MISA

Meccaniche Idroelettriche

Service Arzignano

OUR RENEWABLE ENERGY

MISA is a dynamic and reliable company operating in the electrohydraulic plant engineering and energy production sector.
The tireless commitment of MISA towards a continuous improvement has also been formally recognized with the certification of its quality system according to the UNI EN ISO 9001:2015 standard, as well as the UNI EN ISO 14001:2015 certification for the environmental management system and the ISO 45001:2018 certification for the occupational health and safety management system.
The SOA certificate completes the necessary qualifications for participation in public tenders in 10 different categories.
The SOA certification in the OG9 class, category IV, “Plants for the production of electricity”, confirms the number of hydroelectric power plants built over the years.
MISA is able to guarantee complete-cycle solutions, from the design to the realization and installation, following the turnkey formula. The own production of parts of the plant involves the company well beyond the simple supply.

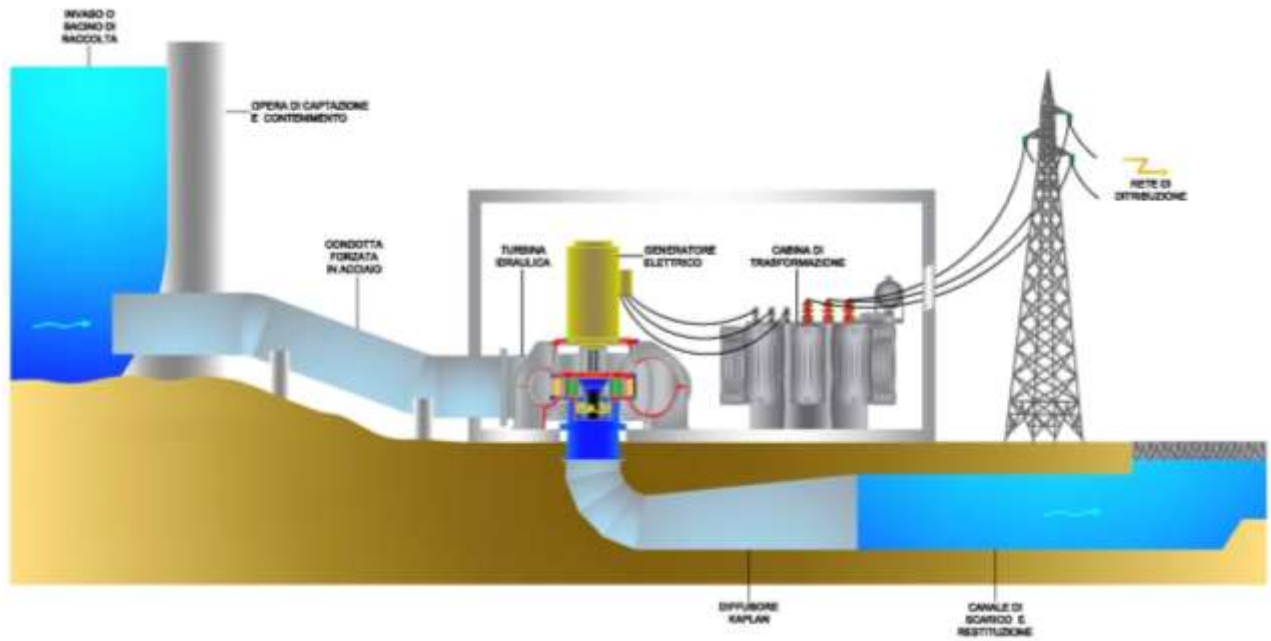
MISA’s corporate mission is to organize and coordinate at national and international level the realization of engineering projects in the water pumping and energy sector, maximizing the results obtainable, through excellent use of its operational structures, the identification of new energy resources, in particular renewable energy, the development of new technology, and the best use of available human, technical and financial resources.

HYDROELECTRIC PLANTS

Since its origins, the hydroelectric power source has been and still is among the most important and very first sources of renewable energy in the world. In Italy, it covers 10-15% of the national energy needs. The water that flows in rivers and canals has always been used by the man in his activities.
The power generated by a hydroelectric plant depends on the head (potential energy), otherwise on the difference in height (o gap) between the free altitude where the water mass is available and the level to which it is returned after passing through the hydraulic turbine. The potential and kinetic energy of the water is transformed into mechanical energy available to the turbine shaft and therefore, through the generator, into electricity. All this respecting the environment and without any dispersion of water resources.
The hydroelectric power plant consists essentially of the water collection and containment work, the intake work, as well as the regulation and transport of water, up to the hydraulic machines that transform the potential energy of water into sustainable electricity. The turbined water is then returned to its natural river bed, through a suitably sized diffuser or an discharge channel.
Hydroelectric power plants can be run-of-the-river, if the flow exploited practically coincides with that available in the waterway, up to the limit allowed by the derivation works, unless the minimum vital flow left in the riverbed to ensure ecological balance.
When from the intake structure, an accumulation tank is instead created to modulate the flow rates according to production needs, then the plant is called a tank or regulated flow.

