

New shapes and constructions are helping impact protection materials provide greater comfort and freedom of movement, without compromising protection.

Impact protection expands its comfort zone

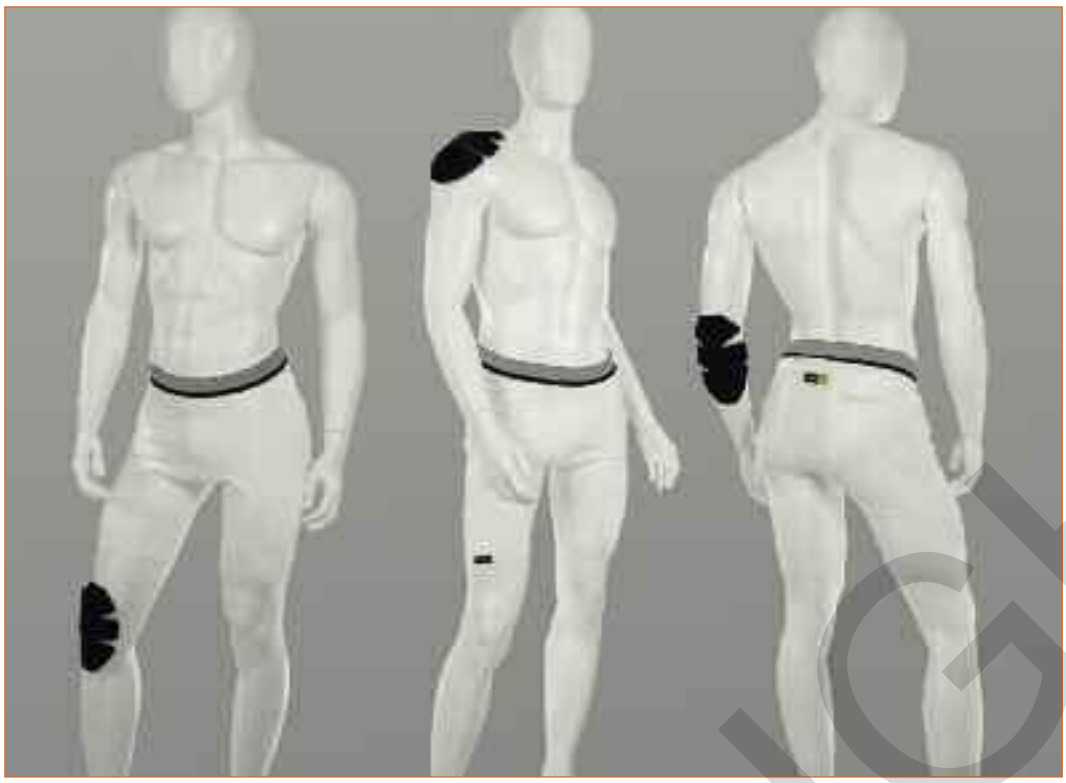
They come in an array of candy colours, bright orange at D3O and vivid green at POC, as if to convey a cheery and appealing aspect beyond their serious role of absorbing shocks. Developed in-house by sports brands, such as POC or Dainese, or by chemicals companies, such as Poron or D3O, impact protection materials are often based on visco-elastic polymers, foams or rubbers and come in varying chemical compositions that can include ethylene vinyl acetate (EVA), nitrile rubber or polyurethane, though each brand tends to keep its particular formulation secret. Deflexion, an alternative product based on a spacer knit impregnated with silicone, has recently been discontinued, despite a considerable amount of effort put in by Dow Corning.

Soft visco-elastic impact absorbing substances are considered smart materials as they adapt to the degree of impact applied, a property known as strain-rate dependence. This is why the thermoplastic protections that currently dominate the market are soft and comfortable in normal conditions and stiffen, "lock" or "freeze", upon impact. To explain how this process functions, Poron evokes diving into water: at low heights, jumping into water feels soft and

Olympic gold medallist Maria Höfl-Riesch is among the skiers who wear protective technology from Dainese.

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Poron XRD components are designed to be placed on specific parts of the body. Flexible at rest, the material stiffens upon impact.

Poron Technology

cushions the dive. At high heights (i.e. jumping from a bridge) water feels like ice. Poron says this is due to the speed at which the body enters the water. Another example put forward by the company is that of adhesive bandages: if a bandage is removed slowly, the adhesive sticks to the skin, if it is removed quickly, the glue freezes and sticks less.

