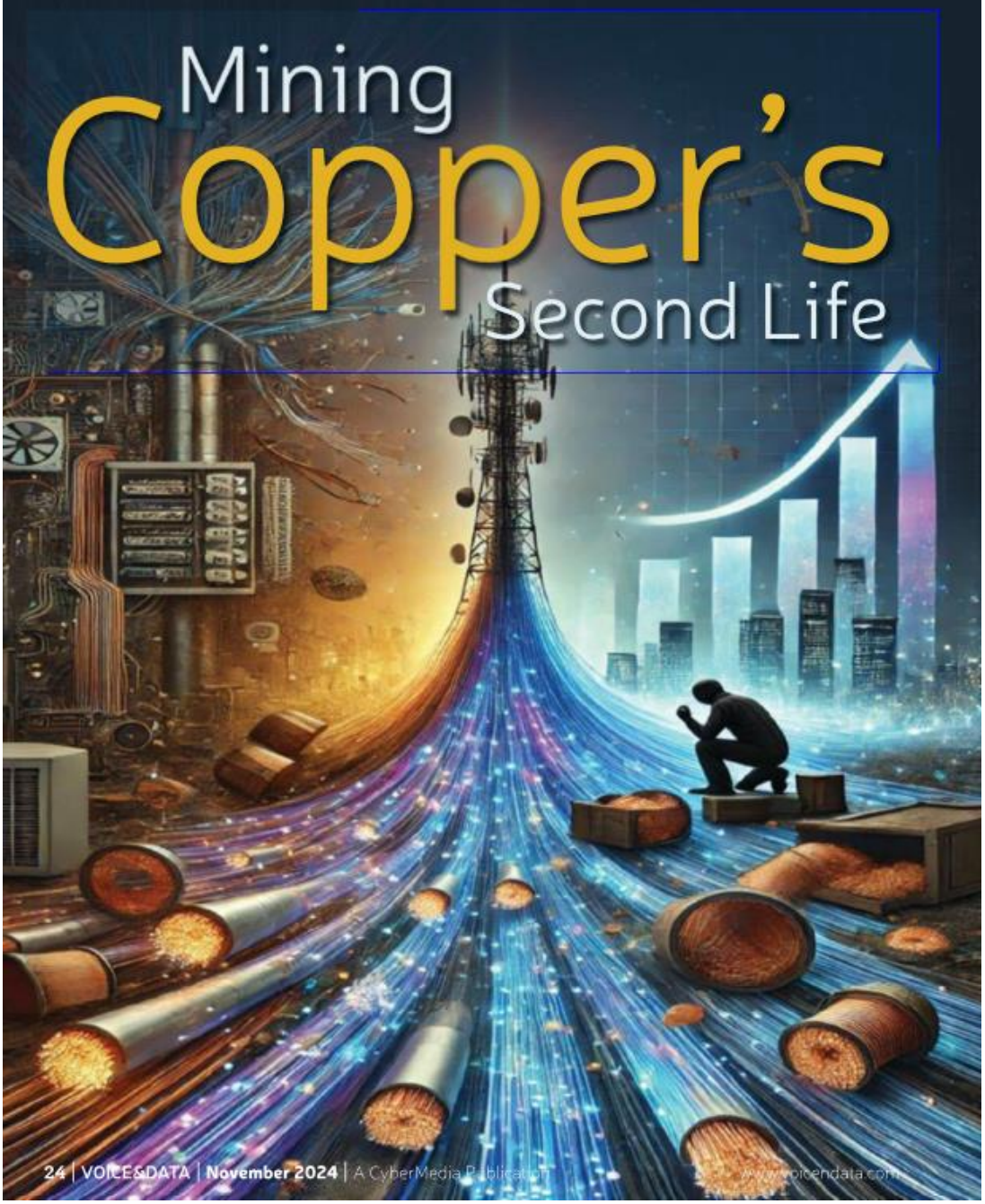
[COVER STORY]
E-WASTE

Mining Copper's Second Life



As telecom shifts to fibre, copper recycling emerges as a challenge and an opportunity, promising new revenue streams amid increasing demand for the metal.

