Francis turbine experiment pdf

October 24, 2009 Administrator FRANCIS TURBINE INTRODUCTION: Francis Turbine is an internal flow reaction turbine that was designed and developed by American engineer James B. Francis. Francis' turbine has a purely radial flow runner; the flow passing through the runner had a speed component only in the normal plane to the runner's axis. Reactionary hydraulic turbines relative to the average speed with radial flow of water in the turbine component are runners. DIAGRAM: CONSTRUCTION DETAILS OF FRANCIS TURBINE: Francis turbine components: - Stick to stoke: - It's a large shape size; where water is provided to the turbine runner from the dam. · Scroll hull: - Penstocks are connected to and feeds water directly into the ring channel around the turbine runner. The channel spirals into its layout. · Guide to the blade: - A series of air-shaped blades called guide vans are located inside the enclosure to form a series of flow passages between the hull and the blade runner. The guide van is fixed in a position (they do not rotate with a rotating runner). · Guide wheel and control mechanism: - It changes the position of the guide blades to affect the change in the speed of the water flow as a result of changes in the load conditions on the turbine. When the load changes, the control mechanism rotates all the guide blades around its axis at the same angle, so that the speed of the water flow to the runner. · Runner and Blade Runner: - Turbine runner Francis Rotor, which has aisles formed between the drat pipe and the scrolling hull. · Project Tube: - After passing through the runner, the water is discharged into the tail of the race through a gradually expanding tube. WORK FRANCIS TURBINE: The amount of water falls on the runner's blades (buckets). The rotor of the turbine is called the runner. The runner rotates on a permanent basis using the control mechanism. The runner's shaft is connected to the generator; electricity is thus produced by a generator. And the water is discharged from the tail race. THEORY OF OPERATION: Francis' turbine is a reactionary turbine, which means that the working liquid changes pressure as it moves through the turbine, giving away its energy. A hull is needed to contain the flow of water. The turbine is located between the source of high pressure water and the release of low pressure water, usually at the base of the dam. The entrance has a spiral shape. The guide van directs the water towards the runner. This radial flow acts on the runner's vans, causing the runner to spin. The guide van (or gate gate) can be adjustable to ensure the turbine works efficiently for a range of water flow conditions. As the water moves through the runner its spinning radius decreases, further acting on the runner. Imagine swinging the ball on a string around in a circle. If the string is missing, the ball spins faster. This is In addition to the water pressure, helps the inner flow of the turbine to use the energy of the water. At the exit, the water acts on the function of the runner in the shape of a cup, leaving without a vortex and very little kinetic or potential energy. The turbine's output tube has a special shape to help slow down the flow of water and restore kinetic energy. APPLICATION: Francis Entrance Scroll, Grand Coulee Dam Great Francis Turbines individually designed for each site to work at the maximum possible efficiency, usually over 90%. They are best suited for areas with high streams and low and middle head. Francis turbines are very expensive to design, manufacture and install, but have been operating for decades. In addition to electrical production, they can also be used for pumping storage; where the tank is filled with turbine (acting as a pump) during low electricity demand and then reversed and is used to generate energy during peak demand. Francis turbines can be designed for a wide range of heads and streams. This, along with their high efficiency, has made them the most widely used turbines in the world. Francis' turbine was designed by James B. Francis, and it is a type of reactionary turbine, which means that it can only convert a portion of the available common head fluid into kinetic energy. These types of turbines have a major application in the production of electricity that works in the water head from 40 m to 600 m. This type of turbine when used in electric generators, they can generate power output of up to 800 MW.1 Turbine reaction consists of three different types of guide van: Fixed Guide Vanes (Stay Vanes) Adjustable Guide Vanes (Wicket Gates) Rotating Blades The other main components of Francis' turbine are the impeller (runner), scrolling hull and draft tube. The aforementioned guide vans are present between the hull of the scroll and the impeller, which directs the water to the impeller. Due to the force produced by the fall of water on the impeller, it helps to rotate the mine impeller. At the most experimental site, its entire unit works on the recycling of the water system. Its complete setting consists of a sump tank, a centrifugal pumping kit, a turbine block and a venturi counter. An electric dynamometer is used to load the turbine; It is connected through the V-belt drive (V land pulley).2 In a very similar manner to the Pelton wheel, the speed of the Francis turbine remains constant as it is used to drive the alternator. The main purpose of the experiment is to study the performance of the Francis turbine. MATERIALS REQUIREMENTS: Francis Turbine Optical Tachometer PROCEDURE First, connect the panel to the source, and make the direction of the pump in order by arrow direction from the end of the shaft. After that, fill the sump tank with clean water worth up to 75% of the total capacity. Be sure to hold the gate valve completely closed position and directing the van in a fully open position. Now start the pump and slowly open the gate valve until the turbine reaches the desired speed for power generation. When the turbine speed and voltage become constant, turn on the first electric load switch and adjust the voltage to 200 volts. When you switch on the successive load switch one by one, gradually increase the load while keeping the voltage constant. Choose the right position for the turbine guide van and change to this point with the help of a manual wheel. Then place the turbine in a state without load, slowly turning off off, the load switches one by one and closing the valve of the gate. The Francis turbine performance experiment was discussed. The power of the mine produced by the turbine is determined by the data of the pony-brake and data from the tachometer. REFERENCES S. M. T. T. C. J. P. L. L. R Susan-Resiga, Effect of the field of speed at the entrance to the Francis turbine tube project on performance on the operating range, IOP conference series: Earth and Environmental Science, vol. 15, No. 3, page 95-102, 2003. The question: Xin, J. Wu and J. Chang, Field Flow Analysis and Forecasting the Performance of 3D Turbulent Flow in the Francis Turbine, Deals of the Chinese Society of Agricultural Engineering, vol. 26, No. 3, page 118-124, 2010. Francis Turbine is a laboratory reaction turbine for use with a digital Tec'quipment hydraulic bench (H1F, available separately). The turbine has a solid base, which is located on the top of the hydraulic bench. The turbine is connected to the pumped-up supply of the hydraulic bench. The bench measures the speed of flow. A mechanical sensor measures the pressure at the entrance to the turbine. The adjustable guide van in the turbine changes the flow speed and direction of the flow to the turbine's impeller (runner). End of pipe turbine socket is located in an open water canal of a hydraulic bench. The turbine includes a dam to create a shallow reservoir in the bench water canal. This ensures that Water covers the end of the project during testing. The range brake with spring balances measures the torque on the turbine shaft. A strobe with display speed (ST1, available separately) or an optical tachometer (OT1, available separately) can measure the speed of the turbine. The strobe can also freeze the image of the turbine and the flow of water to improve students' understanding of the turbine. Students test the turbines at different flow speeds, loads and vane guidance settings. They use measurements of flow, torque, pressure and velocity to calculate hydraulic energy input and the mechanical (gross) power of the turbine. They use them to create performance curves for the turbine. See the digital hydraulic bench flyer here. 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