When the going gets tough

copper gets going

The Capanna Osservatorio Regina Margherita – Monte Rosa, Italy

copper gets going to the summit of Europe

The Capanna Osservatorio Regina Margherita

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Going to the peak

Copper has literally reached new heights – 4554 metres to be exact! That's the altitude of the 'Capanna Osservatorio Regina Margherita', or Queen Margherita Observatory and Hut, making it officially the highest building in Europe. This unique copper-clad structure is perched on Punta Gnifetti, one of the peaks of the Monte Rosa Massif in the Italian Alps.

Going to the extreme

Low oxygen, extreme cold, wind and weather at an altitude above 4000 metres? This shelter has got it covered: Covered in 5.5 tons of copper sheet in fact. The copper acts as a giant Faraday cage, which insulates and protects the interior from lightning and atmospheric phenomenon. Tough copper stands up to the extreme conditions – resisting corrosion and electrical discharges – keeping the hut and all inside safe from the elements.

Going the alpine route

Originally constructed in 1893 and rebuilt in 1980, this three-level shelter and scientific research centre can host 70 mountaineers and alpine skiers in summer – after enduring an extremely challenging glacial trek or Alpine climb. Not for beginners or the faint of heart! The hut is also uniquely positioned to conduct high-elevation medical research, and environmental and climate studies.

Going 360 degrees

With stunning views spanning 360 degrees, the 'Capanna Osservatorio Regina Margherita' is a copper-covered beacon – anchored on a 2000 metre precipice of rock and ice. Not merely a summit to be conquered, but a destination in itself.

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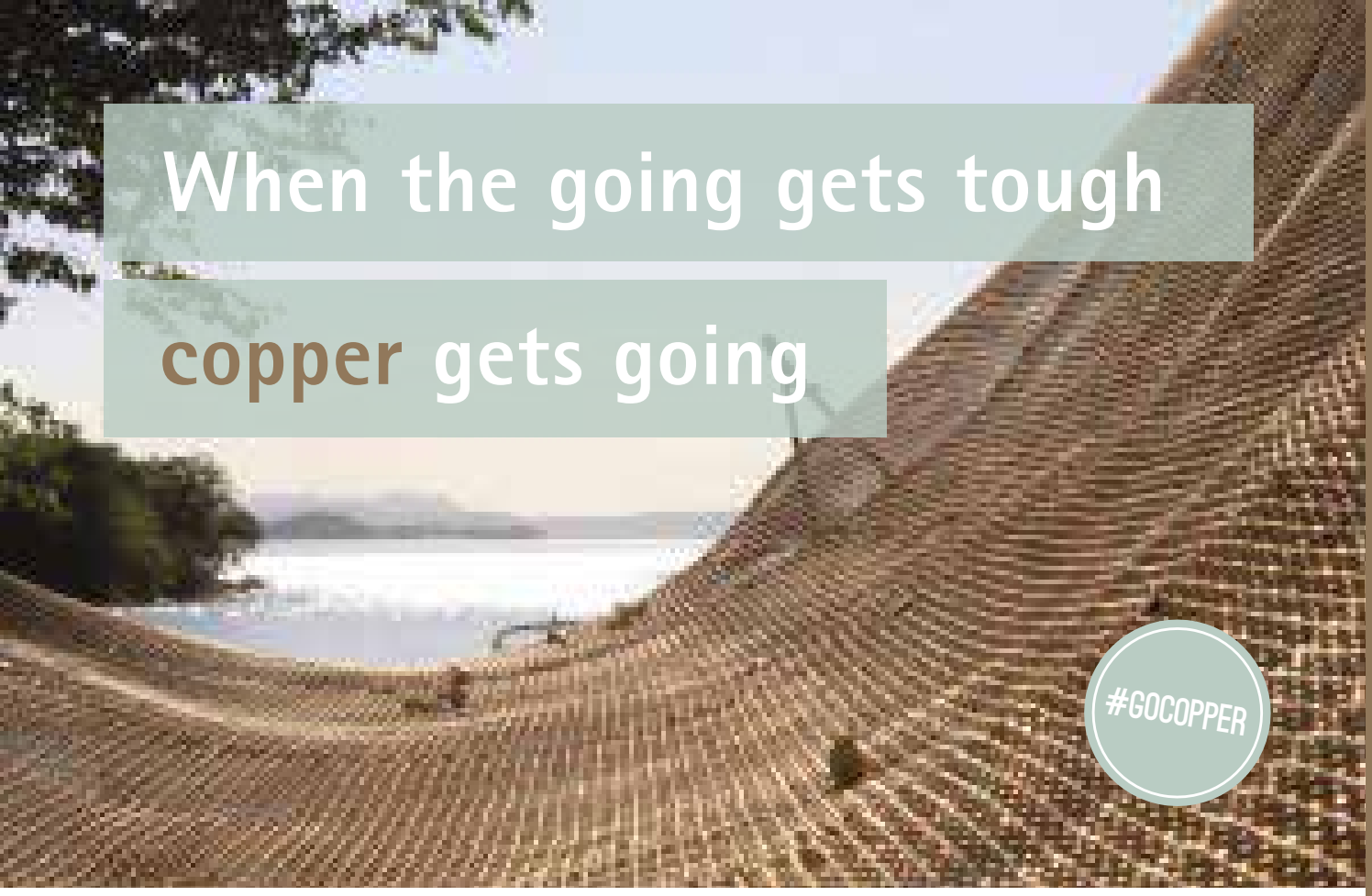

