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# BEIJING IWHR TECHNOLOGY CO.,LTD.



Realistic

Innovation

Solidarity

Dedication

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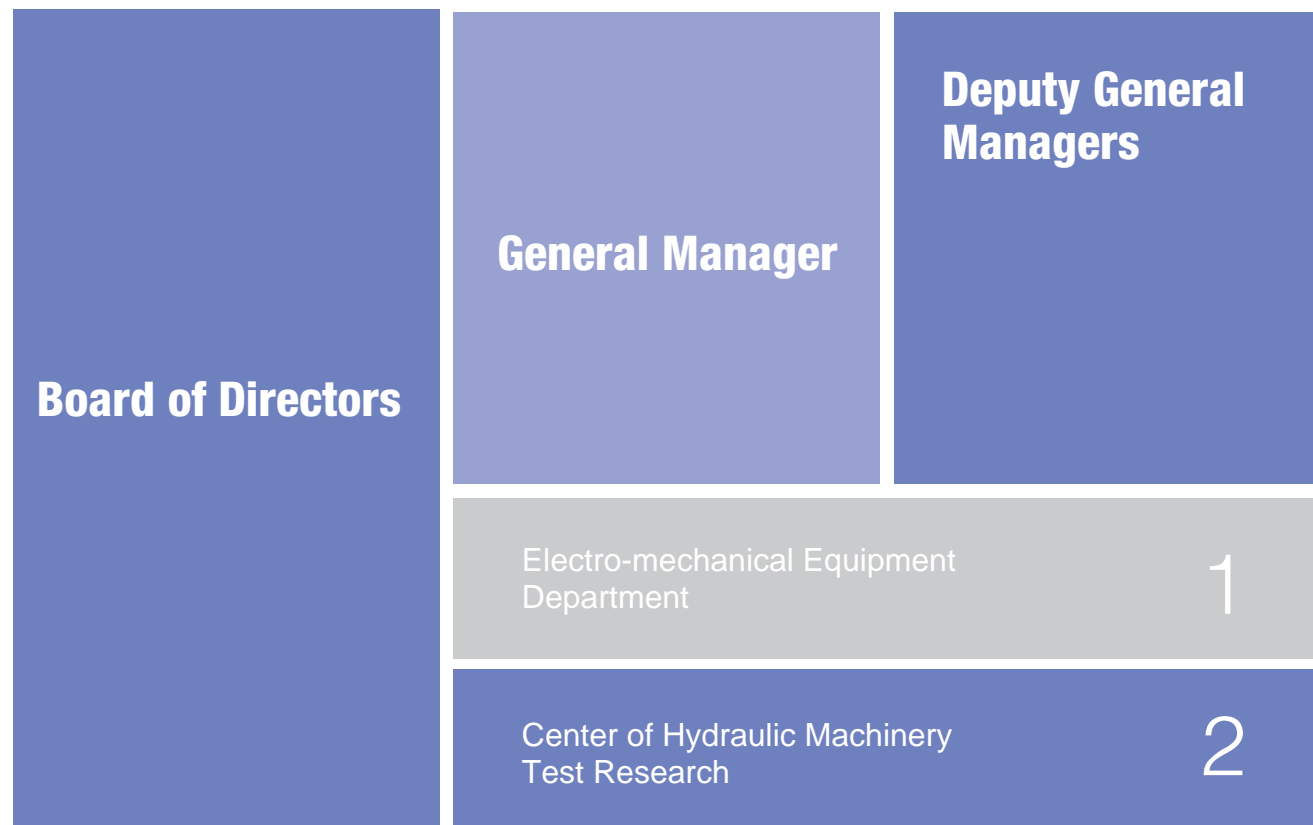


## Introduction of the Company

Beijing IWHR Technology CO.,Ltd. is a new and high technology enterprise, a joint venture between China Institute of Water Resources and Hydropower Research (Beijing IWHR Corporation ) and China Three Gorges Cooperation (TGP). The company is formed on the basis of original Department of Automation, and Department of Hydraulic Machinery of China Institute of Water Resources and Hydropower Research, and the staff are the optimum composition of all technical and the management backbones. The present number of employees is 280, of which, 81% possess bachelor degrees or above, and 35% are masters or PHDs.

The company's primary service includes computer monitoring technology and system engineering of water resources and hydropower engineering, automation system engineering of observation and prediction of flow regime and water dispatching, techniques and facilities of hydroturbine governors, techniques and equipments of hydraulic machinery, techniques of operating insurance of water turbine generator set, experimental study on hydraulic machinery etc.

