

Snow NEWS

WINTER 2013-2014



ENGINEERING: DOING THINGS YOUR WAY

**NEW PRODUCTS: TWO BOLD
NEW MOUNT DESIGNS**

**CUSTOMER STORIES: ROSA
KHUTOR - A BEAUTIFUL SUCCESS**

**TECHNOLOGY OF SNOW: ADVICE FROM
OUR EXPERTS AT SMI SNOW UNIVERSITY**

**AUTOMATION: SMI SMARTSNOW 6.0
SIMPLE, RELIABLE & RESPONSIVE**



Joe VanderKelen
President, Snow Machines, Inc.



EDITORIAL

SMI offers the widest variety of snow machines and mounts at strong value. SMI products are rugged, durable and have low

The snowmaking market has experienced significant consolidation over the past two years. SMI has remained financially strong with

SMI is the oldest snowmaking company now at 39 years old and going strong. So you can be confident with SMI over the next 39 years.

maintenance costs. We hope you will consider our 25-year product life span as your snowmaking choices are evaluated.

SMI's recent technical innovations and improvements are many, including our new Delta mobile chassis, Omni portable tower, 10" climbing with 359 oscillating tower, new SmartSnow 6.0 software, and a redesigned Viking V2 head and automatic package. Visit our website at snowmakers.com to explore the possibilities.

a growing global market share. Our products and conservative business approach continue to have solid fundamentals. SMI is the oldest snowmaking company now at 39 years old and going strong. So you can be confident with SMI over the next 39 years.

We thank our customers for your loyalty and support and look forward to continuing mutual success.



Contents

Engineering: Doing Things Your Way 3-6

New Products: Two Bold New Mount Designs 7-8

Customer Stories: Rosa Khutor - A Beautiful Success! 9-12

Technology of Snow: Your Degree for Quality Snow 13-18

Automation: SMI SmartSnow 6.0 19-22



DOING THINGS YOUR WAY

(using our perspective)

The SMI Engineering group has several responsibilities within the SMI Snowmakers group. Engineering designs and tests new and custom equipment, and generates product manuals and parts lists for our equipment. Engineering also assists with Snowmaking Master Planning by developing mapping solutions.

SMI has been using 3D CAD (computer-aided design) for over 5 years now and the benefits are many. 3D CAD allows us to model equipment and evaluate it on the screen before cutting a single piece of material. Using 3D CAD tools, we are also capable of determining stress conditions, adding motion, and generating dimensional drawings for manufacturing and exploded views for production and customer parts manuals. The visuals are most impressive! And the stories we can tell now are much more powerful.

In recent years the SMI Engineering group introduced the Puma Snowmaker, the Axis SnowTower, the improved Viking V2 SnowTower, the SMI Swing Arm Tower for Puma and PoleCat series fan snowmakers, the 359° (Programmable) Oscillation Carriage and Tower for PoleCat and Wizzard series fan snowmakers, multiple Vault Mounts and Lids for LowE Sticks and Fan Snowmakers,

a re-designed Hydrant Actuator for automated equipment, and several additional features and options, along with lots of custom solutions.

And we're not about to stop now. Our products will continue to be innovative, dependable, user friendly, and energy efficient, as they have always been. It is SMI Engineering's responsibility to educate our customers to what is new, what has changed, and

how to properly maintain and operate our equipment. We also listen closely to customer feedback and ideas on improvements to our products from the users of our gear.

Last summer, SMI Engineering launched two new platforms that can be used with PoleCat Series Snowmakers. The "Delta" Chassis is a triangular shaped chassis developed for easy lifting with a groomer.

Its shape allows the machine to be picked up from three sides. The chassis is based on the 359 Oscillation design, but can also be purchased without oscillation. Non-oscillation units can still be re-oriented by lifting a handle and rotating the unit to the pick position. The original design was developed at a customer's request to provide a tighter package with lower COG. The customer required the design be easy to pick up and set down (with a groomer blade) on steep slopes. Long stroke jacks are used to provide leveling on steep terrains. SMI Engineering further developed the product to make it better suited to more customers.

The "Omni" Mount was also developed to fit a customer need for a portable tower. This design was originally developed for the Puma Snowmaker, but now also fits the Polecat family. The design features a portable tower concept that can be transformed into a mobile wheeled machine. The frame nests into the tower and is retained with pins. Change-over from carriage to tower (and back) is tool-less. Both of these product concepts were viewed as successful, so SMI is rolling them out to offer to other resorts in 2013.

SMI Engineering has also made several subtle changes to the PoleCat

product line. We have developed new nozzle configurations implementing our existing nozzle design. The configurations use more flow steps to produce drier snow at marginal snowmaking conditions, yet still provide maximum performance in cold temperature snowmaking. Pressure control at the hydrant allows us to manage flow rate in even more steps with automated controls.

An automated Super PoleCat also now features our color touch-screen HMI (Human Machine Interface). This color HMI is standard on all automated stand alone equipment. The user-friendly and common sense HMI was introduced across our automated product line based on its success on our Puma snowmaker.