THE HYDROELECTRIC PLANT INCLUDES:

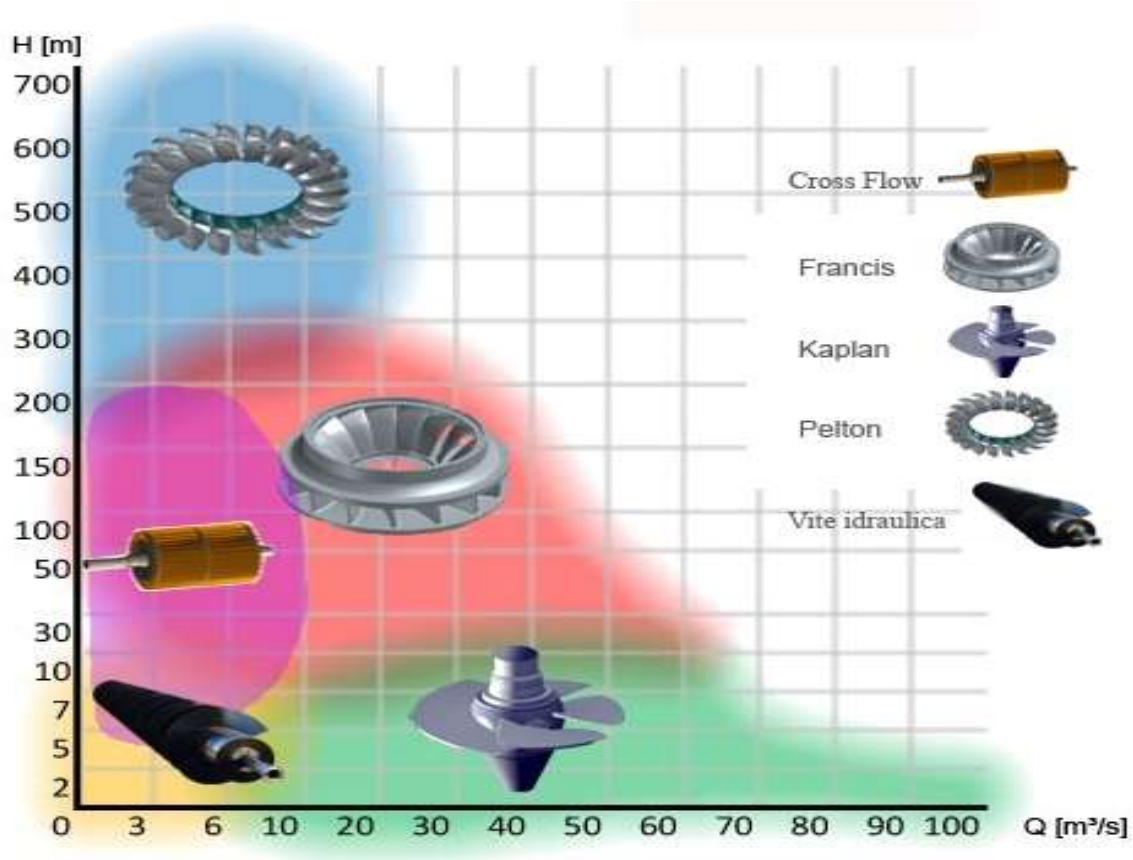
- The water collection basin, configured according to the nature of the installation site;
- The forced pipe, generally in steel, suitable for the conveyance and adduction of the accumulated water;
- The hydraulic, safety, control and monitoring equipment of the turbine;
- The hydraulic turbine, which transforms the potential energy of water into mechanical energy;
- The generator, which converts the mechanical energy transferred by the turbine into electrical energy;
- The LV/MV transformer substation with equipment and accessories;
- The control, regulation and supervision system.