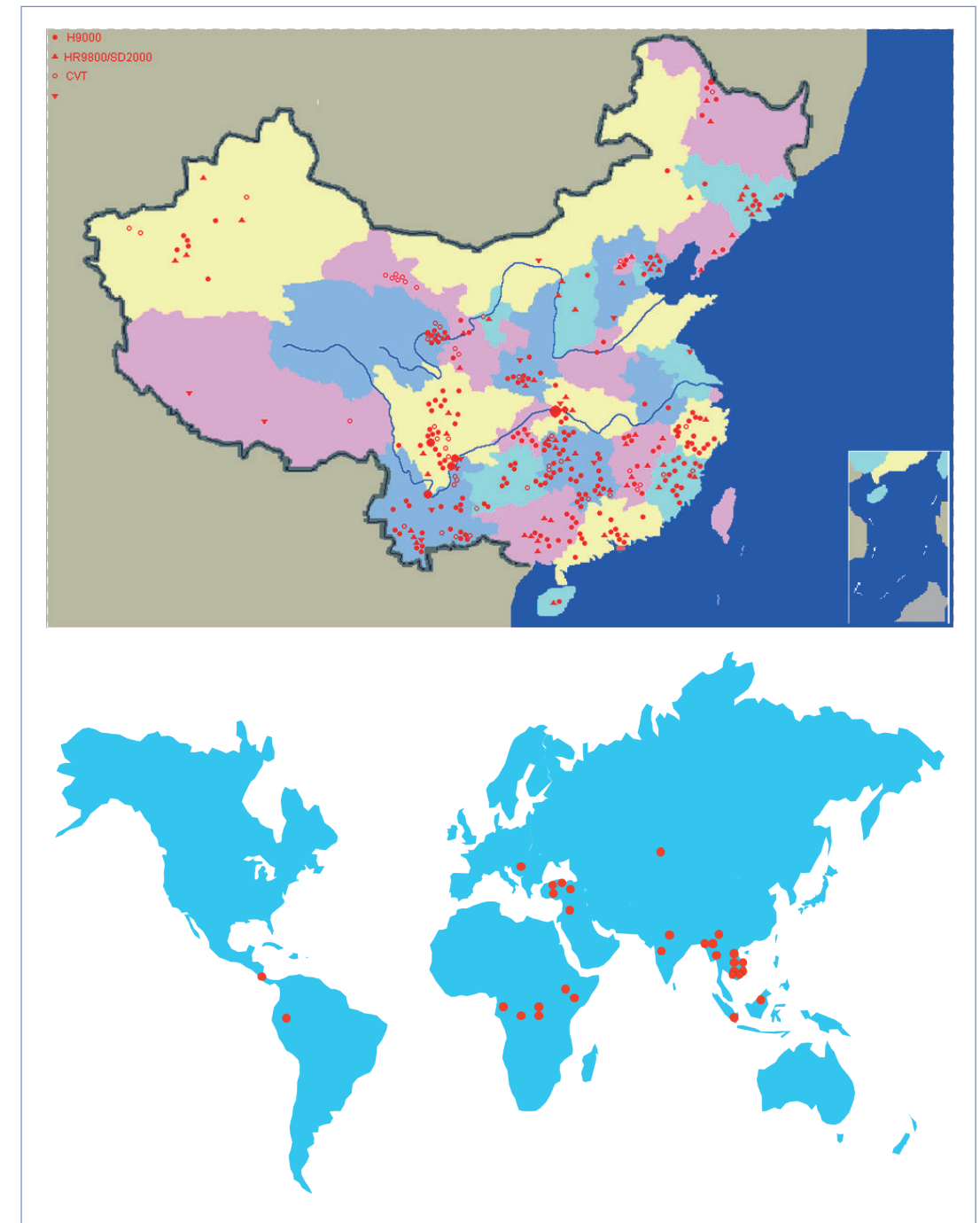
# Company's Organization



# Qualifications



# References



# >> 1

## *Electro-mechanical Equipment Department*

Its business field includes R & D of hydraulic turbines, pump turbines, CFD and optimization design of hydraulic machinery, development of outfits and essential equipments of hydraulic engineering. It has provided hydropower equipments for over 200 water power plants, and won national and provincial /ministerial prizes for many times.

## Introduction of the Bussiness Departments

Kuang Shangfu, President of IWHR,  
Visiting SOYAK Group Company



### **EPC Project of International Hydropower Station**

As EPC general contractor of international hydropower project, we can provide design, manufacturing, erection, integration, testing, commissioning and training for following electro-mechanical equipment.

- Hydraulic turbine, Inlet valve, Governor and Hydraulic auxiliary system
- Generator, Excitation and auxiliary system
- SCADA system
- MV switchgear, Protection, Station service system
- HV switchyard
- Emergency power system
- Other electro-mechanical equipment

# Overview of Bayramhacili



Particularly, based on strong R&D capabilities in hydraulic turbine, advanced numerical techniques and high-precision model test stand, a series of turbine models with high efficiency and anti-cavitation, the performance of turbine for every hydropower project can be guaranteed. For EPC project, customized design and equipment are supplied by us with advanced and mature technology to ensure that all equipment operate safely, steadily and efficiently.

We have experienced and professional technical team engaged in the management, design, supervision and quality control for electro-mechanical equipment as well as directing installation, commissioning and operation of hydropower stations. Several projects have been completed including Bac Binh, Dakr'tih in Vietnam and Bayramhacili, Gullubag in Turkey. Kozbuku Project in Turkey is being constructed.

## Hydraulic Turbine

Business field includes R&D of hydraulic turbine and pump turbine, CFD and optimization design of hydraulic machinery, development of outfits and essential equipments of hydraulic engineering.

- Development of runner models of hydro turbine and pump turbine.
- Parameter demonstration, technical consultation and development of hydraulic turbine
- Technological renovation of electro-mechanical equipment for hydropower station

With the technology of computer optimum design and the high accuracy universal model test stand, the Department has developed a series of high efficiency model turbines, including Francis (JF), Kaplan (JK), Propeller (JP), Bulb (SK), Tubular (JG) and Pump-turbine (PT). The maximum model efficiency of Francis turbine is over 94%. The Department has provided key equipments to about 200 power stations, and finished more than 100 technical renovation projects.

Bayramhacili Hydropower Station in Turkey



Bac Binh Hydropower Station in Vietnam



Assembling of scroll case of Bayramhacili Hydropower Station in Turkey



Hydraulic turbine for Bac Binh in Vietnam

The newly developed medium-high specific speed turbine



Installing rotor of Gullubag HPP



Hydraulic turbine generator of Gullubag HPP



# Runner of Tainanhe



Powerhouse of Bac Binh Hydropower Station in Vietnam



The erection of prototype turbine

## Key Reference of Hydro-turbine Equipment

(1) EPC Project of International Hydropower Station

Name of Project	Location	Qty	Unit Capacity	Project description
Bac Binh	Vietnam	2	16.5	Newly built, finished in 2009
Dakr'tih (upper cascade)	Vietnam	2	41	Newly built, finished in 2011
Dakr'tih (lower cascade)	Vietnam	2	31	Newly built, finished in 2011
Bayramhacili	Turkey	2	23.47	Newly built, finished in 2011
Gullubag	Turkey	3	32.3	Newly built, finished in 2012
Kozbuku	Turkey	4	20.25	Newly built

