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## Greenhouse Intelligent Monitoring and Control Solution

Date: 3/12/2015 12:00:00 AM

Location: Taiwan

### Project Description:

Farming Orchids is the most successful form of precision farming in Taiwan, and also the most exported flower. Orchids need a specific temperature and humidity conditions to grow and bloom, and its flowering time may not be in line with market demands, so the price collapses when there is overproduction. Therefore, some farmers began to import automated greenhouse control systems for breeding and forcing, which not only improves quality, but also effectively controls the production period and yield to ensure revenue.

In 2012, an orchid farmer built a Forcing Greenhouse of about 200 pings (approximately 661 Square Meters) in Tainan, Taiwan. The system integrator adopted Advantech's APAX-5000 series programmable automation controllers to build the control platform, coupled with Advantech WebAccess HMI/SCADA software, to achieve cloud monitoring. The staff of the orchid field can monitor important data anytime via smart phone, iPad, and other handheld devices, and control the growth and flowering conditions.

### System requirements:

In the past, most environmental control systems of orchid greenhouses in Taiwan used PLCs (Programmable Logic Controller) with poor scalability and control, and could not be connected to the Internet for monitoring from the cloud. For advanced database analysis and networking capability, the PC platform must be adopted. Therefore, PAC Systems (Programmable Automation Controller) with both PLC programming capabilities and PC functions is a better choice. The environmental control of the Orchid greenhouse switches on and off devices like fan, shade net, cooling/heat pump, liquid flow control, water-cooling wall etc. It is controlled by a control panel of electric controllers, and is driven by a motor, to adjust the greenhouse temperature, humidity, and other environmental conditions to the set parameters.

Therefore, a PAC greenhouse environmental control system requires the following devices:

- Sensors to detect environmental conditions such as temperature and humidity inside and outside the greenhouse, sunshine, wind direction and speed etc.
- Control components to execute commands, to control fans, shades, nets, water walls, liquid flow, and other equipment.
- A control host which can analyze and compute, connecting sensors, control components, electric equipments, and office computers.
- HMI/SCADA software to input control parameters from computer, with the abilities of database analysis and remote monitoring.

### Project Implementation:

<a href="#">APAX-5520(control host)</a>	XScale CPU Microcontroller / PC-Based Controller
<a href="#">APAX-5002(module expansion base)</a>	2-slot backplane module
<a href="#">APAX-5017</a>	12-channel analog input module
<a href="#">APAX-5028</a>	8-channel analog output module
<a href="#">APAX-5045</a>	12-channel digital input / 12-channel output module

  
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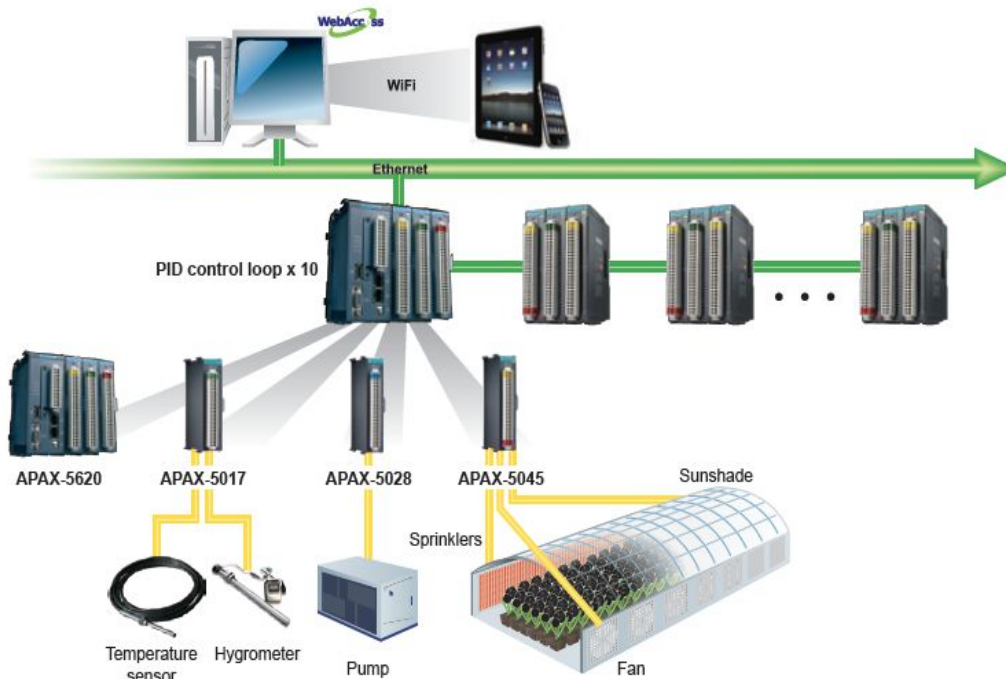




## Chatting with Chuck



## System Diagram:



## System Description:

The Forcing Greenhouse uses an Advantech APAX-5520 programmable controller as a control host to connect the APAX-5520, APAX-5017, APAX-5028, APAX-5045, and other I/O modules, to attach to the remote sensors and control components via cables, and to connect to expansion modules and electric controllers via a network cable. The above devices form a complete automation and control architecture.

With Advantech APAX controllers and WebAccess software, the staff of the orchid farm can set the greenhouse's environment control parameters with an easy-to-use graphical interface in the computer and network environment. The system automatically detects the sunshine, temperature, humidity, air circulation, and other conditions, activating control components to adjust the environmental condition inside the greenhouse to the set parameters.

For clients, the APAX-5520 control host connects to the office PC via a network cable, and connects to the cloud via wireless transmission. For monitoring orchid greenhouse conditions and data, the staff only needs to download and install Advantech App on a smart phone or iPad.

Advantech's APAX-5000 series have the advantage of saving wiring costs and being of a low cost. In the old PLC system, the control host needed several cables to connect to electric equipment in greenhouse. The wiring is quite complex and difficult to maintain but the APAX-5020 only needs one network cable to connect to the APAX expansion module and the environmental control room.

## Conclusion:

The automated greenhouse control system with Advantech APAX controllers and WebAccess software has the advantages of being low cost and high scalability. Users can easily control and monitor through a computer and network environment, and also achieve cloud monitoring.

By using an automated greenhouse environmental control system, farmers can effectively control the production period and adjust their yield. For example, when the price is expected to rise, the greenhouse's environmental conditions can be set in the forcing stage and when there is over supply, it can suppress flowering. Thus, it improves revenue and reduces loss. At the same time, the greenhouse environment controls the optimum conditions to ensure the quality of the flowers.

As well as orchids, the automated greenhouse environment control system is also suitable for growing and improving varieties of organic fruits and vegetables, increasing the survival rate per unit and agricultural economic value. With the increasingly severe climate change, extreme weather often affects harvests. The automated environmental monitoring, warning and control system, coupled with information and communication technology, can help agriculture get rid of the destiny of "relying on the mercy of Mother Nature" and to alleviate the food crisis.



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