

Notes Taken at the Biathlon Canada Olympic Solidarity Seminar

The following are notes taken by John Langstone from the presentations by Gerhard Thaller of Fischer, and Bjorn Bakken of Swix during the seminar.

Company Profile

An interesting thing about Fischer is that they diversified some years ago into the aircraft component business. Aside from Skis and boots, the spinoff FACC (aircraft component) business is bigger than the ski business.

In terms of business, it appears that 94/95 was a high year for sales, and since then there has been a decline, with sales fairly flat the last few years.

Ski Preparation and Testing

It was emphasized that mistakes are made preparing skis for harder and softer tracks. Much of the World Cup stuff is on fairly old and hard track, and not necessarily applicable to what we race on at home given the same environmental parameters.

In terms of ski selection for skating, it was emphasized that timed or runout tests can be misleading. Only 12% of time on WC courses is downhill; the skis must feel good in the climbs. Fastest ski is not always the best ski.

In timed/runout tests, the first two runs are often the fastest on the new wax.

Camber, Residual Camber and Expressiveness Defined

Camber was defined as the distance the base of the ski is above a flat surface when unloaded. This should not be more than 3 cm. If too high, the tip and tail dig into soft snow. With skating, you have to lift higher on each step. (more energy and time)

Residual Camber was defined as the distance the base of the ski is above a flat surface at half body weight. If this is not high enough, the ski will drag. If too high, there is too high pressure at the tip and tail of the ski.

Expressiveness was defined as the force required to set the ski flat on the snow at the balance point. (.1mm gap to a hard surface).

Residual Camber and Expressiveness numbers can be scanned on the labels of Fischer skis (HA and FA). Only Fischer Canada has the scanner yet.

**Notes on
Camber and
Expressiveness**

Late kickers will generally prefer a softer ski.

High cambered skis will generally glide better (usually faster in timed tests), but can be a problem on uphill. (problem with timing or runout testing only). Skating skis in particular should be tested in groomed snow.

If the camber pocket of the ski runs in too close to the foot, there is excess friction. This is not improved by waxing short.

Waxing short in front on classic skis is often not a good idea. Strong skiers can often do well initially with this, but miss the kick as they tire.

Generally recommends higher cambered skis for warmer conditions; the softer the wax, more residual camber is desirable.

The harder the skating track, the stiffer the skating ski can be.

In timed tests in the track, the stiffer ski will usually be chosen, but can be slower in softer trails. Fastest ski is not necessarily the best ski.

Other ski selection Notes

Too short a skating ski is a problem with a skier who doesn't straighten up. This creates friction on the front of the ski. If the skier straightens up, this is not as big a problem.

Too soft a skating ski causes drag, with too much pressure under foot.

Short skis are sometimes good on uphill, but sometimes don't glide well.

If the tip is soft for a skating ski, the tip may slide out. Tip splay in a skating ski can indicate a ski which will slip out at the tip. A skating ski with tip splay will often test faster, and is often good in soft snow. Skating skis with soft tips can be difficult to handle on downhill with turns. Some tip splay is OK for classic skis.

Side cut seems to be preferred for sprinting.

The Fischer cold and plus classic skis have different residual camber profiles. The plus has a unique semi-circular pattern, which keeps more of the pocket higher off the snow than the cold ski. This allows using more uniform thickness wax from end to end of the pocket.

There will probably be sprinting skis in the future. This will probably be a lighter ski with lighter tips. The lighter ski should allow the skier to move the ski faster. May see carbon fibre used (this will be pretty specialized).

The old 3 groove skis were unstable.

Benefit of side cut more pronounced with poorer skiers who are on their edges a lot.

If porosity of the base is too large, snow crystals penetrate and create friction. Fischer cold snow skis have less porosity than the plus skis.

Other Notes

Jumpers apparently cork fluoros.

Multiple applications of fluoros to a ski in tests contaminates the waxes, so you end up not knowing what you are testing.

Track preparation on racing WC racing courses makes new snow old snow very quickly. Snow crystals are reworked and flattened out, possibly explaining to some degree why powders etc. are used more frequently on highly prepared courses than "at home".

Loss of camber in skis may well be too much heat, not a lot of use.

**Ski
Construction
(Fischer)**

Side of ski is wood for torsional stiffness. Centre is pretty much a honeycomb, with hardwood sawdust and glue pressed in for binding mounting (not particularly deep). This may well be a good repair technique. In the old days, aluminum used to contract and change the residual camber in cold weather.

High temperature irons can destroy the glue between base and core. Fischer has adapted a wood layer between the base and the core to insulate this glue layer.

Base melts at 135 degrees celsius.

Residual camber is adjusted with layers of fibreglass sheets along the top of the core of the ski.

Moulding involves pressing the ski with 8 minutes of heat and 2 minutes cooling.

Skating skis are generally thicker for the same length. Stronger laminates are used in skating skis.

Stiffness is regulated with the thickness of the core.

Numbers on the bases of Fischer racing serviced skis are used to determine the base and camber press used. The first number is the base, and the second the press. There is sometimes a third number. These allow Fischer to collect test data.

There is no real difference in performance with a cap ski, unless the covering layer is too thick. It is a construction technique which is perhaps cleaner, requiring less lacquer in the factory.

Base thickness typically 1 mm - 1.2 mm and are roughly max. 15% carbon .

**Comp Base
Prep Notes**

When preparing the base, a warmer wax penetrates more than a cold.