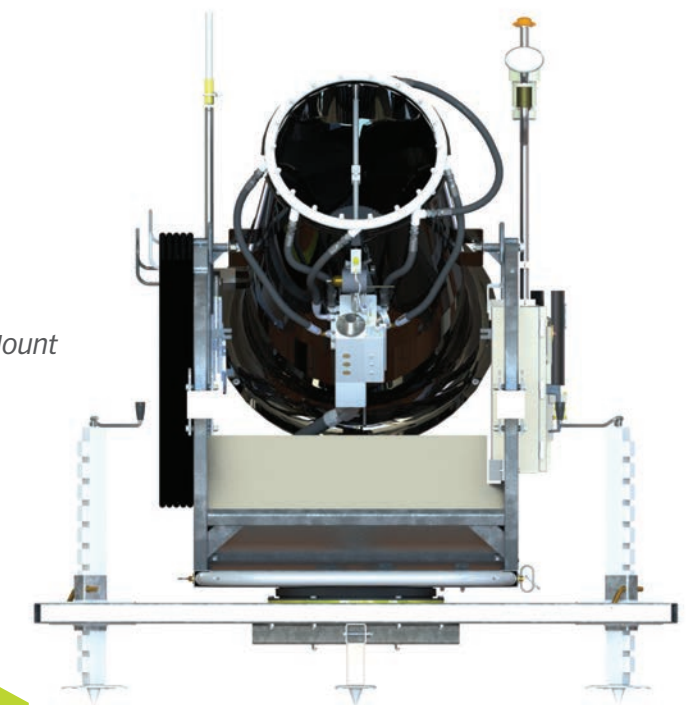
The Super PoleCat is now available with programmable 359 Oscillation and an electric head jack for vertical adjustment. If you prefer to dress up your Super PoleCat or Standard PoleCat, SMI also offers a fan shroud cover that mounts to the exit of the fan. The design adds a cleaner look to the machine while still allowing easy access to key components for maintenance and trouble shooting. There is no need to remove the cover for machine adjustment. The fan shroud is an optional feature and is not required to protect hoses or heaters or make the machine look complete.

SMI Engineering will continue to work with our customers to provide the best energy conscious snowmaking solutions available. It is our belief that we have a product that suits every need from basic manual snowmaking to fully automated equipment with several add-on options. We are improving at letting you know all the different versions of SMI products available today. We offer many flexible and custom solutions for you. It is not just one way with SMI. We have many ways to offer you value and unique concepts. Feel free to contact us today. We would be happy to discuss all of our snowmaking solutions with you or work to develop a new solution that best suits your needs.

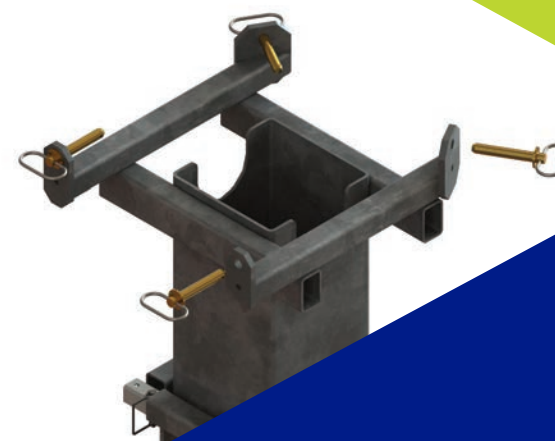
Bob Abraham, SMI Engineering



Delta HD Mount



Omni Tower Mount



If you have ideas, comments or questions, email Bob and the engineering team at bob@snowmakers.com

Our engineers are from diverse backgrounds, but share the same passion for and understanding of the snowmaking experience.

ENGINEERING TEAM

TWO BOLD NEW MOUNTS

SMI engineering has launched two new platforms that can be used with our PoleCat Series Snowmakers—the Delta and the Omni.

