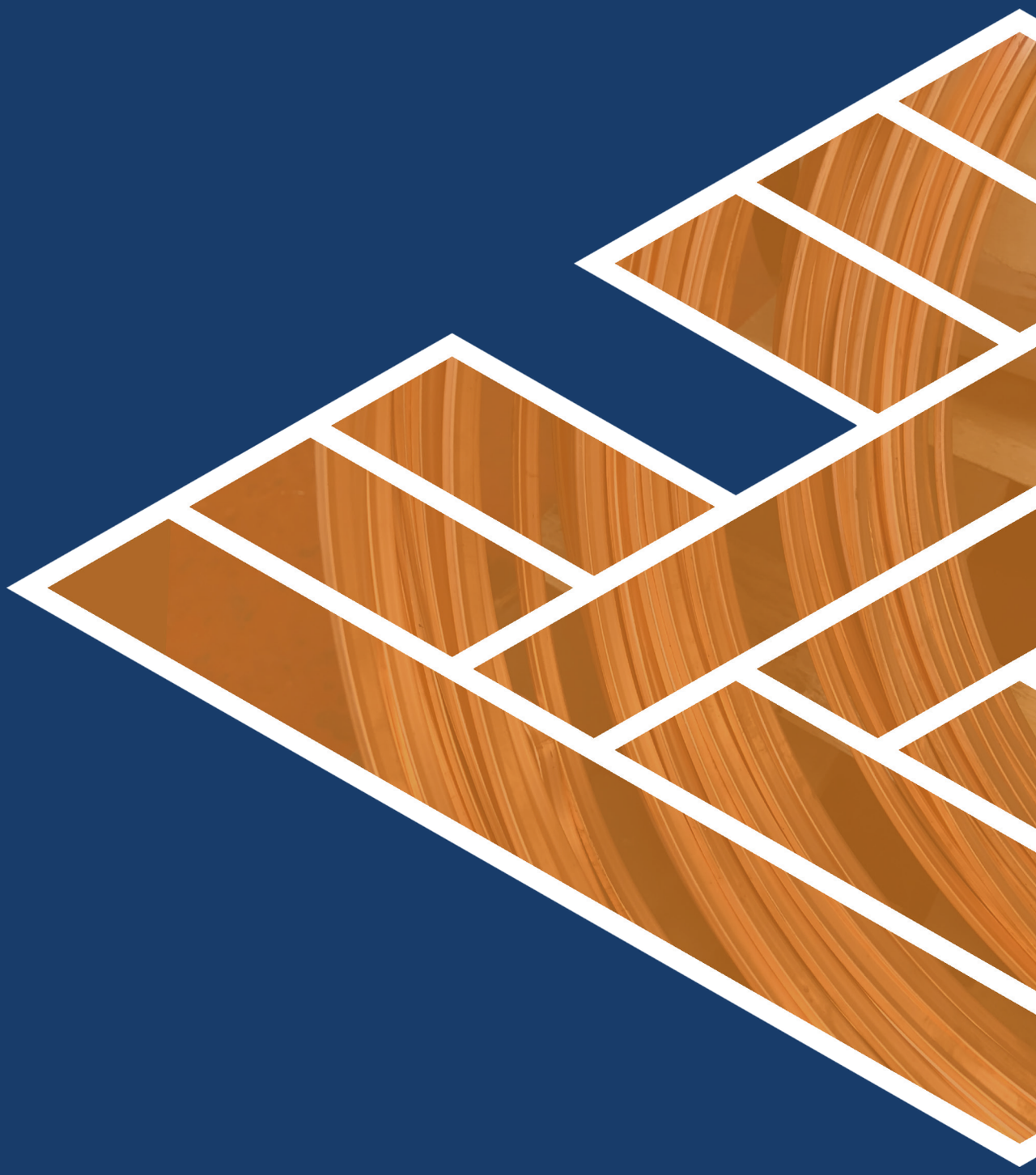
HARDY

MADE IN LIVERPOOL



HARDY UK LIMITED
ALUMINIUM VS COPPER CAULKING

TECHNICAL GUIDE

HARDY UK LIMITED
ALUMINIUM VS COPPER CAULKING

Copper and aluminium are the two most commonly used materials for caulking blades in the tanning sector. A small number of re-bladers also use steel slabs but these are not so common.

While aluminium is the most abundantly available of the two metals, the demand and scarcity of copper have caused its cost to fluctuate widely. Some regions therefore have started to use aluminium in the last years as their sole caulking agent to fix the blades to the cylinders. From a basic cost perspective, this would be considered acceptable.

