XVIII World Water Congress
International Water Resources Association (IWRA)

Research on Key Technologies for Design of High-lift Pump Station Clusters

Li ling ling

Yunnan Institute of Water Resources and Hydropower Survey, Design and Research

XVIII WORLD WATER CONGRESS
Water for All
Harmony between Humans and Nature

第18届 世界水资源大会
水与万物：人与自然和谐共生

XVIII World Water Congress
International Water Resources Association (IWRA)

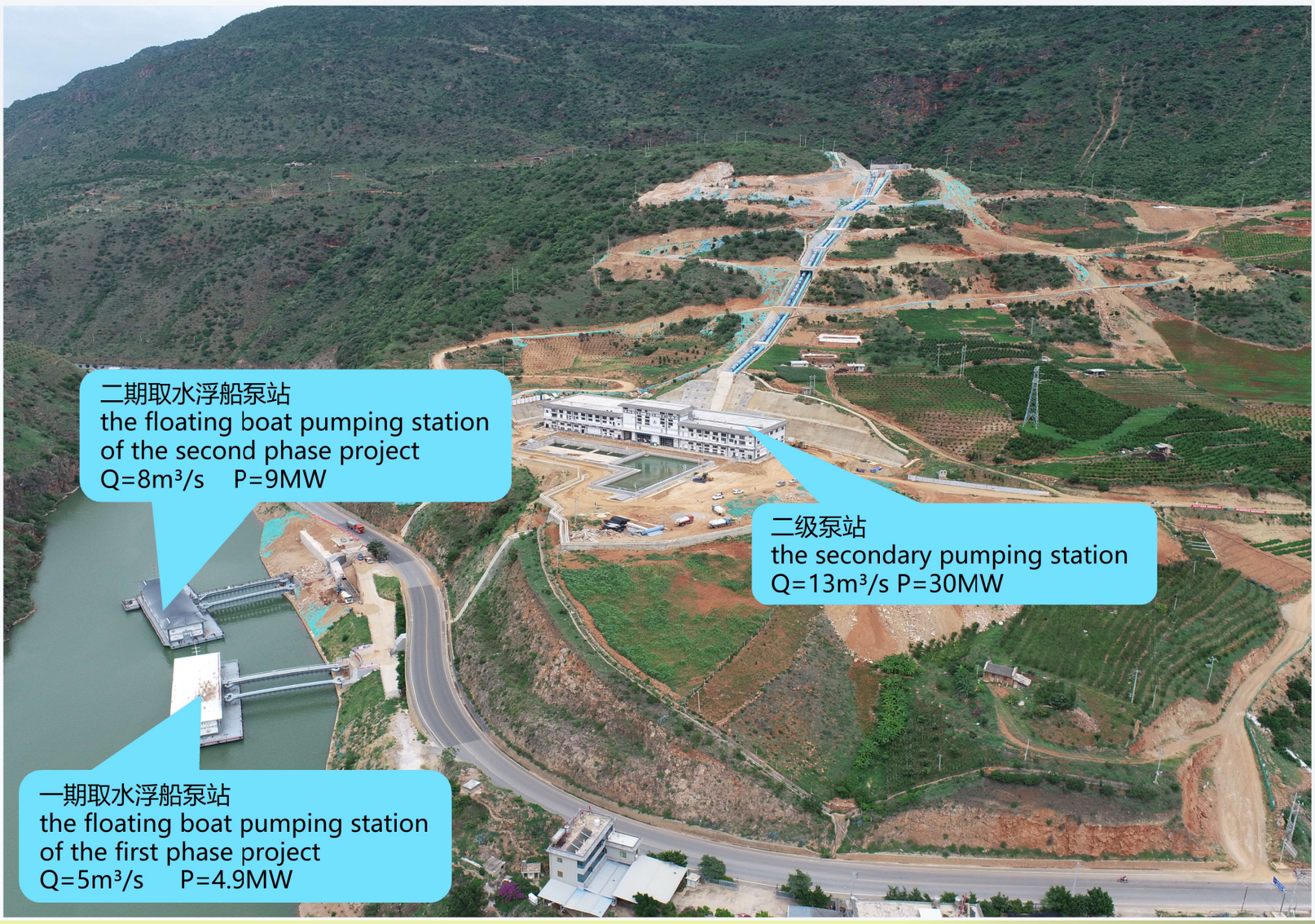
Content

- Project Description
- Key Technologies
- Achievement

- 工程介绍
- 关键技术
- 取得成效

Project Description of high-lift pump station clusters

XVIII World Water Congress
International Water Resources Association (IWRA)