BY PRATIMA HARIGUNANI

Let us start with a question from a chemistry textbook. What is the parking spot of a superb thermal and electrical conductivity metal, aka copper or Cu (Cuprum), in the Periodic table?

While you jog your memory for that answer, you may also reflect on some not-so-distant news items. In the US, a carrier, Windstream's Kinetic, had announced a USD 10,000 award for information related to copper thefts in Clay County, Kentucky. Apparently, 66 copper thefts were noted in the US in 2024. In a similar situation, Verizon had made a USD 10,000 offer related to information on thieves in Pennsylvania. Not far away was AT&T, which, in 2023, proffered a USD 40,000 grant to the San Joaquin County law enforcement for monitoring copper theft.

Yes, copper is being stolen in a big way, not just from electrical substations, statues, and lonely homes in the US but also from cellular towers and telephone landlines in India. Here, we have heard of numerous theft reports from telecom towers and, sometimes, of towers. There has been a significant escalation in thefts of essential telecommunications equipment, particularly Remote Radio Units (RRUs) and Baseband Units (BBUs) in 2023. Regions like Andhra Pradesh, Assam, Delhi NCR, Haryana, Karnataka, Punjab, Rajasthan, Tamil Nadu, and Telangana have been affected significantly.

You are not alone if you are scratching your head at this weird pattern worldwide. Consider this: As per the Market Data Forecast, the global recycled copper market was valued at USD 252.64 billion in 2023 and is projected to reach USD 270.58 billion by 2024 and USD 468.39 billion by 2032.

Also, observe this. The industry is going through a major overhaul with optical fibre cables. They offer high bandwidth, better capacity, low latency, high insulation from interference, and stronger coverage for 5G. They also reduce signal loss and help in network densification.

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Practice Director, Everest Group

IN BRIEF

- Copper theft is rising globally, affecting telecom networks, utilities, and infrastructure, signalling a growing value and demand for the metal.
- Fibre is replacing copper in telecom, promising better network efficiency while creating opportunities for copper recycling in India and beyond.
- India's telecom fibreisation target of 70% by FY25 will require substantial investment, with copper recycling offering potential cost offsets.
- Recycling copper is a sustainable solution; it reduces e-waste while generating valuable resources for telcos amid rising demand for recycled metals.
- With 95-99% copper recycling efficiency, India is among the global leaders, meeting over 50% of its demand through reprocessed copper.
- Despite a copper transition to fibre, telecom companies can tap the recycled copper market, valued at USD 7 billion over the next decade.

No wonder, as per some estimates, the National Broadband Mission had set a target to achieve 70% tower fibreisation by FY25. The latest counts put tower fibreisation anywhere between 38–44%; covering that new road will take time, effort, and money. As per some data, India needs to invest approximately Rs 2.2 lakh crore to fibreise 70% of its towers and Rs 2.5 lakh crore for 15 lakh more towers by 2025.

Incidentally, or not so, in FY 2023, India's apparent copper demand was 1,522 KT, up 16% from 1,311 KT in the previous year, as per the International Copper Association (ICA) data. The constraint on supply-side issues led to copper cathode imports increasing by 180%, while a 22% jump in secondary copper, primarily direct melt, was also seen.

Can you make that Venn Diagram now? India is switching to fibre fast. The country needs money and space to do that. And if it can reuse the copper lying about instead of throwing it away, there can be a good intersection of industry needs, challenges, and opportunities. Why does the country not recycle copper? That leads to the obvious question first.

