



Advanced Solutions
for snowmaking

caprari

Advanced solutions for optimal, efficient snowmaking

It's called artificial snow, even though the "recipe" is simple: water, air, cold and no chemical additives. Some call it scheduled snow, as snowmaking systems start operating – often automatically – as soon as the appropriate weather conditions are detected.

One could even call it necessary snow, since today skiing and winter tourism largely depend on it. At this point it's simple reality: the white blanket covering the slopes of major ski resorts is technically produced by snowmaking systems. This because of **climate change**, resulting in a **rise in global temperatures and the reduction in snowfall**.

During the presentation of the "2022 State of the Climate Services" report, the World Meteorological Organization sounded the alarm about the consequences of global warming in the mountains and the importance of a joint effort. The trend is clear and there are several studies confirming this. These include an investigation conducted by French and Austrian researchers and published in *Nature Climate Change* in 2023. After analysing the situation of 2,234 ski resorts in 28 European countries, it was found that 53% of these resorts would be at high risk of a lack of snow in the event of a global warming of 2°C, a percentage that rose to 98% if the temperature increase reaches 4°C.

Another worrying figure concerns the thermal zero level, which 50 years ago was around 600 metres above sea level, but today, with the increasingly mild winters, has risen to around 850 metres. Not to mention the state of the Alpine glaciers, which have lost about 60% of their volume since 1850.

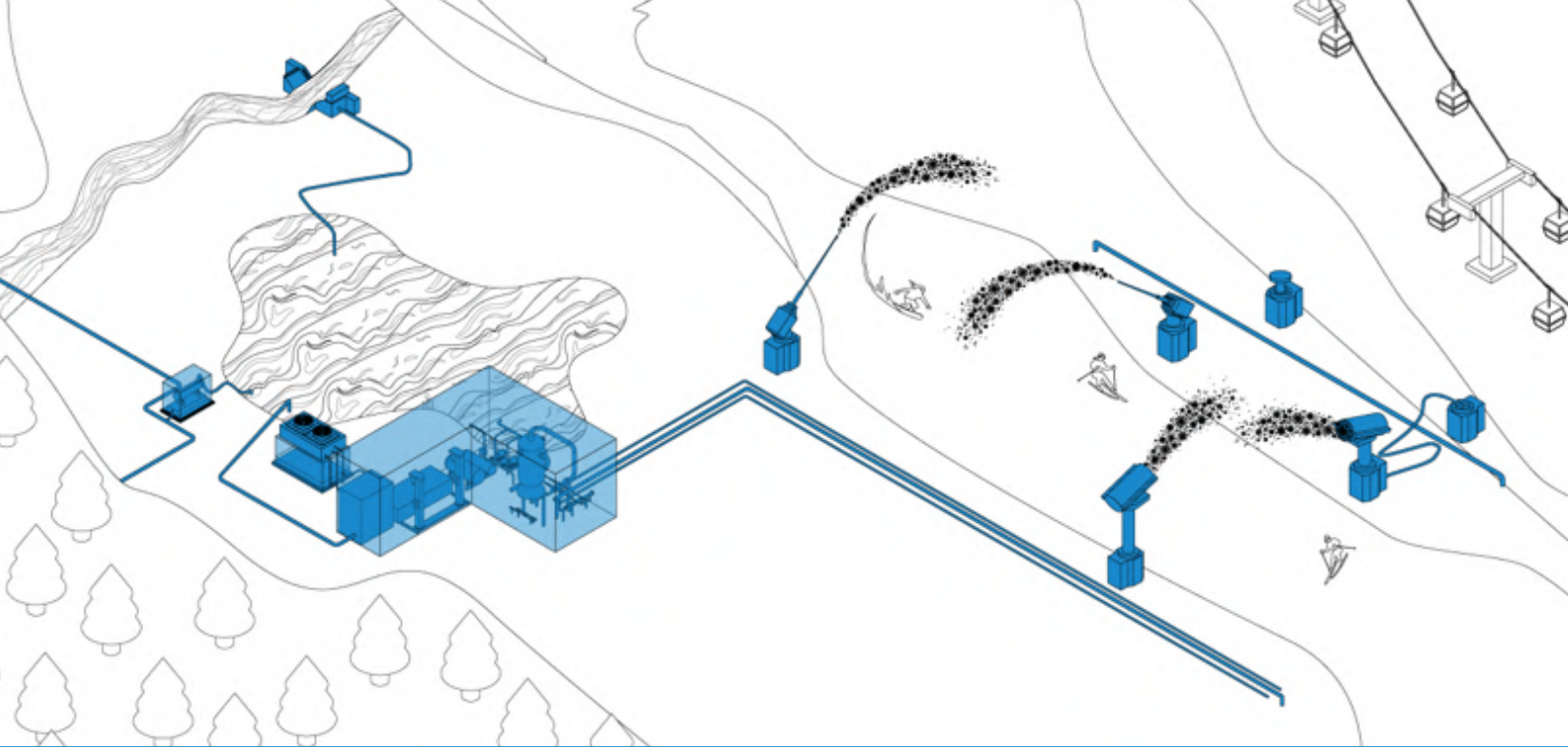
Only snowmaking can therefore provide mountain resorts with the key ingredient for winter tourism. However, there are further advantages to consider. Artificial snow makes up for the lack of precipitation, and provides a water reserve for the spring. It also protects the turf, which, in the absence of natural precipitation, would be damaged by deep freezing.