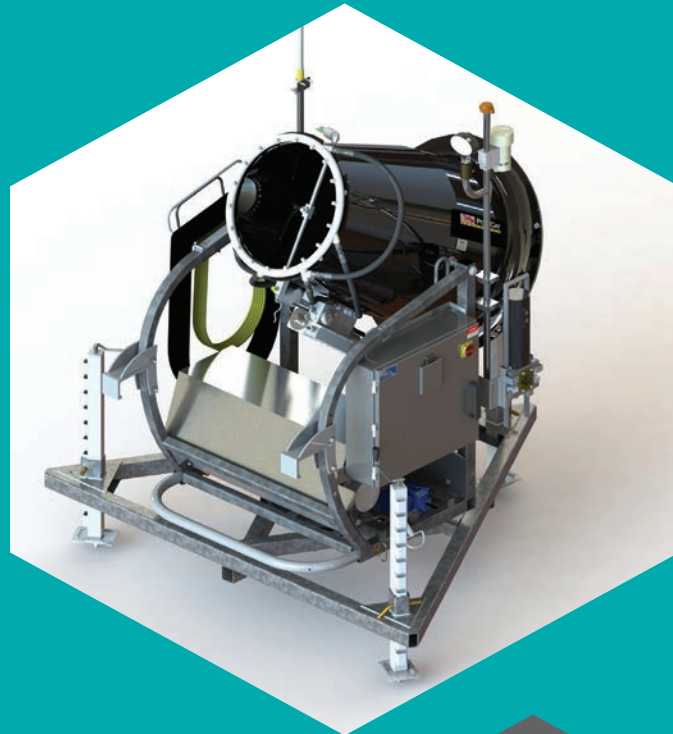
Delta Mount

1 The Delta is a triangular shaped, extremely light chassis developed for easy lifting with any groomer machine. Its shape allows the snowgun to be picked from any of the three sides, making it convenient when the carriage gun needs to be moved or picked up out of the snow. It allows an easy approach from any side. The chassis is based on the new 359 oscillation design, but can also be purchased without the oscillation upgrade.

Non-oscillation units can still be re-oriented by lifting a handle and rotating the unit to the pick position. The original design was developed at a customer's request to fit a specific need and our engineers and R&D teams immediately saw the need to offer this product. SMI engineering further developed this product to make it better suited to more customers worldwide!

Delta Mount main characteristics and features:

- Provides major flexibility and extreme height adjustment
- Center of gravity closer to lifting brackets for easier transport
- Ideal for constantly changing snow levels
- Extra portability without the need for wheel assemblies
- A-frame shape
- Longer strokes jacks/legs
- Compatible with the PoleCat

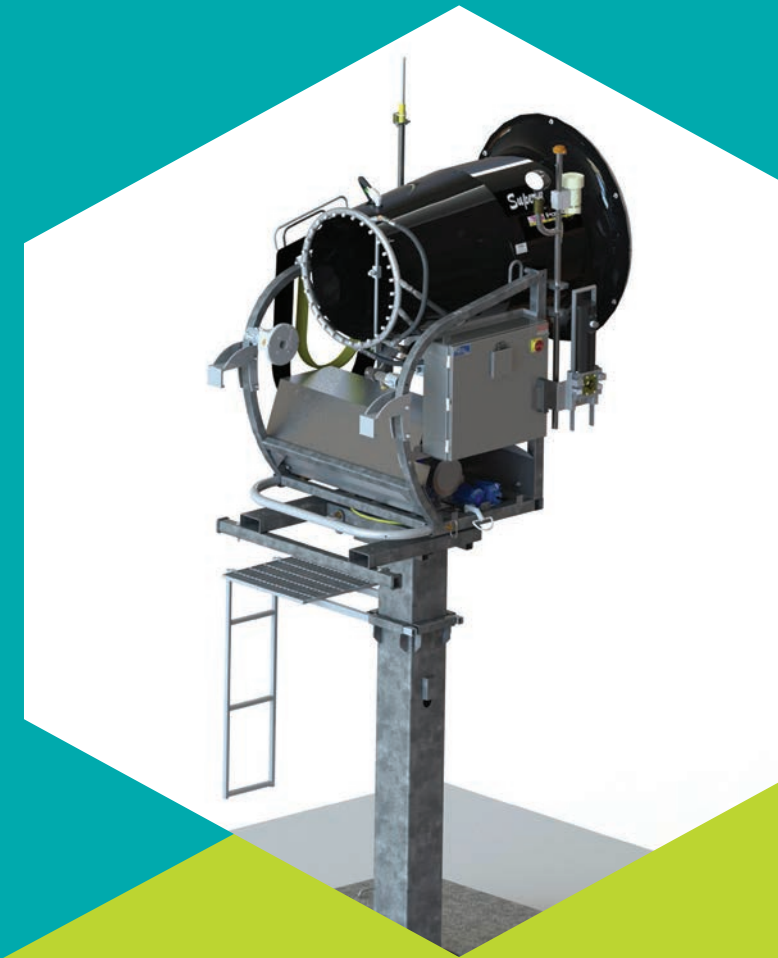
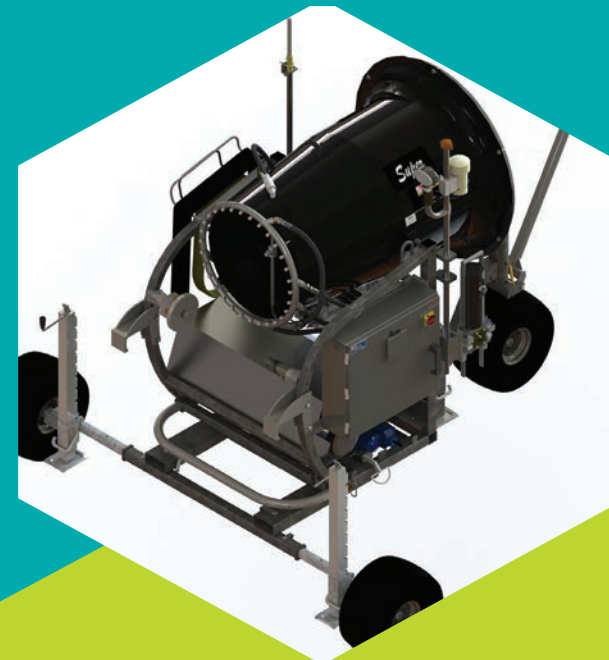


