

The Copper Industry's EU Newsletter

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from The European Copper Institute

Page 1

EDITORIAL

A World of Copper

By John Schonenberger,
ECI Chief Executive



Welcome to the second issue of the European Copper Institute's EU newsletter. This issue covers a range of topics. You'll discover the three ways copper is minimizing the environmental impact in the "house of the future", find out how poor power quality affects a business's bottom line, and learn how copper is helping to prevent the spread of hospital "superbugs".

The last quarter has seen the completion of the Member States' review of the copper industry's voluntary risk assessment (VRA). The review confirms that existing EU regulations are sufficient to ensure that the production and use of copper products are generally safe for Europe's environment and its citizens' health. Future risk assessments will be carried out under the EU's REACH (Registration, Evaluation and Authorisation of Chemicals) legislation and the industry enters REACH with a strong basis for the copper registration dossier.

[Read more on page 2](#)

Challenging Times

By Professor Philippe Chalmin,
University of Paris-Dauphine

World commodity prices have reached sky-high levels during the first months of 2008: oil at \$120 a barrel, wheat at more than \$400, copper at \$8,000, coking coal at \$300 per tonne. Almost all commodities are concerned, be they energy, metals, raw materials, even food. In the broader context of the "sub-prime" financial crisis, commodities are definitely seen as a new set of assets and many investors are now looking at them as a way to protect their portfolios against a weakening U.S. dollar and financial turmoil.

It is now clear that the 2008 commodity crisis is the most intense that the world has known since the early seventies, the time of the first oil shock. At that time, the general feeling was that commodities would remain scarce and that most reserves would be exhausted by the end of the 20th century. Such was the message of the study published in 1971 by the Club of Rome: "Limits to Growth".

[Read more on page 3](#)



> CONSTRUCTION

Copper in the House of the Future

[Read more on page 4](#)

> ELECTRICITY & ENERGY

European business loses €150 billion annually due to poor Power Quality

[Read more on page 5](#)

> ENVIRONMENT

The Recycling Champion

[Read more on page 6](#)

> HEALTH

An Effective Weapon Against Superbugs

[Read more on page 7](#)

> TRANSPORT

Copper Makes Trains Go Faster

[Read more on page 8](#)

EDITORIAL

A World of Copper

By John Schonenberger, ECI Chief Executive

From the perspective of innovation, trials are now under way in German and UK hospitals to establish whether the installation of copper surfaces, such as door handles, push plates, bathroom taps and grab rails, will inactivate superbugs like MRSA and other hospital-acquired infections, such as *Clostridium difficile*, as already observed in laboratories. Comparisons will be made between those wards with the copper fittings and those with conventional fittings. These trials coincide with the recent announcement of the approval by the United States Environment Protection Agency of the registration of copper as an anti-microbial agent.

From 3-6 June, ECI will participate in Green Week, organised by the European Commission's Environment DG. This year's theme is the sustainable use of natural resources and ECI seizes the chance to communicate copper's important contributions to sustainable development, and, in particular, copper's exceptional recycling properties. Among its planned activities, ECI is organising a side-event: a visit to a multi-metals recycling plant to show how the recycling of end-of-life products can regenerate valuable raw materials.

We hope you will take the opportunity to visit our stand or to join us for the recycling plant visit (see poster, right) ■

COPPER

ESSENTIAL FOR LIFE

NATURAL



SUSTAINABLE



RECYCLABLE



Join the European Copper Institute

VISIT A STATE-OF-THE-ART RECYCLING PLANT.

Thursday, 5 June 2008
Depart Brussels 13h30
Return to Brussels 17h45

As part of Green Week 2008, visit the Belgian group Metallo-Chimique's recycling plant in Beerse, near Antwerp. It processes more than 12,000 tonnes of Waste of Electrical and Electronic Equipment (WEEE) annually, as well as 340,000 tonnes of other secondary raw materials.

The plant's innovative recycling processes turn copper, lead and tin scrap back into new marketable resources. Visitors will see all phases of the copper refining process.

Please contact: Christian de Barrin, European Copper Institute's Communications Manager if you are interested in joining the trip. Spaces are limited. Email cdb@eurocopper.org, visit Stand #45, Second Floor or call 02 777 70 82.



