Vidya Vikas Education Trust's
Universal College of Engineering
Accredited with B+ Grade by NAAC
(Permanently Unaided | Approved by AICTE, DTE & Affiliated to University of Mumbai)

The Official Newsletter of Dept. of ETRX, UCOE
FEBRUARY_2022, VOLUME 4, EDITION 8

ARTICLES INSIDE THIS ISSUE:

College Profile:

Everything you need to know about us:

Embraced by lush greenery and scenic beauty, Universal College of Engineering is a treasured place for aspiring engineers to leave their imprints on success.

As a college within the wider network frame, we are one of the fastest- growing institutions in India. Our institute has been accredited by the National Assessment and Accreditation Council (NAAC) with a B+ grade in the first cycle of accreditation. Times of India Survey Ranked No. 1 in India among Top Emerging Private Engineering Institutes for 6 consecutive years 2015, 2016, 2017, 2018, 2019, and 2020 and the saga of accolades still continues.

In response to the expectations of quality technical education, our college is approved by the All-India Council for Technical Education (AICTE), New Delhi; Recognized by the Directorate of Technical Education (DTE), Government of Maharashtra; affiliated to Mumbai University. Our college is also associated with professional bodies like IEEE, IETE, ISA, and CSI to update the revolutionary technological advancements.

We offer 4 years of full-time Bachelor of Engineering in Computer Engineering, Civil Engineering, Artificial Intelligence & Machine Learning, Information Technology Engineering, and Data Engineering.

The unique state-of-the-art facility of the institute has been carefully designed to accommodate the needs of the students. Laboratories are equipped with world-class facilities based on the latest technology of different sectors. Our smart classrooms are well ventilated, spacious, and equipped with overhead and LCD projectors along with the public address system. The College library provides a rich collection of specialist library resources and services to support student's academic work and enrich their research skills.

We are obliged to equip our students to get placed in highly reputed companies by mentoring their necessary skill set for cutting-edge technologies. The core highlighted areas are helping students with their technical competency, communication skills along with career guidance and counseling.

Universal College of Engineering has produced a large number of successful alumni who are working in reputed organizations in India and abroad and have contributed immensely to the cause of nation- building and society. We welcome all engineering aspirants to create an incredible legacy in the field of engineering.

Quantum Computing Startup Opens London Lab in Quest to Build CMOS-based Qubits

Based in Islington, North London, the new lab includes several specially configured dilution refrigerators that provide cooling near absolute zero (–273°C) for the quantum chips, making it the most substantial low-temperature facility of any U.K. quantum lab established to date, according to the company. The facility will employ 25 full-time staff, including quantum theorists, physicists, and IC engineers, to realize Quantum Motion's vision of truly scalable quantum computers based on silicon chips.

Founded in 2017 as a spinout from research efforts at University College London and Oxford University, Quantum Motion was has raised almost £20 million (about €23.7 million) in equity and grant funding, with venture backing from INKEF, IP Group, the National Security Strategic Investment Fund (NSSIF), Octopus Ventures, Oxford Sciences Enterprises, and Parkwalk Advisors. The company intends to use existing silicon manufacturing processes to produce quantum processors fully integrated with conventional electronics, with high yield and low cost, in order to dramatically widen access to quantum computing.

In 2021, the Quantum Motion team made a breakthrough discovery that proved quantum computers could be built using standard silicon chips. In a paper published in PRX Quantum, it reported the measurement of an electron spin in a singly occupied gate-defined quantum dot, fabricated using CMOS-compatible processes at the 300-mm wafer scale. For readout, it employed spin-dependent tunneling combined with a low-footprint single-lead quantum-dot charge sensor, measured using RF gate reflectometry. The team demonstrated spin readout in two devices using this technique, obtaining valley splittings in the range of 0.5–0.7 meV using excited-state spectroscopy and measuring a maximum electron-spin relaxation time (T1) of 9 ± 3 s at 1 T. Those long lifetimes indicate that the silicon-nanowire geometry and fabrication processes used to achieve the results show great promise for qubit devices, while the spin-readout method demonstrated is suited to a variety of scalable architectures.

In summary, the paper reports that Quantum Motion was able to isolate and measure the quantum state of a single electron for a period of 9 seconds on a CMOS chip. The chips were manufactured at CEA-Leti. Qubits, the building blocks of quantum computers, are often realized using exotic technologies such as superconductors or individually trapped atoms. Quantum Motion proved that it is possible to create a stable qubit on a standard silicon chip, like those found in any smartphone, rather than one specially created in a lab environment. This creates the potential for stable and scalable quantum computing.