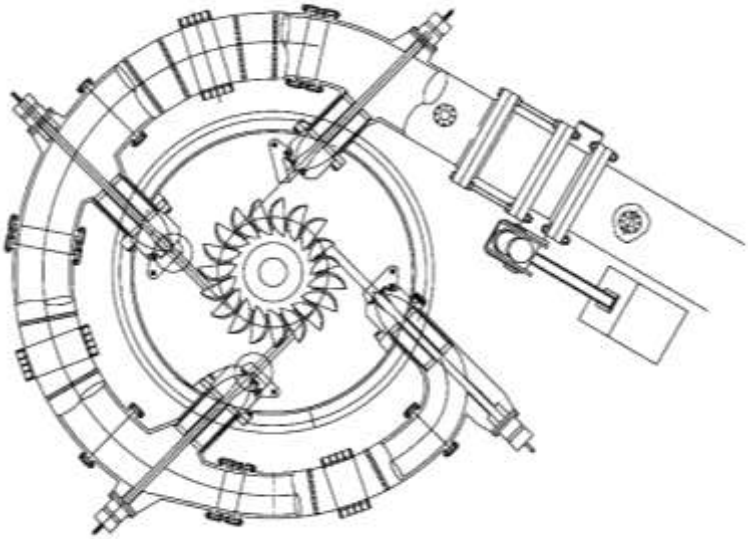


THE WATERWHEEL

Water wheels were the first devices designed to transform the potential or kinetic energy of watercourses into mechanical energy in the form of rotary motion.
The protagonist of a hydroelectric plant is therefore the turbine, evolution of the past water wheel which was used by man in his daily activities, such as grinding wheat, cutting wood, or as a water hammer for forging. Even today they represent a valid technology in the field of mini hydroelectric, especially in rural and mountain areas.
The hydraulic characteristics that define the various groups of modern turbines are mainly the kinetic and potential energy of the water, which is transformed into mechanical energy available at the axis of the turbine and therefore into electricity by the generator connected to the turbine.
The main types of hydraulic turbines used today are:
Pelton, Francis, Kaplan, Cross Flow and Hydraulic screw.

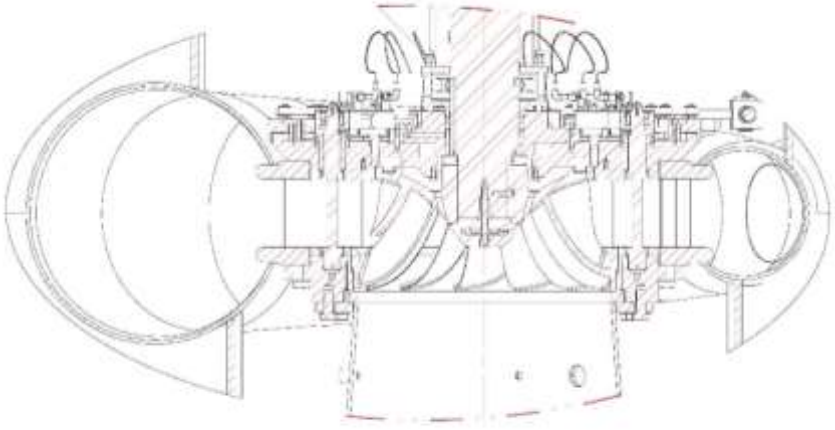
PELTON - FRANCIS - KAPLAN - CROSS FLOW TUYRBINES - HYDRAULIC SCREWS WORKING RANGE





PELTON TURBINE

Pelton turbines are mainly used in alpine hydroelectric basins, for medium/high water heads that range **from 50 to 1200 meters**. The monolithic stainless steel impeller is keyed directly on the generator shaft. The multi-jet distributor allows the best capacity regulation in order to optimize the energy efficiency of the entire machine. The main advantage of these turbines consists in the possibility of maintaining a high efficiency both with maximum and minimum capacities. They can be with horizontal axis and in the combination up to three jets, or with vertical axis in the combination of 4 to 6 jets.

