



CONCEPCION 10 MW PROJECT COMMISSIONED IN PANAMA WITH TWO MAVEL FRANCIS TURBINES

Benesov, Czech Republic – 20 January 2009 – Mavel, a.s. announced the commissioning of the new 10 MW Concepcion hydroelectric power plant (“Concepcion HPP”) on the Piedra River in the Chiriqui Province of Panama.

Istmus Hydro Power Corporation (Istmus) is the owner of the power plant and contracted a consortium of ABB, Inc. and Mavel, a.s. to provide “Water to Wire” equipment delivery and supervise the installation and commissioning.

The site is located approximately 500 kilometers west of Panama City in the Chico River basin. Concepcion HPP is built as run of river project and uses the natural flow of the Piedra river. The power plant works with designed gross head 65 meters and maximum total flow $20 \text{ m}^3\text{s}^{-1}$ and installed power is 10 MW. A 2 250 m long penstock was built to reach 65 m gross head.

Mavel, a.s. worked closely with Istmus and its design office to find the optimal solution for a Francis turbine installation since the beginning of bid process. Istmus had a simple request - minimize civil construction and equipment price and maximize energy production. To meet this requirement it was necessary to solve two issues.

The first issue was to find the optimal size of the powerhouse. For this reason, Mavel prepared three equipment alternatives utilizing different turbine size, speed and suction head. For each proposal, the expected energy production was calculated. Istmus, with the help of the design engineer and civil contractor, evaluated the corresponding civil cost of each solution. From there, the final solution was selected.

The second issue was to optimize the transient effects within the entire water way and protect the penstock against a water hammer effect, especially in the case of emergency shut down. Mavel provided for Istmus a detailed transient analyses of the complete hydraulic system and

