The contact area to the ice

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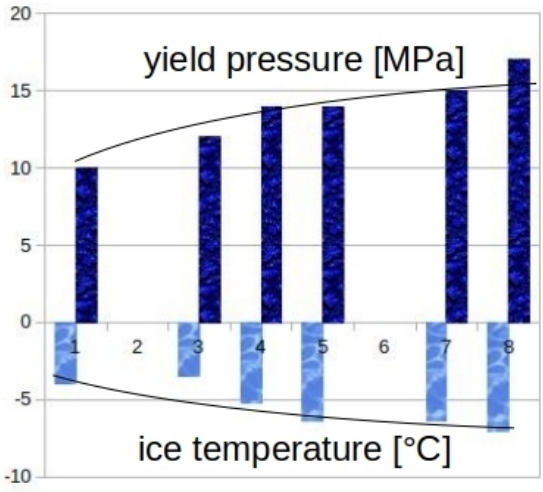
In addition to the vibration influences described in [1], the real contact area between the runner and the ice also has a major influence on good running times. Tribologically, a small real contact area stands for low friction. From an ice mechanical point of view, however, a small real contact area also leads to ice destruction. The resulting pressure is the quotient of force in the vertical direction and contact area. The force is composed of $m \times g + m \times a$. m is the mass of athlete or sled, g is the acceleration due to gravity and a is the acceleration generated in the curves. The physical unit of pressure is the pascal and above a pressure of about 10 megapascals the ice starts to flow plastically and local destruction occurs. However, he pressure at which ice begins to flow plastically depends on the temperature.



The figure shows the temperature and the yield pressure along the first curves of the Olympic track in Korea. Both variables increase up to curve 8 and then remain almost constant. Since as an athlete you cannot change anything about the conditions on site, we now look at the potential that lies in equipment and biomechanics.

For this purpose, the sled was placed on a high-resolution pressure measurement plate, which has a length of 2 m and a width of 54 cm. More than 15,000 individual sensors are integrated into the plate. The measurement was made at a frequency of 100 Hertz, the measurement range of the sensors is 1 to 20 N/cm^2 with an accuracy of ± 5 % of the final value. The measurements show that the runners make contact with the base on a length of about 35 cm. The maximum pressure is about 18 Newtons per square centimeter, which corresponds to a contact pressure of 0.18 megapascals. In the further course of the measurement, position variations, changes in the bow and analyses of the effect of additional weights were carried out. Finally, design influences on e.g. the load distribution on the runners were analyzed.

[1] Vibrationen im Skeleton Sport, M. Scherge, Gliding Short 2(2022)