



A problem shared is a problem solved

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Solving a problem is a bit like doing a jigsaw—we find out little bits of information that in isolation mean nothing but, if you can fit them all together, a picture of what has happened begins to emerge. In many respects it's like being a detective. The difficulty is knowing where to find these little snippets of information and how to interpret them. To do this successfully requires competence.

Competence is a combination of personal attributes, and technical skills and knowledge of the leather-making process and its raw materials.

The personal attributes that are needed are:

- *An enquiring mind* – a desire to find things out
- *An eye for detail* – the ability to look beyond the problem itself
- *A good memory* – problems have a habit of recurring
- *Willingness to listen* – more information about a problem is always useful
- *An open mind* – scepticism and pre-conceived ideas are mere barriers
- *Intuition* – sometimes a gut feeling is the right one
- *Determination* – never give up unless finance dictates it

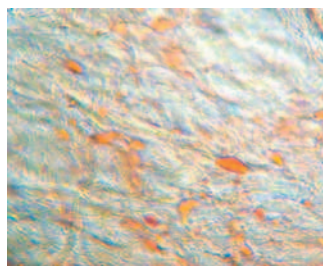
The value of analytical equipment

In addition to these attributes an extensive range of sophisticated analytical equipment is also invaluable for problem solving. These techniques include:

HISTOLOGY

Thin sections of material from any stage of processing can be examined by light microscopy enabling the fibre structure to be examined in detail. This gives an insight into the process conditions that the sample might have been subjected to.

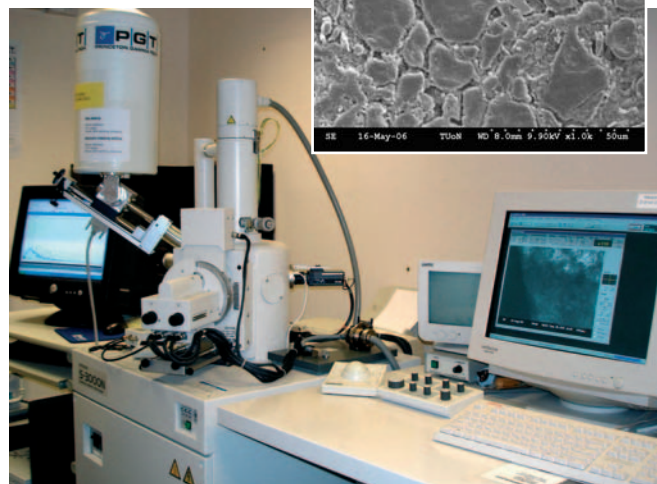
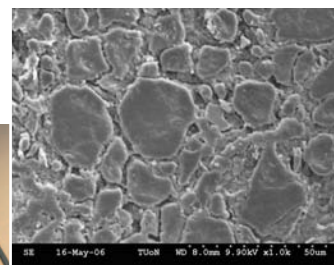
These thin sections can be stained with a variety of different dyes that reveal particular components that might be of interest. For example, the condition of the skin's own fibroblast cells and epidermis can be used to indicate if putrefaction has occurred. Fats can also be revealed with fat-soluble dyes, which can show how well a sheepskin has been degreased or how well distributed the fatliquor is.



Poor emulsification of the fatliquor revealed by histology

SCANNING ELECTRON MICROSCOPY

This provides magnifications many thousand times greater than the ordinary light microscope can achieve. This is because the diameter of a beam of electrons is much thinner than a beam of light, thus enabling much higher resolution. This technique reveals the micro-structure of surface defects such as grain damage, which can be highly informative. For example, a crackled grain effect is often associated with heat, particularly under acidic conditions.



Scanning electron microscope

Inset: Grain surface of hot acid damaged leather as seen at high magnification under a scanning electron microscope

X-RAY MICROANALYSIS

Attached to the electron microscope is X-ray microanalysis. When electrons are used to produce an image instead of light, interactions take place between the sample and the electron beam which cause the sample under examination to emit X-rays. Each element produces a characteristic energy pattern of X-rays that enable that element to be identified. So, it is possible to identify all the elements at the surface of a sample with the exception of the very lightest, such as hydrogen. We can also compare different areas of the sample, so it is invaluable for the identification of contaminating inorganic chemicals that could produce stains, etc.