FEATURE

Challenging Times

By Professor Philippe Chalmin¹, University of Paris-Dauphine

More than 30 years later, we hear exactly the same arguments, but this time they ring truer. Indeed, the main reason for today's commodity price shock lies in the lack of proactive investment over the last 20 years, a lack of investment due to low and non-remunerative prices. Add to this the sudden surge in import demand coming from emerging countries and especially from China. However, an analysis limited to the commodity investment cycle would be short-sighted. We also have to look to the availability of resources for a world that will reach its demographic "plateau" at 9 to 10 billion people in 2070!

This is, of course, true for oil with much debate about the precise timing of the "peak oil" event and true for some minerals and metals, including copper. But it applies even more so to food and agriculture. Indeed, the food challenge seems to be the most crucial for the world in the 21st century. In most forecasting exercises, it is difficult to anticipate the changes in the pattern of consumption due to higher prices: in a world with a barrel of oil at \$100 or more, we have no idea what our children's energy mix will comprise. But one thing we can be sure of is that they will have the same daily food needs: between 2,500 and 3,000 calories and 100 grams of proteins (half from animal origin) per capita. This means that, by 2050, world food production will have to be twice that of today, using roughly the same area of cultivated land but probably with poorer soils and less water. It is therefore quite clear that the first generation of biofuels (such as those coming from coal in the U.S.) will have to be replaced by a second generation that uses waste as its main input.



With regards to energy, metals and, above all, food, the world will have to cope with that new word "scarcity". This is the main message coming from world commodity markets in spring 2008. It will also breathe new life into the search for new sources of raw materials and, of course, for a way to exploit that extraordinary "mine" which we throw away as waste. Each year, the world produces at least 4 billion tonnes of waste: only one billion tonnes are re-used, two-thirds through recycling (metals, scrap, paper) and one-third used as energy.

Thus, approximately, 3 billion tonnes are not used in a productive way. This is the other great challenge, the old dream of the alchemist, to change waste into resources.

Looking at commodity markets, many analysts and politicians criticise speculation and refuse to listen to what the markets say. Prices are high because supply is too limited, because investment has been lagging, because reserves are depleted, because the world is reaching its limits, because the time has come for us to learn to manage scarcity! ■

¹Professor Chalmin is also President of Cyclope. For further information: www.cercle-cyclope.com

CONSTRUCTION

Copper in the House of the Future

Copper's unique properties, such as its durability, recyclability and electrical and heat conductivity¹, make it a vital component of the house of the future. Copper-based features range from conventional and renewable heating and electricity systems, through plumbing, to architecture and design. It is important to add that copper products used in construction contain over 70% recycled materials, thus making it an essential material in the creation of sustainable homes.

Individuals, as well as governments, are responding to the dual need of reducing energy use in homes and reducing mankind's environmental footprint – and the construction industry is undergoing a radical transformation as a result.

In the UK, for example, all new homes are to be carbon-zero by 2016. In Germany, to encourage owners to renovate buildings, from July 2008, anyone wishing to sell or rent out a property must provide the building's energy certificate stating its energy consumption. In France, the objective is that, by 2020, energy consumption of the country's 31 million homes will be cut by one-third, 100% of new builds will be passive and renewable sources of energy will comprise 20% of final energy consumption².

Copper fulfils three crucial requirements in minimising the environmental impact of the House of the Future and ensuring the comfort and safety of those who live in it:

- as the best electrical and thermal conductor of all the metals used in construction, copper is the most efficient material for all heating and electrical applications, thus reducing energy losses and ensuring homes' electrical safety;



- its durability and 100% recyclability (without any loss in its performance) make it a clean and environmentally-friendly construction material;
- the fact that it is naturally anti-bacterial makes it a material of choice for water distribution.

Along with wood and clay, copper is one of a trio of sustainable construction materials that considerably reduce a house's environmental footprint. ECI has recently produced a leaflet in five languages 'Copper – a key material for sustainable homes' which communicates all the uses to which copper may be put in the sustainable home.

