



SNOW THAT DOES NOT MELT

The global rise of dry ski slopes.

Climate change is taking a toll on the ski industry. The United Nations Environment Programme (UNEP) predicts the ruin of many German and Austrian ski resorts by the mid-21 century due to global warming. The experts at the University of Zurich expect melting snow to cause major trouble for anywhere between 37 to 56% of Switzerland's mountain resorts and completely eliminate all of Australia's ski resorts by 2070.



Indoors pistes with artificial snow are not affected by the vagaries of weather or seasonality.

CLIMATE CHANGE COULD SPELL RUIN FOR MANY GERMAN AND AUSTRIAN SKI RESORTS BY MID-21 CENTURY.

Ski resort owners are investing in construction of indoors all-season facilities that make use of the dry slope technology, but the high cost of the snow-making machine, its installation and maintenance, as well as maintenance of the tracks and the electric equipment plus the long lead times do not exactly make it a highly lucrative investment. In fact, these facilities are almost always loss-making, with most money coming from the related infrastructure: hotels, cafés, entertainment venues, etc.

This is where the alternative comes in: ski slopes with synthetic surfaces that mimic snow, which have been gaining traction over the last years. They are cheaper to build and use while being very versatile as they are also fit for snowboards and tubes.



The first artificial ski slopes were made using brush manufacturing by-products.

THERE ARE NOW OVER 500 SKI RESORTS WITH DRY SLOPES IN MORE THAN 40 COUNTRIES.

Dry slopes trace their origin to 1952's Britain. The first slopes were made from a by-product of brush manufacturing, but the coarse and spiky material had a major drawback in that it was really easy to get injured. Polymers helped change it for the better.

There are now over 500 ski resorts with dry slopes in more than 40 countries, and the UK leads the pack with 75 of these resorts. They are manufactured using modern geosynthetic materials that are based on polymers combined with minerals, glass fibre, basalt fibre, etc. The source polymers are polyethylene, polypropylene, polyester, polyvinyl alcohol, and aramid. Dry slopes feature geogrids that help reinforce the ground and protect the tracks themselves.

Environmentally friendly

The all-season slopes are built on both mountainous and plain terrains, the latter requiring additional construction to introduce the incline structures. The natural slopes are reinforced with geogrids. An underlayer of geotextile (a non-woven material from polypropylene fibres) is laid between the ground and the 3D geogrid. The web is then covered with gravel, crushed stone or concrete grout.



Geogrid helps confine and reinforce natural slopes.

COMPARED TO NATURAL SNOW SLOPES, ARTIFICIAL ONES ARE MORE ENVIRONMENTALLY FRIENDLY.

The slope surface is lined with polymer rolls or mats that mimic snow. The synthetic coverings have the minimum coefficient of friction, which enables smooth sliding.

Based on the quality of the material, polymer surfaces can last from 2 to 25 years. To enhance durability and sliding characteristics, some types of surfaces are lubricated. In addition, certain types of coverings can be recycled at the end of their useful lives, which makes them easy to dispose of.

Compared to natural snow slopes, artificial ones are more environmentally friendly. In spring and summer, natural slopes require granulated chemicals to firm up slush. The excessive amounts of sodium chloride hurt the soil and mountain rivers. As for polymer ski tracks, they keep the topsoil safe and prevent landslides thanks to their snug fit.



DRY SKI SLOPE SURFACES ARE MANUFACTURED USING MODERN GEOSYNTHETIC MATERIALS THAT ARE BASED ON POLYMERS COMBINED WITH MINERALS, GLASS FIBRE, BASALT FIBRE, ETC.

Advantages of dry ski slopes:

- inexpensive to build and maintain, fast return on investment;
- all-season outdoor skiing;
- not dependent on nature and climate conditions, able to be built in any region.

Drawbacks of dry ski slopes:

- lack of the real snow sensation;
- stricter fire safety standards;
- need occasional lubrication with water or other substances to improve speed.

According to **Mikhail Yablokov** – Ph.D. in Physics and Mathematics, senior researcher at the Enikolopov Institute of Synthetic Polymer Materials of Russian Academy of Sciences (ISPM RAS), and a skiing aficionado – dry slopes will hardly substitute actual snow, but the all-season skiing opportunity afforded by them is very appealing.

“Polymer surfacing for all-season tracks must ensure low friction, be durable, hard and firm. Its role is to form a surface layer for a composite, shock-absorbing material. With that in mind, the most suitable surface material would be polybutylene terephthalate (PBT) fibres,” he says.

“Another strong point of PBT is that it is recyclable,” adds Mikhail.



Dry slopes are also used for tubing. Photo: discoverglencoe.scot.

Dry slope evolution

50s–60s

Dendix. By-products of brush manufacturing on a metal mesh. Application: mats on a slope.

Country: UK.

70s–80s

ProSnoProslope. Made using plastics. Application: sheets on a slope.

Country: UK.



Proslope surface. Φοτο: proslope.com.

90s

Neveplast. Made from cellular mats. Application: Synthetic mats that do not require special ground preparation and can be of any form or length.

Country: Italy.

Snowflex. Made from a monofilament composite polymer material. Application: Rolls on a slope. Can be used for complex surfaces such as modular tracks and freestyle ramps.

Country: USA.



Snowflex can be used to make complex surfaces. Φοτο: Snowflex.com.

2000s

Perma-snow. Based on the geosynthetics technology. Application: An artificial carpeting solution with high cushioning capabilities. Consists of two layers: the first one is lined with felt and attached to the base, and the second one is the skiing surface.

Country: UK.