However, there are 'hidden factors' which would justify spending more in order to obtain better results and lowering risks, by using copper.

PHYSICAL PROPERTIES

Some of the key physical properties which are of interest are mentioned in the following table.
A definition of each compared item follows the table:

COPPER	ALUMINIUM
Density: 8.95 g/cm^2	Density: 2.7 g/cm^2
Melting point: 1083°C	Melting point: 660°C
Ultimate tensile strength: 220 N/mm^2	Ultimate tensile strength: 50 N/mm^2
Breaking elongation: 49%	Breaking elongation: 40%
Coefficient of linear expansion: 16.2	Coefficient of linear expansion: 23.9
Admissible surface pressure: 293.7 N/mm^2	Admissible surface pressure: 52.8 N/mm^2

- **Density** – the amount of pure material by a given surface. The higher the density, the more purity in the material we have. Copper has a higher density than aluminium.
- **Melting point** – for our purposes a higher melting point is better, meaning more time would be required to reach that point. Aluminium has a much lower melting point.
- **Ultimate tensile strength** – this is measured by the maximum stress that a material can withstand while being stretched or pulled before breaking. Copper resists more stress before cracking.
- **Breaking elongation** – this is the percentage in which a material can increase in length before breaking. Copper out stretches aluminium.
- **Coefficient of linear expansion** – this shows the tendency of matter to change in shape, area and volume in response to a change in temperature. Copper's lower coefficient of thermal linear expansion results in better response to these variations.
- **Admissible surface pressure** – copper can take more pressure before obtaining damage to the material.

THE FACTS

It is important to understand what happens on the cylinder during the fleshing/shaving operations.

As we know, the blades are fixed to the cylinders with the “caulks” but this fixing is more than just a piece of metal holding the blades. It should be understood that these caulks are critical to efficient blade performance having a variety of functions which are normally unobserved, such as; holders, forces absorbers, heat conductors and heat-sinkers, sealants, etc.

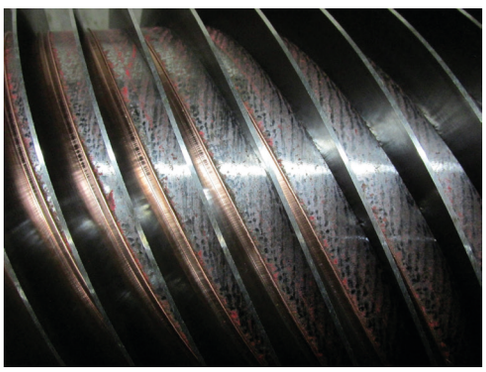
CAULK FUNCTIONS IN ACTION

Blades and caulking media will absorb heat created by the grinding operation (particularly ‘over grinding’ which is a common error). During grinding operations the blades heat increases due to friction. This heat can act as a ‘tempering’ effect, softening the blades default hardness. But it is not only the blade’s edge that is heated by friction as this heat would be “transported” by conduction, all along the blade’s profile, ultimately reaching the cylinder grooves and being absorbed by the caulking. Consequently as the caulks are in touch with the blades, heat will also go into the blade’s foot (and of course the cylinder’s body). Copper can absorb almost twice heat (translated in our case to the melting capacity) of aluminium.

> **RESULTS –** Aluminium could crack on the caulking, producing holes or uneven caulked surface. Risk of blade cracks are very high.

Absorb heat created on the blade by the grinding media and leather. During grinding operations the blades increase their heat due to friction. This heat can derive on loss of the tempering the steel obtains during the hardening process. But it is not only the blade’s edge that is heated by friction with the grinding stones or blocks – this heat would be “transported” by conduction, all along the blade’s profile, reaching the cylinder grooves and being absorbed by the caulks.

Cracked Aluminium Caulking



Good Quality Copper Caulking

Consequently as the caulks are in touch with the blades, heat will also go into the blade’s foot (and of course the cylinder’s body).