However, the energy efficient concept of the House of the Future also involves the occupant using more **energy-efficient equipment** therein. When we consider that end-user energy consumption in the EU increased by 12.6% between 1990 and 2004, the adoption by the EU of Directive 2005/32/EC, the so-called Eco-design Directive, proved timely. This Directive – which came into force in summer 2007 – takes into account the impact

of products on the environment throughout their life-cycle and seeks to limit energy consumption of electrical equipment. In view of its life-cycle, its potential to improve the energy efficiency of electrical appliances, thus reducing greenhouse gas emissions, and its capacity to be recycled, copper is the supreme eco-design material.

Given increased life expectancies, ensuring the health and safety of elderly or partially disabled people who live alone has become a priority. Under the Leonardo ENERGY programme, analysis has been undertaken which points to the fact that the house of the future should offer smart-ageing potential. These developments are designed to serve the needs of the elderly to permit them to live independent lives and stay in their own homes as long as possible.

Innovative developments that can be incorporated in the house of the future include safety features whereby a cooker that has been untended for 15 minutes will automatically turn off. An 'inactivity' alarm establishing a link with the person's family or with the local social/care services, in the event that no activity has been detected for a period of time, can also be installed, as can other alarms to be activated in the event of a fall or an accident.

In future issues of this newsletter, we will look at the role of copper in the revival of architecture and its new applications in design. ■

More information: www.eurocopper.org/files/pr_house_of_the_future_en%283%29.pdf

1: Of all the non-precious metals, copper is the best conductor of electricity.

2: http://www.eurocopper.org/files/presskit/press_kit_house_of_the_future_final.pdf

ELECTRICITY & ENERGY

European business loses €150 billion annually due to poor Power Quality

Both reliability and consistency of electricity supply are critical to many industrial and service industry processes. Copper, as the best conductor of electricity, greatly enhances the quality of electrical energy systems. When Power Quality³ is inadequate, business suffers. One of the conclusions, drawn from ECI's Power Quality survey in 2007, was that companies often do not recognise that the causes of poor reliability are of their own making and that cost-efficient solutions are in their own hands.

What is Power Quality?

Electrical power is perfect for end-users when voltage and current are correctly balanced. These can be distorted by disturbances such as interruptions, dips or surges, harmonic pollution and interference. Just how much deviation from perfection can be tolerated depends on users' applications, the type of equipment installed and their personal view of their requirements.

Poor Power Quality (PQ) affects the reliable operation of computers and computer-based equipment, which are now commonplace in business. The most serious consequence of poor PQ is often not the risk of damage to hardware, but lost data, reduced productivity and costly downtime. Like most ailments, they are much easier and cheaper to prevent than to diagnose and cure.

How often does a Power Quality problem arise?

According to a similar study in the US of 112 different sites of varying size and type, performed by National Power of Necedah, Wisconsin, the average site had 106 disruption events per month, with the worst location having more than 4,000. Most disruptions show up in random ways which are

difficult to reproduce, such as a PC that locks up, a PBX that loses calls or a motor that fails prematurely.

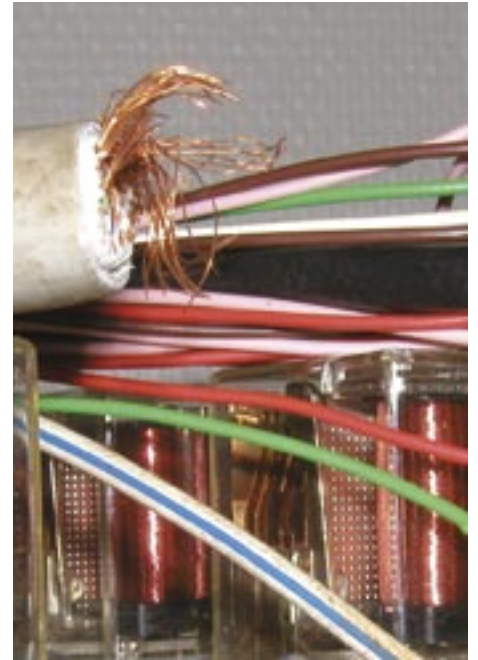
'Cost of poor Power Quality' research project

Lack of awareness and the under-reporting of the effects of poor Power Quality are critical issues that need to be addressed. This is why, in 2007, the European Copper Institute led a research project, in collaboration with several academic and commercial organisations, into the economic consequences of unreliable electrical power for European business. The study, which covered industrial sectors representing over 70% of the EU27's economic output, showed that poor Power Quality is seriously affecting business results in the industrial and service sectors, causing an **annual loss of €150 billion** across the European Union.