Rilling causes high spots on the base on each side of the pressed groove, which can slow the ski. This is most dramatic with larger rills, and possibly using too much pressure. The ski should be plastic scraped after rilling to level this.

Where usually your well waxed and used ski is a better ski, it may not be the case in wet conditions. Sharp structure is often better in wet conditions. A recently ground ski may be fine in warmer conditions.

Temperature loss from the iron to boundary layer (wax) is 20 to 30 degrees celsius.

Sanding grip zone generally fore and aft. Sometimes this is done sideways in icy conditions.

Brushing

Recommended to re-brush skis outside. Inside it is generally too warm, wax is soft and doesn't come off. Re-brushing cold cleans the structure.

Brush Cleaning

Uses wax remover and steel or brass brush to clean brushes

Ironing

One of the interesting things to watch was the care with which Bjorn and Gerhardt used an iron on ski bases. Significant damage is done to ski bases through improper iron use.

Ironing glide wax around the pocket on classic skis can damage bases near the pocket from the iron being left in this area too long. Ironing should start at the pocket and work out from the pocket to the tip or tail. Going the other way can overheat the base adjacent to the pocket.

**Fluoro
Application**

Fluoro powders aren't heated to star them any more. Basically now, the powder is poured on the base and a relatively fast pass is made with the iron to melt the powder on the skis. This is brushed up and the process repeated. Neither presenter went into roto-corking.

The presenters preferred taping the grip zone when applying fluoros.

Grinding

Stone grinding is difficult to control. Particular problem spots are the tip and tail. Start up at the tip, and the tail must be lifted as you grind the tail to get the curvature thickness uniform. Sometimes the base can be burned around the bridge. Burned bases look like orange peel.

The more the porosity of the base, the harder it is to grind with quality. Cold snow bases are easier to work. Fewer micro-hairs with lower carbon bases.

Warm and Cold skis require different hardness stones. Three hardness stones available currently. Cold wheel speed can be faster than for plus skis.

Grinds are hard to replicate, and quality control on stones a problem.

If a grinding machine is not well mounted, it may vibrate and generate waves in the base.

If a ski is not fed straight, it may not track straight.

Particles of stone can break off and scratch bases.

Too narrow an angle in the "V" of the grind can lead to more force in breaking suction.

If the shop does Alpine skis, they go over the edges. This stone has to be dressed before doing cross-country, but dressing stones adds expense.

Maximum wax penetration is .002 to .003 mm. Grinding (.1mm) removes all wax.

Structuring

Can do back and forth passes with Fischer "warm" tractor riller.

Recommended to rill before and after waxing.

With fluoro powders, press structure with powder before brushing. This presses the fluor into the base.

**Initial Base
Prep Notes**

Micro hairs the biggest problem with skis post grinding (not such a problem at zero degrees or higher.

One should be careful with roto-fibretext, or even just fibretext. These can create heat which can bring up micro hairs and even close the base.

First step is to fibretext following grinding.

Gerhardt prefers using a burnished thin scraper if scraping.

The edge of the skis are chamfered to 45 degrees for the full length of the ski.

Can polish with a fine fibretext for 5 minutes.

Some people try to remove micro-hairs with hard waxing nad scraping. Gerhardt doesn't like warming a new base hot for this.

Heating/Saunas

Some techniques for warming wax into bases for long periods can get to temperatures where screws come loose.

There is risk of getting to temperatures which can affect structural glue in the ski.

Camber changes in heating are sometimes short lived.

**Binding
Mounting**

If you mount the binding too far forward, the ski feels good with light tips, but forward movement on the ski can slow you down.

They illustrated finding the balance point on a steel scraper, and averaging the difference between the individual balance points.

Recommended to use binding guides.

Recommended to mount classic 1 cm behind balance point. Skating should be mounted at balance point, but never in front of the balance point. Heavier skating bindings can cause imbalance in the skis.

Not necessary to glue screws, but the glue lubricates the screws on the way in. Use the right size drill (3.6 mm).

Be careful with two part epoxy in foam core.

Can repair screw holes in Fischer with epoxy/sawdust mix. If you have a delamination, fill the air core and glue together. Toko epoxy is good for repairing sidewalls.

**Notes on
Practical
Session on Base
Prep by
Gerhardt
Thaller**

Fibretext after grinding, often under a brass brush.

The feel of fibretext is more draggy on unoxidized material.

Uses a thin metal scraper, and will burnish it. He metal scrapes some after grinding.

Edges are chamfered to 45 degrees full length of ski. He uses a scraper for this (fibretexted after), but you want to have a pretty good hand if you do it this way.

He polishes with a "fine" fibretext for about 5 minutes.

He doesn't like removing micro-hairs with hard wax; doesn't like warming a new base hot for this.

**Swix Testing
Equipment**

Swix measure:

- air and snow temperature
- air humidity
- snow humidity (with a “dielectricity” device ~\$500 Cdn)
- net radiation (balance between ground and atmosphere, device ~\$2500 Cdn)
- Snow Grain Type & Size

**Klister
Applicaton**

In slushy snow, have really thin layer of purple and then red klister. This keeps the red from going around the side of the ski. Can put a couple of cm of hard klister really thin at the back.

Can quickly sear the outer layer of klister if icing.

Applying klister in striping on an angle helps keep it smooth.

Orange Peel appearance after skiing is desirable, shiny surface not desirable.

Can scrape klister after testing to judge dirt absorption.