Of course the production of artificial snow requires the use of water and electricity in significant quantities. This is why it's crucial to devise an **increasingly sustainable use of scheduled snowmaking**, putting in place good practices aimed at protecting natural resources and sources of energy. For this technology can play a crucial role. The evolution of snowmaking systems, the use of increasingly high-performance components, and the adoption of forecasting and control systems make it possible to optimise the transformation of water into snow and to consistently improve energy efficiency.

HIGH MOUNTAIN AREAS WARM FASTER THAN THE REST OF THE GLOBE

Over the past 20 years, areas close to glaciers have experienced a sharp average increase in the length of the season without snow on the ground: from two weeks to one month per year.

Source: International study published in *Nature Communication*, coordinated by researchers from the University of Milan and the CNR, in collaboration with MUSE - Science Museum in Trento



The pumping station: the heart of the snowmaking system

The construction of a snowmaking system requires a tailor-made design that takes into account all variables, from the conditions of the terrain to the specific needs of the area. It's a complex system in which each individual component must be perfectly integrated with the others: pumping stations, flow patterns, water reservoirs, pipelines, cooling systems and snow generators work synergistically, in line with local conditions and snow production time calculations.

The pumping station is a crucial component in the system. It's responsible for supplying water for the entire network, and must be calibrated to provide the ideal flow rate and pressure for the specific snowmaking system deployed.

The starting point is the surface area to be covered with snow. Based on this number it's possible to calculate the volume of snow required, and consequently both the amount of water needed to produce it and the time necessary. With this information one can then identify the **right size of the electric pumps** used for the water