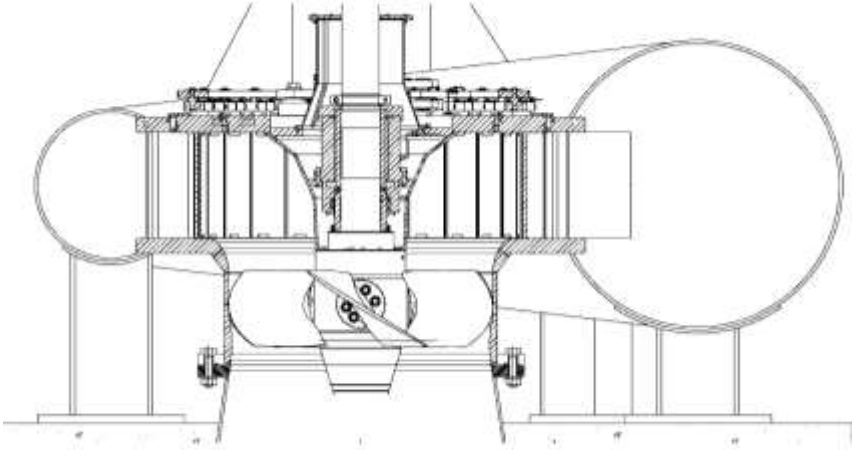


FRANCIS TURBINE

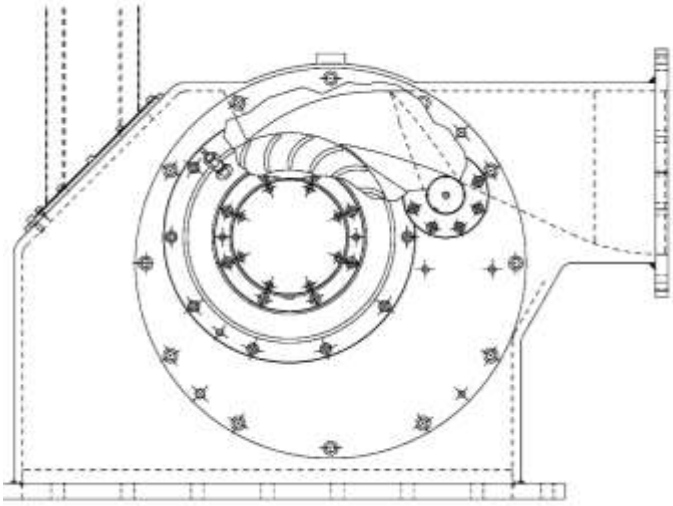
Francis turbines are widely used. They exploit the difference in water **between ten to a few hundred meters**. The water is distributed on the wheel through a spiral box and its predistributor. The distributor, usually with adjustable blades, directs the water towards the impeller blades. They can be considered small, medium and large, according to their power. The efficiency of these machines is high over a wide range of capacities. They can also be realized with the horizontal or vertical axis, based on the size of the site.

KAPLAN TURBINE

Kaplan turbines allow numerous applications, even in very different sectors. They are used in the presence of generally **small heads and up to 50 meters**. They take advantage of the large flow of the river, which can reach up to a hundred cubic meters per second. They can be built with the vertical, horizontal or inclined axis, as well as in a dry or wet room. The construction, based on the head and the capacity, can have a fixed distributor and adjustable blades, in this case, the turbine is of simple adjustment, also called mono-regulating. When both the distributor and the blades are variable in running, then the turbine becomes bi-regulating. With the double regulation, it is possible to obtain greater advantages, on the capacities modulation and on the heads. In this case, the performance curve remains constant practically over almost the entire range of capacities, so as to obtain a better degree of efficiency.



