



Computer cutting systems are replacing the traditional clicker.

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Footwear Fundamentals

QUALITY OR YIELD?

Cutting the components of a leather shoe upper demands a wide range of skills, not the least of which is balancing quality with yield. It could equally be referred to as balancing quality with cost and, as such, is an age old debate that continues to this day.

To maximise quality, we can cut only the best parts of the skin, leaving the rest unused. A large amount of material is wasted, the yield will be very low and the cost per pair extremely high. Alternatively, higher grade skins can be specified that have better overall quality. While less leather is wasted, it will have cost more, so nothing is saved. Disposal of low quality areas of material has merely been transferred from shoe factory to tanner.

At the other extreme, we can minimise cost by cutting up the whole skin without regard for component quality. This gives a very high yield and low material cost per pair. However, it is quite likely to result in manufacturing problems and unsaleable shoes. For example, if the upper stretches on one side and not the other when lasted, it may not sit properly on the last. If components are cut from areas where the surface is not uniform or has a coarser grain and this shows on the finished shoe, customers won't buy. Retailers are quick to recognise when a manufacturer's quality affects their sales.

Achieving the required balance is to a great extent in the hands of the cutter or 'clicker' as he is still frequently referred to. His success, however, depends not only on his own skill and knowledge but also on that of the leather buyer and pattern cutter who have preceded him in the shoemaking process.

THE LEATHER BUYER

The buyer forms a judgment based on the quality of sample skins when he decides to purchase. Colour, surface finish and average substance must all be suitable. How 'well-rounded' the skins (or sides) are, their general uniformity, freedom from surface defects and size and shape, will also be taken into account when considering the price of the leather. He must also be confident the tannery will deliver material in bulk to match the sample.

THE PATTERN CUTTER

The pattern cutter should ensure the patterns for each style are reasonably economical to cut and that unavoidable waste between cut components is minimal. Understandably, for expensive footwear it is not as vital as on cheaper footwear, where it becomes essential. Indeed, it

“...as a matter of interest...”

Break is the wrinkling of the grain surface when it is folded against itself. If the wrinkles are very fine, the quality of the leather is good. If they are coarse and widely separated, the quality is poor and the

grain said to be ‘pipey’. Leather showing this feature will have a loose fibre structure and is therefore not suitable for vamps, which are required to flex throughout the life of the shoe.



3D inspection tables have quickened the examination of leather deliveries.

CREDIT: BIMA

is sometimes necessary to change the shape of parts to reduce in-between waste when cutting. A pattern cutter must have the skill to judge this and how much to take it into account without affecting the manufacturing processes, fit on the foot or appearance of the finished shoe.

THE CLICKER

The clicker's main skill is to be able to fit shapes together, alongside each other, as closely as possible. It is sometimes referred to as the ‘jig-saw’ skill but, as the clicker decides where to cut each component, he will be considering, almost subconsciously, many other factors too. His ability to consider these other factors is the key to resolving the conflict between yield and quality. It begins with a quick examination of the skin, including the reverse side. He will note where there are flesh-side faults, where the best quality lies on grain leather by comparing the surface ‘break’ in different areas and looking to see if there is any significant colour change across the skin.

UNDERSTANDING ESSENTIALS

He will start in the best quality area and, while cutting, will take into consideration the relative importance that different upper components have in terms of the quality of material from which they should be cut. A good example is the men's Oxford, named after a shoe produced in England

for Oxford College choir boys during the 17th century. The design fits the foot well and also makes maximum use of the leather in terms of yield thanks to the shape of the sections and the way in which they can be locked together. The shapes also involve few straight lines and sharp corners, so that in the days of hand cutting, the clicker's knife typically used only two strokes per shape, making it both faster and cheaper to cut.

To see how the system for an Oxford works, it is necessary to look at the directions of stretch for most types of leather. An animal's skin must stretch in order for it to be able to move. Therefore, one must expect this to be greatest around the neck, belly and legs. The right-hand lines show the greatest resistance to stretch and, those on the left, the least (Figure 1). The butt should show little difference.

Because of the variations in every skin, the clicker had to think for himself where to place his patterns, so he had to understand both the likely effect of these variations and any blemishes, as well as how each upper section was expected to perform (Figure 2). In simple terms, the best material needs to be at the front of the shoe where it is seen, with a progressive reduction in quality towards the back and the inside.

Figure 1: Lines of stretch and tightness.

