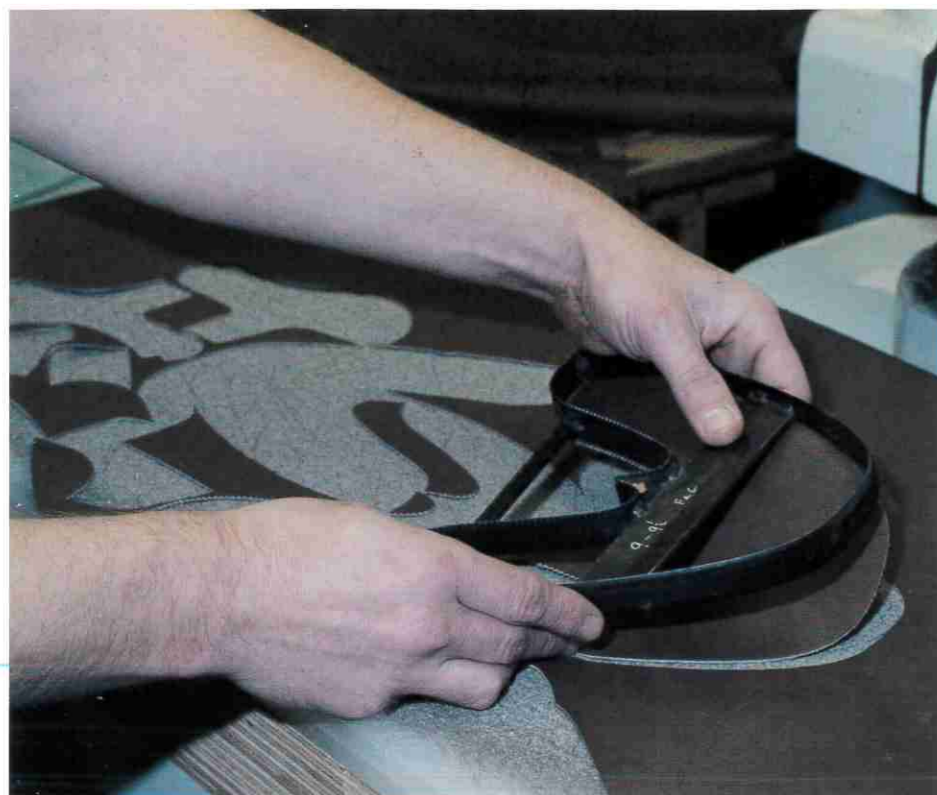


# A consideration of cutting methods

There are a variety of upper material cutting methods and machines available to shoemakers today, and making the best choice depends on many factors.

LEE LYTHGOE describes different cutting methods and the advantages and disadvantages associated with them.



*Traditional swing-beam press cutting*

While new technology – such as 3D printing and knitting – is gaining a foothold for certain styles, the vast majority of shoe and boot upper components require cutting before they can be assembled. Material cutting is a major undertaking, and the processes and equipment used are fundamental to the finished product.

Components are cut from leather or other materials in sheet or roll form, using methods as diverse as manual