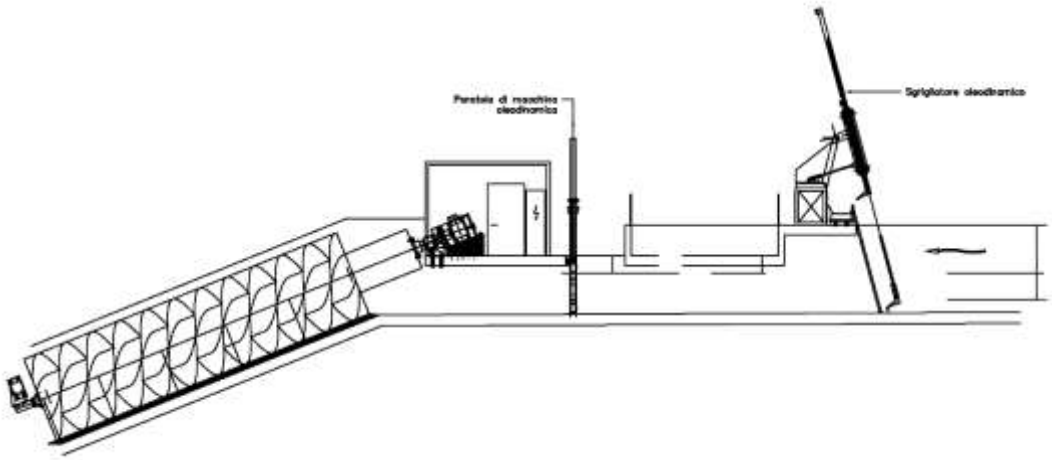
CROSS FLOW OR BANKI TURBINE



Cross Flow or Banki turbines are suitable for working with heads **between 4 and 60 meters** and are also characterized by their versatility mainly due to the special crossflow. The water enters from the upper side, crosses the impeller axis, and comes out again from the lower side, increasing the efficiency of the turbine. The peculiar characteristics of these turbines are the simple construction and robustness, which allow a modular and low-cost construction. The water passes through the distributor and the entrance chamber, specifically divided into a third or two-thirds, favors operation with both small and medium capacities. Under maximum capacity conditions, the turbine works with the two chambers in parallel. The generosity and flexibility of this turbine are also determined by the uniform performance over the entire flow range.

HYDRAULIC SCREWS

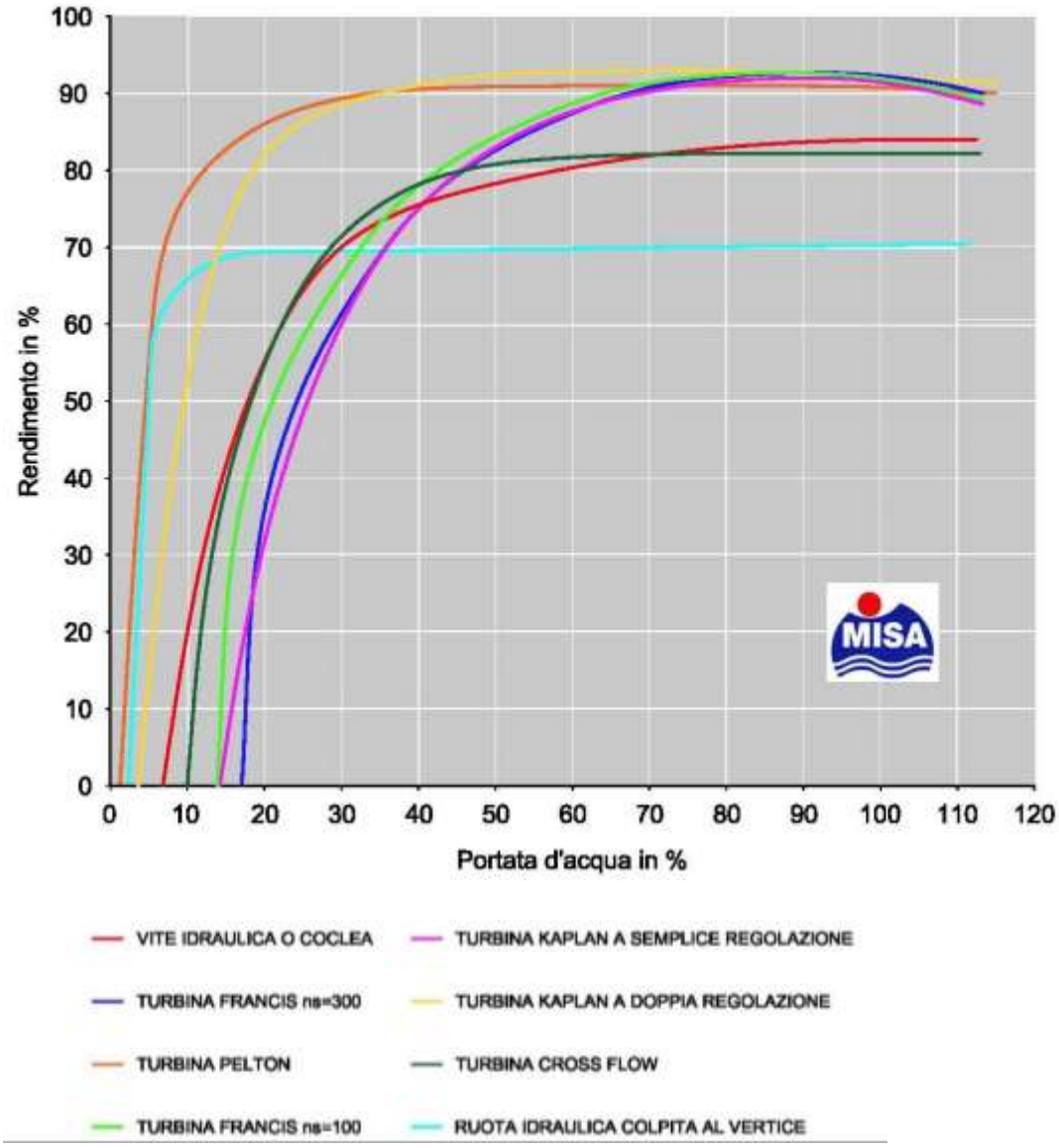
Hydraulic screws are also known as Archimedes' wheel. They invert the operating principle and take advantage from the potential difference of the falling water, from the highest point until it flows again in the course of natural water. They are used for heads **up to 10 meters** and capacities up to 6 mc/s.