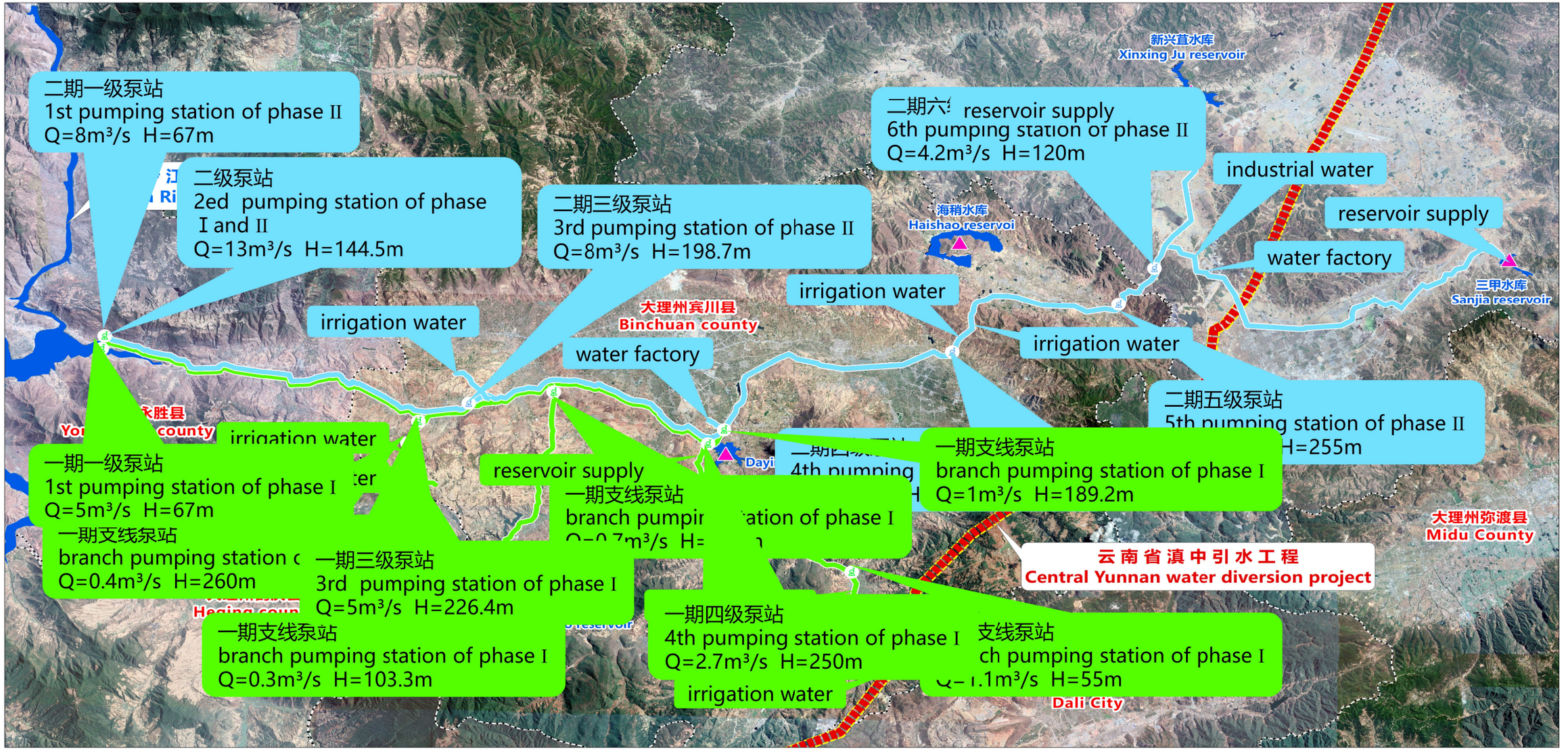


The designed annual water supply of the project is 320 million m^3, the total length of the water transmission line is 230 km, 15 pumping stations are scattered along the line, the total installed capacity of the pump station is 158.9MW. The maximum cascade design head is 1002m. At