(2) Hydraulic Turbine

Name of Project	Location	Turbine Model	Qty	Unit Capacity (MW)	Project Description
Bac Binh	Vietnam	JF3026-LJ-180	2	16.5	Newly Built
Dak'rih	Vietnam	JF3011-LJ-190	2	31	Newly Built
Gullubag	Turkey	JF2061-LJ-245	3	32.3	Newly Built
Ahange-Lang	Uzbekistan	JF3001B-LJ-160	2	10	Newly Built
Goma	Sierra Leone	JF3001B-WJ-60	4	1.5	Newly Built
Qiaqima	Pakistan	JP502-LJ-188	1	1.76	Newly Built
Quart	Italy	JF-2191-WJ-210	2	19	Newly Built
Langwaihe	Yunnan	JF3017-LJ-272	2	22.5	Newly Built
Tiecheng	Gansu	JF3017-LJ-183 JF3017-LJ-135	3 1	16 9	Newly Built
Tucang	Yunnan	JF3014-LJ-290	2	17.5	Newly Built
Huangtupo	Sichuan	JF3014-LJ-220	2	10	Newly Built
Dalong	Hainan	JF3013-LJ-135	3	5	Newly Built
Dangshang III	Gansu	JF3011-LJ-117	2	6.3	Newly Built
Lingtouqiao	Zhejiang	JF3011-WJ-92	2	3.2	Newly Built
Shafan	Zhejiang	JF3003A-LJ-102	2	5	Newly Built
Uluwati	Xinjiang	JF2511-LJ-162	4	15	Newly Built
Liujiaogong	Fujian	JF2504-LJ-122	2	12.5	Newly Built
Anrenxi	Fujian	JF2504-LJ-116	2	8	Newly Built
Manla	Tibet	JF2503-LJ-128	4	5	Newly Built
Hongshanzui I	Xinjiang	JF2058-LJ-180 JF1606-LJ-165	2 2	16 9	Newly Built
Tiejue	Sichuan	JF2053D-LJ-125	2	12.5	Newly Built
Furong	Zhejiang	JF2053D-LJ-115	2	8	Newly Built
Baihe	Zhejiang	JF2053-LJ-110	2	12.5	Newly Built
Shuangkoudu	Fujian	JF2052-LJ-132	2	16	Newly Built
Longdi	Yunnan	JF2052-WJ-91	3	5	Newly Built
Dimaluohe	Yunnan	JF1260-LJ-145	2	26	Newly Built
Jingouhe	Xinjiang	JF1058-LJ-180 JF1058-LJ-100	2 2	10 3	Newly Built
Heier	Yunnan	JF1053B-LJ-125	2	12.5	Newly Built
Dongxu	Qinghai	JP502-LH-171	3	2.66	Newly Built
Xiabandi	Xinjiang	JF1808-LJ-210	3	50	Newly Built
Xishanwan	Inner Mongolia	JP401-LH-140	2	1.6	Newly Built
Gucheng	Gansu	JP401-LH-280	3	7.5	Newly Built
Baihua	Guizhou	JF3689-LJ-225	1	15	Retrofit

(2) Hydraulic Turbine

Name of Project	Location	Turbine Model	Qty	Unit Capacity (MW)	Project Description
Hongshanzui II	Xinjiang	JF3623-LJ-140	1	4	Retrofit
Tianshengqiao	Yunnan	JF3620C-LJ-180 JF3621B-LJ-120	2 1	4 1.7	Rebuilt
Jiangjunpo	Sichuan	JF3620A-LJ-178	1	10	Upgrading
Xi'niutang	Guizhou	JF3620-LJ-160	2	3.7	Retrofit
Shihuiyao	Xinjiang	JF3610B-LJ-146 JF3610-LJ-140	2 2	4 3.8	Upgrading Retrofit
Sitan	Guangxi	JF3605-LJ-180	2	4.5	Retrofit
Fushi	Zhejiang	JF3165-LJ-100	2	1.8	Retrofit
Hongshanzui IV	Xinjiang	JF3164A-LJ-134	2	3.6	Retrofit
Hongshanzui V	Xinjiang	JF3164A-LJ-134	2	3.6	Retrofit
Hualiangting	Anhui	JF3163-LJ-200	1	13	Retrofit
Shuangdao	Guangxi	JF3158-LJ-150	2	6	Retrofit
Huiliu	Yunnan	JF3157-LJ-140	1	4.4	Retrofit
Nanfeng	Hainan	JF3154-LJ-235	2	10	Retrofit
Huangshi	Hu'nan	JF3153-LJ-134	2	3	Retrofit
Shangyoujiang	Jiangxi	JF3019-LJ-225	4	18	Retrofit
Hongyan	Guizhou	JF3019B-LJ-225	2	18	Retrofit
Hongshanzui III	Xinjiang	JF2529-LJ-140	1	11	Retrofit
Tiemengguan	Xinjiang	JF2517-LJ-140	4	10	Retrofit
Chengbihe	Guangxi	JF2513-LJ-140	4	7.5	Retrofit
Shuicaozi	Yunnan	JF2051-LJ-140	2	10	Retrofit
Xiaohedi	Yunnan	JF2254-LJ-84	1	2.37	Retrofit
Shatian	Hu'nan	JF2253-LJ-140	3	22	Retrofit
Maoyandong I	Yunnan	JF1601-LJ-84	2	3.4	Retrofit
Jiangkou	Jiangxi	JP502-LH-330	1	10	Retrofit
Xin'anjiang	Zhejiang	JF2001-LJ-410	2	90	Retrofit
Wuxijiang	Zhejiang	JF2089-LJ-250	1	50	Retrofit
Canwo	Liaoning	JK602-LJ-330	1	20	Retrofit
Lushui	Hubei	JK508-LH-300	4	10.1	Retrofit
Fuchunjiang	Zhejiang	JK412-LH-800	1	60	Retrofit
Nanhe	Jiangxi	JK412-LH-300	1	8.5	Retrofit
Hengren	Liangning	JF2005-LJ-410	1	70	Retrofit

# >> 2 Center of Hydraulic Machinery Test Research

The Center is engaged in the hydraulic machinery model test, cavitation and erosion research in sand-water two-phase flow condition. The research works had been accomplished in the following, projects: Three Gorges Project, Sanmenxia Project, Xiaolangdi Project, Yuzixi Project, etc. The Center holds the advanced and complete test equipment, and the most modernized laboratory in the world.

### Functions of model test stand include:

- Efficiency test, cavitation test, runaway speed test, pressure pulsation test, W-K test
- Axial thrust test, radial thrust test, guide vane torque test and runner blade torque test for Kaplan turbine
- 4-quadrants test for pump-turbine
- Flow field measuring, vortex-free zone and initial cavitation observation.
- The erosion research for the performance of turbine and pump in sand-water two-phase flow condition

### Main Parameters of Model Test Stand

Test Stand	Test Head Hmax (m)	Test Discharge Qmax (m3/s)	Main Pump Motor(kW)	Main Pump Motor(kW)	Dynamometer (kW)	Test speed (r/min)	Model Runner D1(mm)	Total Error of Efficiency $\Delta \eta$ (%)
TP1	150	2.2	24SA-10 (2)	724 × 2	540	0 ~ 2600	250~500	< ± 0.2
TP2	20 (80)	1.6	32SA-19 (20SH-9)	593	300	0 ~ 3000	250~500	< ± 0.2
TP3	60	1.0	28SA-10A	593	300	0 ~ 3000	250~500	< ± 0.2 (in clean water) < ± 0.4 (in sand-water)

### Test Facilities of Silt Abrasion and Cavitation Erosion

Name of Facilities	Power of Motor ( kW )	Velocity of Test ( m/s )	Function
Large water tunnel abrasion device	150	~ 60	Study on the cavitation erosion and silt abrasion
Small water tunnel abrasion device	30	~ 55	
Rotating-disc cavitation erosion test device	40	~ 47	
Rotating-disc abrasion device	40	~ 55	Silt abrasion test of materials
Rotating-disc jet abrasion device	50	~ 90	
Jet abrasion device	5	~ 20	