MINI TURBINE

Mini turbines are the ideal solution to have electricity especially in those areas not subject to the distribution network. They derive from series production, but constructively are much simpler. The regulation is done with variable speed drives. These also reduce the consumption of traditional fuels avoiding air pollution.

PELTON - KAPLAN - FRANCIS - HYDRAULIC SCREWS TURBINES PERFORMANCE

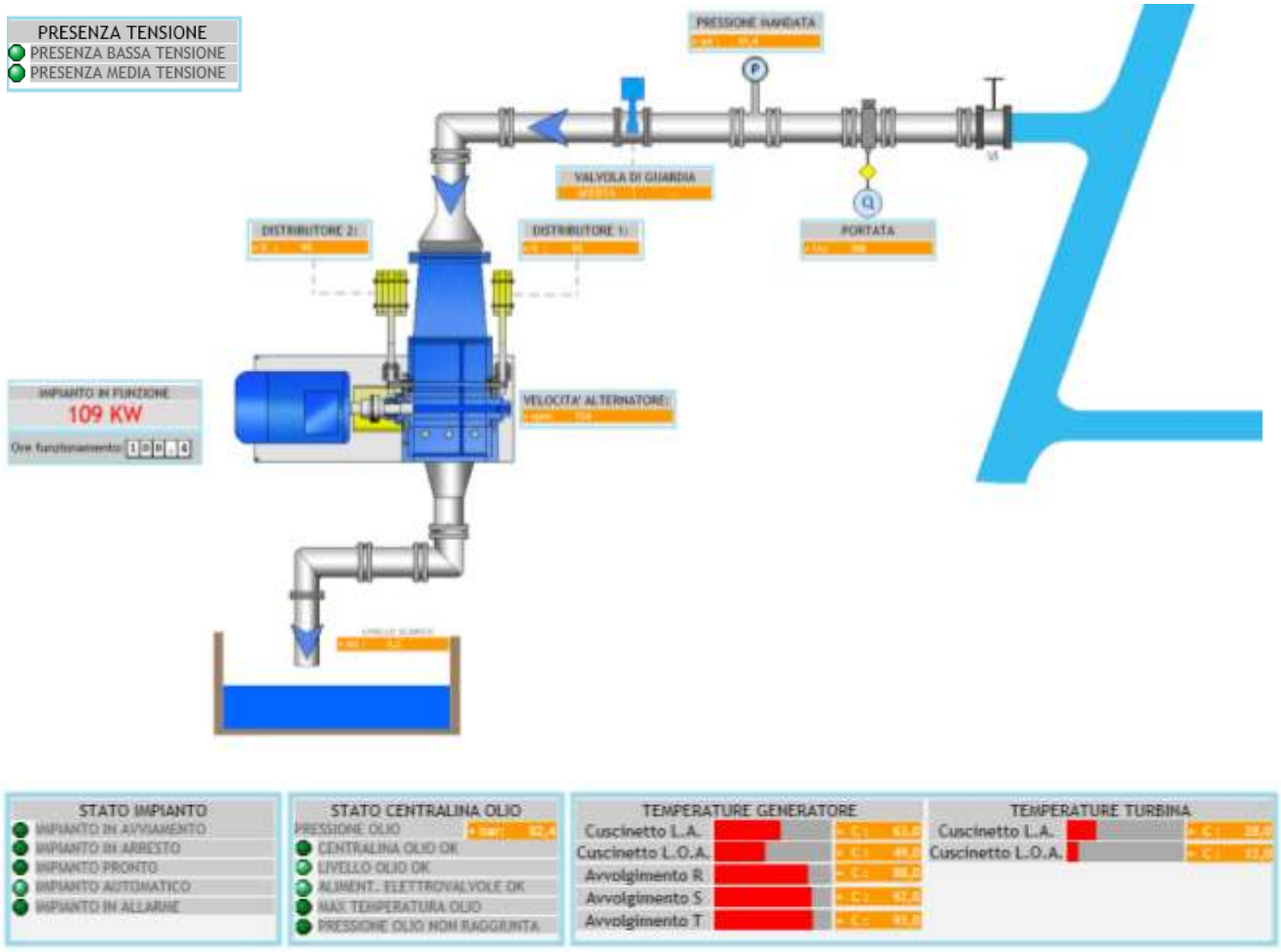


ELECTRIC GENERATORS

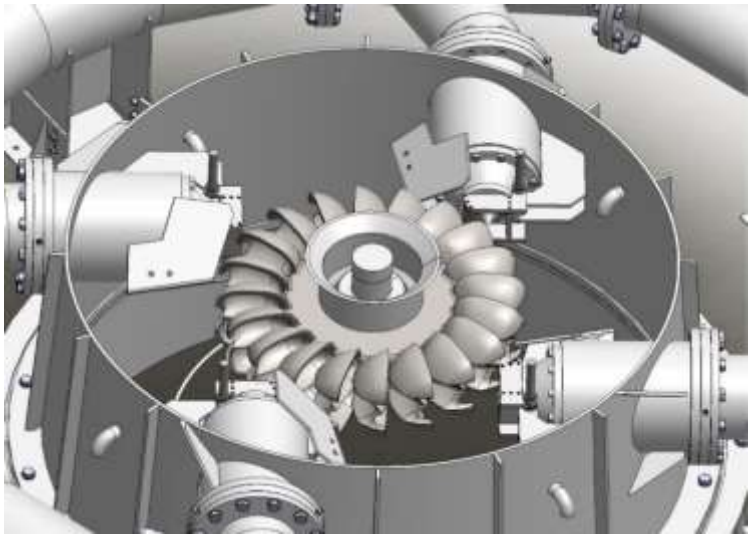
At the output of the turbine shaft there is the alternator, or commonly called generator, that is the rotating electrical machine that transforms mechanical energy into electrical energy.
The operating principle of an alternator is very simple: on the moving part, rotor, a rotating magnetic field is generated by means of electromagnets capable of regulating and optimizing the induced field; in the fixed part, stator, there are copper windings in which the rotating magnetic field generated by the rotor induces electromotive forces which in turn produce the electrical energy made available at the terminals.