X-ray microanalysis can also be used to map the location of chemicals such as the penetration of process chemicals into the structure of the leather e.g. waterproofing agents. ➤

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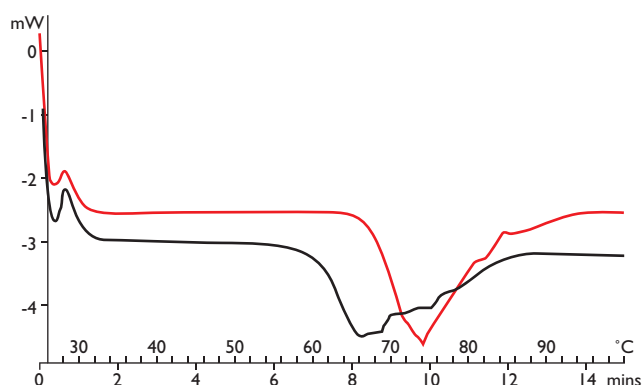


Mapping the penetration of process chemicals into the leather (grain surface at the tip of the image). Brighter colour indicates a higher concentration.

DIFFERENTIAL SCANNING CALORIMETRY (DSC)

This technique is used to show how a sample reacts to heat. A small piece of the sample is placed in a sealed aluminium pan and heated in a furnace. The absorption or release of heat is measured and compared with an empty reference pan.

When testing leather, the results not only indicate when the leather begins to shrink, but also gives information about how it shrinks. For example, the shape of a peak can indicate if a low shrinkage temperature is due to a lack of tannage or an existing thermal degradation of the leather.



DSC results showing different shrinkage temperature of two samples of leather.

FOURIER TRANSFORM INFRA-RED SPECTROSCOPY (FTIR)

This is used to identify organic substances such as polymers, fats, oils and waxes. It can also have a microscope attached enabling very small samples or thin sections of samples to be analysed. When infra-red light interacts with a sample, it makes the bonds between functional groups vibrate, stretch or bend. This causes them to absorb infra-red radiation at a particular wavelength enabling them to be identified.



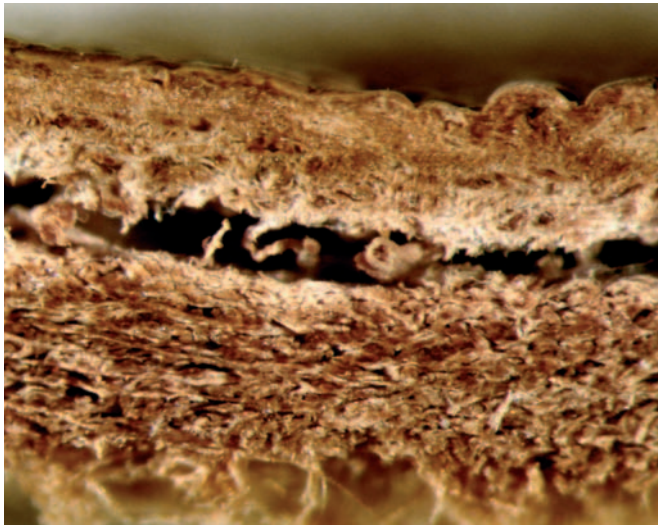
Fourier Transform infra-red spectrometer

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Interpretation of results

Having the technical skills to use these pieces of equipment is not enough to be a good problem solver—we need to understand what the results obtained mean and know how to apply those results to the manufacturing process under investigation—it's all down to interpretation. If the results are not interpreted correctly, the investigation may go in the completely wrong direction, which can be a very expensive mistake to make.



Cross section of a sheepskin showing delamination between the grain and corium

Knowledge of the raw materials involved is necessary; we make leather from the hides and skins of animals such as sheep, cattle, pigs and goats, etc. Therefore, knowledge about the differences in structure between these different animals and how it affects the leather properties is needed. For example, domestic woolled sheepskins are prone to delamination of the grain from the corium because they deposit a fatty layer here. Cows and goats don't.

Knowledge of how things that happen during the life of the animal or at the abattoir affect the leather is important—disease and parasite damage for example. The ability to be able to recognise the difference between these types of damage that the tanner has no influence over and those that he himself has caused is vital.

A broad knowledge of the entire leather-making process is obviously an essential quality to have; as is which chemicals and machines are used in the leather-making process and how they interact with each other and the leather to produce problems. But the knowledge has to go beyond the leather-making process—knowing how leather products are made is also essential as problems are often introduced during the design or manufacture stages.

And then of, course, there are all the dreadful things that consumers can do to leather once they get it home. To be able to recognise if a problem is due to a fault with the leather or if it has been abused or not cared for properly by the consumer is a common request. Where two parties cannot amicably agree an outcome of a dispute, a third party can be brought in to arbitrate. When this happens, complete professional independence must be guaranteed by the arbitrator, even if one or both parties are known. Sometimes, disputes end up in court. When this happens it is important to be aware of relevant legislation, such as the Trades Descriptions Act in the UK. Ⓢ

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