Omni Portable Tower Mount

2 The Omni portable tower mount was also developed to fit another customer's need for the Puma Snowmaker. It features a chassis that can be used as a portable, rolling frame that transforms into a tower mount. The wheels, jacks, and lifting bracket (Puma) are easily removed from the frame. The frame nests into the tower and is retained with pins. Change over from carriage to tower (and back) is tool-less meaning it can be done in only minutes!

Omni Portable Tower Mount Features:

- 360 rotation
- Removable lifting bracket with reinforced legs
- Fork pockets (with lifting bracket removed)
- Tool-less removal of front and rear axles
- High lift rear jacks
- Dismountable wheel assembly (without removing jacks)
- 90° swivel with spring loaded drain valves
- Hydrant actuator and drain block mounts
- Removable HMI display
- Compatible with the PoleCat and Puma



For more information please visit snowmakers.com or contact us at +1 (989) 631-6091

NEW PRODUCTS



A BEAUTIFUL SUCCESS:

ROSA KHUTOR, RUSSIA

Until some years ago, Sochi, Russia was known only as a fun beach town, full of palm trees, holiday homes, nice beaches, sand...Oh, and bikinis. But as crazy as it sounds, for two weeks this same location will become heart and home to thousands of Winter Olympic Athletes from five continents.

Everything has been carefully planned: like the shell's lining the sea side of the Olympic Stadium built for 40,000 people, and the walls and roof as one continuous glass surface designed to reflect sunlight off the sea during the day. The bowl opens to the north, allowing for a direct view of the Krasnaya Polyana Mountains, and the upper deck opens to the south, allowing for a view of the Black Sea during the games. Beautiful!

Transportation to the events will take less than 20 minutes aboard a high-speed train going from the new state-

of-the-art Sochi-Adler airport to the mountain cluster. This train follows the bed of the Mzymta River up to the village of Krasnaya Polyana with fewer than 5,000 inhabitants. There are many major hotels in this mountain area and much of the Olympic Village can be viewed along this new train and highway route. From the sea

up to the totally new Alpine Villages, there are upgrades everywhere!

From Krasnaya Polyana skiers can take a high speed new 3S gondola that goes from 590 meters to 1170 meters. In just one hit, it takes you directly to the doors of paradise, where the Men's and Women's downhill events will be held.

Imagine you are on your skis, less than 30 minutes away from that famous beach town mid way down the black sea. From there you can take the Caucasus Express Gondola and keep going up to the very top of Rosa Khutor ski fields. In every direction, you can enjoy fantastic sea views

and all the green subtropical forest that lies between 2,320 of altitude to the Black Sea.

The resort is surrounded by the steep pointed beautiful Western Caucasus' peaks, with lots of chutes, wide long slopes and impressive big vertical. The design and development of the resort has set high international standards for a new world class resort including environmental aspects, energy loads, Russian Architecture and local materials, blended with modern technology and of course world-class snowmaking.

Nothing has been left to chance, including the snow! The resort has very marginal snowmaking conditions due to its southerly location and prox-

imity to the Black Sea. These conditions required the best snowmaking technology in the most powerful system available.

Finding a plentiful, clean source of water was a key aspect of the solution. Past Olympic experience was important with regards to getting big systems built on time and on budget.

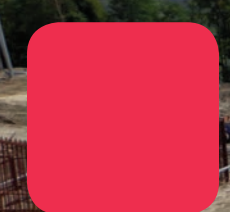
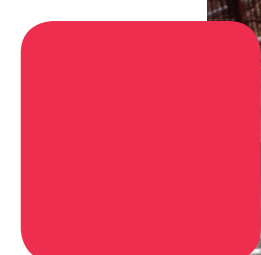
Both the snowmaking design and the owner objectives were extremely challenging. Only SMI and its exclusive Russian partner, Samara based Skado, had the capacity and experience for the job.

The system includes more than 130 hectares, and 35 km of some of the most exciting slopes on earth, with 1400 m of vertical, and two reservoirs holding over 150,000 cubic meters of pristine water, with around 46 cubic meters per minute of water capacity (12,000 gpm), half of which is cooled, and strategically placed 359 SMI Super PoleCats and Puma towers, 22 Super PoleCat and Puma swing arms and 22 radio portable Pumas for a total of 450 snowmaking stations, all of this

working through a fiber optic backbone and the latest SMI SmartSnow 6.0. The system is fully automated and controlled from a NASA style snowmaking control room, next to pumps with thousands of horse power cranking hard.