### Key Reference of Hydraulic Machinery Testing and Research

Name of Project	Location of Project	Date of Project
The model contrast and check test of Three Gorges right bank hydro turbine	Hubei	2003
The model check test of Jinping-hydropower station hydro turbine at Yalong River	Sichuan	2006
The model check test of Jinping-II hydropower station hydro turbine at Yalong River	Sichuan	2007
The model acceptance test of Obruk hydro turbine of Turkey	International Cooperation	2006
The model development test of Nuozhadu hydropower station hydro turbine	Sichuan	2006
The model development test of pumped-storage set with 500m Head	Sichuan	2007
The model test of Panjiakou hydropower station diagonal-flow pump turbine	Hebei	1983
The model development test of Canada Dominion Company axial-flow turbine	International Cooperation	1988~1989
The renovation model development test of Xin'anjiang hydropower station	Zhejiang	1991
The model development test of Xiaolangdi mixed-flow Francis turbine	Hu'nan	1992
The model check test of Sanmenxia hydropower station axial-flow turbine	International Cooperation	1994~1995
The model test of pump turbine ( Head > 200m )		1995
The optimization test research of Three Gorges hydro turbine impeller and overflowing parts	Hubei	1996
The renovation model test of unit 1 in Sanmenxia hydropower station	International Cooperation	1997
The hydraulic stability test of turbine in Xiluodu hydropower station	Sichuan	1997~1999
The stability test and parameters selection of Three Gorges right bank hydro turbine	Hubei	1996
The silt water model test of the renovation mixed-flow turbine in Liujixia hydro station	Gansu	
The silt water model test of the renovation axial-flow turbine in Sanmenxia hydro station	International Cooperation	1996~1997
The test research of pump turbine impeller and overflowing parts (400m < Head < 600m)		1993~1994
The technique renovation model test of Jiangdu No.3 station vertical axial pump	Jaingsu	1988
The model test of Huaiyin No.2 station reversible bulb cross-flow pump	Jiangsu	1987~1988
The model test of Two-stage dam pump station open bulb cross-flow pump	Shandong	1988
The model test of ZZ990-WP-35 bulb cross-flow turbine		1989
The model test of SK111B-WP-35 bulb cross-flow turbine		1989~1990
The model test of bulb cross-flow turbine		1991
The model test of bulb cross-flow turbine (Head=7m)		1992
The renovation model development test of pump in Fankou pump station	Hubei	1996~1997
The simulation acceptance and model check test of 15°slantways axial-flow pump in Kuqi station	Fujian	1998
A serial model tests of bulb cross-flow pump in South-North water transfer project east line program		1994~1997
The model turbine check test of XILUODU hydropower station	Sichuan	2007~2008
The model turbine check test of XIANGJIABA hydropower station	Sichuan	2007~2008
The model check test of 129MW turbine renovation at GEZHOUBA hydropower station	Hubei	2009~2010
The bulb turbine model acceptance test of HEKOU hydropower station	Gansu	2009
The Kaplan turbine model acceptance test of KHE-BO hydropower station	Internation Cooperation	2009

# >> 3 Computer Supervision and Control System Department

The Department is specialized mainly in the research and development of computer supervision and control system for large and medium scale hydropower stations, cascade hydropower stations, pumped storage power stations, pump stations as well as integrated automatic system hydropower dispatch. The Department provides automation system and Satellite Time Synchronization System in hydropower and water resources projects with design, manufacture and installation both domestic and abroad.

Based on the rich experience of 30 years on research and development of automation system in the hydropower and water resources projects, through wide international cooperation, tracing and application of the updated technology, H9000 series computer supervision and control system with open and distributed structure are developed by the Department independently. H9000 system is an advanced real time process control system, designed for universal utility and with widely adopted industrial standards.

combining object-oriented structure, international language environment, friendly human-machine interfaces, convenience to operation and maintenance, supporting the network interconnection between different computers and operation systems, with the characteristics of high reliable performance, perfect functions, flexible configuration, convenience extension, All these make it suitable for various utilities. H9000 system has been widely used in more than 200 hydropower stations both domestic and abroad. H9000 system is applicable to hydropower stations, pump-storage stations, pump stations, sewage treatment plant, cascade hydropower stations, dispatch center, transform stations, wind power stations and other automation control fields as well.



## Key Reference of Computerized Supervision and Control System

Sort	Name of Project	Location of Project	Installed Capacity (MW)	Date of Operation
Hydropower Station	Right Bank powerstation of Three Gorges	Hubei	12×700=8400	2007
	Underground power station of Three Gorges	Hubei	6×700=4200	2012
	Pubugou	Sichuan	6×600=3600	2008
	Shweli	Burma	6×100=600	2008
	Letan	Guangxi	4×150=600	2005
	Sanbanxi	Hunan	4×350=1400	2004
	Gongboxia	Qinghai	5×300=1500	2004
	Zhouning	Fujian	2×125=250	2004
	Wujiangdu	Guizhou	5×250=1250	2003
	Kozjak	Macedonia	2×50=100	2003
	Tis Abay II	Ethiopia	2×36=72	2001
	Longyaxia	Qinghai	4×320=1280	2000
	Xin'anjiang	Zhejiang	9×90=810	1999
	Dongfeng	Guizhou	3×190+1×125=695	1999
	Jiangya	Hunan	3×100=800	2009
	Ankang	Shanxi	4×200=800	2007
	Centralized Control Center for Catchment Area	Tekeze	Ethiopia	4×70=280
Baishan & Hongshi		Jilin	5×300+2×150=1800, 4×50=200	2005
Wuqiangxi		Hunan	5×250=1250	2006
Hunanzhen & Huantankou of Wuxijiang		Zhejiang	4×46.25+1×100=285, 4×7.5+2×26=82	2005
Bailongtan		Guangxi	6×32=800	2004
Wuling Power		Hunan	8384MW	2010
Shupaihe		Yunnan	306.5MW	2009
Qingshuijiang cascade remote control center		Hunan	1570MW	2006
Meiguhe cascade remote control center		Sichuan	5×60=300	2006
Zhengzhou cascade remote control center for Xiaolangdi of Yellow River		Henan	1940MW	2005
Huadian cascade remote control center for Baishan		Jilin	2000MW	2005
Cascade remote control center of upper reaches of Yellow River		Qinghai	10645MW	2005
Wuxijiang cascade		Guizhou	367MW	2004
Baishan pumped storage power station	Jilin	2×150=300	2005	
Qingyuan storage power groups	Guangdong	4×320=1280	2015	
Right bank Three Gorges power station	Hubei	GPS, 26	2006	
Gezhouba Satellite time synchronization system	Hubei	GPS, 30	2009	



