



## Hexcel Case Study: HiTape<sup>®</sup> Dry Carbon Tapes for Madshus Skis

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Since Martin Madshus first started building skis in his father's barn in 1906, the finest materials and absolute attention to detail have defined the Madshus brand as a leading innovator in the world of cross country skiing.



More than a century later, skis crafted in Norway have topped Olympic, World Championship and World Cup podiums with Madshus constantly in the hunt for medals at every race. As an early adopter of composite materials, Madshus made its first fiberglass skis in 1974. Since then, Madshus has continued to evolve its ski construction to include the latest developments in epoxy and carbon fiber composites.

To ensure quality, precision and consistency in every ski manufactured, Madshus has automated many of the production processes which in turn places demanding

specifications on the material suppliers. Hexcel was more than ready to accept this challenge.

The brief from Madshus was to deliver competitively priced carbon fiber tape products that would produce less fuzz in production as well as meeting tight tolerances for aerial weight and width.

Lindberg & Lund, Hexcel's Norwegian distributor, has supported Madshus with various formulated products for nearly 20 years but the last 3 years has seen the group work together with Hexcel and Madshus to



engineer a range of next-generation dry carbon fiber tapes for Madshus' cross country racing skis.

HiTape® is a true high-performance dry UD tape, developed and manufactured at Hexcel's Les Avenieres site, the company's European center of excellence for carbon fiber reinforcements. Dry fiber tows are sandwiched between lightweight thermoplastic veils on the upper and lower faces. No fiber splices and no cut filaments give a very clean "fuzz free" product, perfect for automated production processes. Excellent formability and permeability allow rapid material placement and infusion.

After some initial testing in 2016 the Hexcel team provided Madshus with 3 different HiTape® products based on the specific design parameters of different cross country ski types. The tapes were manufactured with industrial grade fiber with aerial weights from 120-250 gsm and widths between 38-47mm. All of the Madshus UD's used a lightweight thermoplastic veil on both sides of the fiber tows, adding additional toughness to the finished laminate.

Madshus uses a rapid curing high pressure epoxy molding process to produce their skis. Dry carbon tapes and woven glass fiber fabrics are lightly fixed to precision shaped PU cores before a glass fiber braided sock is passed over the top to secure the reinforcements. This dry fiber ski "blank" is then

positioned in a aluminum mold, with the ski's digitally printed topsheet and low friction running base, before the mold is clamped shut and the resin injected.

These HiTape® products have been extremely well received at Madshus, with the fuzz free edges massively reducing the previously seen build-up of fuzz and furballs caused by slitting of wider tape rolls. Lindberg and Lund are now delivering nearly 500,000lm of HiTape® per year with strong customer demand forecast to increase volumes in the very near future.

HiTape® materials represent the ultimate in dry carbon fiber UD tape technology. They provide a cost and production rate optimized tape solution producing prepreg-like mechanical properties without an autoclave. HiTape® products are well suited to automated production in a wide range of winter sports, automotive, aerospace and industrial applications.

"HiTape® gives us exactly what we need for our automated production processes - consistency and quality. In particular the exceptionally clean edges of the tapes, really makes a difference in our molding process and enhances the surface finish of the finished ski. We always aim for the highest levels of quality and Hexcel HiTape® helps us to deliver that" comments Bjørn Ivar Austrem, Technical Director, Madshus.

# Hexcel Product Family



## For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax™ multiaxial reinforcements
- HexPly® prepregs
- HexMC® molding compounds
- HexFlow® RTM resins
- HexBond™ adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates

For quotes, orders and product information call our sales office in Austria +43 7229 772-0. For other worldwide sales office telephone numbers and a full address list, please go to:

<http://www.hexcel.com/contact/salesoffice>

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