present, the first phase of the project has been running normally . The second phase of the project is still under construction.

工程设计年供水 3.2 亿 m^3，输水线路总长 230km，沿线分散布置 15 座提水泵站，泵站总装机达 158.9Mw，最大梯级设计扬程达 1002m 。目前一期工程已累计运行 6 个月以上。二期工程尚在建设中。

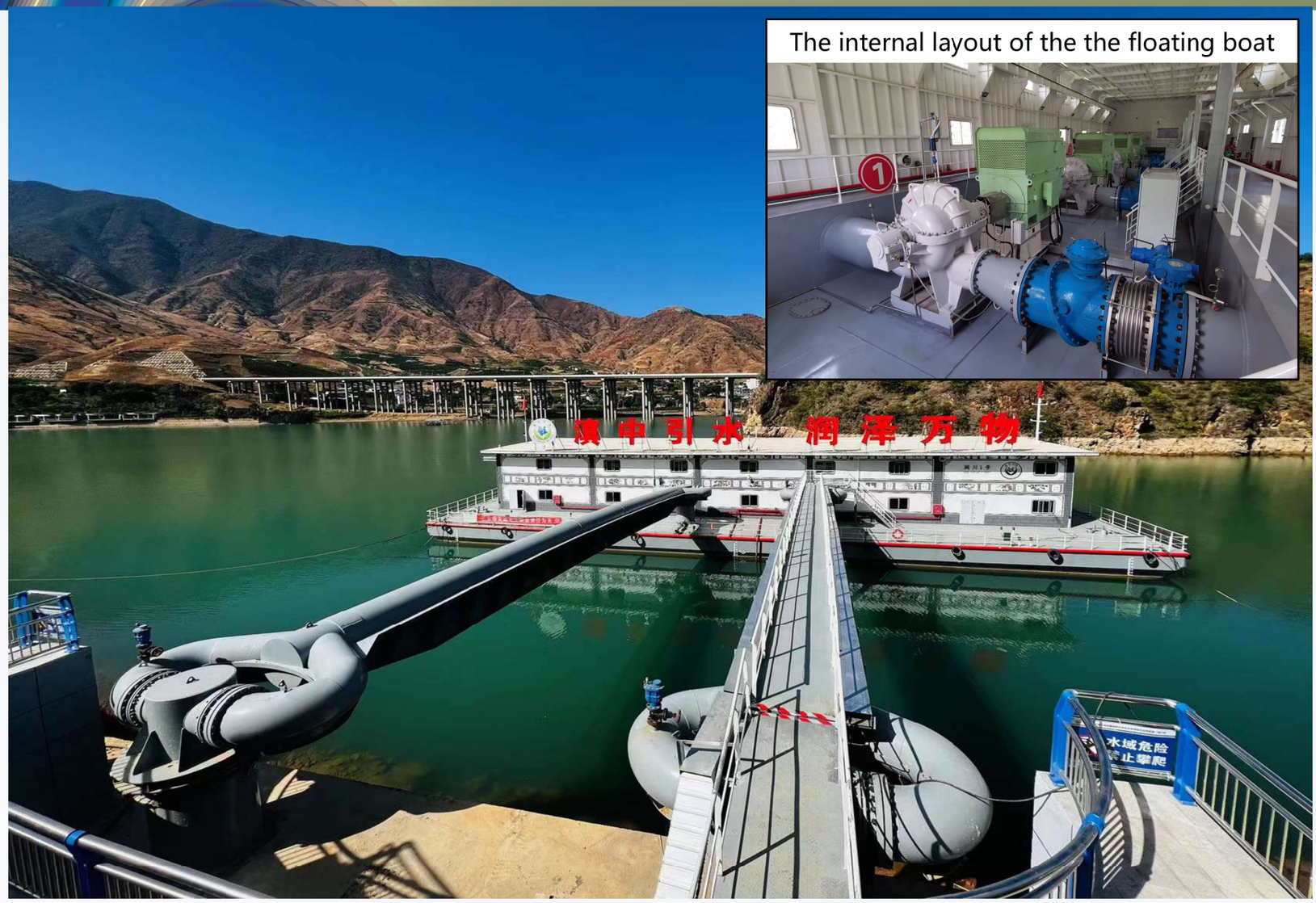
Project layout of high-lift pump station clusters