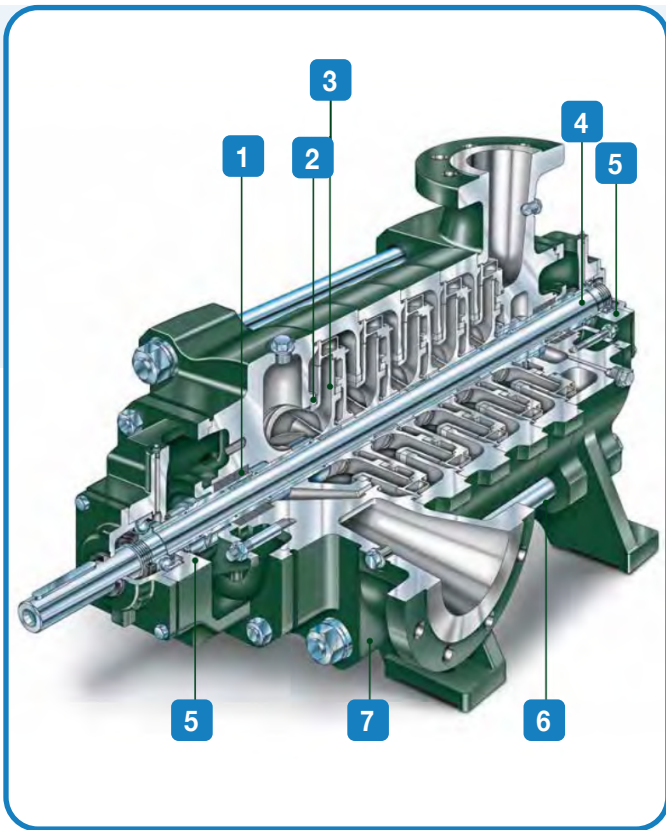
catchment and transport phase, as well as for the pressure increase.

What might seem like a simple mathematical calculation actually requires a great deal of expertise to identify **solutions** that can both **maximise performance and reduce environmental impact**.

Typically, the pumping station serving the snow guns consists of a pair of water pumps and another pair of high-pressure pumps, all with the same flow rate. However, there may be pumping stations serving large systems that require more machines. In any case, given the harsh contexts and the hours of operation, it's essential that the electric pumps – both those for catchment and those operating inside the snow cannons – ensure reliability and excellent performance. **Hydraulic efficiency** and **energy-efficient motors** are particularly strategic characteristics for this type of application. When combined with an **electronic control** of the pumps thanks to the use of inverters, it's possible to modulate the power based on actual needs, further increasing energy savings.



Advanced technology for efficient pumping stations



HIGH PRESSURE HORIZONTAL MULTI-STAGE ELECTRIC PUMPS PM SERIES

1 - LOW-FRICTION PACKING OR MECHANICAL SHAFT SEALS

Chamber size according to DIN 24960 and ISO 3069

2 - IMPELLER SEAT RINGS

Replaceable, to guarantee performance over time

3 - IMPELLERS WITH AXIAL THRUST COMPENSATION

Support protection

4 - FULLY PROTECTED STAINLESS STEEL SHAFT (UNI 2946 AND ISO 496 STANDARDISED SHAFT HEIGHTS)

Reliability

5 - DOUBLE SUPPORT

Double shaft support at both ends by means of permanently greased ball bearings, generously sized for radial and axial loads to make the machine robust

6 - DRAIN/DRAINAGE PLUGS

These facilitate maintenance and ensure durability

7 - INTAKE BODY WITH ADJUSTABLE MOUTH

Ease of installation

The pumping stations must guarantee the right pressure and flow rate for the system, but also contribute to reducing the overall operating costs.

To ensure this, Caprari can provide the **most suitable high-performance technology at all points of the system**, in the withdrawal phase as well as in the pumping and inlet phase, thanks to particularly robust and energy-efficient submersible and high-pressure pumps.

These high-pressure surface pumps and centrifuges are a true benchmark for the snowmaking sector, as well as for water purification, reverse osmosis and marine sectors. Their popularity in the market derives from the fact that they provide the **maximum that current technology can offer in terms of reliability, performance and versatility**.

The pumps are specially designed to work for a long time, even in extreme conditions, thanks to the metallurgy of their construction in terms of materials and thicknesses. This naturally minimises the need to replace worn parts. Furthermore, the **range of flow rates is broad** and available in various materials: cast iron, stainless steel and duplex. They can have two configurations, with mechanical seal or packing seal. In the former case, perfect adjustment and no leakage is guaranteed, while in the latter case ease of installation and maintenance is ensured, eliminating the risk of machine downtime.