In 2012, after only a few years, this whole system was fully tested and up and running perfectly. Rosa Khutor's snowmaking system is arguably considered by many, to be the greatest modern snowmaking system ever built, and here at SMI we have no doubt about it.

SMI is once again proud to be a key contributor to another great Olympic venue.





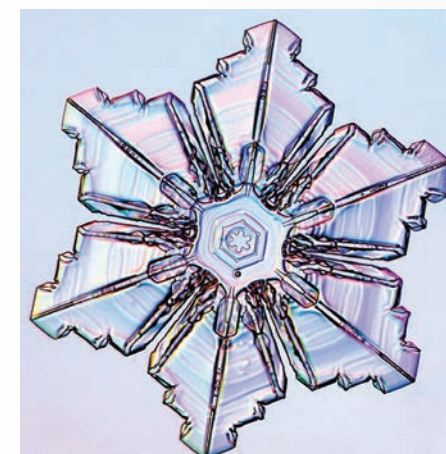
SNOW UNIVERSITY

YOUR DEGREE FOR QUALITY SNOW

In this new section we are sharing all about Snowmaking as a really cool science with both technical and practical information. Here you will be able to find expert advice from our SMI technical support team evolving

Snowmaking is a really cool science.

from our Research and Development center in Midland, MI, as well as the invaluable input from skilled resorts from five continents. Using the most variable conditions, we have found a way to create a practical interaction



between science, theory, facts and real life on the slopes.

We are proud to introduce Baltazar Sanchez, an avid skier and fanatic snowboarder, who has many years of snow management experience in hundreds of ski resorts in Australasia, Asia, Europe and the Americas. He brings perspective from both the resort operations and vendor context with cool info about natural and machine made snow, snow depths and snow curing.

What exactly is natural snow?

Snow crystals form in the atmosphere and continuously grow by absorbing surrounding water droplets. The snowflakes we end up seeing on the ground are an accumulation of hundreds of these ice crystals. As we all know, snow forms when the atmospheric temperature is at or below freezing (0° Celsius or 32° Fahrenheit). These growing crystals typically pass through numerous atmospheric strata as they fall to the ground.





These ice or snow crystals can still reach the ground when the ground temperature is above freezing if the conditions are just right. In this case, snowflakes will begin to melt as they reach this higher temperature layer. Right. Nothing new here at all, BUT... this melting process creates a heat exchange, or evaporative cooling effect which cools the air immediately around the snowflake creating a chain reaction and a Nano climate around the melting flake, helping the surrounding ice crystals to remain solid, even when the initial ambient temperature near the surface is above freezing. **Aha! And here's where SMI's decades of research and understanding pay off. Our snow machines replicate this whole natural heat exchange mechanism and are able to make snow even at very marginal temperature conditions with high humidity as well.**

Once natural snow is on the ground, then the type of snow accumulated on the surface will depend on the original form of the snowflakes collapsing against each other. Then they will start changing based on the weather conditions present along the dynamics within the snow depth. These snow/ice crystals constantly change in shape daily and weekly as the snow falls, even if temperatures are constant and the conditions ideal for the snow to be on the ground. We call this snow metamorphosis.



For example, when a snowfall is accompanied by strong winds, the snow crystals are broken into smaller fragments that can become more densely packed.

After a snowfall, snow may stay, melt or even evaporate/sublimate, or if temperatures are constant and cold it will persist for long periods going through this unstoppable metamorphosis process. So if snow isn't affected by external factors while on the surface or in the pile, the texture, size, and shape of individual grains will change. Even ice crystals will round on the edges, link to each other, fuse, maybe refreeze as a whole and eventually separate again close to the warmer spring weather, resulting in what it's commonly known as corn snow. They could even be re-compressed by new snowfalls and it is this compaction force that can cause the flakes and grains to fuse and can even lead to the formation of glacial style high density blocks of ice.

Machine made snow generally goes through exactly the same process with the difference being that the snow crystals are not linked to each other as they have no dendritic arms. So machine made snow generally has a stronger resistance to outside factors due to the differing crystal count per square inch and the lack of air pockets. And thus machine made snow lasts longer than natural snow.



Over the winter season, the snowpack typically accumulates and develops a complex layered structure made up of a variety of snow grains, reflecting the initial snow produced by the weather and climate conditions prevailing at the time of deposition, as well as changes within the snow cover over time.

After years of research and investigation of the hardest conditions on the

When nature doesn't provide the natural snow needed to open or operate the slopes, SMI snowmakers take over!

planet and at our advanced SMI R & D campus, I would like to suggest some practical advice, like "Let it snow," of course! But we also highly recommend leaving snow in piles until ready to push out, and then to compact and groom this fresh snow to maintain the snowpack much longer! And if the temperature allows it, make some SMI machine made snow on top of those fresh natural snow flakes to mix in and provide the best possible quality to secure that all skiers and riders will enjoy the product for many weeks. Please note that snow management is very dependent on weather variables and the best snow surface providers react daily and even hourly to

weather events and know when to touch and not touch snow and how to manipulate it to provide the best conditions possible.