RECYCLING TELECOM COPPER

Copper wires are highly recyclable, assures Gay Gordon-Byrne, Executive Director, The Repair Association. Gordon-Byrne, who has espoused many Right to Repair crusades in the technology industry, explains this further. "There is a significant trade in chopping wires to remove the plastic covers and then recovering the copper for smelting and reuse. I cannot say the same (yet) for fibre as most of the fibre I know of is strung as utility wires with long expectations of lifetimes. Maybe I am missing something, but given the very low values of glass as a recycled material, I doubt there is much commercial interest in recovering glass strung by thousands of miles."

Titus M, Practice Director, Everest Group, echoes that recycling already mined copper could be considered a

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DAVID EVANS
Group Head of AR & Services, TXO

viable and sustainable solution to refurbished copper. The rising demand and supply shortages of the metal have necessitated responsible reuse of the metal. Companies like Cyient, TXO, and Extracta Group have tapped into an estimated USD 6–10 billion market, which is now contributing to the annual copper demand.

Let us hear it from hands-on people in this alchemist lab, trying to turn copper into Gold. David Evans, Group Head of AR and Services, TXO candidly calls out that legacy copper infrastructure is becoming redundant as fibre rollouts expand. "Telecom operators have two options: leave the copper cables in place or remove and recycle them. Urban mining for extracting and reusing valuable materials from existing networks provides a sustainable and economically viable solution. Given the high value of copper, it makes sense to recover and recycle it."

Reports indicate that a spurt of companies has started identifying this big gap and copper's new story now. Copper recyclers have urged telcos to work with them in this process, pointing out that as much as 800,000 metric tons of copper could be tapped in the next ten years and might be worth more than USD 7 billion.

Chetan Barapatre, Senior Manager at Aranca, says that while fibre penetration in India is still low at ~40% for towers, fibre optic deployment has reached around 3.7 million km in 2023. "This transition to fibre generates substantial e-waste such as old routers, modems, switches, DSLAMs, transmission equipment, and copper cables, containing plastics and metals which can be recycled. Globally, copper cables have a recovery potential of ~800,000 tons of copper worth USD 7 billion (as per TXO). However, this requires an established recycling value chain from Telecom companies to recyclers with specialised Cu recycling capabilities."

CAN INDIA MAKE IT HAPPEN?

Turns out that India is emerging with one of the highest copper recycling rates globally due to high collection

TELECOM'S FIBRE SHIFT

As optical fibre networks replace traditional copper-based telecom infrastructure, a new question arises: what to do with the surplus copper? This scrap is not a waste; it is a valuable resource. If recycled effectively, it can meet the growing demand from sectors like electrification and infrastructure while advancing telco modernisation. But there are challenges:

- Investment needed for recycling infrastructure
- Variability in scrap quality and purity requirements
- Source collection and contamination issues
- Supply chain and logistical hurdles

Telecom operators stand to gain despite these barriers, with copper prices hovering above USD 11,000 per metric ton and steady profit margins of 20–40%. With an estimated 800,000 tons of copper potentially worth USD 7 billion, the industry is pivotal in acting on these challenges and seizing the opportunities.

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Senior Manager, Aranca

DEMAND FOR COPPER

India's copper demand is surging, reaching 1,522 KT in 2023, and this momentum could persist until 2030. The building and construction sector, in particular, is expected to grow rapidly at 10–13% annually, driving demand even higher. Secondary copper recycling contributed significantly, with 353 KT from copper scrap and 225 KT from brass scrap.

Globally, copper demand is set to double from 25 million metric tons to 50 million by 2035. However, by 2050, only 20% of the needed copper for net-zero goals will be produced, underscoring an urgent call for sustainable practices in copper recycling.

efficiency and minimal loss during resmelting, as observed in a study by the ICA India, the stock and flow model. The country can boast of the highest recycling rates (proportion of end-of-life copper scrap that gets recycled and reintroduced into the system) globally, about 95.1–99.4%. In fact, copper, derived from the recycling of scrap, both domestic and imported, including finished products, is fulfilling over 50 per cent of India's copper needs.