Huadian remote control center for Baishan cascaded power station



Xining remote control center for the upriver cascaded hydropower station of Yellow River



Central control room of left bank of Three Gorges power station



Tuning the control system of the 1st unit of right bank power station of the Three Gorges



Central control room of Xin'anjiang power station after rehabilitation



Powerhouse of Dongfeng hydropower station after rehabilitation



Central control room of Three Gorges cascade dispatching center



Test before FAT of equipment for right bank power station of the Three Gorges



Achievements appraisal meeting of computer supervision and control system for Three Gorges right bank Hydropower station (November 6, 2009)



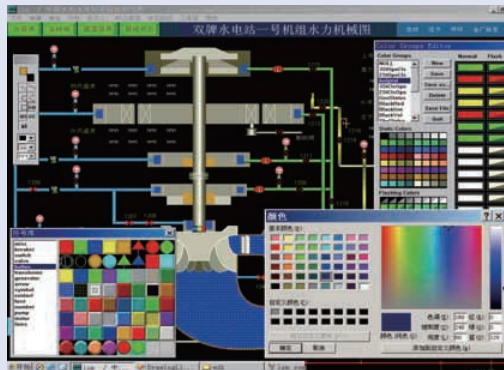
Demonstration of H9000 V4.0 computer supervision and control system



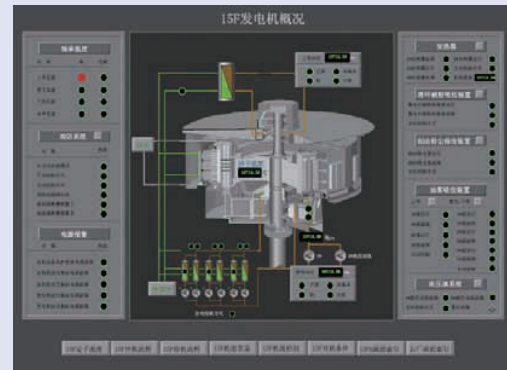
BSS-3 Satellite time synchronization system for Gezhouba hydropower plant



SCADA lab-union test hall



H9000/IPM interactive HMI development system



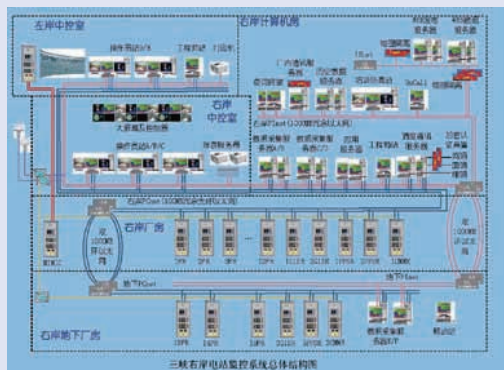
H9000/OIX operator interface, supplying the best interactive HMI



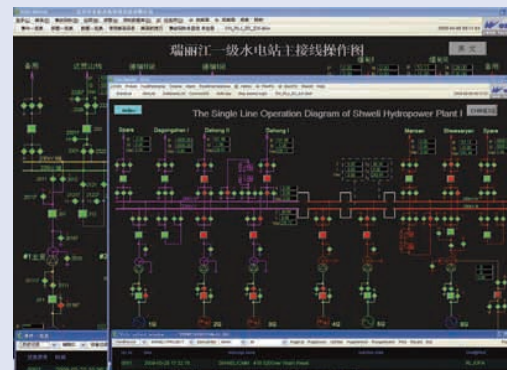
FAT of control system for Tis Abay II power station in Ethiopia (Africa)



Cooperative, creative and efficient team



The structure of computer supervision and control system for Three Gorges right bank hydropower station



Multi-language supporting system- The single line operation diagram of Shweli Hydropower Plant



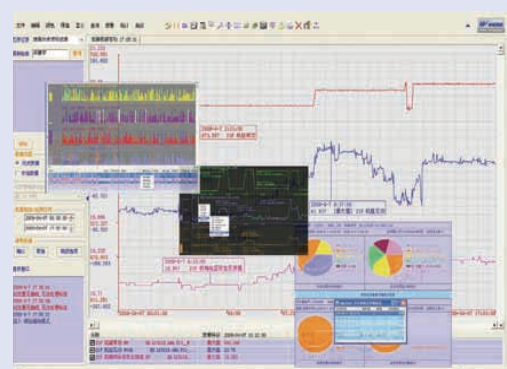
On-site customer training at Tis Abay II plant of Ethiopia



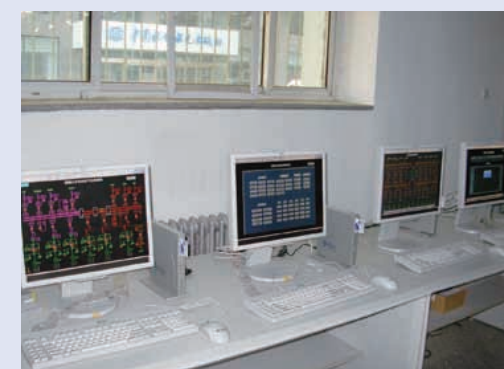
Computer supervision and control system of Pubugou hydropower station on Daduhe River in Sichuan Province



Operator Training Simulation System for Hydropower Stations



SMA2000 state monitoring & analyzing system operation in the right bank hydropower plant Three Gorges



Sun Ray computer system development environment



The test instruments in laboratory

# >> 4 Hydrological Telemetry and Reservoir Dispatching Department



SD2008/HD9000 reservoir dispatching automation system



SD2008/HD9000 reservoir dispatching automation system

Main tasks: The hydrological telemetry and reservoir dispatching automation system for reservoirs, hydropower stations and the whole catchment.

The first Inmarsat and Vsat satellite hydrological telemetry automation systems in China were designed and developed by the Department.

Main products:  
HR9000 hydrological telemetry automation system  
SD2008/HD9000 reservoir dispatching automation system  
Flood forecasting and dispatching system  
Dynamic control of the flood control limited water level of reservoirs.

The above products have been widely used in about 150 large scale water resources projects, hydropower stations in China and abroad.