In the absence of specific standards for sports uses, impact protections are regulated by motorcycle norms, which come in two levels: EN 1621-2 Level 1 materials absorb energy up to 18kN (kiloNewtons) and Level 2 materials absorb impacts up to 9kN, offering a higher degree of protection. Sports accessories tend to comply with Level 1, offering more leeway for wearer comfort, though Level 2 products are also available.

Flashy geometry

Making the technology easier to use and more comfortable to wear is the focus of a number of new developments in impact protection. For its recently launched Smart Skin, UK company D3O has developed a lighter open-celled polyurethane foam, and applies an adhesive film to the back of the modules to simplify garment manufacture. Based on the company's Aero technology, which is said to be softer, less dense and half the weight of D3O's existing materials, the graphic Smart Skin components can be directly heat-bonded to a garment. They are shaped to protect the coccyx, thighs, hips, knees, shoulders or elbows. The finest reference measures 3 mm, but the 10 mm components comply with EN 1621 Level 1.

The XRD range of Poron Performance Cushioning, a division of US-based Rogers Corporation, is now also available in components that adapt to elbows, knees or shoulders. Poron XRD is an open cell urethane-based material that is said to absorb up to 90% of the energy applied, meeting EN 1621 Level 1. More flexible and lighter weight than previous references, the moulded Poron XRD shapes can be sewn on a garment or slipped into a pocket. "The slim, sleek shape allows designers to incorporate impact protection technology without sacrificing style," says Poron marketing director, Angela Walters. Certain references are treated with Microban to limit bacteria, mould and mildew growth.

German company Ortema, whose background is in the medical field, has recently improved its own impact protection material used for the P1 Dynamic back protector. Here again, the substance of choice is a visco-elastic memory foam which absorbs impact and rigidifies. The four-layer construction of P1 Dynamic includes a sheet of polyethylene so that the back protector fulfills the



The new geometry developed for D3O Smart Skin adapts to body shape and movement. It can also be heat-bonded directly to a garment.

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Back protection: (left) the ergonomic design of the Manis by Dainese is said to enhance mobility and protection without adding weight compared to previous designs.

(right) Launched for winter 2013-14, Ortema's four-layer P1 Dynamic has been improved upon in terms of materials and appearance.

Dainese / Ortema

requirements for protection level 2, with a residual force that doesn't exceed 5.8 kN according to company documents. The special shape of the back protector is designed to cover the cervical vertebrae to the lower lumbar vertebrae without restricting mobility. In the improved version, a kidney belt with a hook-and-loop fastener holds the protector snuggly around the body. A textile cover (50% polyester, 20% polyamide) with a breathable mesh fabric provides added comfort and ventilation.

The Manis back protector presented by Dainese at ispo 2013 is also designed to provide greater freedom of movement. The Italian company has been developing soft protection technologies since 2009 as demand switched to supple shock-absorbing gear. Under the articulated and perforated polypropylene outer shell, Dainese places a layer of elastic-visco nitrile rubber, called Crash absorb, and an additional layer of foam, enabling the product to meet the requirements of EN 1621 Level 2. "The special articulated construction increases freedom of mobility by four degrees, which offers additional protection as the protector follows body movement in all positions," says Dainese product manager, David Manzardo. Compared to the Wave back protector, Manis covers a larger surface area without adding weight.

Shaving off weight is the goal of a new generation of impact protections developed by Swedish brand POC under the VPD 2.0 label. The revised polyurethane foam compound known as VPD, which stands for Visco-Elastic Polymer Dough, a product that absorbs energy and stiffens when exposed to impact, meets Level 2 standard requirements (thanks in part to the addition of a thermoplastic polymer sheet). The bright green polymer is perforated for ventilation and said to offer a higher level of comfort and increased flexibility in cold temperatures.

Softer, more flexible and comfortable to wear, protections are moving ever closer to second skins as opposed to plated armours. While companies experiment with new compositions offering a better balance of energy absorption and wearer comfort, new designs are also made to appeal to the growing population of skiers and snowboarders adventuring ever further into the backcountry.



POC's new VPD 2.0 range - ventilation is provided through the perforated protectors and mesh fabric.

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