

Artificial Snow Machines Preserve Jobs – Motor Management Controls and Protects Pump Drives



Artificial Snow Machines Application Profile

Artificial snow machines have become vital for the European skis resorts. In Switzerland, strict environmental regulations that have been in force for many years have produced systems that do not represent a hazard for the environment. The “Alpine Arena”, a skiing area in the mountains above the resorts of Flims, Laax and Falera in the Canton of Grisons, attracts thousands of skiers every day and has over 80 artificial snow machines. The engineers of the mountain railway companies responsible for them put their trust in modern motor management solutions such as the SMC Dialog Plus soft starter to control and protect the water pump drives.

The Canton of Grisons calls itself the “Holiday Corner of Switzerland” which is not surprising since tourism is the second most important branch of its economy. The main part of the tourist sector is winter sports which attract tens of thousands every year from all parts of the world to the “250 valleys”. With a net skis piste area of 800 hectares, the “Alpine



Artificial snow has become an important economic factor for European ski resorts. Weisse Arena AG, the biggest employer in the tourist industry in the Swiss Canton of Grisons, is making moderate use of artificial snow machines to keep critical sections of the piste covered. To keep the pumps going that supply the many artificial snow units, Weisse Arena AG rely on motor management technology from Rockwell Automation.

Arena” bounded by Flims, Laax and Falera is one of the best skis resorts in Grisons and one of the biggest in Europe. Nevertheless,

the relatively little snow of recent winters has often made it impossible to skis all the way down into the valleys and has produced bare

AB Parts

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Balz Arpagaus and his team can start the water pumps for the artificial snow machines in the control room. Just ten minutes later pressure is up and snowing can commence. The soft starter SMC Dialog Plus makes an important contribution to the high availability of the pumps 24 hours a day throughout the winter season.

patches on the more popular slopes. Without resorting to technical alternatives, the consequences of the absence of snow would be nothing short of disastrous for the economy of the region. Eighty percent of the holiday guests come for the winter sports. Without snow they would stay at home or go to other destinations (sunshine and seaside) and the livelihood of many would be at risk.

Moderate utilisation of artificial snow machines

Since artificial snow machines are of no detriment to the environment, the biggest employer in the Canton's tourist industry, the "Weisse Arena AG", decided to moderately deploy them in their area (less than 4 % of the pistes). The aim is to maintain the snow layer on difficult sections of the

pistes and to keep the descent into the valley open.

Air, water and know-how

Although many think otherwise, artificial snow machines are based on an entirely natural process involving the "ingredients" water and air, i.e. at air temperatures of around minus 4 °C or lower, water is simply sprayed into the air and freezes during its descent to form snow crystals. In this way, an artificial snow gun can transform 1 m³ of water into 2.5 m³ of snow. The piste maintenance service in the "Alpine Arena" has a total of 80 mobile or fixed units.

Depending on the system, the power consumption varies between 3,000 and 12,000 kWh per hectare and season (by comparison, the annual consumption of a Zurich tram is 342,000 kWh).

A demanding task for the pump control system

The water for the artificial snow in the "Alpine Arena" is drawn from a reservoir with a capacity of 57,000 m³ at 2,059 metres above sea level. Some of the pumps also supply the mountain restaurants with potable water and therefore the control and protection systems have to fulfil the highest demands with respect to reliability of supply and the protection of the installations that are mainly buried in the ground. This caution is quite justified in view of the fact that changes in the volumetric flow give rise to pressure waves in the pumps and pipes that can cause all kinds of damage such as deterioration of seals, sucking in of seals, water hammer or pipe implosions. The 110 kW pump motors are also subject to

considerable stress. The ideal drive should therefore be capable of starting and stopping briskly (water lubricated bearings), smoothly (to avoid mechanical damage), with minimum consumption of power (load on the power supply system) and under varying load conditions (varying water pressure).

Ideal solution for demanding applications

“It was clear from the outset that conventional starters and controllers provide inadequate protection against water hammer and we would have scarcely been able to handle the peak starting currents”, Balz Arpagaus, the engineer responsible for the artificial snow equipment remembered. “Although the project had already reached an pretty advanced stage, with the help of Rockwell Automation’s local agent a good solution was quickly found”, he continued. The user decided in favour of the SMC Dialog Plus soft starters that have a “Pump control” function that ideally fulfils the requirements described above.

In this mode, the device uses the characteristic of a centrifugal pump stored in its memory. The effective load conditions while starting and stopping are continuously and precisely measured and evaluated. The soft starter therefore always uses the actual pump load and speed data. The advantages of this technique for the user are:

- A signalling relay is activated when the pump reaches its rated speed
- The drive does not stop at any point on the characteristic while running up

- The soft starter switches the motor off automatically as soon as the pump slows to a standstill at the end of a soft stop
- The artificial snow machines can be started and stopped without current surges

Assurance of economic viability

It is not an exaggeration to say that the starting and control function of the SMC Dialog Plus soft starters are way ahead of their time and by protecting the user’s plant and maintaining its availability contribute to effectively assuring his economic viability. Or as the engineer responsible observes day in and day out: “It is good to be able to relax in the knowledge that I can rely on the snow machines being available when they are needed throughout the winter season. We can start the motors on the PC in the control room and ten minutes later there is enough pressure at all the hydrants to run the snow machines.”

Rockwell Automation’s motor management solutions are reliable,

they protect and switch every conceivable kind of industrial process in countless plants around the globe. Motor management is synonymous with a technology that adapts itself to the requirements of the user and measures its performance by the users’ success in business.



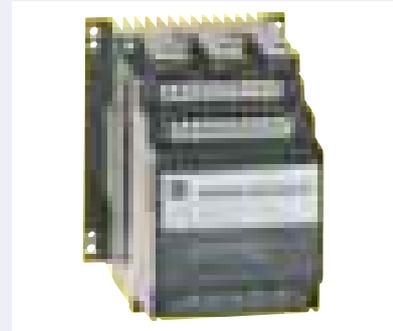
The “Pump control” mode on the soft starter SMC Dialog Plus provides unique interactive control that reduces the pressure waves in centrifugal pumps. Although smoothness of control is similar to a regulator, a speed transmitter is not required on the pump motor.



In brief

Problem: The popular Swiss skiing area “Alpine Arena” relies on moderate use of artificial snow machines to ensure that winter sports guests can enjoy their holidays. The water is drawn from a reservoir and is pumped to the artificial snow equipment. The starting currents of the pumps have to be kept to a minimum and the entire system including the pipes has to be adequately protected.

Solution: The “Pump control” function on the SMC Dialog Plus soft starter fulfils these high demands. This unique interactive pump control program was especially designed to reduce pressure waves in systems with centrifugal pumps. Although the control system operates as a regulator, it does not require a speed transmitter on the motor. From his daily experience with the system, the engineer responsible for the snow machines speaks of a “good solution” which was engineered by the system integrators without difficulty although it was already relatively late in the project.



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