Map showing isoline of hydrology and rain storm of flood control



RFDS flood forecasting and dispatching system

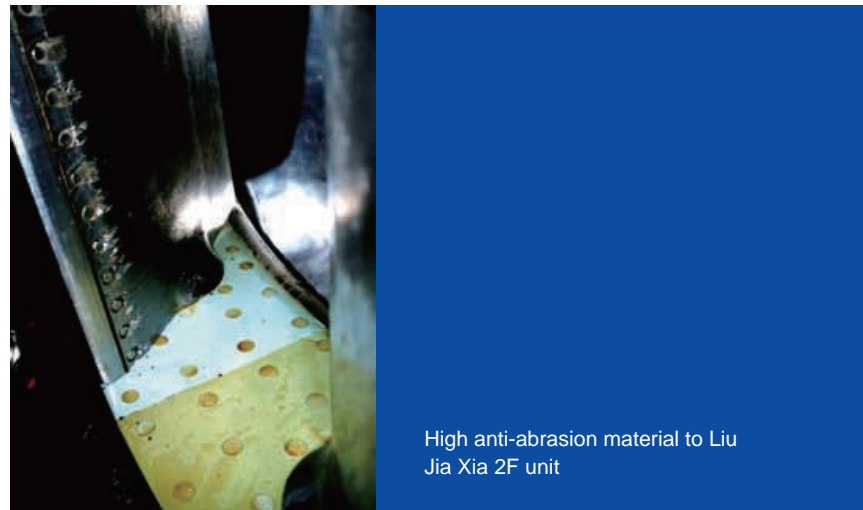
## Key Reference of Hydrological Telemetry and Reservoir Dispatching

Sort	Name of Project	Location of Project	Construction Scale	Date of Operation	
Hydropower Station	Nuozhadu	Yunnan	1 Central station, 1 Sub-central station, 15 Remote telemetric stations	2005	
	Dahua	Guangxi	1 Central station, 14 Remote telemetric stations	2006	
	Daguangba	Hainan	1 Central station, 14 Remote telemetric stations	2006	
	Wan' an	Jiangxi	1 Central station, 26 Remote telemetric stations	2006	
	Ankang	Shanxi	1 Central station, 5 Relay stations, 40 Remote telemetric stations	2007	
	Xiangshan	Heilongjiang	1 Central station, 7 Remote telemetric stations	2008	
	Three Gorges(Pingshan-Cuntan)	Hubei	90 Remote telemetric stations	2008	
	Doulingzi	Hubei	1 Central station, 16 Remote telemetric stations	2008	
	Zuojiang	Guangxi	1 Central station, 21 Remote telemetric stations	2008	
	Siping	Hubei	1 Central station, 1 Remote telemetric station	2008	
	Quanhe	Hubei	1 Central station, 1 Remote telemetric station	2008	
	Chaoyangsi	Hubei	1 Central station, 2 Remote telemetric stations	2008	
	Jinghong	Yunnan	1 Central station, 21 Remote telemetric stations	2009	
	Liaofang	Jiangxi	1 Central station, 1 Sub-central station, 21 Remote telemetric stations	2009	
	Fengman	Jilin	1 Central station, 17 Remote telemetric stations	2010	
Water Control Pivot	Shuanggou	Jilin	Reservoir dispatching automation system	2010	
	Fengman	Jilin	Consummating Reservoir dispatching automation system	2011	
	Julongtan	Jiangxi	1 Central station, 12 Remote telemetric stations	2006	
	Wudu	Sichuan	1 Central station, 5 Sub-central stations, 40 Remote telemetric stations	2006	
	Longkou	Shanxi	1 Central station, 2 Relay stations, 12 Remote telemetric stations	2007	
	Dongping	Hubei	1 Central station, 7 Remote telemetric stations	2008	
	Hadashan	Jilin	1 Central station, 16 Remote telemetric stations	2011	
	Centralized Control Center for Catchment Area	Wushui	Hunan	1 Central station, 4 Sub-central stations, 14 Remote telemetric stations	2007
		Longjianghe	Guangxi	1 Central station, 6 Sub-central stations, 27 Remote telemetric stations	2009
		Chief tributary of the right side of the Nen river	Jilin	1 Central station, Flood forecast for 12 Sectional area	2010
Yalongjiang		Sichuan	1 Central station, 140 Remote telemetric stations	2010	

**Major Services and Research Scope**

- Condition monitoring and fault diagnosis
- Field Test and Field Test Technique Research
- Dynamic simulation and estimation of efficiency, cavitation erosion, abrasion and vibration performance
- Research and consultation of stability key technology
- Parameter choice and operational optimization of the hydraulic machinery
- Calculation and analysis of Strength, fatigue and flow of hydraulic machinery
- Control and repair of cavitation erosion, abrasion
- Research & Development of Anti-cavitation erosion and anti-abrasion material
- CFD Optimization design of Hydraulic Machinery
- 3D parametric CAD and computer simulation techniques

>> **5**  
**Operation Support Department**



High anti-abrasion material to Liu Jia Xia 2F unit

**Achievement:**

Performance tests and fault diagnosis researches accomplished in Three Gorge power plant, ErTan Power Station, YanTan Power Station, GeZhouBa Power Station, DiShiLin Power Station in Syria. Fulfilled more than 30 items of quality examination and supervisory of the prototype hydraulic turbine parts. Undertaken and accomplished various consultation services concerned with mechanical and electrical equipment of some Hydraulic projects, such as Three-Gorges right strand, Xi Luo Du, Xiang Jia Ba, Jin Ping, etc.

**R%D products:**

HM9000 condition monitoring and fault diagnosis system for Hydraulic generator unit; Silt abrasion forecasting system of turbine runner. High anti-abrasion material works successfully in large or middle scale water power stations, including Liu Jia Xia, Wan Jia Zhai, Da Xia, Qing Tong Xia and Yan Guo Xia and so on, the accumulation area has surpassed 600m<sup>2</sup>.



**Other services:**

Fulfilled CFD Optimization design of 28000 m<sup>3</sup>/hr Discharge High Efficiency Dredge Pump; Developed a virtual prototype of the Three Gorges Ship-lift, by means of 3D parametric CAD and computer simulation techniques, which provide solutions for management of large engineering projects, and can promote 3D design of hydraulic engineering project and the digitization of equipments and products.



