

Using an innovative new technology, the Esjot Group, part of Texon International Group Ltd, has produced a toe cap using an aluminium alloy which has some real advantages for both the producer and wearer of safety footwear.

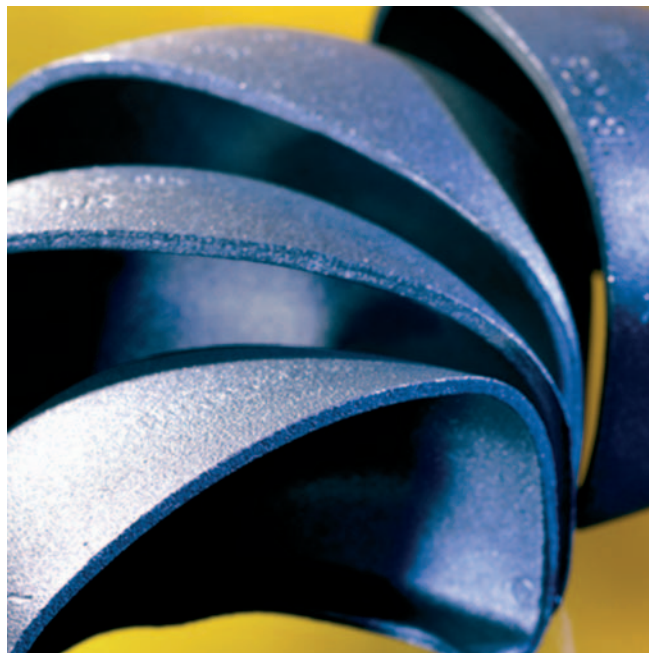
Liquid forged safety toe caps

The process of liquid forging differs from the other casting techniques used with aluminium alloys due to the application of very high pressure on the liquid metal during the solidification stage. While a conventional extrusion process would involve casting and extrusion stages ahead of the actual forging procedure, liquid forging reduces the conventional six-stage production cycle down to three simple steps as shown in the bar diagram.

First, a pre-determined quantity of liquid metal is fed under low pressure directly from the integral furnace into the mould (Figure 1). A piston then applies high hydraulic pressure to the whole surface of the casting during solidification. This creates the desired definitive shape of the casting and eliminates any excess rising liquid material that is then returned to the furnace (Figure 2). While the liquid forging process is not new in itself (it was patented 20 years ago), adapting it for use with aluminium has involved the development of new machinery and mould systems, and was completed only recently.

The adoption of aluminium liquid forging has a positive impact on the cost of melting aluminium ingots in terms of efficiency. It is also more environmentally friendly than existing processes, which fits in well with Texon's strategy to protect the environment through innovation and conscientious process management. It creates less waste and in fact uses five times less energy to recycle than steel.

These aluminium toe caps have been designed to be completely interchangeable with steel caps, enabling manufacturers to replace steel toe cap models easily and without having to alter lasts, upper patterns, lasting equipment

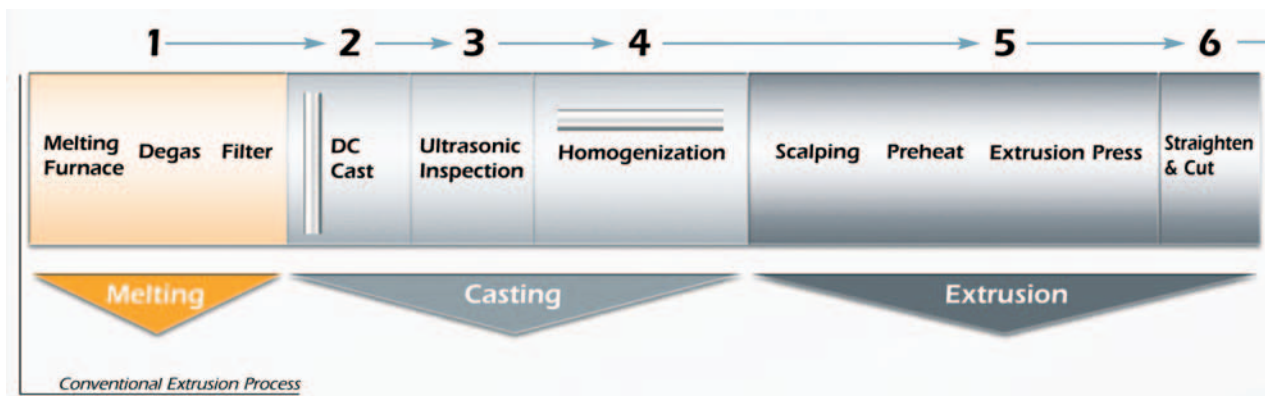


or direct injection sole moulds. This is a factor that has often created problems in the past and prevented many manufacturers from making the change.

This patented new technology will apparently accommodate the production of light alloy parts of any type, including magnesium alloy, and is said to offer the following benefits:

- Non-porous castings
- Excellent structure
- Performance on a par with hot-forging but with costs similar to high pressure die-casting over weights from 40g to 10kg

Comparison bar diagram



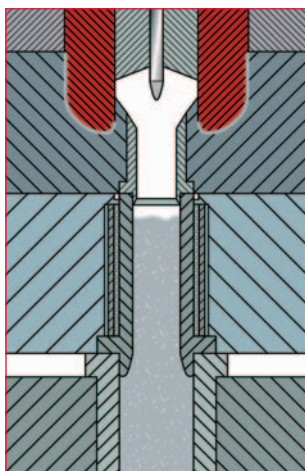


Figure 1: Feeding the mould

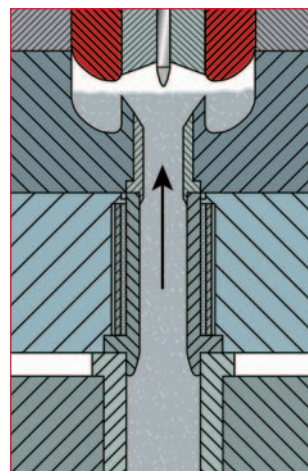


Figure 2: applying the pressure

- Variable gauge thickness while maintaining a good shape and dimension to match different industry standards and reduce costs

The new cap conforms to the EN12568 Standard and absorbs more energy on impact than steel. At the same time, the lightweight properties (200 joules approved) offer greater comfort



The forging installation



The mould close up

and freedom for the wearer. The fact it is also non-magnetic, makes it ideal for the electronics industry. It is corrosion resistant, even when uncoated, and, in addition, can be treated with a special coating to provide non-conductive properties.

The liquid forging of aluminium is also ideally suited for the production of components in other industries that use light alloys such as the automotive sector, where it can be used for suspension and brake parts. At present, Esjot only produces toe caps using this technique at its Italian plant in Gargallo outside Novara, but it is soon to open a new facility in Asti near Turin. 



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