Both traditional synchronous alternators and those with permanent magnets are used and, for lower powers, also asynchronous alternators (“squirrel cage”).

AUTOMATION AND CONTROL

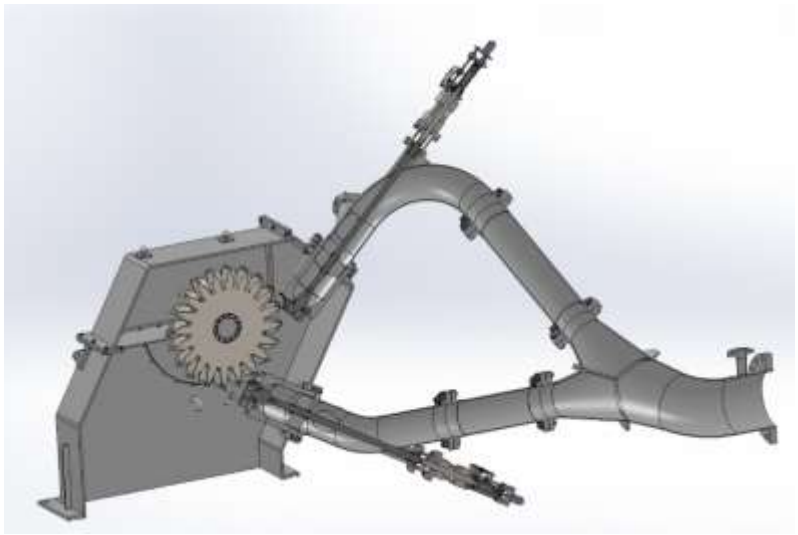
All our hydroelectric plants are managed, interfaced with microprocessor logic controllers capable of coordinating the entire generation process and connection to the network.
They intervene in the event of breakdown or malfunctions, till the turbine is released for emergency.
In recent years, thanks to technological development and the spread of networks, all our systems are controlled and operate by remote control by 3G, GPRS, UMTS, GSM or RADIO.
It's also possible to manage the hydroelectric plant remotely, via PC, smartphone, tablet, access the S.C.A.D.A. o at the WEBSERVER, view the station with internal and external cameras, access the panel view of the control panel, check instantaneous production and historical trends, etc.
The alarm signals are stored and made available to the management of the remote alarm system according to established availability and recording the traceability of the event.