So exactly what is Artificial or Machine Made Snow?

Here at SMI we do not like to use the term "artificial snow" as it is not fake or imitation snow. Our machines make the real deal and it is excellent qual-

ity - perfectly sized and compacted machine made snow. We have gone one step further and sometimes call it SMI Snow when referring to our high quality machine made snow.



As a matter of fact, many ski areas using SMI's equipment can convert over 5,000 gallons (18,900 liters) per minute of water into SMI Snow. This is 20 tons per minute or 1,250 tons per hour. Or stated another way, more than a full truckload every minute! That is a lot!!

When nature doesn't help by providing the natural snow needed to open or operate the slopes, SMI snowmakers take over! Given enough water, energy, and the right temps SMI Snowmakers can make snow.

SMI Snow is nothing other than small particles of snow crystals. Our snowmaking machines make snow by breaking water into small particles. Heat is then removed from this water by evaporative and convective cooling and released into the surrounding environment.

This heat exchange, similar to what occurs when natural snow evaporates, creates a micro-climate inside the snowmaking plume, blown by our

powerful fans and advanced barrel design or via gravity in our sticks. We keep the micro-climate acting and reacting at its best and inside this environment it can be very different from ambient conditions where no evaporation, heat exchange or snowmaking is happening.

Really dry snow can be produced with our equipment that is immediately skied while the slopes are open too! This very dry and totally frozen snow is 100% frozen within seconds of leaving the snowgun.

Automation can also help to achieve the highest production, with the best quality in no time!

Continuing with the SMI Snow process, this cooled water then starts to freeze and by nucleating the water particles coming from the nucleating nozzles (we will go more in depth about this in future articles) snow crystals are produced, which with our powerful fans and modern up to 359

degrees oscillation can then be distributed equally on a surface creating an evenly spread snow whale, long and wide instead of a higher but narrower and shorter whale where curing takes longer and becomes harder to groom. Our Viking and Axis products tend to work more with gravity and the natural winds available.

What is Snow Curing?

Snow is typically produced and temporarily stored in piles to allow the water droplets time to thoroughly freeze and/or drain any excess water

to make the snow whale lighter and drier. It is like some snow is only frozen like an egg shell and it takes time to freeze 100% of the total droplet. So most resorts prefer to leave snow in piles for 8 to 10 hours before pushing them out. Yet really dry snow can be produced with our equipment that is immediately skied while the slopes are open too! This very dry and totally frozen snow is 100% frozen within seconds of leaving the snowgun.

What's the right depth for Snow on the slopes?

Many snow fanatics from all over "Planet Snow" ask us repeatedly what should be the right initial snow depth to open a slope and why. Well the air temperature above the surface controls the snow surface temperature - pretty logical! So the colder the air above the surface, the colder the snow layers near the surface will be, especially within the top 30 to 45 cm (12 to 18 in). The ground is relatively warm given that the latent heat stored in the earth over the summer is slow to dissipate. In addition, snow is a good insulator, just like the insulation in the ceiling of a house, and thus slows down the flow of heat from the warm ground to the colder air above. Another important factor is your terrain and surface. Most are not like the volcanic rocky slopes of Whakapapa, NZ, where two meters on average is needed to open and cover up the

huge lava rocks. Others may be like the perfectly grass mowed silk carpet slopes of Konjiam, Korea, where one could slide perfectly with about 20 cm of depth. In general, depths will vary between 30 cm (+12") to 50 cm (20") of SMI snow to be able to better maintain and preserve pristine snow during the opening while adding depth to protect the whole season. The goal is to create the optimal layer and depth to protect your season.

What is snow-water equivalent?

To finish, Balta would like to quickly introduce Snow-Water Equivalent, another cool topic which we will explore further in a future Snow University article.

We have said that natural snow is composed of many frozen water crystals linked together, but because there is so much air surrounding each of those tiny crystals in the snowpack, most of the total volume of a natural snow layer is made up of air, as it's easy to see by only pressing with one's foot and compacting the pack by sometimes more than 90%! We refer to the snow water equivalent of snow as the thickness of water that would result from melting a given layer of snow. An often-repeated assumption for natural snow claims a

ten-to-one ratio of snow to water, but that is not always accurate. The water equivalent of snow is more variable than most people realize. The majority of new snowfall in the United States contains a water-to-snow ratio of between 0.04 (4 percent) and 0.10 (10 percent), depending on the meteorological conditions associated with the snowfall. It depends on your geography, elevation, position near large bodies of water, and other variables.