The superior hydraulic efficiency that these pumps can boast is the result of constant research and long experience in design and construction. The strength of the series is the high BEP thanks to the optimised geometry of the impeller and diffuser profiles. The wet end is also equipped with an axial thrust compensation system that minimises wear. Vibration propagation is also very limited under different operating conditions, resulting in reduced noise, especially when several pumps are used at the same site.

It's extremely important that the pump and motor are perfectly aligned in order to operate safely, efficiently and reliably, which is why we can supply complete base units. Thanks to their unique features, our base units allow:

- ▶ The cementing of the frame to the foundation.
- ▶ A very simple pump-motor adjustment/alignment, even vertically, without the use of dedicated tools.
- ▶ The base unit does not present any obstacles when replacing the motor.

In summary, **the robust, mechanical stress-resistant structure and specific geometry make it possible to combine high efficiency and stable operation, reaching a pressure of 100 bar.**

The pumps are available with axial suction (PMA) or with suction on the top, right or left (PM series).

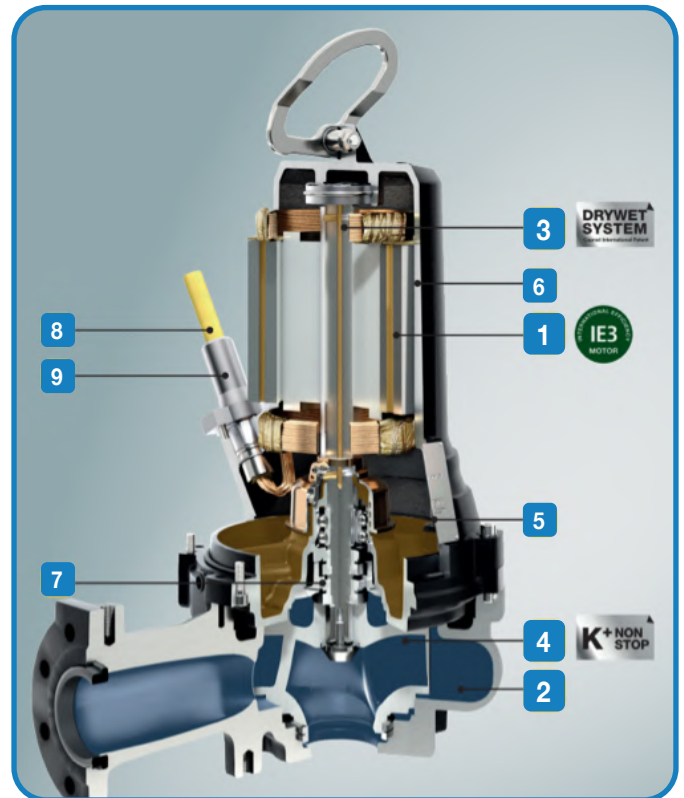
K+ ENERGY SUBMERSIBLE ELECTRIC PUMPS FOR WASTE WATER

This range is particularly suitable for water withdrawal from reservoirs. It's a wide-ranging family that allows identifying the most suitable model in terms of flow rate and head, for precise sizing to specific requirements. The distinguishing feature of these submersible pumps is their maximum efficiency, guaranteed by the **excellent quality of the hydraulics**. Furthermore, they are designed to achieve premium efficiency thanks to the **motors with IE3-class efficiency**.

As pumps are also used to convey waste water containing gases and solids, they are particularly **robust and reliable even in heavy-duty conditions**. Moreover, the presence of the patented "Dry Wet" cooling system has several advantages, as it allows use in both tanks and dry chambers, requires no additional maintenance and doesn't consume any energy to boost pump performance. Installation is also easy thanks to the pump's **compact design**.

The electric pumps are available in the single-channel impeller variant (KCM series), the vortex impeller variant (KCW series), the multi-channel impeller variant (KCD series) and the high-efficiency two-blade open impeller variant (KCA series), which guarantees an efficiency of more than 80%.