The total cost of poor Power Quality is often hidden but can account for a loss of up to **10% of a company's turnover**. For instance, how can the loss of productivity due to flickering lights and screens, affecting the comfort and health of staff, be calculated?

Cost-effective Power Quality solutions

It should also be noted that solutions to poor PQ generally cost less than the financial losses they cause. Most simply involve better electrical designs and the installation of additional wiring. For example, the chances of problematic connections which could cause voltage fluctuations in normal scenarios and catastrophic failure in extreme cases are decreased with the use of copper conductors. The Electric Power Research Institute in the U.S. highlights the point that as many as 80% of Power Quality problems relate to inadequate wiring or earthing.



Electrical power is, perhaps, the most essential raw material used by commerce and industry today. It is an unusual commodity because, although it is required as a continuous flow, it can neither be conveniently stored in quantity nor can it be subject to quality assurance checks before it is used. Therefore, it is necessary to raise awareness of the importance of Power Quality among commerce and industry and to work towards ensuring the reliability of supply. Electricity suppliers have a variety of engineering solutions available to them to eliminate or reduce the effects of supply quality problems.

In the next issue of this newsletter, we will look at the important issue of electrical safety in homes. ■

More information is available from: www.leonardo-energy.org/drupal/node/2579

3: The Power Quality Initiative was co-funded by the European Commission and was presented with the Leonardo da Vinci Award in 2004 by Commissioner Jan Figel.

ENVIRONMENT

The Recycling Champion



Western countries have been accustomed to an economy of abundance. However, due to a surge in demand for naturally occurring raw materials, the use of sustainable resources has become crucial. Because copper is 100% recyclable without any loss of performance, and because its recycling process saves up to 85% of the energy required in primary production, copper is expected to make an important contribution to a sustainable future.

In the last decade, there has been a surge in the usage of metals such as copper, largely fuelled by the rapid

economic growth in Asia. In 2007, alone, demand increased by 4%, resulting in a record 18.3 million tonnes and placing considerable upward pressure on its price. However, Europe has a long tradition of recycling, particularly in regard to electrical and electronic equipment, which allows 42% of Europe's copper usage to be sourced from recycled materials compared with 37% at global level, according to the ICSG⁴.

According to estimates contained in a report by the United Nations Environment Programme, annual waste electrical and electronic equipment

(WEEE) has reached 20 to 50 million tonnes, a figure which is increasing by 3 to 5% each year. In this regard, to encourage recycling, the EU adopted the WEEE Directive in 2002.

The Directive requires producers to take back and recycle any electrical and electronic equipment, providing them with an incentive to design such equipment in an environmentally more efficient way, taking waste management aspects fully into account. Given that it is estimated that copper may account for up to 20% of the weight of electrical and electronic equipment; when products reach the end of their life, the copper content can be easily recovered, then recycled and reused to make any kind of new product. A short film on the copper recycling process, broadcast by CNN World Report, may be downloaded at: <http://194.78.217.215/files/CNN/index.htm>

As one of the side-events at this year's Green Week, organised by the European Commission's Environment DG between 3 and 6 June, ECI will be organising a visit to a multi-metals recycling plant in Belgium. This will enable visitors to witness the copper (as well as other metals) recycling process from A to Z at a plant that melts down 1,000 tonnes of WEEE scrap per month and produces refined copper with 99.99% purity.

The next issue of this newsletter will look at the EU's Eco-design Directive and the role of copper. ■

4: The International Copper Study Group (ICSG), established in 1992, is an intergovernmental organization based in Lisbon that serves to increase copper market transparency and promote international discussions and cooperation on issues related to copper. More information: <http://www.icsg.org/>

HEALTH

An Effective Weapon Against Superbugs

Research has established that the natural antimicrobial properties of copper and copper alloys can effectively combat the spread of potentially deadly pathogens and microbial infections. According to the Director of the Environmental Healthcare Unit at Southampton University in the UK, Professor Bill Keevil, "copper reacts with the bacteria and inhibits their respiration". What is the significance of these findings?