And do we not need all that copper?

A report by the International Institute for Sustainable Development (IISD) states that India's burgeoning infrastructure, from building construction to expanding transportation networks and power grids, is predicated upon a steady supply of copper. It is the fuel for new clean energy technologies such as electric vehicles, electric motors, wind turbines, solar panels, and battery storage.

Copper is also becoming crucial for industrialisation, especially electrification and global energy transition. It is worth noting here that emerging economies, like India, that are highly dependent on imports for their primary copper supply have high sensitivity to market price trends. Also, a potential copper supply deficit over time can seriously affect the country's clean energy goals and economic development.

CHIMNEY-CLEANING WITH HIDDEN GIFTS

Recycling can be a chore as the industry peels away all that old copper and rolls in new fibre. But can telcos make money from copper extraction and recycling, which turns out to be a cumbersome clean-up task?

Yes, says Evans. "Telcos can profit from copper extraction and recycling. The demand for copper

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remains high, making its recovery a potentially lucrative opportunity, especially for larger networks. While logistical and extraction costs can be challenging, partnering with a specialist like TXO can streamline the process and make it more efficient."

"Rapid fibreisation has brewed beyond a clean-up chore and has now become a strategic cost-saving and revenue-generating opportunity for telcos. Major telcos have already made around USD 100 million with copper extraction in the last two years. As copper demand doubles in the next decade, this could further boost profitability," adds Titus.

"Telcos can now anticipate a steady profit margin of 20–40%, as copper prices surge beyond USD 11,000 per metric ton, unlocking a significant commercial opportunity in the marketplace," he says, spelling out the opportunity in precise numbers.

BORN WITH A COPPER SPOON, BUT...

A lot of challenges can pave this seemingly rosy path of transition. According to Gordon-Byrne, telecom equipment (not the wires) has always been easily recyclable but not often financially rewarding. "Routers and switches can last a long time and cycle through many owners, but Cisco, in particular, has rigged the trade in used products to prevent long-term use. They argue vehemently against the 'Right to Repair' as a used router is credible competition compared with a new router. Much of the investment in telecom is in the data centre behind the wires," he says, explaining why it is such "big money".

The copper-to-fibre transition has other factors, too, even if and when the intention is not an issue.

Incomplete migration to fibre or continuation of copper for critical services can hamper supply. The degradation of underground wires and the expenditure of digging the metal up and converting it into a saleable condition are also worth considering.

Adds Evans: "At TXO, we have led the way in urban mining, focusing on sustainable materials recovery from legacy infrastructures. Our experience has shown that the main challenges are logistics, regulatory compliance, and cost-efficiency." But he also adds that the company has successfully worked with operators to manage large-scale copper recovery projects that meet regulatory standards and deliver financial returns."

Barapatre observes that in India, where copper imports meet much of the demand, recycled copper already contributes 30–40% of the supply. "However, much of the scrap collection and processing occurs in the informal sector, which lacks sufficient infrastructure."

But all that is not stopping many telcos curious about copper's new role.

"The Indian telecom companies are mindful of recycling and have taken steps to recycle e-waste, including copper cables, through partners and auctions, which is purchased by both large and small recycling firms and traders," he adds.

Reportedly, AT&T recycled 14,000 tons between 2021 and 2023, while giants like BT and Orange are also developing strategies for copper reclamation. With increasing fibreisation, the amount of copper waste from the telecom sector will continue to grow, underscoring the need for India's copper recycling industry to enhance its infrastructure and capacity to create a sustainable and effective recycling ecosystem, which is gaining from the opportunity, Barapatre surmises.

And yes, you got the answer. Copper's atomic number is 29. Now, let us mix some economics and chemistry here. Do you also know who Copper's neighbour is—seated at number 28 at that table? Well, it happens to be Ni or Nickel. Co-incidence?

pratimah@cybermedia.co.in