But when we are talking about SMI's machine made snow, the ice crystals formed are not linked between themselves before touching the ground, resulting in a highly compacted yet dry, pile of great quality snow. The compaction ratio is generally less than 20 percent and has a water to snow ratio of 30 to 40 percent, in other words 2 ft. (61 cm) of SMI's snow equally spread on the ground can be even more beneficial for your ski slopes than 8 ft. (240 cm) of fluffy new fallen snow yet to be groomed.



For more information or comments about this and other interesting snowmaking information about density and other up to date advanced topics visit snowmakers.com If you are interested in more info about a specific topic, would like to comment or have something to share, please forward any comments and ideas to snowuni@snowmakers.com



Baltazar Sanchez
International Commercial Director



AUTOMATION



SMARTSNOW 6.0 SIMPLE, RELIABLE & RESPONSIVE

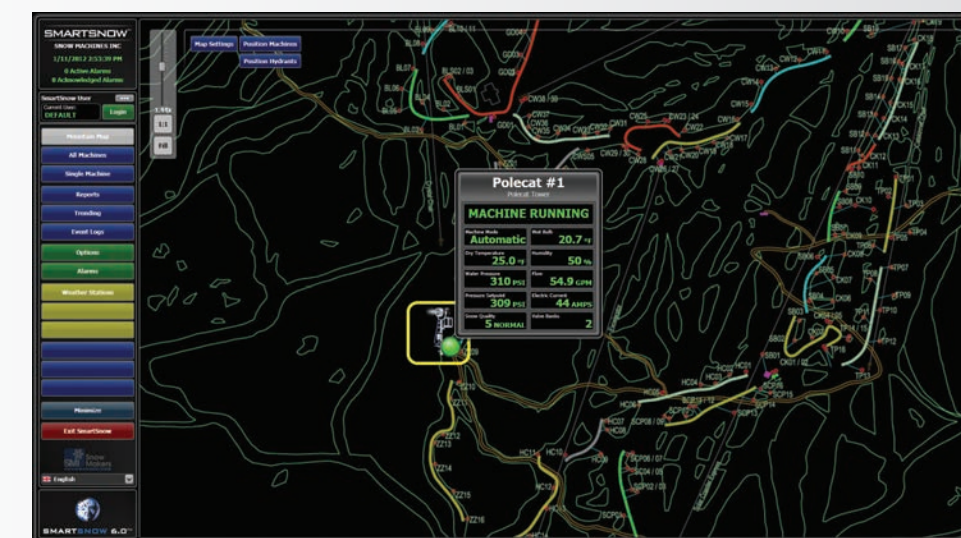
Few things in this world compare to hitting the slopes after a night of heavy snowfall. With fresh powder blanketing the mountain, and it is though the pistes are just waiting for you. These are the days we relish; but unfortunately, weather patterns are far too irregular to depend on. It is therefore essential that a winter resort identifies its unique environment and devises techniques to overcome the challenges presented each season.

Ensuring adequate snow coverage is one of these challenges, and possibly the most vital. Snow is a ski resort's most valuable asset.

For the past twenty-three years, SMI has been on a mission to enhance automatic snowmaking capabilities at ski resorts around the world. Like all great technological advances, snowmaking automation has transitioned from a chic extra to an industry-wide necessity. Since its inception, SmartSnow has been a key to this mission and the newest version, SmartSnow 6.0, is specifically focused on simplifying

mountain operations, managing valuable resources, and analyzing critical data.

Primarily, the software platform is designed to be reliable, responsive, and easy to operate. Upon logging in,



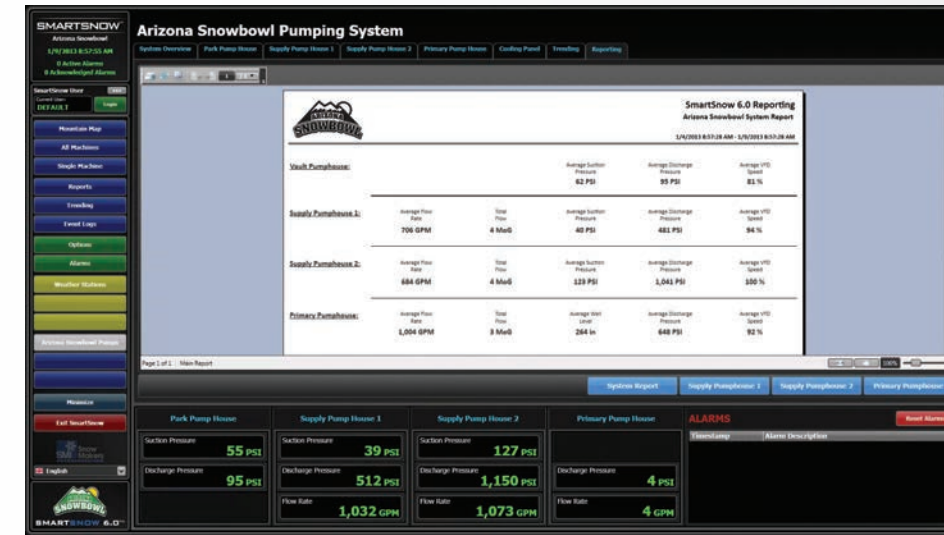
the user has immediate control over all mountain operations. Also, the new 1080 pixel HD design makes viewing the mountain map more enjoyable than in previous versions. Users can easily zoom in and create custom, pre-set views of specific regions, slopes, or machine groups. At the Rosa Khutor

