



A comparison between leather and alternative substrates



There is ongoing debate about the relative merits of leather and alternative materials. Many of the arguments employed are based on sentiment and appear to pay little attention to the facts. In this article, technical editor Mike Tomkin looks more closely at those facts and examines the factors that must be considered when selecting the best substrate for a particular purpose.

Raw materials

The first thing to look at is the raw materials used. Leather, by definition, is made from the hides and skins of animals. This means that any comparison must include the impact of the lifecycle of the animal. Around 99% of the hides and skins used are by-products of the meat and dairy industries. Once the lifecycle impact is fairly shared between all the industries using derivatives from the animals, the part that should be attributed to the final leather is minimal. We must also consider the huge environmental impact if the hides and skins were disposed of instead of being used in leather production.

Of course, we cannot make any broad statement about the impact of the raw materials used to make potential leather alternatives; these would have to be studied in every individual case, but given the very low impact of leather, it is difficult to see how any replacement could be a significant improvement.

Waste

One downside for leather is the amount of waste generated during processing and during the subsequent manufacturing of leather articles like shoes, bags and automotive seats. For bovine leather, which accounts for most of the leather produced, as little as 25-30% of the original hide ends up as leather. For many tanneries, the rest ends up as waste. With growing concerns about the disposal of any sort of waste, this is an area where the leather industry really needs to improve.

Fortunately, some forward-thinking companies are already coming up with solutions to this problem. Bridge of Weir Leather Company, part of the Scottish Leather Group, diverts a large portion of its solid waste to its on-site thermal

Finished product manufacturers are faced with a choice between leather (left) and a growing list of alternative substrates, such as Modern Meadow's bio-fabricated collagen material (right).

energy plant. Lanxess has developed its ReelL ('Resource-efficient production of leather chemicals') process, which allows tanners to use some of their leather waste to make new retanning agents. The fact that this can be done on site resolves one of the biggest problems faced by those trying to reduce the amount of waste they generate by reusing it in some way. Waste material is generally of very low value; if it has to be transported to an off-site processing centre, the logistical costs can be enough to make the whole process uneconomical.

The latest advancement that could help in reducing waste is



UK-based Bridge of Weir Leather Company operates its own on-site thermal energy plant, to which it sends much of its solid waste.



the introduction of much-improved splitting machines. Previously, any leathers undergoing splitting had to come out thicker than the final intended material because of the relative inaccuracy of the process. They then had to be shaved to the correct thickness, generating waste shavings, usually amounting to 5-10% of the weight of the leather. New splitting machines are so accurate that no shaving is needed, meaning waste at this stage of the process can be eliminated.

Again, it is difficult to make any broad statement about the waste generated during the manufacturing of alternatives to leather, but it is highly unlikely any of them generate as much as leather processing does. This means it is vital that the leather industry makes full use of the new technologies available and continues to search for further improvements.

Yield

The irregular shape of leather and its natural imperfections can make cutting it for use in products more difficult. For example, in the making of car seats the amount of leather used is a little over 50% of the finished leather. With most alternatives being supplied in regular shaped sheet or rolls and being free of natural faults, the cutting yields are considerably higher, resulting in a corresponding reduction of waste.

The impact of the leather waste is reduced, however, as much of it can be used to make small leathergoods items. It is also possible to grind it up and use it to manufacture an alternative substrate, as has been demonstrated by sportswear manufacturer Nike. The fairly widespread reuse of leather waste means that although alternative materials would probably come out on top in this category, the margin is less significant than the previous section might suggest.

Chemical usage

A number of chemicals are required in the production of leather or of any alternative material. To go through every stage of the process and look at each individual chemical is beyond the scope of this article, but for the purpose of comparison we need to examine which chemicals could end up in the waste and which could end up in the final substrate.

The leather industry has made real progress in this area in response to REACH regulations, with some chemicals being eliminated from all stages of leather production and sensible limits being established for others. There is still hard work ahead, but the leather industry will be far ahead of many of its rivals once this process is complete. Only the textile industry has been subjected to the same level of attention. Many other industries still have this to come.

Perhaps the only remaining concern for the leather industry is that of Chrome VI. The majority of leather is tanned with trivalent chrome (Chrome III), which can under certain conditions and on a limited scale change to Chrome VI. Chrome III is relatively harmless, but Chrome VI is toxic. Testing leather for Chrome VI is troublesome, with false positive results often given. This means it remains a difficult area, but one which must be closely monitored. Who knows what will emerge once leather alternatives are subject to the same scrutiny as leather.

Comfort

Despite the constant improvements in alternative substrates, one area in which leather remains ahead is comfort. The three-dimensional fibre structure of hides and skins is carried through into the leather, something extremely

difficult to replicate in a man-made substrate. This unique structure allows leather to mould to the shape of the foot when used in a shoe or to stretch with the movement of the fingers when used in a glove.

The processing of leather has an important influence on these properties. In gloving, where a so-called 'plastic stretch' is required to allow the fingers to bend without being pulled back by the leather, a stronger bating process is used, meaning more elastin in the skin is broken down. For bridle or sole leather, where shape retention is essential, a heavy vegetable tannage is used to allow minimal stretching.

Smell is another point which often comes up when comparing leather and its potential alternatives. The smell of any substrate comes mainly from the chemicals used in its manufacturing process. With the replacement of solvents with water in leather finishing and the fact that most leather is tanned using chrome rather than with vegetable extracts, the smell of leather has been greatly reduced. This is notably different from some of the cheaper alternatives which still involve strong-smelling solvents in their production. This includes some solvents banned from use in leather production. Go into a shop selling cheap shoes and one cannot fail to notice the strong solvent smell.

Durability

Durability is a major concern in our business. Consumers are entitled to expect that the items they buy have an extended lifespan and will not need to be replaced after a short space of time. Leather has always been justifiably considered a durable material; many early imitations could not come close to matching the performance of leather in this regard. Unfortunately, mislabelling and the misleading brand names of alternative materials led many consumers to mistakenly believe they were still buying leather. This caused its reputation to suffer somewhat. Some alternative materials have improved in terms of durability, but they cannot surpass the performance of leather. It is sad to see that mislabelling continues and that many alternative materials still use brand names which suggest they are leather.

End of life

What happens at the end of their lifespan is increasingly important in relation to all products, regardless of the substrates involved. We must recycle and reuse wherever possible to reduce the volume of items which end up in landfill. The main issue facing both those using leather and those using alternative materials relates to the construction (and deconstruction) of articles. If we take shoes as an example, it is not just the substrate used in the upper that must be considered. There are also linings, soles, laces, eyelets and other components to take into account. Separating these different materials poses a greater problem than choosing what to do with the main substrate. Should the upper end up in landfill, leather should eventually biodegrade. Many synthetic alternatives are far less likely to do so.

Conclusions

The debate over whether leather should be used or not is likely to continue for years to come. Those of us who believe leather still has a place in today's market must be prepared to speak out and to correct the misinformation being deliberately fed to consumers. By looking at the facts, as has been done here, we can better prepare ourselves to do so. 🌱