

## PURE - AN EXCEPTIONAL SKI BINDING FOR SKI MOUNTAINEERING

### 1. Company presenting the composite solution

#### Contact person:

Company [advanced polymer engineering GmbH](#)  
Tel [++43-3842-45106-11](tel:++43-3842-45106-11)  
Fax [++43-3842-45106-78](tel:++43-3842-45106-78)  
E-mail [hafellner@ape.co.at](mailto:hafellner@ape.co.at)  
Address [Peter- Tunner- Strasse 4, 8700 Leoben](#)  
Country [Austria](#)  
web [www.ape.co.at](http://www.ape.co.at)



#### Activities of the company:

Advanced polymer engineering GmbH (**ape**) is a highly specialised company for Research and Development projects in the fields of polymers and composites.

The core strength of **ape** resides in concept finding and optimisation of product ideas based on the profound understanding and interpreting of physical and mechanical processes. **ape** works with a wide range of simulation software combined with mechanical analysing methods such as strain gage measurement and microscopy on a very high level.

**ape** was founded in 1998 as an university spin- off company by DI Reinhard Hafellner and Dr. Bernd A. Mlekusch, two graduates in plastics engineering and polymer science of the Montan University of Leoben, Austria. The company currently employs seven in-house personnel, most of whom are graduate from university in physics or plastics engineering.

**ape** focuses on team spirit and creative idea finding to lead the research and development projects as early as possible to their best success.

**ape** is the engineering partner for the presented product,

### - “PURE” AN EXCEPTIONAL SKI BINDING FOR SKI MOUNTAINEERING –!

In close collaboration with the designer Breuer-Bono and the other partners we worked in the areas mechanical concept finding, 3d-design, choosing of materials, finite element simulation, effective weight reduction, process simulation and optimisation for the trademark owner Salewa.

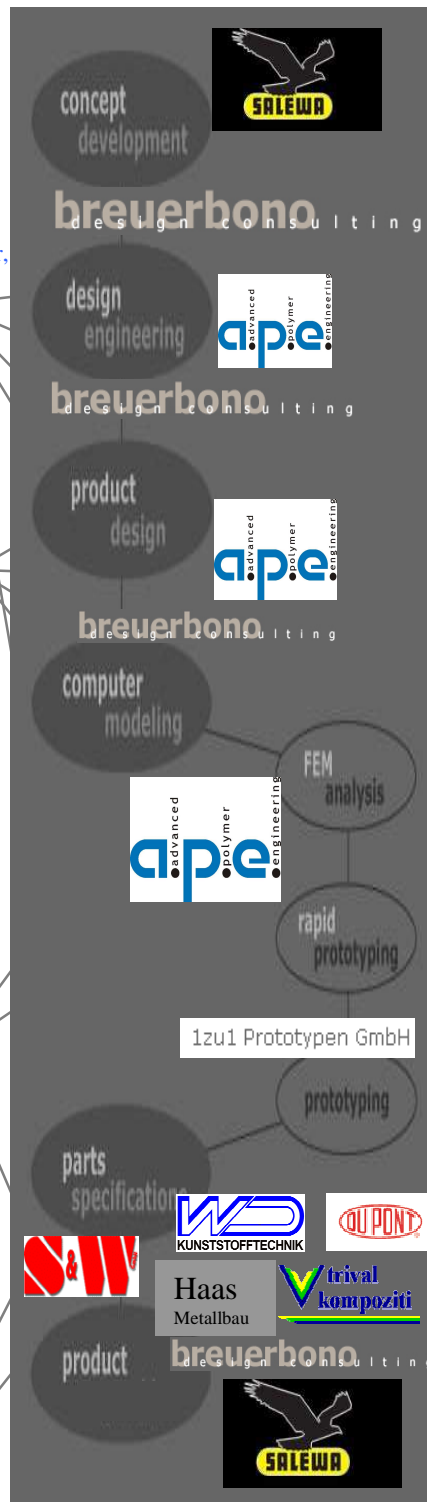
## 2. Chain of development partners:

**Name: Salewa Sportgeräte GmbH**  
 Address & Country: Saturnstrasse 23,  
 D-85609 Aschheim / Germany  
 Tel: 0049 89/909 93-0  
 Fax: 0049 89/909 93-174  
 E-mail: robert.appelt@salewa.de  
 Name of the contact person: Robert Appelt  
 Part in the composite solution: trademark owner,  
 development, assembling, commercialisation

**Name: advanced polymer engineering**  
 Address & Country: Peter Tunner Str. 4,  
 A-8700 Leoben / Austria  
 Tel: 0043 3842 45106 11  
 Fax: 0043 3842 45106 78  
 E-mail: hafellner@ape.co.at  
 Name of the contact person: Reinhard Hafellner  
 Part in the composite solution: development,  
 engineering, 3d-design, structural simulation,  
 process simulation, optimization

**Name: WD Kunststofftechnik**  
 Address & Country: Neufeldgasse 9-9a,  
 85232 Neukirchen/Grüding / Germany  
 Tel: 0049 8131 71081  
 Fax: 0049 8131 4262  
 E-mail: wd-kunststofftechnik@t-online.de  
 Name of the contact person: K. Riedl  
 Part in the composite solution: mold and part  
 producer