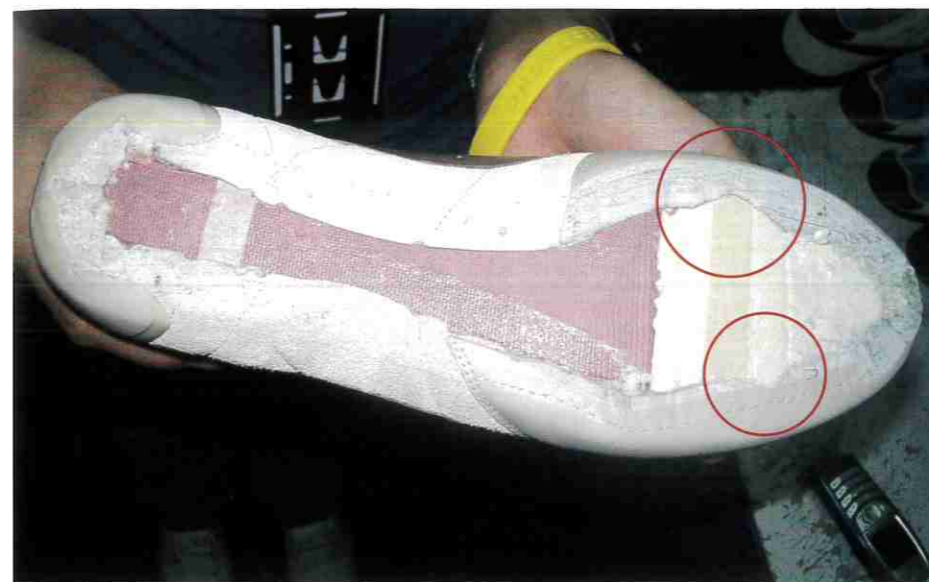
cutting with a knife, mechanical cutting with swing beam or bridge presses utilising metal dies, and automated cutting tables incorporating knives or fluids (and, increasingly, lasers). Factors influencing the method selected include the quantity of components to be cut, the availability of skilled labour, the frequency of pattern changes, factory floor space, capital investment available and the required quality of the finished products. Economics will inevitably be an influence,

but the method chosen should not compromise the actual cutting quality.

Traditionally, leather was the predominant upper material and is, of course, still widely used. It has long been recognised that the efficient usage of leather has a significant effect on the profitability of the finished product, and the cutting of this material for use in shoes has long been regarded as one of the most skilled jobs in the footwear industry. Taking into account that leather is a natural material with different characteristics throughout the hide or skin, as well as the additional complication of blemishes such as wire marks, insect bites and growth lines, a significant period of training was required before a cutter was considered ready to cut the upper material.

For many years, leather was the most expensive material used in the making of footwear, and only the most experienced of cutters could ensure that the components were of the required quality and that the material had been utilised correctly. Such was the importance of saving material, that a fully trained and motivated cutter could cover his own salary in the value of leather savings. Recognising the importance of efficient cutting led to SATRA developing SATRASumm as the industry standard package upper material system for managing the efficient cutting of leather and synthetic materials, thus reducing materials waste and saving money.

For small production volumes, hand cutting with a knife is still preferred, as it



*Chipping on a lasting edge*

would be uneconomical to use machinery. For larger volumes, it is generally more effective to use a form of mechanical or automated cutting. Particularly for leather, where companies want to most effectively utilise the material, a swing beam cutting press is used. In this instance, a highly skilled cutter places cutting dies (in the shape of the components) onto the material in the most efficient way to reduce material wastage, while considering the cutting rules and achieving the desired quality. For sheet or roll materials, a bridge press is more likely to be used.

## Synthetic materials

The introduction and wide use of relatively cheap synthetic materials, often in roll form, changed the cutting role and, in many cases, reduced the need for highly skilled cutting labour. However, with the increased use of high-performance man-made materials, efficient cutting of these has become much more important due to the increased cost.

Today's automatic cutting machines were developed initially from computer aided design (CAD) systems that cut paper shapes. These evolved into equipment used to cut leather for the clothing, design, automotive and upholstery industries.

The benefits for the automotive and upholstery industries are clear – the cutting dies associated with presses would be too large to handle and too expensive to be made from steel, so

fluid jet, knife and laser technology has developed rapidly. Additionally, laser technology is very flexible in terms of geometries. Complex geometries, individual designs, prototypes and small-scale production runs of products lend themselves very easily to automatic cutting. Information is sent electronically to the cutting machine, identifying the placement, shape and quantity of the components to be cut. There is no need for cutting dies, which can be a great expense in manual cutting where a considerable number are often required.

The globalisation of footwear manufacture over the last 25 years towards less industrially developed countries has enabled the use of an abundant but relatively unskilled workforce, and processes have been developed around this. The training of a leather cutter has not been viewed with the same importance, as was traditional in the West. As a consequence, cutters with the level of skills of their Western counterparts are rare in Asia.

