I-7000 Series Modules Applied in

Wastewater Treatment

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Abstract:

This paper introduces a monitor and data acquisition system for a water treatment plant using I- 7000 series modules With the dual watchdogs of I-7000 series modules, the system can operate more easily and reliably.

System Introduction:

This system consists of 6 areas: old turbid water pump area, new turbid water pump area, clean water pump area 1, clean water pump area 2, new thermodynamical station and old thermodynamical station. The system requires many digital input signals, digital output signals, analog input signals and temperature signals. Totally seventy-seven I-7000 series modules were used in this system. There are 503 actual acquisition points, the field wiring reaches up to 800 meters. The system has the following features: real-time alert, history trend curve and reports etc.

I-7000 series modules used in this project:

I-7520   **RS-232 to 485 converter**

*Speed: 300 bps—115,200 bps

*RS-485 network with 256 modules(without repeater)

*Isolated voltage: 3000V

*Support multiple baud rate and data formats

*Communication distance: 1.2 Km

I-7510   **RS-485 Repeater**

*Support multiple baud rate: 300—115,200 bps

*Support multiple data formats

*" self-tuner " inside

I-7052   **Isolated Digital Input Module**

*Input: 6 differential, 2 single-ended

*Input high level (1): 3.5V~30V

*Input low level (0): 0V~0V

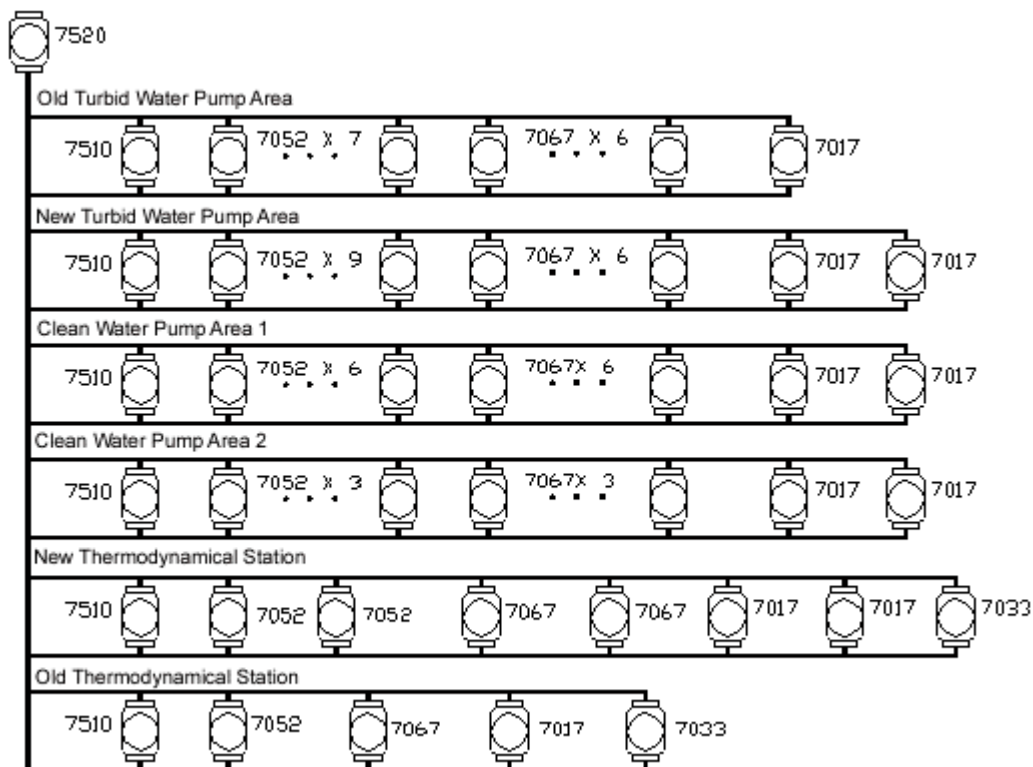*Isolated voltage: 5000V

I-7067   **Relay Output Module**

*7 channels for digital output, type A

*Relay action time: 5ms

I-7017   **8-channel Analog Input Module**

*channels: 6 differential, 2 single-ended or 8 differential

*sampling rate: 10Hz

I-7033   **3-channel RTD Input Module**

System Illustration

1. Old Turbid Water Pump Area

There are five water pumps used for importing muddy water into the plant in this area. Five pumps are active in the peak of water consumption and only one to three pumps are started in off-season. Each pump is assigned 8 digital input signals by which the on/off status and all main valves of each pump can be monitored. Additionally, each pump is assigned seven digital output signals that are used to control the status of pumps and valves in this area. The two functions can be implemented separately by seven I-7052 modules and five I-7067 modules. The voltage and current of each pump can be acquired by I-7017 analog input module. All the modules in this area are placed in a switch cabinet. Communication between the front-end PC and the station is via RS-232 to 485 converter (I-7520 module). Because of the long distance between the stations, a relay module I-7510 in installed in the middle of the communication line.

