

HENRY

Hydraulic Engineering Repository

Ein Service der Bundesanstalt für Wasserbau

Article, Published Version

Xianming, Chen; Rujun, Zhang

The Kaléta hydroelectric station - an achievement of sino-african cooperation

HydroLink

Verfügbar unter/Available at: <https://hdl.handle.net/20.500.11970/109304>

Vorgeschlagene Zitierweise/Suggested citation:

Xianming, Chen; Rujun, Zhang (2015): The Kaléta hydroelectric station - an achievement of sino-african cooperation. In: HydroLink 2015/4. Madrid: International Association for Hydro-Environment Engineering and Research (IAHR). S. 112-113. https://iahr.oss-accelerate.aliyuncs.com/library/HydroLink/HydroLink2015_04_Africa.pdf.

Standardnutzungsbedingungen/Terms of Use:

Die Dokumente in HENRY stehen unter der Creative Commons Lizenz CC BY 4.0, sofern keine abweichenden Nutzungsbedingungen getroffen wurden. Damit ist sowohl die kommerzielle Nutzung als auch das Teilen, die Weiterbearbeitung und Speicherung erlaubt. Das Verwenden und das Bearbeiten stehen unter der Bedingung der Namensnennung. Im Einzelfall kann eine restriktivere Lizenz gelten; dann gelten abweichend von den obigen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Documents in HENRY are made available under the Creative Commons License CC BY 4.0, if no other license is applicable. Under CC BY 4.0 commercial use and sharing, remixing, transforming, and building upon the material of the work is permitted. In some cases a different, more restrictive license may apply; if applicable the terms of the restrictive license will be binding.



THE KALÉTA HYDROELECTRIC AN ACHIEVEMENT OF SINO-AF

BY CHEN XIANMING & ZHANG RUJUN

The total installed Capacity of Kaléta Hydroelectric Station in Guinea is 240 MW, which has tripled the existing capacity of this country. The total investment, 25% by the government of Guinea, and 75% by the Exim Bank of China in terms of loans, adds up to 446 million USD. China Three Gorges Corporation (CTG) was contracted this project in EPC form, and its subsidiary company China International Water & Electric Corporation (CWE) was responsible for its execution. Construction of the project started in April 2012, and all three power generator units came into service in the national electrical grid at the end of August 2015, which benefitted the Capital region Conakry and eleven other provinces and territories with a total population of 4 million. Kaléta supplies electricity to tens of thousands of families and it is viewed as a new engine for the socio-economic development of Guinea

The Kaléta project is part of a long cooperation between China and African countries in the

development of hydroelectricity in the continent. In the 1960s, China Water & Electric Corporation (CWE) under CTG built the Kinkon Hydroelectric Power Plant as part of economic assistance from China, and in the 1970s, the Tinkisso Project, both in Guinea.

The Kaléta Hydroelectric Station is located in the Konkoure river basin in Guinea, and is the biggest hydroelectric project in the country. CTG, the builder, operator and manager of the Three Gorges Project in China, has been the principal executor of Kaléta. CTG is a model enterprise in the Chinese hydroelectric industry, and a leader in the hydropower industry worldwide. The Kaléta Hydroelectric Station and its facilities adopted Chinese hydropower standards in design and construction. All permanent electric machinery was supplied by Chinese equipment manufacturers.

Kaléta is a run-off-river hydropower project, with total installed capacity of 240 MW. The normal

water level is 110 m, the minimum operation level is 109 m, and the regulating capacity of the reservoir is 6.5 million m³ providing daily regulation.

The project includes a roller compacted concrete gravity dam of total length 1 150 m, of which, the water retaining section is 661 m, the spillway is 360 m, and the intake section is 66 m; the crest elevation of the dam is at elevation 114 m, and its maximum height is 31 m. A free overflow spillway without sluice gates is located on the right bank. Its crest is 110 m, 4 m lower than the crest of the retaining dam. Its design transverse section of its weir is formed by two circular-arcs, and its downstream surface is made up of steps for energy dissipation. The intake is composed of three sections (each section 22 m long, with the total length of the intake sections 66 m), respectively connecting to the penstocks of three units. Along the direction of water flow in each section, are in order, the trash rack, the maintenance gate and the

Panoramic view of KALETA Hydropower station, whose 3 generator sets were connected to the grid



Powerhouse of KALETA, whose annual generating capacity is 965 GWh



Transmission Lines reach Conakry, capital of Guinea. More than 4 million people benefited from it directly.

