

American company Black Diamond Equipment's quest to develop its own line of ski boots turns into a truly global project, working with Clariant Masterbatches in getting the right colour match for the injection moulded components of the finished boots

When Black Diamond Equipment Ltd (www.bdel.com) set about developing the first American-made ski boots to be introduced in 25 years, they wanted to make use of colours to deliver a clear message — that these are boots for skiers who are serious about performance, comfort and style.

Black Diamond (BD) has decided a few years ago to develop its own line of skis (launched in 2007) and their new line of boots, which are being introduced to the retail market this year.

As the project progressed along, the boot developers leveraged fully on the colour and plastic materials expertise of Clariant Masterbatches (www.clariantmasterbatches.com) to turn their ideas into reality — from design to production to market, including technical guidance and coordination of global sourcing and manufacturing.

"We've never taken on anything like this before," say Brett Keyes, ski hardware product developer at Black Diamond. "When I joined the project early in 2007, our designers had already come up with nine boot models and a preliminary palette of colours. We were beginning to work on prototypes with our moulder in Taiwan when it became obvious that we needed help making the colours work."

The boot components were to be moulded in polyurethane and — particularly for parts of the top-of-the-line models — in lightweight TPE (specifically, Arkema's Pebax polyether block amide). Therefore the colours would need to be matched perfectly in both resins.

Colour lift

The Taiwanese moulder Minson Enterprises had worked previously with Clariant Masterbatches and suggested Black Diamond contact them directly for colour discussions. It became apparent to Keyes that it would be best to develop the project at the Clariant ColorWorks centre in Holden, Massachusetts, USA.

Translating colour ideas

"As a company, we have a lot of experience working with anodised metals," recalls Black Diamond creative director Matt Law. "We understand how colour works in those materials, and the ColorWorks team in Holden was really good at translating our colour ideas into plastic."

One of the original concepts for the BD boots was to use the inherent translucency of the PU and Pebax materials

to allow some of the structural components of the boot to be shown and add depth to the colours.

Hearing this, Bill Blasius, Clariant Masterbatches' director of technology for North America, suggested adding pearlescent effects to the colour base. It fitted perfectly with what Law had been envisioning when he originally used automotive colour combinations and special finishes to describe what the ski boot colours could look like.

Black Diamond would take advantage of the resources at the ColorWorks site in McHenry, Illinois, another of Clariant's seven global centres and one that is specialised in packaging applications.

The McHenry ColorWorks centre's experience in developing high end colour and effect concepts for cosmetics and personal care products was ideal for getting the BD product into the final development stage — the McHenry technicians were skilled at creating multilayer plastic bottles that combine pearlescent colours with clear plastic or translucent material in com-

plementary or contrasting combinations.

ColorWorks lab supervisor Chris Spencer grasped what the Black Diamond designers were expressing verbally and then translated those ideas first into digital mock-ups and then into colored plastic samples. Matt Law recalls: "She understood that we were looking for richness and depth that would make our boots stand out on the store wall and on the slopes."

The latest technology was used to ensure that the colour formulations would not affect the processing or performance of the finished boots. For instance, tensile tests using an Instron device compared natural Pebax resin with the coloured version to identify differences in physical properties. Materials were also evaluated in a capillary rheometer to observe any differences in flow characteristics.

Specific colour for different segments

Armed with dozens of colour chips, the BD designers began the next round of boot mock-ups. Small batches of the colour formulations were produced and shipped to Minson in Taiwan so that actual boot components could be moulded and analysed.

Keyes says: "By October of 2007, we had sample parts and were actually assembling boots and adding surface graphics, so we were really starting to get a sense of what the finished boots would look like. We also uncovered one more problem with one of the colours we had originally considered."

Some of the components moulded using an orange masterbatch seemed to be prone to cracking. Further testing at ColorWorks suggested that a stiffening agent used in the orange masterbatch was causing the problem.

Black Diamond decided against using that specific colour, shifting instead to a pearlescent gold accentuated by dark brown and black (called "Bronze"). That particular colour scheme would become a signature look for the Telemark Power line of boots, one of three product groups aimed at different segments of the skiing market.

Now that the boots are in full production, the colour masterbatches are being manufactured in Taiwan using formulations that have been tailored for the specific resin grades sourced locally by Minson Enterprises.