snowfall, snowmaking will always be affected by a number of weather elements. Wet-bulb temperature is perhaps the most significant of these, and this ultimately dictates whether or not snowmaking is possible. Wet-bulb temperature is largely determined by the actual air temperature (dry-bulb temperature) and humidity. Essentially, it is the temperature felt when the

weather data in order to produce the desired quantity and quality of snow. By means of a combination of real-time weather trends and historical reporting, the system is able to create a precise representation of the weather's effect on the snowmaking system.

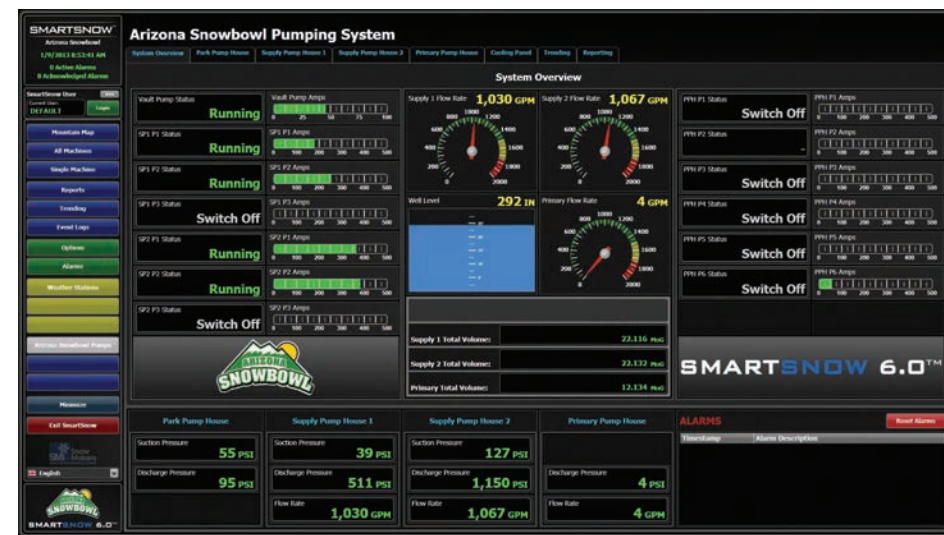
Managing, allocating, and reducing the use of limited resources is a chief concern for winter resorts. The challenge is to produce the highest quality and quantity of snow, while simultaneously minimizing overall resource consumption. The owners of Arizona Snowbowl considered this to be a determining factor when planning their new fully-automated snowmaking system. Due to the scarcity of water in the region, water is pumped fifteen miles (24 km) from the city of Flagstaff to a mid-mountain snowmaking lake. The system's three pump stations and twenty-five fully-automatic Super Polecats are controlled by SmartSnow 6.0.

The new software platform is also engineered to facilitate data collection, management, and delivery. The system constantly monitors data such as machine and system flows, energy



consumption, and run hours. As such, historical reports containing system-wide totals, individual machines or pumps, and comprehensive weather

SMI strives to empower their users, not limit them. By providing the freedom to tailor many configuration parameters, users can maximize over-



Our software is simple to use, reliable, and very responsive, making it the preferred choice of Olympic Venues and the world's leading winter resorts.

which will host the Sochi 2014 Winter Olympics, SmartSnow 6.0 is being used to monitor system-wide operations and 450 snowmaking stations on two 42" HD displays.

skin is wet and exposed to moving air. SmartSnow 6.0 and its associated network of weather stations and snow machines are constantly monitoring, processing, and transporting current

Although snowmaking automation reduces dependency on natural

For more information or comments about SmartSnow Automation software and control, visit snowmakers.com




data can all be generated and printed or exported instantly.

Furthermore, the system has a built-in, multi language feature that enables users around the world to easily alter the language of their software program without restarting.

all snow production while respecting their unique environmental conditions. SMI has designed the software to be reliable, and very responsive, making it ideal for Olympic Venues and other leading winter resorts.

Dan Paris, SMI Automation





PERFECTLY
**WEATHER
PROOF™**

WEATHER IS THE BIG VARIABLE IN THE MOUNTAIN RESORT BUSINESS

“We knew early on that snowmaking was critical to a great experience on the hills. The snow is the reason people come – everything else is secondary.” –CHIP PERFECT, OWNER, PERFECT NORTH SLOPES

Your continuous investment in snowmaking can help stabilize the effects of poor weather. SMI's fan and lowE snowtower products offer the widest range of snowguns and can all be controlled by SmartSnow™ automation. Find out how SMI can weatherproof your resort at snowmakers.com.



SMI **Snow
Makers**

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