Copper fish cage, Mozambezi Tilapia Farm – Cahora Bassa, Mozambique

copper gets going to stand up to predator attacks

Copper fish cages in Mozambique

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Going on the attack

Picture a crocodile viciously attacking a cage: not a scene from a horror movie, but a daily reality for the Mozambezi Tilapia Farm in Mozambique. How to protect fish in their cages from predators? Naturally, with copper!

Going up against predators

The fish farm had a major problem with predator attacks from crocodiles and otters. The usual solution was to install additional predator nets to protect the holding nets from damage. The nets were also vulnerable to intense bio-fouling, affecting the health of fish and fish mortality. The nets also had to be cleaned weekly after first removing the fish from the nets – stress-inducing for fish and their two-legged caregivers alike.

Going for strong copper

Copper aquaculture cages were installed at the fish farm – no additional predator nets required. The fish are protected from predators and the cages themselves are resilient against attacks. Additionally, as copper is not vulnerable to bio-fouling, the fish are healthier and the mortality rate is much lower. Copper is a clear winner, no contest.

Going fierce on crocodiles

Tough enough to take on crocodiles – copper cages come out on top compared to traditional nets. With its corrosion resistance, antifouling properties and easier maintenance, copper is in its element.

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Micro-alloyed copper overhead lines withstand severe ice storms – El Tienente Copper Mine, The Andes, Chile

copper gets going to take the icy Andes challenge

Copper overhead power lines in Chile

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Going to the outer limits

The Chilean Andes – known for its extreme weather and desolation – is a place for die-hard adventurers, hardened locals... and Copper. In August 2015, Micro-alloyed copper overhead lines were constructed in the Andes mountains, and have proven the extreme location is a perfect match for its ultra-tough capabilities.

Going to icy extremes

The overhead lines must withstand four to six ice storms each winter. Excessive ice on the lines can lead to a shutdown (due to conductor clashing or arc flash). When a snowstorm swept across the line in October 2015, the new copper conductor as well as an existing conductor were put to the test. The copper line showed less ice build-up and 'sag' and no arc flash, compared to the traditional line. An ice-cold winner!

Going high capacity

With its smaller cross section and hydrophobic coating, the new Micro-alloyed copper conductor sheds ice more quickly and resists wind load – while boasting a 30% increase in the circuit's current carrying capacity. Many of copper's characteristics pull together to master the icy and windy elements: higher electrical conductivity, significantly lower energy losses and corrosion resistance. Plus its mechanical strength eliminates the need for steel reinforcement.

Going for top marks

This shows that Micro-alloyed copper conductors are an excellent alternative to steel reinforced aluminium conductors for high voltage overhead lines. They came to the Andes, they stood the test of severe ice storms, and came out on top.