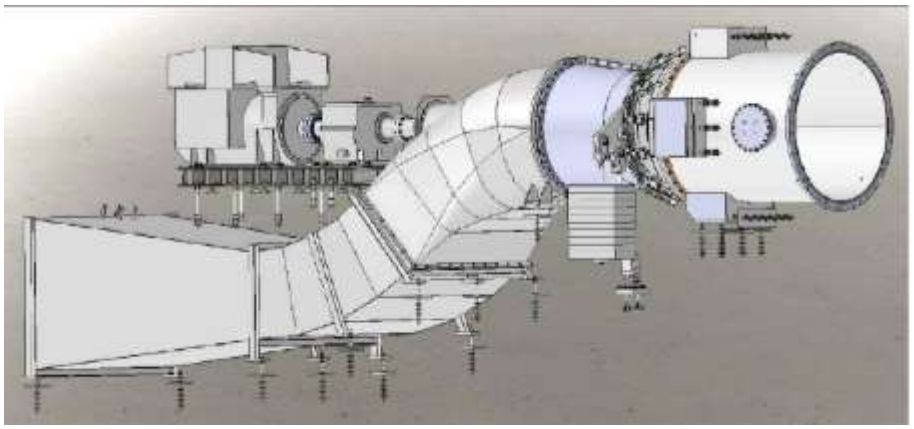
PRODUCTION RENDERING



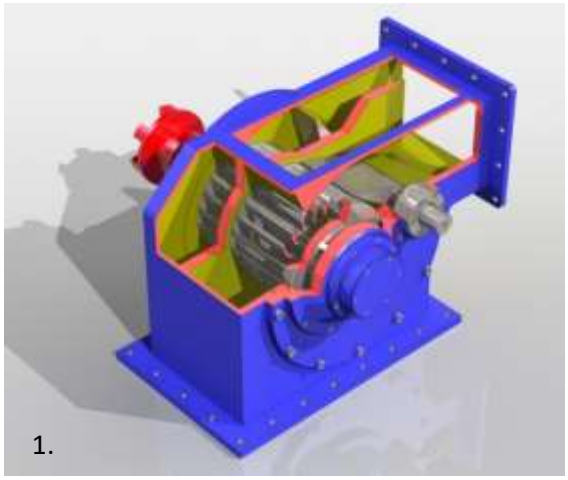
4-JETS PELTON TURBINE WITH VERTICAL AXIS GENERATOR

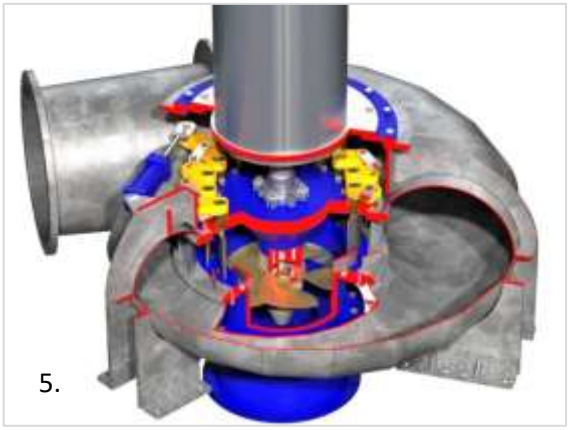


2-JETS PELTON TURBINE WITH HORIZONTAL AXIS GENERATOR

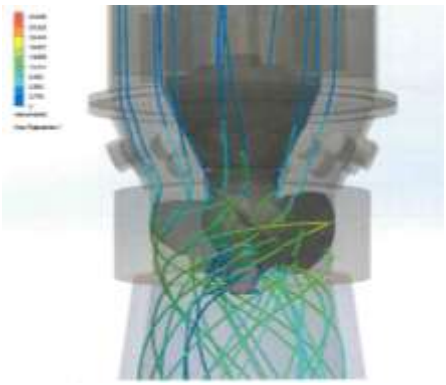


KAPLAN TURBINE WITH DOUBLE ADJUSTMENT





1. Crossflow turbine with 1/3 - 2/3 split distributor
2. Detail of distributor and blades of a kaplan turbine
3. Francis turbine wheel
4. Kaplan turbine assembly with exhaust diffuser
5. Kaplan turbine with double regulation, on spiral case
6. Kaplan wheel for small heads



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