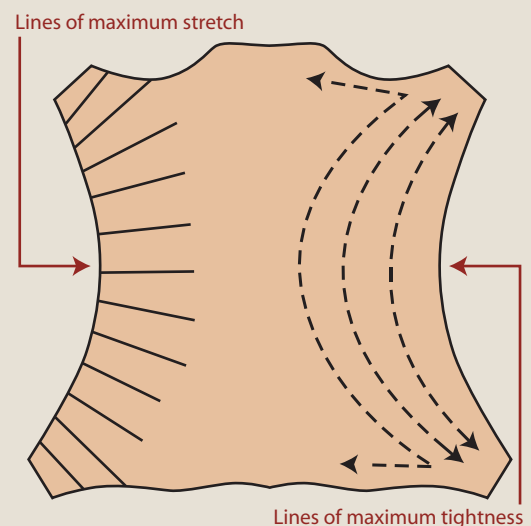


Figure 2: Quality selection.

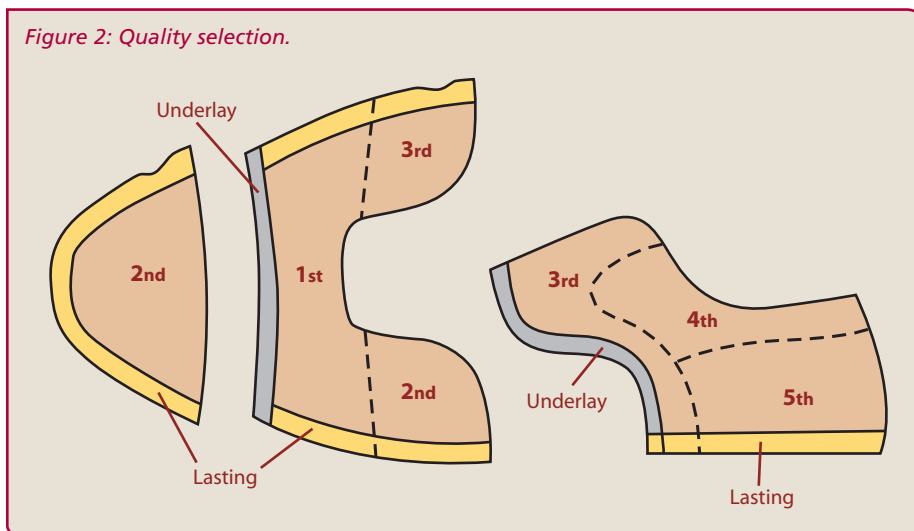
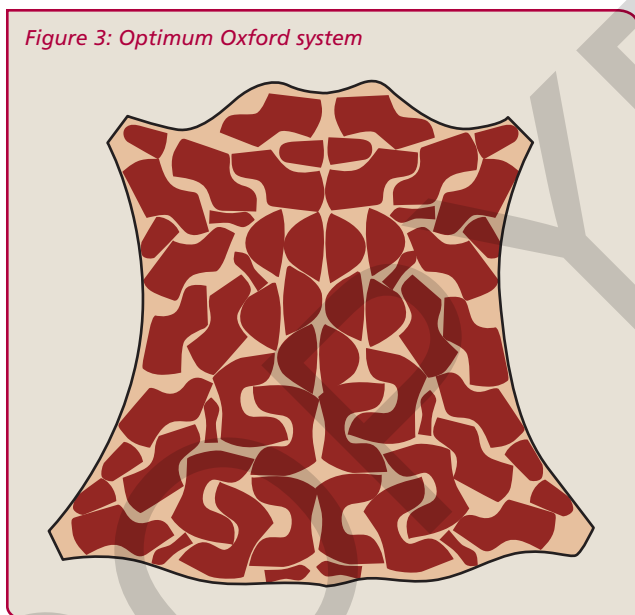


Figure 3 shows how vamps and toecaps are made to fit within the butt and shoulder. The vamps closest to the tail are placed so that the inside wing is nearest to the edge. The belly and neck do not allow a proper system for quarters, so they are cut tight toe to heel with the best leather closest to the vamp seam. Tongues and backstraps use up almost everything else, so there should in fact be very little waste.