XVIII World Water Congress
International Water Resources Association (IWRA)



Key Technologies—The largest floating boat pumping station

XVIII World Water Congress
International Water Resources Association (IWRA)



The internal layout of the the floating boat

The floating boat pumping station of the second stage project is the largest floating ship pump station in China.
L × W× H: 60m × 20m × 2.7m, and the single-stage double rocker arm is used to go ashore. The pump head is 67 m, the single pump flow is 2 m^3/s, and the installed capacity is 9MW.

该工程应用了国内体型最大的浮船取水泵站。浮船体型，长 × 宽 × 高：60m×20m×2.7m，排水量 1560t 。采用单级双根摇臂上岸。水泵扬程 67m，单泵流量 $2m^3/s$，装机规模 9MW 。

Key Technologies—Research and application of high head and large flow pump group

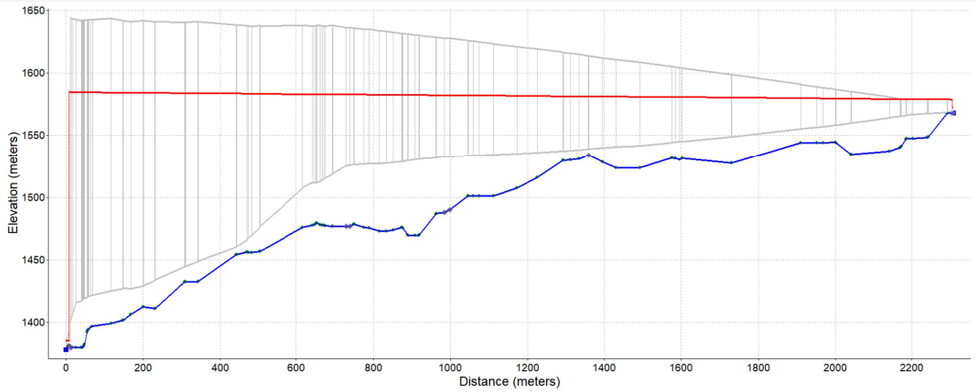
The horizontal single-stage double-suction centrifugal pump set， the pump head is 198.7 m, the flow rate of single pump is 2m³ / s, and the power of single pump motor is 5600kW.