Hospital superbugs

According to the UK's National Audit Office, 300,000 patients pick up infections in UK hospitals each year, as a result of which at least 5,000 are likely to die. These infections cost the National Health Service (NHS) an estimated £1 billion per year. At European level, there are about 3,000,000 healthcare-associated infections each year resulting in some 50,000 deaths. In the United States, for *Clostridium difficile* alone, there was an increase in the number of deaths from 3,757 to 6,480 between 2005 and 2006.

Copper's resistance

Preventing the spread of hospital superbugs is particularly difficult as many of them are resistant to a range of disinfectants and standard infection control practices. In fact, 80% of Methicillin-resistant *Staphylococcus Aureus* (MRSA) transmission is through surface contacts, such as door handles, grab rails, bathroom taps and light switches. Stainless steel is currently the most commonly used surface-metal in health institutions but, by simply replacing steel with copper, there is the potential to save thousands of lives. For example, according to research, MRSA bacteria can remain alive on stainless steel for up to 3 days, whereas, on brass (an alloy of copper and zinc), they die



within 5 hours and, on pure copper, they are eliminated in 30 minutes.

MRSA is not the only superbug that copper has been proven to combat. A year of comprehensive laboratory testing in the U.S. showed copper alloy surfaces to be effective against four other strains of bacteria; *Staphylococcus aureus*, *Enterobacter aerogenes*, *Escherichia coli* O157:H7 and *Pseudomonas aeruginosa*. These bacteria are particularly problematic as they opportunistically infect people and are thus a major cause of hospital-acquired infections.

Testing has shown that 99.9% of the bacteria on copper alloy surfaces (with 65% or greater copper content) were eliminated within 2 hours of exposure. On the basis of these results, the U.S. Environmental Protection Agency (EPA) has approved the registration of copper as an anti-microbial agent to reduce specific harmful bacteria linked to potentially deadly microbial infections. Copper is, in fact, the first solid material to

acquire this status and copper alloy products can therefore now be marketed as antimicrobial in the U.S. This was recently covered in a short report produced by CNN International⁵.

Research and clinical trials

In the UK, Selly Oak hospital has been chosen for a clinical trial of copper's antimicrobial properties. The hospital was selected as it is equipped with an advanced microbiology centre. One general medical ward has been installed with copper fittings while an adjacent ward retains its traditional stainless steel installations to act as a control. If the trial proves to be successful, it is very likely that thousands of hospitals across Europe will introduce copper-based fittings, thus offering them yet another means of tackling the spread of healthcare-associated infections. In addition to the work taking place in the UK and the US, testing of copper's potential to fight superbugs is under way in Germany, South Africa and Japan.

Whilst research has shown that the potential of copper in combating hospital-acquired infections is significant, scientists are also considering the wider medical applications of copper. For example, experiments have shown that the metal can inactivate the human flu virus and, therefore, may be a possible defence against bird flu (which is almost identical to the normal human strain) in the future.

The next issue of ECI's EU newsletter will describe the progress and results of these hospital trials. ■

More information about copper's anti-microbial properties may be found at: <http://www.eurocopper.org/files/copper-mrsa-uk-press-release-13-03-2007.pdf>

5: Click on: http://194.78.217.215/files/CNN/CNN_26.04.08_0546.wmv

TRANSPORT

Copper Makes Trains Go Faster

Travelling at speeds of up to 330-350 km/hour during commercial services, the Velaro®, Siemens's ICE 3 (Inter-City Express 3), is the fastest high-speed train to date in the world and has been plying the Barcelona-Madrid route on an hourly basis since its launch earlier this year. Central to its impressive performance is the fact that copper is an indispensable component both of catenary systems and of distributed electric traction motors.

The 'catenary barrier'

Just as planes are limited by the sound-barrier, high-speed trains come up against what is known as the 'catenary barrier'. The catenary is the power supply cable made of pure copper or copper alloy suspended horizontally above the track.