Figure 3: Optimum Oxford system



FORECASTING YIELD

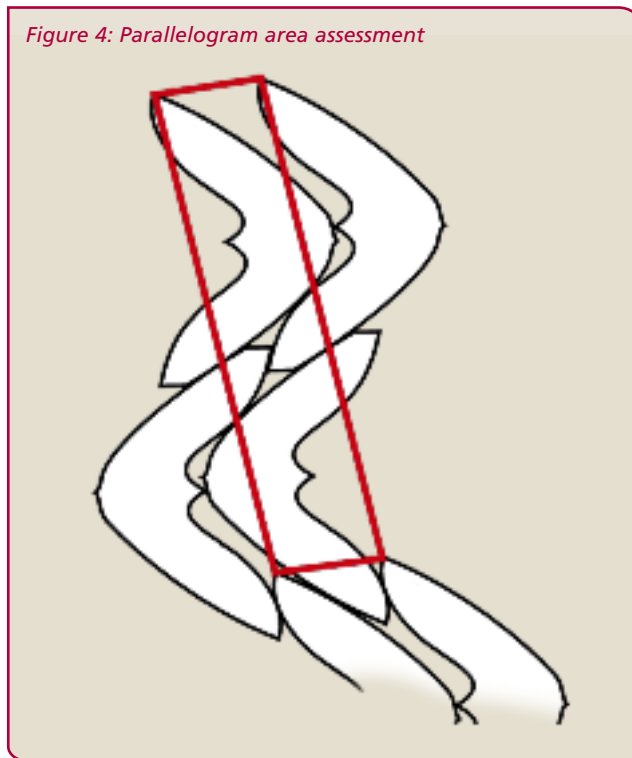
Any boot or shoe must be accurately costed before it is sold. A realistic yield of the upper patterns must therefore be accurately forecast even though components vary in size and shape. Every skin or side will also be different and have the quality variations associated with a natural material. Thus accuracy would appear to be almost impossible but, in actual fact, a few simple steps will lead to a reasonably accurate estimate. More sophisticated methods can be used to provide a thoroughly reliable forecast of material usage for any given design.

One simple process is based on assessing the area of each component pattern to specific rules based on

'parallelogram assessment' (Figure 4). Records of previous cutting results will have established parameters for the range of leathers typically used in the company to convert the sum of the parallelogram area assessments for the various components into a potential yield. This is usually expressed in sq. ft. per pair. Although accuracy of a simple system such as this will vary from one manufacturer to another, it is nevertheless considered by many to be sufficient.

A far more sophisticated method that is increasingly used is the SatraSUMM system offered by SATRA (see accompanying article 'Whywasteit'). This is based on another area assessment method where staff are given special training and follows laid-down procedures from checking the leather when it arrives from the tannery to maintaining the records of leather usage after cutting has taken place. This system is recognised as being very reliable.

Figure 4: Parallelogram area assessment





The quest continues to find ever better nesting systems.

CREDIT: SATRA

NESTING SYSTEMS

Although most shoe uppers are still cut by highly skilled and experienced people, expensive leather is still wasted. It has been estimated that if even a small factory with say 120 employees could improve its cutting efficiency by just 1%, it might save as much as \$45,000 per year. The savings for a large factory could therefore be immense.

The unfortunate truth is that no matter how skilled manual or press cutters may be, they are up against a huge disadvantage; patterns are cut and nested one at a time. Once a cut has been made the skin has effectively developed a major flaw and, even the most skilled people can make mistakes, particularly at the end of a long day. Modern computer technology has provided an answer in the nesting table.

When nesting leather, the final result is influenced by the position of every pattern. Computer-based pick and place systems allow the whole skin and, if needs be, an entire order to be nested before moving forward to an automatic cutting table. The nest can be therefore be manipulated to maximise material usage without sacrificing quality and, this, is where the potential for real savings lies. Unfortunately, although automatic nesting systems have become extremely sophisticated, many of the problems associated with cutting shoe uppers still exist and, if an automatic cutting and nesting system cannot beat a highly trained cutter, it is likely to cost more.

ACHIEVING A BALANCE

The modern shoe manufacturer has access to technologies that his forebears would never have thought possible. Advanced technology cannot however operate in isolation and still needs skilled people to assist it.

Reverting back to the men's Oxford shoe looked at

earlier, J.H. Thornton in his 'Textbook of Footwear Manufacture' published in the 1950s, shows data that suggests a size 8 Oxford cut from an average 10 square foot, grade 2 calfskin would take 2.06 square feet. Could a modern computer nesting system do any better? Probably not compared to a top grade hand clicker but, then again, it would be faster and would not require anything like the degree of skill, experience and sheer effort he had to apply.

However, a computer system also lacks the subjective judgement needed to balance the quality and potential yield of a sample of upper leather in the same way that a skilled and experienced leather buyer will. While it will create a nesting solution that is able to exploit that leather to its maximum, it cannot create quality and performance that is not already there. Similarly, if a CAD system is used to cut the patterns, the operator must have an extensive knowledge of leather, the shoemaking process and how to produce the most economic patterns commensurate with the level of design and final quality demanded of him. Although we may be able to replace the traditional clicker by a computer controlled cutting system, its success will still depend on all that has gone before.

The better the interlock of upper sections, the easier it becomes for clickers or nesters to maximise leather usage and avoid waste. The more even the overall quality of the leather sourced from the tanner, the better the overall quality of the uppers cut and the finished shoes will be.

Finding the right balance between yield and quality or cost and quality is never easy. There almost always is one however and combining the best of technology with the skill and experience of well trained staff is a good starting point. And, continual monitoring of all the factors involved will ensure that established standards are adequately maintained. 🍷