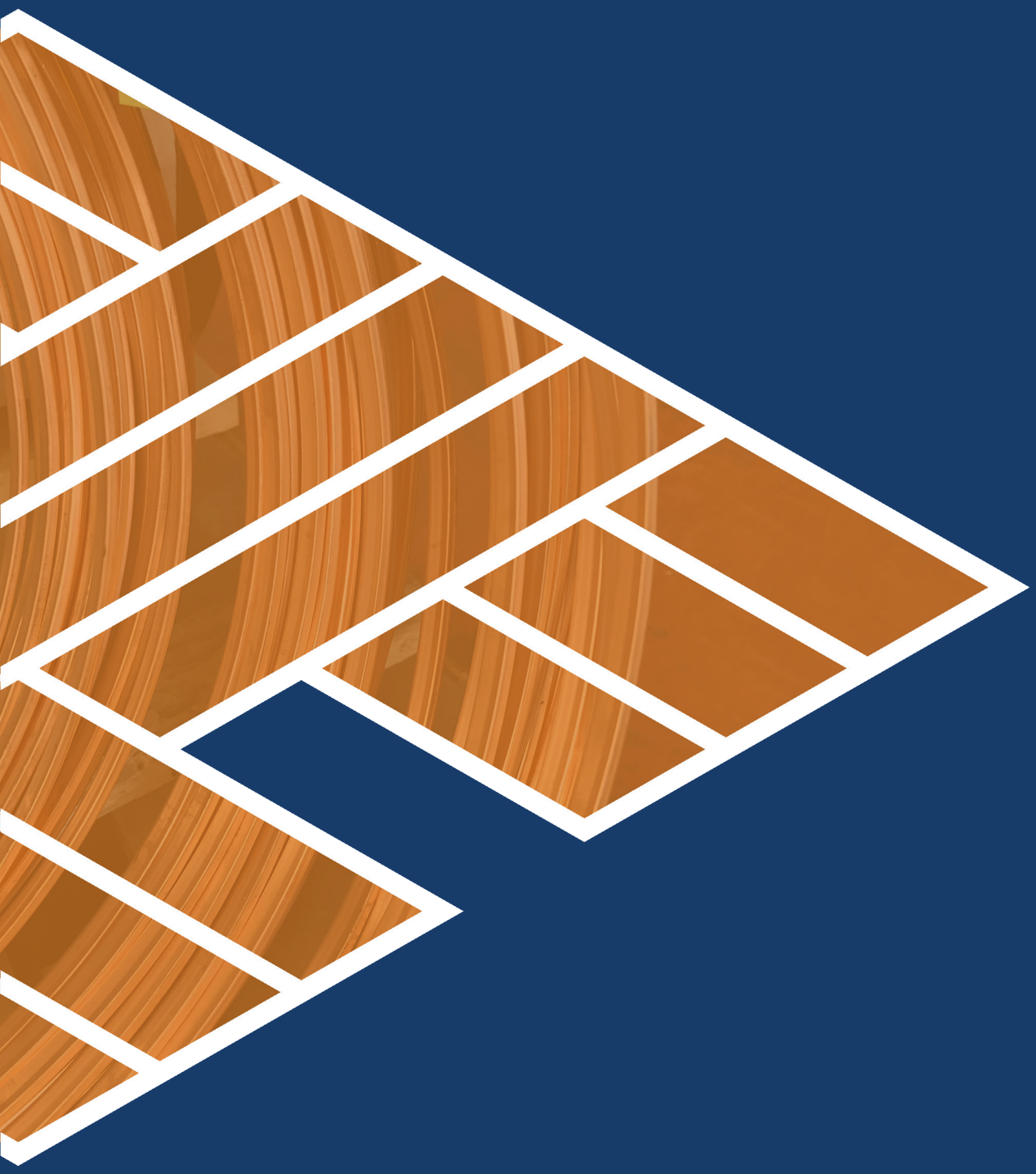
> **RESULTS –** As the transfer of heat takes place, then in the caulks, it is very important for the caulk to have good heat transfer characteristics. Copper has a heat transfer coefficient higher than aluminium, that means, copper is a better heat exchanger than aluminium.

As the caulking is also acting as a sealant, the caulk media should protect against formation of corrosion in the grooves. The caulks are directly exposed to the material moisture content, humidity, grinding/blade compounds and chemicals present in the tanning process. Copper is a noble metal (+.34) compared to iron (-0.44) and hence help protect from corrosion when used together. Aluminium is an ignoble metal (-1.67) compared to iron and hence will corrode instead of iron when used together. Corroded aluminium will furthermore corrode the cylinder and ultimately negatively impact the shaved leather quality. Corrosion will also eventually “filter” into the grooves and destabilise the blades footing, as well as the corrode the cylinder walls.

> **IMPORTANT –** Never re-use any type of caulking media!

Business Card Used to Highlight Space Between Caulking and Blade

CUTTING EDGE PRECISION BLADES **MADE IN LIVERPOOL**



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Part of the Fi-Tech Inc. group

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