**Key Reference of FieldTest of Hydro-turbine**

Name of Project	Date of Project
Startup test of hydropower units in right bank stations of Three Gorges project	2007.3
Unit condition monitoring and fault diagnosis system in Taipingwan hydropower station	2006.12
Units stability and efficiency test during upstream 135 ~ 156m water level period on left bank stations of Three Gorges project	2006.10
Sediment erosion study in the units of Xiluodu hydropower station	2006.12
Parameters demonstration for the hydropower units in Xiluodu, Xiangjiaba and the underground power plant of Three Gorges project	2006.12
Selection and advisory for the units' type and capacity of Saige hydropower station	2006.8
Hydraulic generating units stability and energy performance test on Taipingyi hydropower plant	2007.2
Research on the volute plate tearing reason of ALSTOM units in left bank stations of TGP	2006.10
Research on thrust bearing cooling system optimization of VGS units in left bank stations of TGP	2006.12
Research on abnormal vibration during overspeed test of ALSTOM units in left bank stations of TGP	2006.12
Performance evaluation test for the extension and equipment renovation on Gezhouba hydropower station 3F and 14 F units	2006.5
Ventilation and temperature rise test on Gezhouba hydropower station 0F unit	2006.5
Diagnostic analysis of blade cracks on Syrian Tishrin Power Station	2006.2
Study of unit abnormal vibration with small load in Ertan hydropower station	2005.11
Units efficiency and stability test in Jinshuitan hydropower station	2005.7
No.3 unit runner stress test and blade cracks diagnostic analysis in Yantan hydropower plant	2005.6
Hydraulic generating units stability and energy performance test on Three Gorges left bank hydropower station	2003.10
Diagnostic analysis of blade cracks on Huaneng Xuchun hydropower station	2003.12
Natural frequency measurement for the unit runner and guide vane in Three Gorges left bank hydropower station	2003.5
Technology study and device development for the measurement of large pump and hydraulic turbine runner dynamic stress	2002.12
Stability assessment and runner dynamic stress field test in the hydraulic turbine of Mianhuatan hydropower station	2002.10
Numerical simulation and optimization calculation for pump blades channel	2005.12
Numerical simulation and optimization calculation for the units of Three Gorges right bank hydropower station	2003.1
Research for the characteristics of vibration source and loads with large hydraulic machinery	2003.6
Air-liquid two-phase flow research in a turbine draft tube	2005.1
Development of shiplift simulation system in Three Gorges project	2006.3
Hydraulic generating unit performance test on Shuibuya hydropower plant	2010.5
Remote condition monitoring and fault diagnosis centre for CTGC	2009.12
Hydraulic generating unit efficiency test on Mollasadra Hydropower plant	2008.09
Units stability and efficiency test during upstream 145~175m water level period on Three Gorges Hydropower Plant	2008.08
Research on overall Planning of Hydraulic generating unit online monitoring, diagnosis and condition maintenance system	2007.02



### Key Reference of Anti-wearing Plate

Name of Power Station	Type and key parameters of turbine	Number of sets	Total area	Date of delivery
Liujiaxia 1F ~ 4F unit	Np=250 MW, Hp=100m	8	82	1993,2002 replacement
Liujiaxia small unit	Np=14 MW	5	20	1999,2004 replacement
Daxia 1F ~ 4F unit	Np=77 MW, Hp=23 m	8	136.6	1994
Wanjiazai 1F ~ 4F	Np=184 MW, Hp=68 m	6	215.1	1997
Qintongxia	Np=37 MW Hp=18 m	1	6.6	1994
Yongkou	Np=26 MW Hp=20 m	2	11.8	1998
Shanxi Weijiabao	Np=6.3 MW Hp=96 m	7	5.5	1997 ~ 2003
Fengning, Donggu	Np=10 MW Hp=54 m	4	4.2	1999
Baishuikeng	Np=20 MW Hp=97 m	3	4.4	2002
Hunan Wanmipo	80 MW Hp=39 m	4	46.8	2003
Gansu Gucheng large unit	Np=7.8 MW Hp=16 m	6	12.6	2002
Xixiyuan		2	92	2006

# >> 6 Governor Department

#### Main products include:

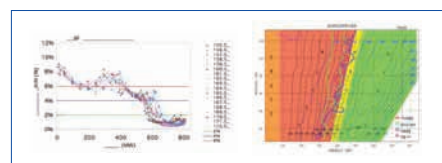
- CVT/CVST (WT/WZT) series, YCVT (YWT) series, fast switch valve (digital valve) turbine governor.
- CATA turbine governor simulation and testing system.
- Portable integrated testing and simulation system for hydropower station
- HYZ (YZ) oil pressure supply units.
- Hydraulic control equipment for turbine inlet globe valve / butterfly valve.
- Basic automation parts: tripping distributing valve, step closure device, the gate/blade displacement sensor with master switch, oil pump combined valve, Hammerclosure device, and so on.



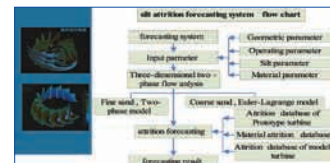
Hydraulic servo-system of governor combined with oil pressure supply unit



HYZ series oil pressure supply unit



Field test and old test technique research



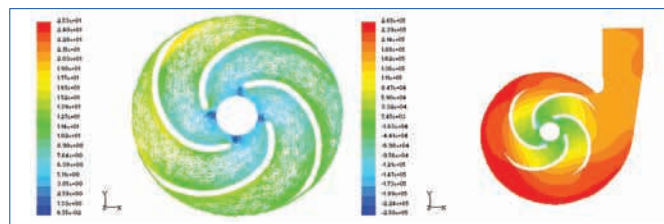
Silt attrition forecasting system



28000 m3/hr discharge high efficiency dredge pump, developed with CFD optimization design



Digitization of equipments and products



Numerical Simulation

CVT/CVZT/GWT (WT/WZT) series and YCVT (YWT) series, which based on the newest hydraulic digital logical cartridge technique, were developed successfully. It is the first time to realize that the high speed valve (digital valve) and logic cartridge control valve is the core of the mechanical actuator of the full redundancy direct digital control turbine governor. The logic cartridge valve act as the main distributing valve, it has not "middle position", the pre-diver control component is replace by the high-speed switch valve. It realize the full redundancy and direct digital control, abolish the traditional electrohydraulic convert-er and main distributing valve, and

make great progress reliability, maintenance, integration and so on. It has some good feature, such as saving resource, economy, long life.

In 2004, it passed the production appraisal which is organized by the national technology department of the ministry of water resource, the expert unanimous consider that the production has arrived the international highest level. The core technology has enroll the national patent, the patent number is ZL 00 2 59624.5.

At present, this series governor have been successfully applied in more than 100 plants' 200 turbine units, including Francis turbine

unit, Kaplan turbine unit, Pelton turbine unit and Tubular turbine unit. etc.

From 2003 to 2009, using the logical cartridge technology, we have developed the step closure device, tripping distributing valve, oil pump combined valve, gate/blade displacement sensor with master switch, hydraulic control system of turbine inlet globe valve/butterfly valve. All these devices have been widely used in the hydro-power station.