卧式中开单级双吸离心泵组，水泵扬程 198.7m，单泵流量 2m³/s，单泵电机功率 5600kW 。

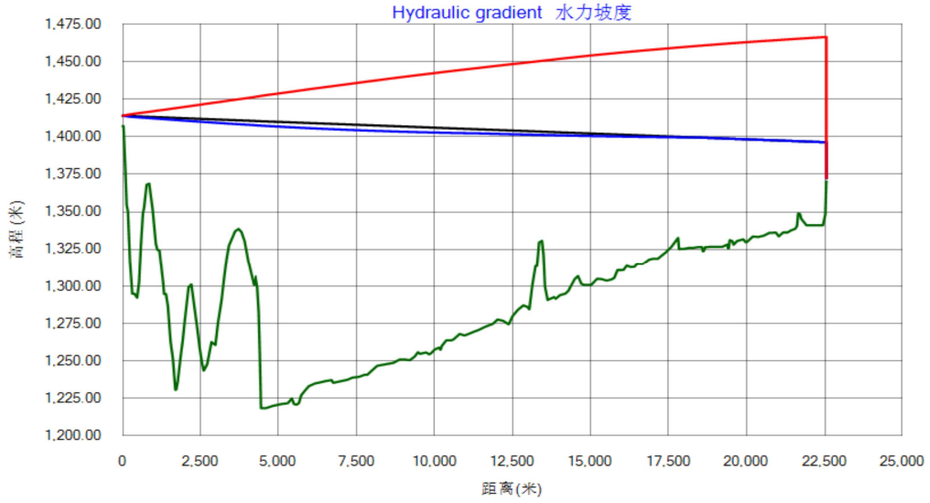
The horizontal middle-open multi-stage centrifugal pump group, the pump head is 255 m, the single pump flow is 1.45 m³ / s, and the single pump motor power is 5000 kW.

卧式中开多级离心泵组，水泵扬程 255m，单泵流量 1.45m³/s，单泵电机功率 5000kW 。

Key Technologies—Hydraulic transient calculation



Pumping station water pipeline

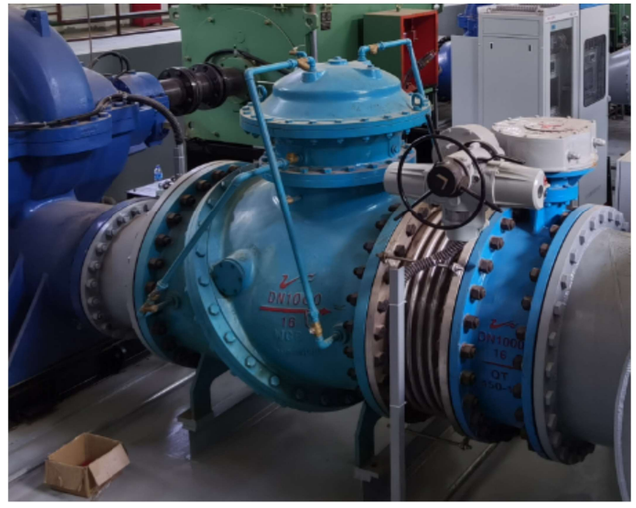


Gravity flow water pipeline under complex terrain conditions

Water hammer prevention valve

Axial flow check valve

Inner bladder air tank



Tilting disc check valves

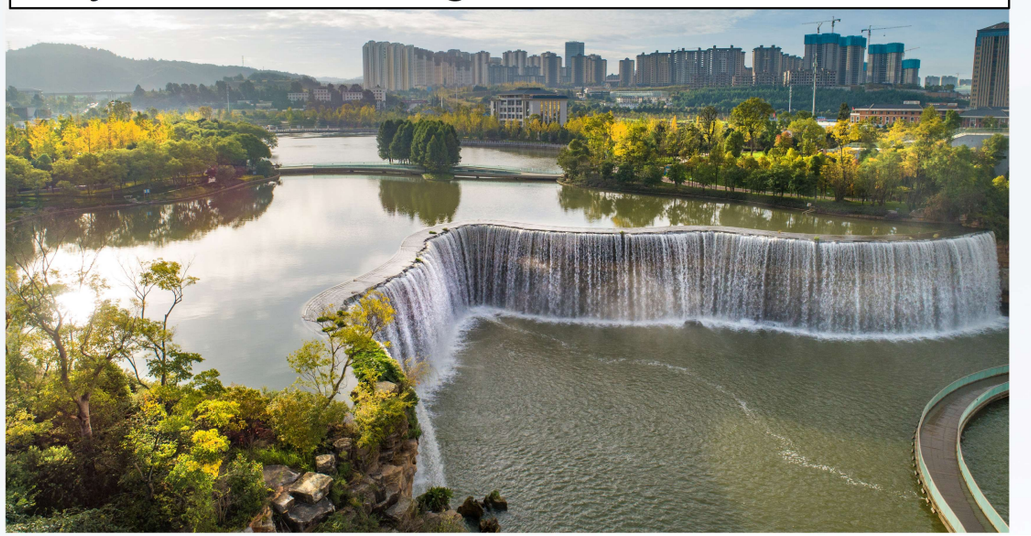
Key Technologies—Research and Application multiple advanced products

