
Press Kit

February 2005 - Report on snowmakers in Austria

Austria : Schneider Electric automates snowmakers

Located in the southern Austrian province of Carinthia, the Bad Kleinkirchheim resort has set up extensive artificial snowmaking equipment to offer skiers optimum snow and skiing conditions at all times. The core of the system is more than 150 snow hoses and snow guns supplied by the Austrian manufacturer HDP. Designed and developed by Elektro Berchtold, an Austrian systems integrator, the equipment's command-control automation system is based on Schneider Electric products and systems grouping Premium and Micro programmable logic controllers, Magelis interactive terminals and Altivar variable speed drives, all managed by a Monitor Pro supervision unit. One unusual thing about this automatic control system is that it was developed with the brand new Unity Pro software, making full use of its functionalities for productivity and open operation.

"With more than 90 km of ski slopes near Villach in the province of Carinthia, Bad Kleinkirchheim is one of the many ski resorts in Austria; its capacity of 30,000 skiers gives an idea of its popularity with visitors. Although it is usually assured of snow, the resort has set up top-level equipment for producing snow to prepare or consolidate the ski slopes. In this way, the installation of 150 snow hoses and 6 snow guns linked up to 3 water pumping stations, a compressed-air production station and 5 weather stations, all coordinated by an automated command-control system, provides top-quality extra snow allowing people to ski in the best possible conditions throughout the season," indicates Gerhard Fladenhofer, HDP's production manager. HDP (Hochdruckprodukte Maschinen based at Hönigsberg in Austria) specializes in the construction of artificial snow production systems. It leads the European market for such systems and offers complete installations in partnership with Elektro Berchtold (a systems integrator based at Pettnau in Austria) which designs and produces the automatic command-control systems.

An automatic control system developed using the Unity Pro software

"We defined the automatic control system with Schneider Electric's technicians in Vienna. Its architecture uses one Ethernet communication network linking a Monitor Pro to several Telemecanique Premium and Micro PLCs assigned to the water pumping and compressed-air production stations, and a second network comprising several Interbus-S field buses linking together the snow guns, hoses and weather stations via Momentum remote I/Os. The program was developed using the Unity Pro software, whose features include object-oriented programming. The data structure mirrors the process structure, so that blocks can be made combining several functions for processing of an object, such as management of a pump or a

compressor. This makes programming much simpler and generates productivity gains by reusing the blocks created," explains Peter Berchtold.

The principle of artificial snow production is simple. It involves spraying water droplets into air which is sufficient cold to freeze them before they hit the ground. The two systems most widely used in ski resorts are snow hoses and snow guns.

A snow hose operates by means of a high-pressure system (or dual-fluid atomization). It uses the water and air from the pumping station and the compressed-air production station, respectively. The water and air enter the hose under pressure. The water is sprayed in fine droplets due to the sudden depressurization of the air in the atmosphere. The air flow is proportional to the size of the hose's nozzle, whereas the water flow depends on a set pressure linked to the temperature changes. A snow hose usually consumes 6 to 18 m³/h of water to produce 12 to 38 m³/h of snow. It requires a 40 kW electricity supply. These fixed hoses fit well with the environment at the edge of the slopes, rather like the street lights in our city streets. A snow gun, meanwhile, is based on a low-pressure system (also called a mono-fluid system with fan generator). A mixture of air and water at high pressure is injected into a low-pressure air flow by an electric fan. This mixture passes through small nozzles and combines with the water droplets and freezes when it depressurizes. The air is produced locally by a small integrated compressor. A snow gun usually consumes 5 to 30 m³/h of water to produce 10 to 63 m³/h of snow. It requires a 150 kW electricity supply. Although they produce more snow than the hoses and are more mobile, snow guns are limited in their movements and use when the terrain is difficult.

150 snow hoses and 6 snow guns to produce artificial snow

The Bad-Kleinkirchheim resort uses both types of systems, with 150 hoses (Gemini Eco) and 6 guns (Gemini S10A), both designed by HDP. All this equipment, supplied by 3 water pumping stations and a compressed-air production station, can produce snow on nearly all the slopes (95 %). Two of the three pumping stations are each controlled by a Premium programmable logic controller linked via Uni-Telway to a Magelis XBT-F graphic terminal which handles local dialog. The third station is managed by a Micro PLC controlled by one of the above PLCs. The pumps are controlled either by Altivar 38 variable speed drives, or by traditional equipment using circuit-breakers, contactors and thermal relays. The Premium PLCs control a first set of 150 hoses and 3 weather stations via 2 Interbus-S networks using optical fiber. The data exchanged transits via Momentum input/output modules on each of the hoses and weather stations. The 6 snow guns are each controlled by a Twido nano-PLC which communicates with a Magelis terminal, on the one hand, for the local dialog, and with a third Premium PLC, on the other hand, by means of a radio link, using the Modbus protocol. This last PLC also controls a second set of 50 snow hoses, 2 weather stations and the compressed-air production station via 2 Interbus-S networks on optical fiber. The 4 Interbus-S networks have a total length of almost 10 km.

Monitor Pro supervision to manage the snow cover

The 3 Premium PLCs communicate with one another via an Ethernet fiber-optic network and with a PC equipped with the Monitor Pro supervision software, which is the foundation of the

"Snow Monitor" program developed by Elektro Berchtold. The PC, set up in the Bad-Kleinkirchheim resort's command-control room, is linked to a printer which prints the log of events as they occur and to a modem for remote access to the whole automatic control system. The supervisor is the heart of the installation; it handles overall management of the snowmaking equipment: pumps, valves and compressors; it analyzes the data from the installation and the parameters linked to the weather conditions (temperature, humidity, wind, etc.) in order to provide the operator with the information necessary to choose and activate the equipment. Screen views offer animated mimic diagrams for each of the subsets (pumping stations, compressors, locations of the hoses and guns on the slopes, , automatic control and network architectures, etc.), pages concerning alarms, faults, operating times, consumption, etc. - in other words, all the data necessary to command, control and monitor the installation.

"The supervisor can also send SMS text messages via the GSM network to notify the duty officer of any alarms or faults. The operating manager also receives this information and can take over control at any time to manage the installation remotely. On our side, at the operator's request, we can hook up to the automatic control system from our offices (located near Innsbruck in the Tyrol, more than 250 km from the resort) to access the PLC programming and diagnostic functions, view the operational log and modify the supervision application. This quick diagnostic facility helps to reduce the number of interventions on site, thus limiting down time and guaranteeing high availability for the installation," concludes Peter Berchtold.