STATION: AFRICAN COOPERATION

emergency gate, which line up to the penstock downstream at the back of the dam.

As part of the project design hydraulic model tests were performed to:

- Study the effect of the general layout on the flow patterns at the hydropower station intake and bottom outlet;
- Verify the flow coefficient and discharge capacity of the spillway for the selected weir surface curve;
- Observe and study the water level and flow velocity distribution in the reservoir;
- Study scouring and silting of the bottom outlet under different water levels, and intake flow patterns and sediment deposition caused by flood discharge.

It was found through these tests that whirls would be produced at the upstream side of the intake side. To eliminate these whirls, two anti-swirl beams were added to the original design at the upstream side of each intakes, which effectively reduce whirl formation.

The powerhouse is behind the dam, and the rated water head is 48.3 m, varying between 42.43 m and 50.3 m. Each individual unit is designed to have a passing water volume of 180m³/s. Turbines with axial flow and rotating blades were selected, which can handle a larger range of water heads and provide running stability, meeting the requirements of the Kaléta Power Plant.

During the construction of Kaléta, CTG assigned technical and managerial professionals, who applied the Chinese Standards on quality, safety and environmental protection. Over ten thousand Chinese technical and managerial professionals were involved in this project, covering multiple aspects such as survey, design, construction, equipment manufacturing, installation, and tests, etc. At the same time, Guinea mobilized all its resources into the project. Workers from the two countries were working hard at the site day and night.

Because of the lack of electricity generation and distribution infrastructure and related technology in Guinea, a significant portion of the project involved technology transfer for the construction of a modern hydro power dam and electrical grid, the optimization of the operation of the system, and the development of a highly efficient dispatching system. In addition the project offered training opportunities to thousands of local workers who acquired new skills through their participation in the construction of Kaleta. CTG also provided training to civil, mechanical and electric engineering and other fields to Guinean professionals.

The construction of the project coincided with the outbreak of the most severe epidemic of Ebola in West-African history in the beginning of 2014. The Guinean government and CTG worked together to develop and implement measures for the prevention of the spread of the disease among the workforce involved in the construction of the project. The program proved to be effective as no Ebola incidents were reported among the workers and the schedule of the project was not affected.

In early October 2015, the first generator unit of the Kaléta Hydroelectric Station completed 100 days of safe operation, and the total power production of the three units reached 300 GWh. The operation of Kaléta put an end to the many daily blackouts in Conakry which were common before the commissioning of the project. The Kaléta project made possible the uninterrupted supply of electricity 24 hours a day to Conakry and 11 neighboring provinces. The lack of reliable, affordable electricity has long been viewed as a major obstacle to the development of Guinea, raising the cost of doing business, limiting the opportunities of economic growth and investment and affecting all aspects of daily life in the country. The completion of the Kaleta project was hailed as a major national accomplishment, memorialized by printing an image of the dam on the newly issued 20,000 Guinean Franc banknotes. ■



CHEN Xianming, Professor, is working for China Three Gorges Corporation (CTG) and is chief engineer of the China Water & Electric Corporation (CWE), subsidiary of CTG. He has 20 years of experience in hydropower project management. His studies are in technology innovation and measures for safety, quality and environmental protection in project construction. The projects he manages are in over 30 countries in Southeast Asia, Middle Asia, East Europe, Africa and South Africa. He also assumes positions as governor in CHICOLD and Governor in Chinese Hydraulic Engineering society and other non-government organizations.



ZHANG Rujun, from CTG, the general manager of KALETA Hydroelectric Project in Guinea, who is 38 years old, has devoted to the development of Africa hydropower industry for 14 years in his 15-year-career. He is proficient in Hydropower technology, Management of hydro-project and Management on international contracts. For years, he has been one of the Practitioners of Sino-African cooperation on hydropower.