Future bobsled competitions may be sliding toward plastic ice

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A Purdue University professor's research suggests the Winter Olympics' icy bobsled tracks could be replaced with a lubricated plastic surface.

Jan-Anders Mansson, director of the Composites Manufacturing and Simulation Center and a professor in materials engineering and in chemical engineering, has conducted research in recent years with the international bobsled and luge federations.

"These are enormously costly facilities, and some of them don't have many people using it," said Mansson, who teaches a sports technology course at Purdue. "So, they're built for the Olympics and then they stand rather unused."

Mansson said his three-year study looked at using ultra-high molecular weight polyethylene for the surface of the 1.2-mile (two-kilometer) tracks. The plastic, under a light mist of water, almost mimics the friction created by the stainless-steel runners on bobsleds, luge sleds and skeleton sleds on ice.

In addition, the plastic track followed almost the exact speed profile as an ice track, letting the sleds reach more than 62 mph (100 kilometers per hour) just three-tenths of a mile (600-meters) into the length of the track.

The low-friction, low-wear plastic is used in a variety of formats, ranging from allowing easier movement in artificial hip joints to coating

the buckets in earth-moving equipment to allow sand and gravel to slide off easily. It also is widely used as the bottom layer of racing skis.

Ultra-high molecular weight polyethylene also didn't deteriorate after 1,000 bobsled runs, sustaining minimal damage that would not affect competitions.

"When a sled passes, yes, it makes a microgroove, but then the polymer heals very quickly," Mansson said. "We were so surprised that it worked so well like this in every category."

The bobsledding track makes sense to use the plastic, he said, as the sport requires a less direct feel for the surface compared to speed skating, ice hockey or curling.

Mansson's research, conducted while at the University in Switzerland, École Polytechnique Fédérale de Lausanne (EPFL), went beyond the science of a plastic bobsled track to tap into the environmental, economic and popularity aspects of such a track.

He said the bobsled track built for the 2006 Turin Olympics cost about $100 million to build and another $1 million annually just to maintain. He pointed out the tracks hosts very few competitions each year and, in some cases, the track is not used at all.

The cost of building the plastic track elements is estimated at just $4-$5 million, with a potential payback time of within 10 years if used for both winter and summer events.

The current bobsled tracks are carved into the natural environment, and require extensive energy for the cooling systems. Mansson noted the tracks are usually constructed some distance from local populations, creating a need for transportation systems simply to get spectators to the

events.

The plastic tracks, however, could be separated into 22 modules allowing for the tracks to instead be temporarily set up closer to population centers or potentially in cities during major events.

"If they can run Formula 1 races in downtown Monaco, this would not be rocket science," he said of the moveable track segments.

The new plastic tracks would cut back on environmental impacts by as much as 70 percent. Mansson's research indicated most of the impact of a conventional ice track is caused by a combination of cooling system elimination and spectators traveling to and from the location.

With more spectators comes the potential of building popularity of the sport, according to Mansson.

"The goal for any sport is to get kids in there and they start to compete, and the interest grows," he said. "If you do this not with ice but with plastic that has the same properties, you can have summer bobsledding, family bobsledding and even large events in warm countries."

Mansson's study pointed to the 2020 Youth Olympic Games in Lausanne, Switzerland, as a potential trial run for the plastic track.

According to Mansson, parallel approaches to the plastic bobsled track can be used to open up new venues in previously impossible locations for popular sports like ski and snowboard slopestyle.

Mansson and partner Josh Dustin, senior software application engineer at CMSC, are following up on this work and other competition sport challenges under a newly created Sport Consortium at Purdue. Their research is focused on taking sports beyond current boundaries through

implementation of cutting-edge material and manufacturing technologies.

Provided by Purdue University