2. New Turbid Water Pump Area

There are 6 pumps in this area, which have the save functionality with the 5 pumps in the old turbid pump area except they are newer. Even in off-season of water consumption the six pumps are still active. The new and old areas are 400 meters apart from each other. A total of 21 modules of 7052, 7067, 7017 and 7510 are used in this area for acquiring and controlling the data of pumps and valves.

3. Clean Water Pump Area

Clean water pump consists of clean water pump area 1 with 6 clean water pumps and clean water pump area 2 with 3 clean water pumps. All of the pumps are mainly used to export usable water after being processed. These cleaning water pumps are less than 200 meters apart and placed in the same computer room. However they are divided into two areas

because the modules of the pumps are placed in different control cabinets with certain distances from each other. The clean water pump area 1 is equipped with 15 modules of 7052, 7067, 7017 and 7510. The clean water pump area 2 is equipped with 9 modules of 7052, 7067, 7017 and 7510. With these modules the system can monitor and control the status of each clean water pump.

4. New and Old Thermodynamical Station

The two stations provide steam and power for the water plant. They also use 12 modules which fall into four types including 7052, 7067, 7017 and 7510 to acquire and control digital signals and analog signals. It is different from the above four station areas on that there are two I-7033 modules used in the two stations to acquire the temperature of the pipe in thermodynamical station.

5. Issues During Debugging

（1）Because it is far away from the field facilities, sometimes certain individual modules in new turbid water pump area can't be detected. After analyzing the reasons and experimenting many times this problem is resolved by adding terminal resistors to both sides of 7520 and 7510 modules.

（2）During the use of 7017, after the field signals were connected, address 0 appeared and can't be reset on-line. The reasons for this is because the analog ground and power ground share the same ground level. Since the default setting of 7017 makes INIT and Vin7- use the same port, the failure can be avoided by opening the module and change the default setting of the 6-channel differential and 2-channel single-ended into 8-channle differential.

6. Upper Level Computer Softwar

In order to take full advantage of the I- 7000 series modules, the KingView software is used in the upper level PC. Because this software includes drivers for all products from ICPDAS, the developer's work load is thus greatly reduced, it also make full use of the
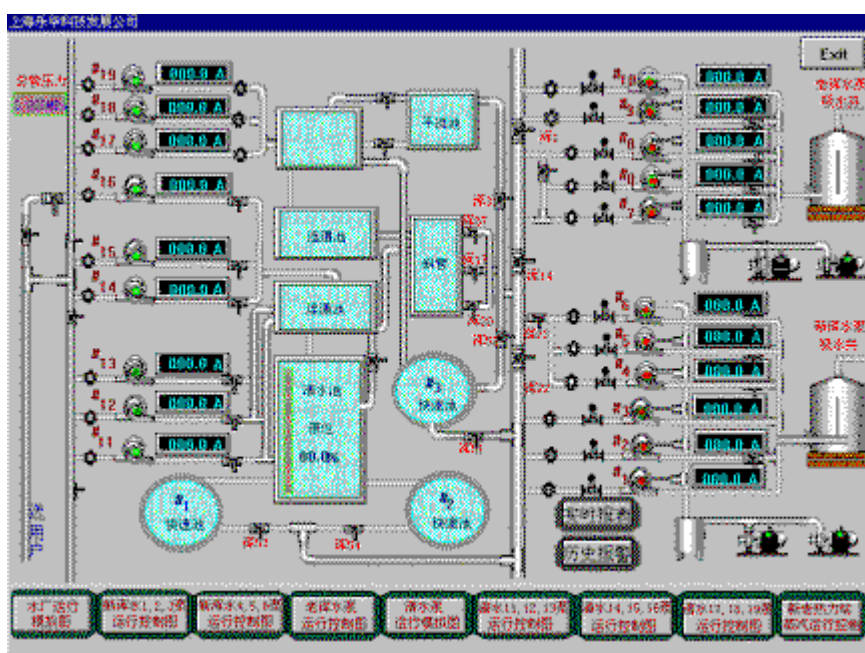
advantage of KingView software, which makes

Software Operating Diagram

the user interface more beautiful..

Conclusion:

The project was designed by Shanghai Wujing Chemical Plant and have been operating securely and successfully for months. It is the first time that the plant adopt non-imported facilities and they are satisfied with the system.

Software Operating Diagram