## A good capital investment?

Companies are now increasingly investigating the use of automatic cutting machines and are considering: i) the economics of a large capital spend, ii) the need for space, iii) the fact that operator training can be quicker for machines that automatically 'nest' (fitting patterns together with the minimum of wasted material), and, not to be forgotten, iv) the cost of increased rejects when automatic cutting machines

are used. While the options for factories are many, the two biggest differences with automatic cutting machines are machines that automatically nest the patterns, and machines where the user nests the patterns.

Although satisfactory for synthetic materials, machines that automatically nest are at a disadvantage when cutting leather. Being a natural substance – with variants in quality, size and shape – these machines do not differentiate for quality or lines of tightness. As they will only nest complete pairs, quality could suffer. The best area of the skin may be used for a lower-quality piece (tongues) and the highest-quality piece (toe cap) could be placed into the lowest-quality area of the skin, (such as the shanks and neck). This needs to be taken into account when considering using this type of machine.

A better option is to use a machine which allows a trained leather cutter to position the pieces. This allows him or her to ensure that the pieces are of the correct quality, and have been cut in the right direction of the lines of tightness across the area of the hide.

## The pros and cons

Advantages of automatic cutting machines are:

- cleanness and uniformity of cut pieces
- a reduction in tooling costs (no need for cutting dies)
- multi-head machines can carry out other tasks such as gimping, punching and stitch marking
- skins can be scanned and stored, to be cut later, helping production planning
- new models or samples can easily be re-engineered at low cost.

The disadvantages of automatic cutting are:

- high initial investment and running costs
- it is not possible to check the leather or slightly adjust placement of pattern before each cut
- there is the potential for higher levels of rejects or poorer quality footwear.
- it can be wasteful, as the lasting margin cannot be 'chipped' (overlapping components slightly where possible when they are cut)



*An example of wasteful cutting*

– for example, on cemented and welted constructions – meaning that material usage is much higher

- large machines take up considerable space.

The software of the automatic machine does not take into consideration the natural stretch of the leather. All leather components should be cut 'tight to toe' as best practice (cutting leather in the direction of the lines of tightness). In a typical example, prime components are cut from the shanks, bellies and necks of the leather, while tongues (non-prime components) are cut from the prime areas of the leather. Therefore, the software does not take into consideration the quality standards of the finished shoe. As the material cannot be handled during the auto-cut/nesting stage, some defects cannot be found during the cutting process, which will increase the risk of reject pieces.

This represents a fundamental difference to traditional leather cutting efficiency models. Minimal wastage and built in quality at the cutting stage

comes at the cost of a skilled cutter, although the savings made more than offset their employment. Skills shortages and new synthetic materials have forced many manufacturers to rethink their model. Fully automatic cutting machines suit consistent, man-made materials but, when used for cutting leather, manufacturers have to accept poorer-quality leather sections, a higher level of rejects and a reduced yield.

It is preferable to use properly trained operators, who are able to choose where the sections are cut by taking leather characteristics and blemishes into account.

### Looking to the future

With the exception of artisan, bespoke and high-end manufactures, it is certainly possible in the near future that the traditional 'clicking room' will change forever. Automatic cutting machines could be the norm, with just a few trained staff nesting the patterns.

However, saving on waste has become even more important in terms of

saving cost and the environment, and SATRA's cutter training – provided by our highly-experienced cutting experts – can teach cutters to achieve cutting allowances while improving quality standards. As outlined above, the importance of a cutter knowing and understanding the properties of leather, the principles of good cutting, and the agreed level of quality required, are most important to production efficiency and cost saving. Although fully automatic cutters have minimal human input, machines with operator involvement in the cutting process would also benefit from aspects of our training in understanding leather as a material.

Please contact [systems@satra.com](mailto:systems@satra.com) for more details of the processes described in this article and to discuss training that can be tailored to suit your needs.