

# Tacares power plant, Costa Rica

The updated Tacares power plant, inaugurated in October 2013, has been designed to help improve the quality of life for the citizens of Heredia province in Costa Rica.

**A** refurbishment of an existing scheme, the Tacares project has been selected as project of the year for the South American region by IWP&DC. We spoke to Mario Arquilla, President & Chairman of the Board of STE Energy, supplier of the project's new electromechanical equipment and leader of the consortium responsible for civil works, and discovered what was so special about this interesting project.

The Tacares plant was originally built in the 1930's on the Poas River in the Alajuela region of Costa Rica to power the old San José - Alajuela railway. A project began in November 2011 initiated by Ing Allan Benavides Vilchez, president of project owner ESPH, to revamp the ageing scheme, culminating in the official inauguration of the updated plant in October

## Electromechanical equipment

2 power transformers and auxiliary transformer.

MV switchgears 34.5 kV in the substation

BT cubicles and protection in substation

MV switchgears 4.16 kV in powerhouse

Earthing cubicles of generators

BT cubicles and protection in powerhouse

MV cables and BT cables

Automation cubicles and SCADA

Crane

## Equipment details

Turbines	Generators	Power transformers
No of Units: 2	No of Units: 2	Standards: IEC 60076.
Type: Francis Horizontal	Standards: IEC-60034	Nominal Power: 4500 kVA
Runner diameter: 925mm	Application: Francis horizontal	Nominal frequency: 60 Hz
Net head: Hn 83.23m	Apparent power: 3981kVA	Primary voltage: 34,5 kV
Nominal power: 3448kW	Voltage 4.160 V (IEC)	Secondary voltage: 4.16 kV
Rotation speed: 514rpm	Excitation type: Brushless	
Runway speed: 852rpm	Frequency: 60 Hz (IEC)	
Flow rate: 4.5m <sup>3</sup> /sec	Speed: 514 rpm	

2013 in a ceremony led by Vilchez and attended by Costa Rican President Laura Chinchilla Miranda, Italian Ambassador Francesco Calogero and CEO of STE Energy, Mario Arquilla.

The project was designed to increase power at the plant to 7MW through the installation of two new horizontal axis Francis turbines while also paying consideration to irrigation needs.

STE Energy was heavily involved in the project. The Italian firm was responsible for the design, construction and local and remote project management, and also delivered, erected and commissioned all the mechanical and electrical equipment. It was also leader of the consortium responsible for the civil works.

## A challenging project

The project is unusual in that it features a very long penstock at a high inclination. The main challenge was the position of the powerhouse – it was in a location impossible to reach with a car or a truck. The powerhouse site faces a 90m slope and lies at an inclination of 45 degrees.

The only way to deliver equipment to the project was through a walkway or a wagon lift controlled by a winch. Because of the age of the project, these had to be completely refurbished by STE Energy to ensure they worked efficiently.

"The erection and movement of the equipment had to be carried out very carefully," said Mario Arquilla of STE Energy. "The two

generators, which each weighed 28 tons, had to be placed on the lift in a particular way and lifted at the end with a crane. The old lift was cut in order to weld on it the two spiral cases of the turbines so they passed below the main entrance of the powerhouse."

Another challenging aspect was obtaining the measurements of all the old civil constructions and buildings. This was needed in order to check the correct net head, gross head and to design the position of all the equipment in the absence of the original drawings and documentation.

## Operation

Since its inauguration, the plant has been producing energy at peak times to cover energy demands in the country. The plant is located on an intake, with permits restricting the times and abstraction of water.

The plant has been operated by a group of local young people trained intensively by STE Energy through an operation and maintenance course. STE Energy owns and controls a local company, STE Costa Rica, located in San José. The firm's experienced engineers aid the customer with day-to-day support. This actually was utilised when noise was heard on a project generator – STE engineers discovered a High Voltage grid failure using advances fault analysis system developed by the company.

The successful revamping of the Tacares power plant is now guaranteeing a higher stability of rates, decreasing fluctuations in electricity prices and producing higher economical development as well as improving the quality of life for the Heredia province citizens. ■

## Further information

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