**Name: HAAS Metallguß GmbH**  
 Address & Country: Industriestraße 13,  
 73347 Mühlhausen / Germany  
 Tel: 0049 7335 6044  
 Fax: 0049 7335 6980  
 E-mail: haas.metallguss@t-online.de  
 Name of the contact person: J. Haas  
 Part in the composite solution: light metal  
 moulds and casting



**Name: breuerbono design consulting**  
 Address & Country: Rosenberggürtel 34a,  
 A-8010 Graz / Austria  
 Tel: 0043 676 308 86 67  
 Fax: 0043 316 384411  
 E-mail: mbb@breuerbono.com  
 Name of the contact pers.: Martin Breuer-Bono  
 Part in the composite solution: concept  
 development, engineering, industrial design,  
 project management

**Name: Izu1 Prototypen GmbH**  
 Address & Country: Färbergasse 15,  
 6850 Dornbirn / Austria  
 Tel: 0043 5572 52946-0  
 Fax: 0043 5572 52946-15  
 E-mail: info@Izu1prototypen.com  
 Name of the contact person:  
 Part in the composite solution: prototyping,  
 casting, milling

**Name: Trivial Komoziti**  
 Address & Country: Bakovnik 3,  
 1241 Kamnik / Slovenia  
 Tel: (+386 1) 8313 341  
 Fax: (+386 1) 8312 294  
 E-mail: trivial.kompoziti@siol.net  
 Name of the contact person: Vladimir Pavlovic  
 Part in the composite solution: carbon tubes

**Name: S&W GmbH**  
 Address & Country: Torstr. 30,  
 85241 Hebertshausen / Germany  
 Tel: 0049 81 31 292 69 0  
 Fax: 0049 81 31 292 69 10  
 E-mail: info@suw-plastics.de  
 Name of the contact person: Thomas Kastlmeier  
 Part in the composite solution: mold and  
 part producer

**Name: Du Pont de Nemours GmbH**  
 Address & Country: Du Pont Straße 1,  
 61352 Bad Homburg / Germany  
 Tel: 0049 61 72 / 87 27 04  
 Fax: 0049 61 72 / 87 27 01  
 E-mail: Beatrix.Uftring@deu.dupont.com  
 Name of the contact person: Beatrix Uftring  
 Part in the composite solution: thermoplastic  
 material

### 3. Description of the composite solution – “Silvretta-PURE”

The presented composite solution is “PURE”, by far the lightest boot independent ski binding system on the market featuring first class ergonomics and handling comfort.

#### targets

A ski binding system for mountain tours has a lot of different requirements and targets to fulfil:

- low weight
- user friendly handling
- robust behaviour under load
- safety in case of accidents
- appealing design
- competitive costs

#### materials

Taking into account the above mentioned targets and requirements in conjunction with the new concept, we decided to choose the following material mix:

- unreinforced plastics – for functional parts with a high requirement in flexibility and impact resistance
- glass fiber reinforced plastics – for functional/structural parts with high stiffness and strength requirement
- carbon fiber reinforced plastics – for structural parts with high requirements in very high stiffness and low weight in combination
- titan and aluminium alloys - for complex geometry components and high stiffness requirements

#### geometry

The final geometry for the product results from a close team work between industrial designer and technical developer deducing the structure and weight optimised geometry with the help of FEM simulation from the aesthetic 3D design.

#### production process

The combination of these chosen materials in a lot of up to 30.000 pieces each year makes the following production processes possible: pulltruded carbon products (carbon tubes), injection moulding (including long and short fibre orientation engineering), die casting and pressing. The choice of these processes offers the most effective and competitive production performance.

### 4. Advantages of composites for this solution

#### weight

By the use of composites, based on consistent light weight engineering, we succeeded in minimising the weight of the product to 1200 g, which is 700 g less in weight than the parent silvretta-modell on the market and 500 g less than the leading competitor product.

#### functionality

The new concept design stands for a very robust product, including a new patented safety release system. Centering the rotation directly below the pad makes a much more comfortable and power-saving body motion possible. The new system is easy to handle and outstanding in design.

#### simplicity

The reduction of the number of parts used in the product from 68 to 43 parts makes the system more reliable in use for extreme mountain sports and saves part- and assembly-costs.

## 5. Development & launching

### high end engineering

ape is known for high end virtual development. A very special field is the prediction of thermal and elastically properties for fibre reinforced materials. Based on scientific work, unique in Europe, we developed a special tool called MicroMec. MicroMec is a software that allows us to simulate complete three-dimensional material properties for composites. It offers the determination of thermo-elastic properties like Young's modulus, shear modulus, Poisson's number and thermal coefficient of expansion as well as the prediction of the heat conductivity. MicroMec makes it possible to determine the material properties of the composite materials that are essential for FEM simulations. Moreover non-existing, respectively future systems can be simulated by MicroMec through virtual material design.



Fig.: From virtual structural simulation of the 3d geometry to the real part.