Achievement—Application research of high head and large flow centrifugal pump group

XVIII World Water Congress
International Water Resources Association (IWRA)

Project inlet—underground pumping station on cliff

Project outlet—the largest artificial waterfall in Asia



The head is 221.2m, the flow rate of single pump is 7.67m^3 / s, and the installed capacity is 4 × 22.5MW.

泵站扬程 221.2m，单泵流量 7.67m^3/s，装机规模 4×22.5MW，泵组主要参数指标在同类单级、单吸立式离心水泵机组中居世界第二。

Achievement—Floating pump station with the largest water intake amplitude in China

XVIII World Water Congress
International Water Resources Association (IWRA)

The largest floating boat pump station in China with a water intake variation of 74m.The floating boat pumping station is a three-stage rocker arm pipe connected to the shore by movable joints. The length of the rocker arm is 158m. Two intermediate floating platforms are set up, with a size of 20.2 m × 9.2 m × 2.5 m.

工程从已建大型库区取水，取水变幅 74m，为全国最大。浮船泵站为三级摇臂输水管通过活动节连接至岸上，摇臂长度 158m，共设置两座中间浮台。

Achievement—High lift series operation of large pumping station

XVIII World Water Congress
International Water Resources Association (IWRA)

Panoramic view of primary pumping station

The engineering design flow rate is 2.5m³/s, and the total net lift of the pump station is 944m. It is divided into three stages of water lifting, with a total installed capacity of 49.8MW.

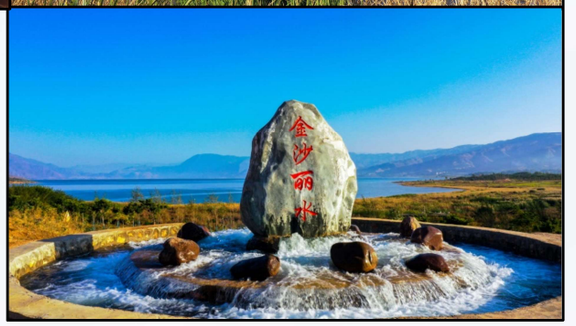
工程设计流量 2.5m³/s 、泵站总提水净扬程 944m ，分 3 级提水，总装机容量 49.8MW ，是云南省首座、国内外鲜见高扬程串联运行的大型提水泵站群。

The horizontal middle-open multi-stage centrifugal pump group

Achievement—High lift pumping station combined with water diversion

XVIII World Water Congress
International Water Resources Association (IWRA)

The project is a rescue protection project for one of the nine plateau lakes-Chenghai Lake. Chenghai is the only alkaline lake with natural growth of Spirulina in China and one of three in the world. The project will directly replenish water to the ecological environment of Chenghai, restore the water level of Chenghai to 1,499.2m which above the legal minimum water level, and enhance the circulation and hydrodynamic force and improve the ecological environment of Chenghai.



The present Cheng Hai

该工程是对九大高原湖泊之一——程海实施的抢救性保护工程。程海是中国唯一、全球 3 个天然生长螺旋藻的碱性湖泊。工程直接向程海生态补水，恢复程海至法定最低水位 1499.2m 以上，增强程海水体循环和水动力，改善程海水生态环境。