QUALITY
RELIABILITY
INNOVATION



1 - IE3 ENERGY EFFICIENCY CLASS

- ▶ High electrical efficiency
- ▶ Reduced energy costs

2 - HIGH-EFFICIENCY PUMP

- ▶ **Painted surfaces:** optimisation of hydraulic profiles with maximum finishing level

3 - OIL COOLING SYSTEM

- ▶ Standard on all models
- ▶ S1 operation in dry chamber
- ▶ Tank/catchment basin operation with uncovered motor

International patent

4 - ANTI-CLOGGING SYSTEM

- ▶ The widest free passages on the market
- ▶ Maximum operating safety

5 - CONDUCTIVITY PROBE IN THE OIL CHAMBER

- ▶ Standard on all models, including ATEX version
- ▶ **Motor protection:** an alarm signal is output to the panel in case of failure of the first mechanical seal

International patent

6 - CLASS H ELECTRICAL INSULATION

- ▶ The best resistance to thermal changes (up to 180°C)
- ▶ Longer service life of the motor

7 - DOUBLE MECHANICAL SEAL

- ▶ Double protection of the electric motor
- ▶ **Commercial type seals:** easy to find
- ▶ **Ease of access:** no need to remove the motor to change the seals

8 - NSSHOU-J DOUBLE SHEATH CABLE

- ▶ The best resistance to liquids containing chemical agents and oils
- ▶ The best mechanical and thermal resistance

9 - EASY MAINTENANCE CONNECTOR

- ▶ **Easy to disconnect and lower maintenance time:** the electric cable can be unplugged from the pump



PRODUCTS AND SERVICES

The potential of a winning combination

Thanks to the trust of our customers, today we're present in the world's major ski resorts.

Snowmaking systems are complex mechanisms, both in terms of design and implementation. They require the synergy of a variety of skills and knowledge: chemistry, physics and thermodynamics, electrical engineering, electronic engineering and automation, and of course hydraulic engineering.

That's why we combine the **know-how** and the **expertise** we've acquired over the years with the aim of being not just a supplier but a reliable, authoritative partner for our customers. This has allowed us to supply electric pumps for snowmaking throughout the Alps and in several Central European countries, as well as being part of major projects such as the indoor ski slope in Dubai, which is the largest in the world, or the Winter Olympic Games held in China in 2022, during which our products were used to produce snow for the many ski runs and facilities for other

disciplines such as the biathlon. We have participated in a wide range of projects over the years, all testifying to a know-how and flexibility that make us the gold standard in the industry.

Thanks to our customised, efficient solutions that are totally made in Italy, we are an excellent partner for **OEM companies** in the snowmaking industry. We operate worldwide, providing a complete service from product engineering to after-sales.

Whether powering **snow cannons and lances, indoor stations, snow production systems or artificial snow production for snow rooms**, our pumps always guarantee high performance, maximum process control and efficiency and low maintenance. Each product can be made to the customer's specifications, from customisation of the materials, labels or colours to the total redesign of the machines.





MAXIMUM SUPPORT

We have an approach focused on the customer that translates into a complete service from product engineering to after-sales.

We are fully engaged at every step of the system's development and implementation, and this is our added value:

- ▶ Design consultancy.
- ▶ Management of assembly and supervision of the installation, for turnkey commissioning.
- ▶ Classic and digital support models that ensure timely responses, efficiency and continuity of service.
- ▶ Repairs and maintenance on site and in the workshop.
- ▶ A specialised training service available at the Caprari Training Center in Modena and online via the Pump Pro Academy, a digital suite accessible 24 hours a day to provide constant learning.
- ▶ A global network of subsidiaries, specialised partners and distributors, able to efficiently and professionally meet all our customers' requirements.

▶ Technological innovation to contribute to higher snow quality and increasing energy savings.

▶ Ability to provide both standard and customised solutions during the design stage.

▶ Excellent product lead times, for fast deliveries worldwide.

▶ Support of qualified technicians and immediate availability of original spare parts.



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