### partnership

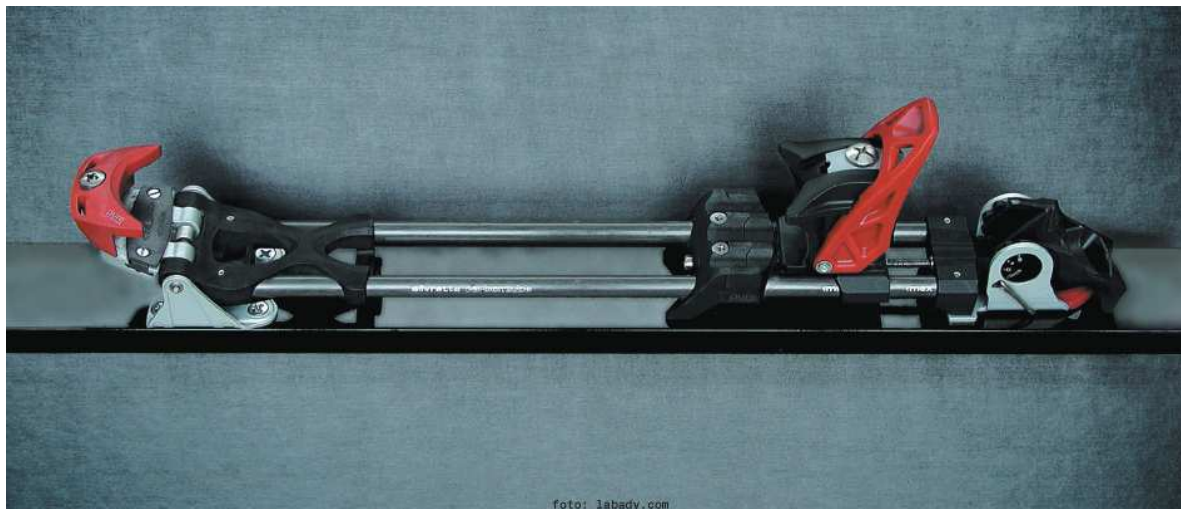
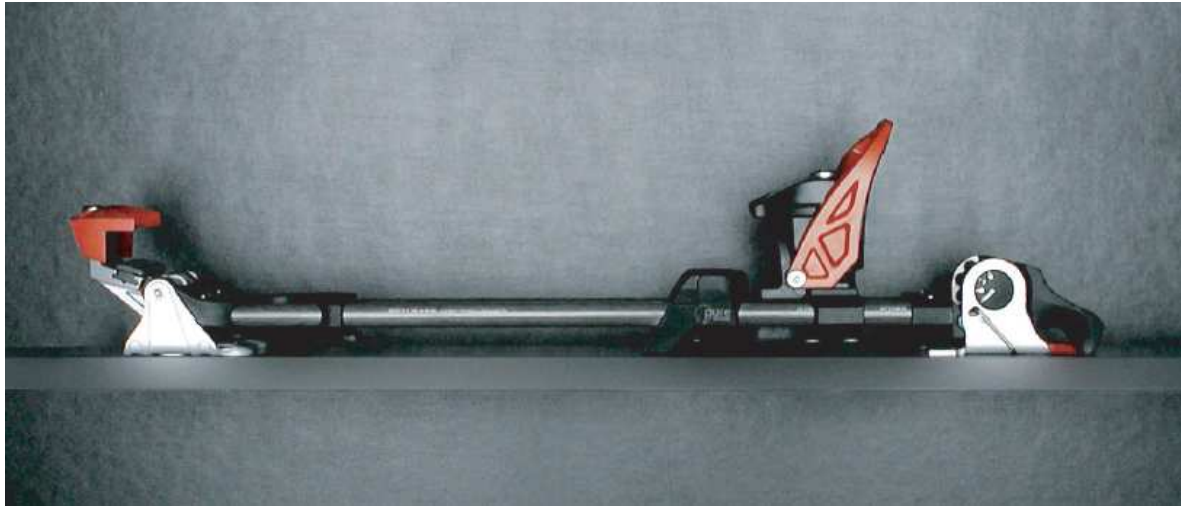
All partners worked in very close collaboration in this development project. It was extremely important to combine creativity, systematics and thorough project management in an advanced development process to reach a high performance product in the shortest possible development time. Including virtual product development played a central role in in the extremely tight time table.

The development lasted 17 months, beginning with the first concept idea and ending with the first product from series.

### launching

The product's first presentation took place during the Sports-Exhibition "ISPO" in Munich in February 2003. "Pure" already won a design- and style-award in Austria (Adolf Loos - Staatspreis für Design) and the outdoor award for a very innovativ sport product on the ISPO. Sale started autumn 2003 in the shops.

## 6. Pictures



## 7. Caption

“PURE”, by far the lightest boot independent ski mountaineering binding system on the market. The design of the product unites several apparently contradictory aspects. On the one hand “PURE” is a highly innovative product which, especially with regard to performance, outpaces the competitors. On the other hand, the target group, because of the exceptional and extreme situation of back country skiing, demands for and gets a reliable and well- engineered product. The “PURE” design succeeds in expressing the light weight of the binding while at the same time suggesting its extraordinary stiffness and robustness.