbine, different machine configuration.
The tool is intended to:

- understand the ***turbine's dimensions*** and ***performances***;
- Define main ***technical specifications***;
- define the most appropriate ***functioning range*** in order to ***maximize production***, ***overall dimensions and costs***.

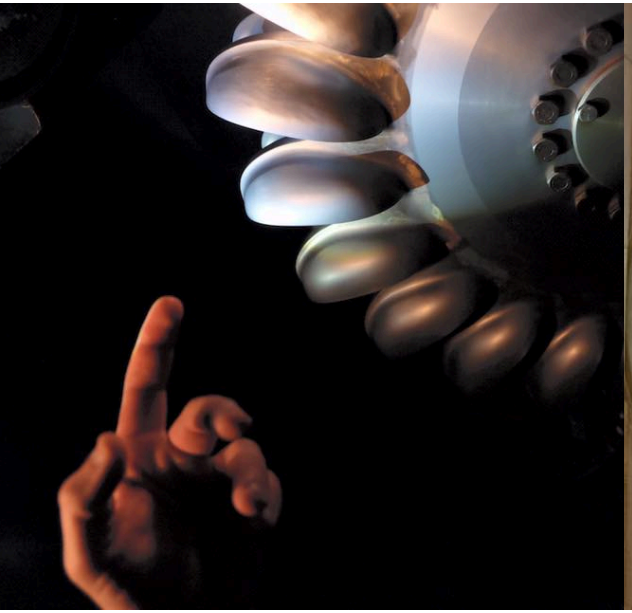
All the sizing data are saved on line and it is possible to access them on each platform.
This is the link to try it out: http://hpp-design.com



# HOW WE DO IT

We carefully select the **most advanced methods and tools in engineering**.
Using dynamics and finite elements software, we can analyze complex structures in order to understand the strains and evaluate the dynamic effects. **CFD analysis** helps us both to understand fluids behavior and create a development process **to improve the hydraulic performances**. In complex systems with multiple boundary condition we use parameterization and **single/multi objective optimization algorithms** in order to highlight the ***leading parameters*** and find their best values to get the required result.



45 ENGINEERING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