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When the going gets tough copper gets going

Transnet's Phelophepa I and II mobile healthcare trains equipped with copper – South Africa

copper gets going to spread healthcare to rural areas

South Africa's 'Miracle Trains'

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Going on track for health

South Africa's 'Miracle Trains' – Transnet's Phelophepa I and II – provide healthcare to rural communities across the country. This 18-coach mobile hospital is fitted with Antimicrobial Copper, essentially stopping the spread of germs in their tracks, while the trains deliver safer healthcare to millions of people. After all, Transnet-Phelophepas means 'good, clean health'.

Going to spread acccess

The trains function as a one-stop health facility, bringing much needed care, medication and education outreach to rural areas that don't have access to healthcare. Travelling 36 weeks a year, the trains serve over 300,000 people annually. Copper is key to the project – spreading good health while preventing the spread of infection!

Going to harness the power of copper

Antimicrobial Copper door handles are a first-line defence against germs, helping to provide a more hygienic environment for patients and staff. Plans are also underway to install copper tabletops and cupboard doors. A powerful antimicrobial, copper touch surfaces are proven to reduce the spread of bacteria and viruses. These trains truly harness the germ-killing power of Antimicrobial Copper.

Going on a path for healthy communities

Copper makes important infection control contributions to these unique 'miracle trains' – protecting the health of millions of people and countless communities across rural South Africa.

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Kamaz truck with CuproBraze® radiator – Sahara desert, The Dakar Rally

copper gets going on extreme off-road conditions

Kamaz truck at Dakar Rally

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Going rough and rugged

The Dakar Rally: it's the ultimate off-road rallying event. With rugged terrain, extreme heat and a harsh schedule, the race has been trying the endurance of drivers – and their vehicles – since 1978. It doesn't get rougher than this. Just the place to put copper's performance to the test.

Going the distance

The 2-week event challenged over 300 drivers on a 9,400 km trek from Paris, France, through Spain and the Sahara desert, ending in Dakar, Senegal. Only true off-road vehicles (cars, motorbikes and trucks) can take the heat: crossing dunes, mud and rocky surfaces, and covering distances up to 900 km a day. The route varies year by year, and since 2009 the rally has taken place in South America.

Going for high performance CuproBraze

For many years Kamaz has dominated the truck category in this gruelling race. The Kamaz truck pictured relied on a Shaaz radiator with advanced CuproBraze® heat exchanger technology. CuproBraze's advantages are the strength and reliability of the core, smaller size and higher heat exchange rate compared to aluminium. CuproBraze revs up the performance and puts vehicles in high gear!

Going extreme durability

Copper is right at home in this punishing world of off-road rally racing. A cool contender under the challenging conditions of high temperatures and rough terrain: CuproBraze is tough and durable to the extreme.

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Copper rocket combustion chamber liner made with 3-D printing – NASA, USA

copper gets going Destination Red Planet

NASA's First 3-D Printed Copper Rocket Engine Part

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Going to 5,000 degrees Fahrenheit

NASA engineers achieved a milestone in rocket manufacturing by 3-D printing the first full-scale, copper rocket engine part. The combustion chamber liner must withstand extreme hot and cold, as temperatures soar to over 5,000 degrees Fahrenheit inside the chamber. Not your everyday copper, this copper alloy is on a mission.

Going to revolutionise rocket building

Copper is extremely good at conducting heat, making it an ideal material for lining a combustion chamber. The part is built with a special copper alloy created by NASA scientists, and it took over 10 days for the laser machine to fuse 8,255 layers of copper powder with its 200 intricate cooling channels. The groundbreaking manufacturing process will guide future 3-D printed rocket engines – to space and beyond.

Going to get fired up

After manufacturing the part, a nickel super-alloy jacket was deposited onto the exterior surface. Then the copper liner will be tested under simulated conditions, to make sure it can handle extreme temperatures and pressures inside the rocket engine during flight. 3, 2, 1 – copper is ready for blast off.

Going on future space endeavours

This is not a one-off; the goal is to reduce the time and cost of making rocket parts, and create a repeatable process for manufacturing advanced designs. These revolutionary technologies bring NASA closer to a journey to Mars. The red metal is Destination Red Planet!

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