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METHOD AND EQUIPMENT FOR CONTROLLING THE SWIRLING FLOW THROUGH THE CONICAL DIFFUSER OF HYDRAULIC TURBINES



The invention relates to a method and an equipment for controlling the swirling flow through the conical diffuser of hydraulic turbines. The claimed method provides for the elimination of self-induced flow instability, the elimination of pressure fluctuations and vibrations by carrying out a progressive and controlled necking of the cross-section of a water jet flowing through a conical diffuser effected by an operator or an automation mechanism, the controlled necking being carried out in the lower region of the turbine conical diffuser, the cross-section being adjusted based on the principle of closing-opening of a circulation diaphragm which keeps in all positions the circular shape of its cross section, with the centre in the turbine main axis.

The claimed equipment for carrying out the method comprises a penstock (2) which takes over the water from an upstream lake (1) and directs it into a turbine spiral chamber (3), the water passing through a stator (4), and a directing apparatus (5) which guides the water to a rotor (6) and, due to the power generated by the rotor (6), a shaft (7) rotates a generator (8) which produces electricity, at the output of the rotor (6), the water passing through a conical diffuser (9), whose role is to convert the water kinetic energy into potential energy and, when the turbine operates at one point away from the maximum efficiency point.

The rope vortex occurs, with its associated pressure fluctuations, which are harmful to the turbine, but when an adjustable-retractable diaphragm (10) is introduced and manually adjusted by means of a handle (11) or by a servo-mechanism of an automation, the rope vortex disappears along with said pressure fluctuations, further on the water being discharged into a downstream lake (12), the diaphragm (10) being adjusted to various openings, by some diaphragm shutter elements (13).

