

When the going gets tough,

copper gets going

#GOCOPPER

Photo credit: G. Tiraboschi

The Capanna Osservatorio Regina Margherita – Monte Rosa, Italy

copper
gets going
to the summit
of Europe

**The Capanna
Osservatorio
Regina
Margherita**

 @Go_Copper

Going to the peak

Copper has literally reached new heights – 4,554 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 are commonplace at altitudes above 4,000 metres. However, this shelter, clad with 5.5 tonnes of copper sheet, has got it covered: the copper exterior acts as a giant Faraday cage, which insulates and protects the interior from lightning and atmospheric phenomena. Tough copper can stand up to these extreme conditions – resisting corrosion and electrical discharges – thus 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. Requiring an enduring and extremely challenging glacial trek, or Alpine climb, it is not for beginners or the faint of heart! The hut is also uniquely positioned to conduct high-elevation medical research, plus 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 2,000 metre precipice of rock and ice. Not merely a summit to be conquered, but a destination in itself.

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Photo credit: CDAA, Advance Africa and the operator of the site, Mozambezi

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

Imagine 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 can they protect the fish in their cages from predators? Somewhat surprisingly, 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 holding nets were prone to intense biofouling, affecting the health of fish and their mortality. The nets also had to be cleaned weekly after first removing the fish – stress inducing for the fish and their two-legged care-providers alike.

Going for strong copper

Copper alloy aquaculture cages were installed at the fish farm – no additional predator nets were required. The fish are protected from predators and the cages themselves are resilient against attacks. Additionally, as copper has high resistance to biofouling, the fish are healthier and their mortality rates much lower. Copper is a clear winner, no contest.

Going fierce on crocodiles

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

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Photo credit: LaFarga

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

copper gets going to take on the icy Andes challenge

Copper overhead power lines in Chile

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 **European
Copper Institute**
Copper Alliance

Going to the outer limits

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

Going to icy extremes

These overhead lines, critical to the country's high-altitude mining operations, 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 major snowstorm swept across the region in October 2015, the new copper conductors as well as an existing conductor were put to the test. The copper lines, on the left, showed far less ice build-up and 'sag' and no arc flash, compared to the traditional lines. 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 an internal steel core reinforcement.

Going for top marks

This shows that, in challenging atmospheric environments, micro-alloyed 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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TRANSNET - PHELOPHEPA

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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'

 @Go_Copper

Going on track for health

South Africa's 'Miracle Trains' – Transnet's Phelophepa I and II – provide healthcare to rural communities across the country. These 19-coach, primary healthcare facilities on rails are fitted with Antimicrobial Copper, essentially stopping the spread of germs in their tracks, while the trains themselves deliver safer healthcare to millions of people. After all, 'Phelophepa' means 'good, clean health'.

Going to deliver local access

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

Going to harness the power of copper

Antimicrobial Copper door handles, table and countertops and cupboard doors are a first-line defence against germs, helping to provide a more hygienic environment for patients and staff. With powerful inherent antimicrobial efficacy, solid 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 an important infection control contribution to these unique 'miracle trains' – protecting the health of millions of people and countless communities across rural South Africa.

When the going gets tough, copper gets going

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

copper gets going on extreme off-road conditions

Kamaz truck at Dakar Rally

 @Go_Copper

Going rough and rugged

The Dakar Rally is the ultimate off-road rallying event. With rugged terrain, extreme heat and a harsh schedule, the race has been testing 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 challenges 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 copper heat exchangers

For many years, Kamaz has dominated the truck category in this gruelling race. The Kamaz truck relies on a Shaaz radiator made from advanced CuproBraz® heat exchanger technology. Its advantages are the strength and reliability of the core, its smaller size and higher heat exchange rate compared to aluminium. Copper-alloy heat exchangers rev up the performance and put 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, a copper heat exchanger is tough and durable to the extreme.

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Photo credit: NASA

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

copper
gets going
destination
Red Planet

**NASA's first
3D-printed
copper rocket
engine part**

 @Go_Copper

Going to 5,000 degrees Fahrenheit

NASA engineers achieved a milestone in rocket manufacturing by 3D printing the first full-scale, rocket engine part made of copper. The combustion chamber liner must withstand extreme hot and cold conditions, as inside gas temperatures can soar to over 5,000 degrees Fahrenheit. Not your everyday copper, this is a copper alloy 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. It took over 10 days for the part – made from a special copper alloy created by NASA scientists – to have 8,255 layers of copper powder fused into its 200 intricate cooling channels by a laser machine. This groundbreaking manufacturing process will guide future 3D-printed rocket engines – to space and beyond.

Going to get fired up

After the part was manufactured, a nickel super-alloy jacket was deposited onto the exterior surface. Next, the copper liner was tested under simulated conditions to ensure it could handle the 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. Such revolutionary technologies are bringing NASA closer to a journey to Mars. The red metal is bound for the Red Planet!

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Photo credit: CERN

The Large Hadron Collider at CERN, the world's largest and most powerful particle accelerator – Geneva, Switzerland

copper
gets going to
the origin of
the universe

**Super-
conducting
wire for
the CERN
particle
accelerator**

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Going to explore the nature of matter

Unlocking the unsolved mysteries of the universe... That's what the CERN particle accelerators aim to achieve. By recreating the conditions right after the Big Bang, scientists are studying the building blocks of matter and forces of nature. And right at the heart of this powerful construction are superconductor strands made of high-tech copper-based filaments.

Going to collide at the speed of light

The Large Hadron Collider is the largest science apparatus ever built. Located in a 27-kilometre tunnel between France and Switzerland at CERN (the European Organisation for Nuclear Research), the particle accelerators project particle beams to near the speed of light. When the particles collide, the scientific magic happens, giving physicists clues to the formation of the universe.

Going to the moon and back – 684 times

Luvata Group provided the superconducting wire for the dipole and quadrupole magnets, which steer and speed the light-speed particles around the tunnel to their collision. It required 2,280 kilometres of superconducting cable, with 36 strands per cable and 6,400 filaments per strand. That's over 525 million kilometres of superconducting filament delivered to exact specifications – equalling 684 return trips to the Moon!

Going beyond the boundaries of science

CERN and the Large Hadron Collider (LHC) continue to search for answers to unsolved questions of the cosmos. The next discovery of rare physics phenomena might just be powered by LHC's copper niobium-titanium wires.