As the train moves, the catenary vibrates and, according to Dr Roland Lehoucq, of the French CEA (Saclay Atomic Energy Commission), it can move upwards by more than 30-35 cm. If the train's speed gets too close to the speed of wave propagation within the catenary, the catenary will disconnect. However, Lehoucq states that 'in practice, the TGV is not allowed to exceed a speed of 70% of the speed of wave propagation throughout the length of the catenary'.

Copper is able to push back the catenary barrier and thereby raise the speed at which the train can travel. It does this by maximising the tension to increase the wave propagation velocity. Because, of all the non-precious metals, copper is the best electricity conductor, it improves the catenary's electrical conductivity - a vital function for delivering power to the train.

Furthermore, when it is alloyed with cadmium or magnesium, copper strengthens the catenary, thereby

enabling greater mechanical strain. Lastly, copper and its alloys are highly resistant to corrosive forces such as water, the atmosphere and chemical products. This property guarantees the quality and durability of the products exposed to the external environment. As much as 10 tonnes of copper are used for every kilometre of dual-track catenary system.

Distributed electric traction engines

Unlike older versions, the new generation of high-speed trains no longer has an engine located in the locomotive. Instead, the traction motors are distributed beneath the whole train. In fact, in the Velaro®, the traction system is based on no fewer than 16 motors shared between four identical and independent traction units. This means that these high-speed trains use between 3 and 4 tonnes of copper compared with 2 to 3 tonnes in the older generation.

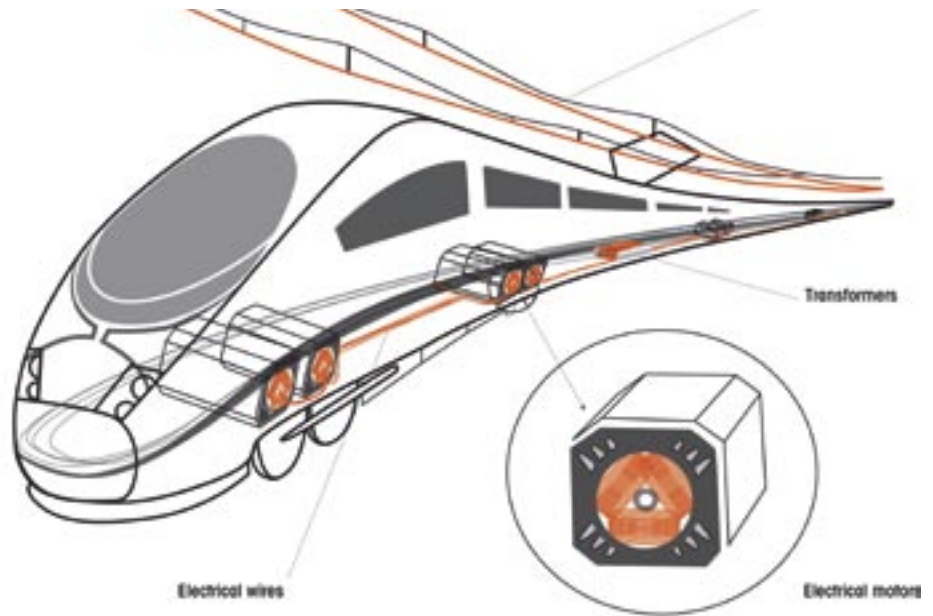
As in the case of catenary systems, copper's conductivity, once again, comes into play enabling the train to generate more speed, reduce energy losses and deliver better performance. For example, with its

acceleration power, the train can climb gradients of up to 4% (twice the capability of a conventional passenger train). Another important advantage of the latest technology is that, should one traction unit fail, it can be disabled without affecting the remaining units so that the train can reach its destination in complete safety with 75% of its maximum traction and braking power.

The next issue of ECI's EU newsletter will look at the development of the CuproBraz® radiator technology and its use in both trains and trucks.

Further information on copper and its role in the railways of the future may be found at:

<http://www.eurocopper.org/doc/uploaded/File/PK%20EN%20Transport%2005%2006%2007%20Final.pdf>



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