**Key Reference of Full Redundancy Direct Digital Control Turbine Governor**

No	Name of Power Station	Governor	Unit Capability (MW)	Type	Type of Unit	Location of Power Station
1	Shuikou station 1 #、5#、6#、7#	4	200	CVZT-150-4.0	Kaplan	Fujian Mingqing
2	Tuokou station	4	200	CVT-150-6.3/ HYZ-8.0-6.3	Francis	Hunan Hongjiang
3	Fengtian station 3#、4#	2	125	CVT-100-2.5	Francis	Hunan Yuanling
4	Tishrin station	6	100	CVZT-150-4.0	Kaplan	Syria
5	Zhexi station	6	89	CVT-100-2.5	Francis	Hunan Anhua
6	Xiangshui station	2	50	CVT-80-4.0	Francis	Guizhou Liupanshui
7	Ankang station 0 #	1	50	CVT-100-2.5	Francis	Shanxi Ankang
8	Xiaogushan station	2	50	CVT-100-4.0/ HYZ-1.6-4.0	Francis	Gansu Zhangye
9	Xiaogushan station	1	22	CVT-80-4.0/ HYZ-1.0-4.0	Francis	Gansu Zhangye
10	Dark' Tih upstream station	2	41	CVT-80-6.3/ HYZ-1.0-6.3	Francis	Viet Nam
11	Baihuatan station	3	40	CVZT-150-4.0/ YZ-8.0-4.0	Kaplan	Sichuan Hongya
12	Z Ninglang Station	3	38	CVT-100-4.0/ HYZ-1.6-4.0	Francis	Sichuan Liangshanzhou
13	Huong Dien Station	2	35	CVT-80-6.3/ HYZ-2.5-6.3	Francis	Viet Nam
14	Dark' Tih lower station	2	31	CVT-80-6.3/ HYZ-1.0-6.3	Francis	Viet Nam
15	Gullubag Station	3	32	CVT-80-6.3/ HYZ-1.0-6.3	Francis	Turkey
16	Kensiwate Station	3	30	CVT-80-6.3/ HYZ-1.0-6.3	Francis	Xinjiang Manasi
17	Kensiwate Station	1	10	YCVT-50000-6.3	Francis	Xinjiang Manasi
18	Ta Thang Station	2	30	CVT-80-6.3/ HYZ-1.0-6.3	Francis	Viet Nam
19	Daxing station	3	27	CVZT-150-4.0	Kaplan	Sichuan Yaan
20	Gaofengshan station	3	27	CVZT-150-4.0	Kaplan	Sichuan Hongya
21	Shantian station 1#	1	25	CVT-100-2.5	Francis	Hunan Rucheng
22	Shantian station	2	25	CVT-100-2.5/ HYZ-1.6-2.5	Francis	Hunan Rucheng
23	Baishujiang III station	2	25	CVT-100-4.0/ HYZ-2.5-4.0	Francis	Yunnan Yanjin
24	Baishujiang II station	2	25	CVZT-100-4.0/ YZ-2.5-4.0	Kaplan	Yunnan Yanjin
25	Baishujiang I station	2	25	CVZT-100-4.0/ YZ-2.5-4.0	Kaplan	Yunnan Yanjin
26	Bayramhacili Dam And Hepp Station	2	24	CVZT-80-6.3/ HYZ-1.6-6.3	Kaplan	Turkey
27	Yutan station	3	20	CVT-100-2.5	Francis	Hunan Zhangjiajie
28	Erlongshan station	2	22	CVT-80-4.0/ HYZ-1.6-4.0	Francis	Gansu Zhangye
29	Erlongshan station	1	20	YCVT-75000-4.0	Francis	Gansu Zhangye
30	Dagushan station	2	22	CVT-80-4.0/ HYZ-1.6-4.0	Francis	Gansu Zhangye
31	Dagushan station	1	20	YCVT-75000-4.0	Francis	Gansu Zhangye

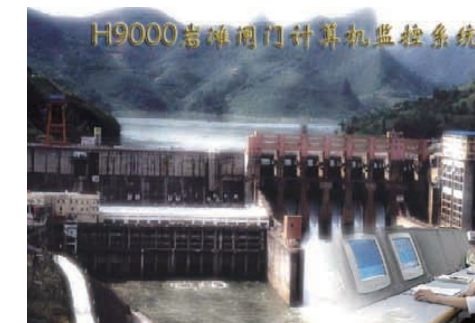


Control system for Jingtaichuan Pumping Irrigation Project

# 7 Water Conservancy Automation Department

The department is divided from the Department of Computerized Supervision and control system in June 2010, is specialized mainly in the research and development of computer supervision and control system for large and medium scale hydraulic engineering, such as water diversion projects, irrigation projects, sewage treatment projects, pumping stations, sluice gate and auxiliary equipment, as well as the automatic dispatching system for cascade pumping stations etc. The department provides automation system in water-control projects with design, manufacture and installation both domestic and abroad.

Based on H9000 system, the department has developed and provided numerous automatic control systems, for example, Dazhangzhuang pumping station which is part of water diversion project from Luan River to Tianjin, flood control and dispatching automation system for Beijing Feilaixia, control system for Longquanxihe sewage treatment project, control system for Jingtaichuan Pumping Irrigation Project with 13 pumping stations in cascade. Xinjiang Sutang irrigation project is currently being implemented with 180 thousand hectares of farmland with the main function of water supply and water-saving irrigation.



Installing the control system at Sutang Irrigation project



Gate control system for Yantan power station



Gate control system for Yantan power station



Central control room of Dazhangzhuang Pumping station



The cubicle of the LCU equipment



Engineers installing the LCU



Operating the H9000 control system device in Longquanxihe sewage treatment plant



On-site training of H9000 system to experts in Longquanxihe sewage treatment plant

### Key Reference of Computerized Supervision and Control System for Hydraulic Project

Name of Project	Location of Project	Date of Operation
Jingtaichuan pumping irrigation project	Gansu	7/31/1997
Dahe	Guangdong	5/29/1999
Wanjiazhai	Shanxi	7/31/2002
Tizidong	Chongqing	6/1/2003
Jiangkou	Chongqing	6/1/2003
Dazhangzhuang pumping station of diversion project from Luanhe river to Tianjin	Tianjin	10/27/2003
Dashankou	Xinjiang	11/24/2003
Nierji	Heilongjiang	8/1/2004
Gaosha	Fujian	9/1/2004
Baozishi	Jiangxi	12/1/2004
Fenshuijiang	Zhejiang	7/20/2005
Runhai	Hunan	9/1/2006
Yantan	guangxi	5/1/2007
Jiepai	Jiangxi	6/8/2007
Xiaozhai	Yunnan	8/1/2008
Maguan Laqi	Yunnan	12/1/2008
Longquanxihe sewage treatment project	Sichuan	12/30/2008
Baishuihe	Guizhou	4/30/2009
Seergu	Sichuan	5/1/2009
Sutang Irrigation Project	Xinjiang	5/31/2010

