

PU Wellington boots

ALL CREDITS: KLÖCKNER DESMA



CLEVER IDEAS FROM DESMA

The term 'Wellington' boot appears to have been first used by the North British Rubber Company sometime in the late 1800s. Boosted by their use in the trenches of the 1914-1918 War they became the essential item of footwear for millions of people wanting a reliable method of keeping their feet dry. Indeed, by the late 1900s, they had become a fashion icon in the form of the green 'Hunter' wellie. They continue to be an important item of footwear for many agricultural and industrial workers throughout the world.

These Wellington boots are mostly made using either vulcanised rubber or PVC. Both types are heavy to wear and have poor insulation properties making them either very hot or very cold depending upon the local climate or the time of year. The machines used to produce them have low outputs due to very long cycle times caused by the vulcanisation process in the case of rubber boots by the cooling time needed by those in PVC. DESMA has come up with a method of producing Wellington boots in PU which shows a number of significant advantages for both producer and wearer.

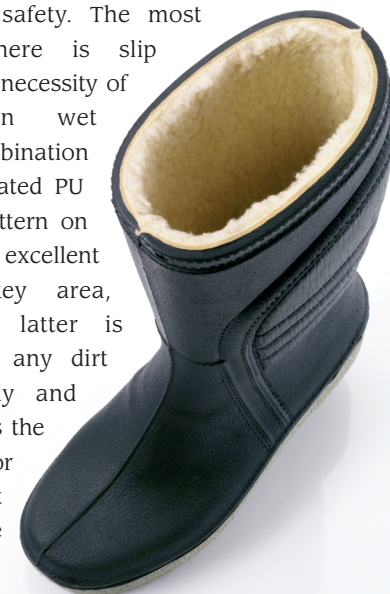
Wellington boots can now be produced entirely from PU in a one-step process which uses one density for the main body of the boot and another for the sole. Alternative materials for the outsole can also be incorporated using, for example, pre-moulded rubber soles for very wet conditions. These are prepared and then inserted into the mould and the main body of the boot moulded on. Similarly, TPU can be used where a higher resistance to abrasion than that of standard PU is required.

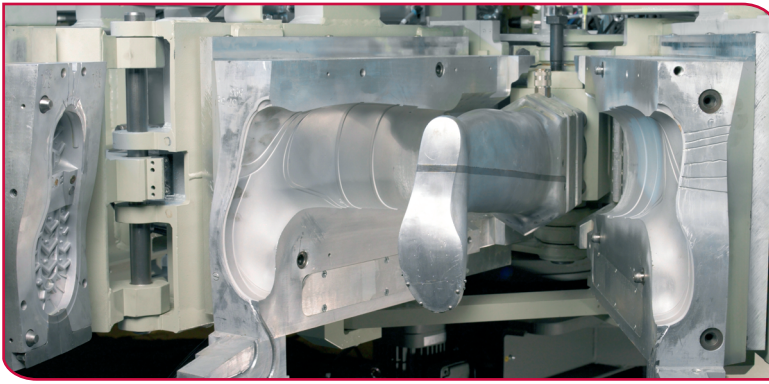
This multifunctional ability has opened new possibilities for boot producers to widen their ranges and at the same time lower manufacturing costs. In addition, all the well known benefits of PU such as comfort, lightness and greater scope for design can be introduced.

ADVANTAGES

Most of the PU boots produced so far have been for industrial applications where workers will spend an eight-hour working day in them. It is therefore a great benefit to all concerned if the standard of comfort can be raised without reducing safety standards. PU boots can do this in several ways.

To begin with, they are at least 40% lighter than PVC or rubber boots. Polyurethane also has excellent thermal properties enabling PU boots to be worn in a much wider range of environments. They are particularly effective in cold conditions as they can be worn in temperatures as low as -30°C . Due to new developments by PU systems suppliers, the boots can also have excellent resistance to all the normal chemicals, oils or acids found in industry. Then there is the question of safety. The most important factor here is slip resistance due to the necessity of wearing them in wet conditions. The combination of a correctly formulated PU and a good tread pattern on the outsole will give excellent results in this key area, particularly if the latter is designed such that any dirt comes away quickly and easily. Finally, there is the question of colour for which there is no limit as witnessed by the title image.

*PU Boot with thermal insulation.*



Moulds for the DESMA B512 machine have four parts and are mounted horizontally.

B512 MACHINE

The heart of the technology is DESMA's B512 rotary machine which can be equipped with ten or twelve mould carriers and includes all the advantages associated with the company's tried and tested self-cleaning low pressure technology. A key advantage is the horizontal last position, which provides excellent working conditions with convenient handling for fitting linings and removal of the finished boot. This position also assists mould-flow which greatly improves surface definition as well as overall quality.

A SECOND IDEA IS A WAY TO USE LESS GLUE

Most modern footwear is dependant on adhesives in its construction. Environmental pressures have led to solvent-based adhesives being replaced by water-based alternatives in almost all instances and a consequence, development of new systems for drying and re-activating them. Even though the adhesives may have changed they are still extensively used and this in itself has become of increasing concern to manufacturers in terms of price and flexibility.

The manufacturing costs of adhesive-based footwear constructions have now become relatively high due to the cost of the adhesives themselves and the rapidly rising wage levels in Asian countries where most sports shoes are produced. Where adding extra labour was once not an important cost factor, the talk is now all about automation and how it is able to reduce labour costs and, at the same time, produce more uniform and better quality footwear.

A reduction in the amount of adhesives used in their products has therefore become an important part of the basic manufacturing strategy of many sports shoe companies facing ever tougher global competition. A further plus for them would be improved working conditions for production line staff which would in turn satisfy the demands of increasingly powerful trade unions. The problem has been how to achieve it.

SIMPLE CONCEPT

DESMA has again come up with an answer. It has developed a system that combines PU and TPU in double layer soles for sport shoes in a special one-step direct moulding process that has the potential to reduce adhesive use by anything up to 70%. While EVA continues to be a popular choice of midsole material for many types of sports shoe due

to its high shock absorption, it does require adhesives to bond the outsole to the midsole and the complete unit sole to the lasted upper.

The system enables complex or multi-colour sports shoe soles to be produced with no adhesive. The heart of the process is the combination of PU and TPU whereby the EVA midsole is replaced by one in reactive PU which is directly moulded to a TPU outsole as can be seen in the following diagram.

- Step 1 – colours A and B are injected as islands or spots in the main sole
- Step 2 – two insert parts fixed manually or robotically in the bottom plate
- Step 3 – overcasting of the main colour TPU around all existing parts
- Step 4 – injecting the reactive PU midsole bonds the sole to the upper

The process is already being used on safety and casual footwear and offers potentially lower production costs while at the same time increasing design possibilities. The latter is an increasingly important consideration as designers can be offered fresh scope for new ideas in sole design as shown in the title image of this article.

ELIMINATING ADHESIVES

A trial has been made on an existing design of basketball boot to see how much adhesive can be removed from the soling sequence without adversely affecting the latter's performance in wear.



Typical multi-colour TPU sole design that can be produced by multi-injection and casting on a direct moulding machine.