MEIN

APPLICATION OF OUR HYDRO ENERGY PRODUCTS

Due to the fact that turbines work under highly demanding mechanical conditions, the mechanical performance of their parts takes on a special role.

Francis turbine: Mixed-flow turbines were invented by James B. Francis, from whom they take their name. In Francis turbines, the water flows from pressurised tubes to the distribution system through a "snail" or spiral chamber which goes around the distribution system.

The parts which form the Francis turbine are: the "snail" or spiral chamber, fixed ring, fixed blades, moving blades, runner, turbine shaft and suction tube.

Our production focuses on the runners which can be manufactured in monoblock form or consisting of welded components. In this case, the runners are comprised of the band, crown and blades, which are then welded together.

Pelton turbine: Lester Alan Pelton invented the Pelton turbine. The Pelton turbine is widely used in the hydroelectricity plant with heads from 80-1600m.

The wheel of the Pelton is like a circular disc mounted on to the rotating shaft. This circular disc has several buckets, spaced equally apart along its circumference. The mouths are arranged around the wheel in such a way that the jet of water which emerges from each mouth is tangential to the circumference of the wheel.

The main parts of a Pelton turbine are: The distributor, the runner, the casing, the discharge chamber and the shaft.

Our production of this turbine is limited to the production of the runners and based on dimensions at the core of the runners.

Kaplan turbine

Kaplan turbines are one of the most efficient types of axial-flow reaction turbines, with a runner which operates in a similar way to the propeller on a boat's engine. They owe their name to their inventor, the Austrian, Viktor Kaplan. They are used on shallow waterfalls. The large blades of the turbine are propelled by high pressure water released by a gate.

The blades of the runner in Kaplan turbines are always adjustable and are shaped like a propeller, whilst the distributor blades may be fixed or adjustable. If both are adjustable, the turbine is said to be a real Kaplan turbine; if only the runner blades are adjustable, the turbine is called a Semi-Kaplan turbine. Kaplan turbines are axial-admission turbines, whilst the admission of their semi-Kaplan counterparts can be radial or axial.

To adjust them, the runner blades rotate around their axle, activated by handles which support connecting rods joined to a cross-section which moves up or down inside the hollow shaft of the turbine. This movement is activated by a hydraulic servomotor with the turbine in motion.

A distinguishing feature of propeller turbines is that both the blades of the runner and those of the distributor are fixed, therefore they are only used when the water flow and fall are practically constant.

Cavitation

An important feature of our steel cast parts is that thanks to their quality, they offer excellent resistance to cavitation.

Cavitation is defined as the formation of spaces within a flowing body of liquid or around a body moving within the liquid: when the local pressure is lower than the pressure of the vapour and the liquid particles tend to stick to the edges of the liquid's path.

Vapour bubbles are formed when the spaces formed within the liquid are filled. The inertia of a moving particle in a liquid varies according to the square of the speed, and the greater the inertia, the greater the pressure required to force the particle to follow the curved path of a surface.

Cavitation can happen in tubes, turbines, hydraulic pumps, propellers and surfaces holding and conducting liquids. For cavitation to occur, three conditions must be met: high speed flow, low pressure and an abrupt change in the direction of the flow. Cavitation causes the erosion of the surfaces along the edges. This erosion is caused by the removal of material (metal, high resistance steel), due to the violent collapse of the vapour bubbles formed by cavitation.

In hydraulic reaction turbines, cavitation often occurs in low pressure areas, such as the convex part of the blades and the side parts near the output of the runner and at the intake of the suction tube.

What turbine manufacturers look for is the elimination of cavitation, known as cavitation-free or zero cavitation. This is the ability of the turbine to operate for a period of 25,000 hours without major losses exceeding 2.27kg of the metal of the runner; and 0.91kg on the non-rotating parts, and no more than 0.23kg of metal loss in any other individual area of 930cm^2. As a result, a perfect combination between the design of the turbine and the quality of the steel is essential