EE Times Europe visited the new facility in London and spoke with John Morton, co-founder and CTO, and James Palles-Dimmock, COO. Morton expanded on the company's background, saying, "We have been working for 20 years on qubit hardware and 10 years ago focused on realizing qubits in silicon. And then, five years ago, we were convinced there was enough proof of principle and that we could see a route to silicon quantum transistors, so we founded Quantum Motion."

The executives noted that the idea of trapping single electrons has been around for nearly 15 years, but Quantum Motion has achieved proof of material, showing that the approach is achievable in practice. "Our idea is to turn that idea into a processor chip using an industrial-grade CMOS process to manufacture the qubits," said Morton. "It's all about the charging energy; as long as you can control the gate voltage in the tens-of-meV range, you can control the electrons."

The company's vision is to enable a fully error-corrected quantum computer, he added. "When you don't have full error correction, it reduces the potential applications for quantum computing."

Supply Chain Challenges for EVs

According to the Intergovernmental Panel on Climate Change, transportation accounts for around 23% of worldwide energy-related greenhouse gas emissions, with road transport accounting for 72%. Governments have implemented more rigorous emissions regulations for light-duty vehicles such as passenger automobiles in order to tackle climate change. While the industry has always reached these higher criteria by steadily improving ICE, vehicle aerodynamics, and tire technology, new rules in some automobile markets may necessitate a significant shift.

Europe and China will lead the way in adopting electric vehicles. Several countries intend to ban the sale of fossil-fueled vehicles by 2040, and are offering substantial financial incentives to push consumers to purchase electric vehicles. Despite these incentives, the primary drivers of sustainable EV adoption will be economic rather than regulatory, and it is only when parity is achieved in total cost of ownership that EVs will begin to represent a significant share of new vehicle sales.
The main issue is semiconductor shortages. The peak of the crisis, which took place in the summer, has now been overcome. From the beginning of the autumn onwards, the improvement in supplies has prompted research companies and managers to forecast a gradual normalization of the situation. Until the end of the first half of 2022, difficulties are still expected, but on a much smaller scale than those experienced in recent months.

Let's pursue the discussion with Richard Barnett, CMO at Supplyframe.
EE Times Europe: Why is there a bottleneck in the global supply of semiconductors at the moment and how long is it likely to last?

Richard Barnett: A number of factors have converged since 2020 in what many would consider a "perfect storm" of challenges. Not only has Covid and its variants caused delays in the form of lockdowns and labor shortages, but rising demand for semiconductors in industries like automotive, consumer electronics, and IoT has led to an overabundance of demand and very limited supply.

It's also important to keep in mind that semiconductor production is both costly and time-consuming. Even with billions of dollars of investment, it still takes upwards of 26 weeks to go from production to packaged chips. Our estimation, based on data from our DSI Network, is that relief won't be in sight until the first half of 2023.

EE Times Europe: What are the long-term implications of the current supply/demand imbalance, and how can businesses best navigate them?

Barnett: Beyond short-term delays and costly spot buys to accommodate sourcing needs, the long-term implications here reveal vulnerabilities and inefficiencies within current supply chains. A lack of visibility, focus on resiliency at the point of design, and poor risk mitigation are all things that have been discussed for years, but now we are faced with the consequences of ill-prepared supply chains.

Digital transformation across the electronics value chain was always a discussion to some extent, but now it has become an imperative for the industry. Businesses need to take a step back, acknowledge the gaps in their visibility, understand the need for outside-in intelligence, and realize that minor adjustments or small initiatives will no longer work in the long-term.

EE Times Europe: What strategies are the global auto companies using to maintain a supply chain?

Barnett: Automotive executives are focused on preventing total production shutdowns at all costs, because this is where the largest costs are incurred. We're seeing short-term solutions like GM removing their automatic start-stop systems from full-size pickups and SUVs, simply because the vehicles can't leave the production line with those capabilities in light of the shortages.

General Motors CEO has gone on the record saying that they will make "substantial shifts" by "building direct relationships with manufacturers." All of this leads to a renewed focus on collaboration and visibility in automotive supply chains, and that's where industry leaders are focusing their efforts in the near-term.

EE Times Europe: How has the supply/demand imbalance increased the risk of counterfeit chips?

Barnett: While counterfeit chips are nothing new, the current shortages are putting a lot of supply chains in a bind, and causing ill-advised panic or spot buying without first properly vetting the supplier. These types of components often enter the supply chain by targeting production lines that are in danger of shutting down due to complete lack of components.

This is less of an issue for large manufacturers that purchase directly from chip foundries. Counterfeit chips tend to become an issue when companies buy chips in smaller batches from distributors that exist downstream from the supplier.

An interesting thing to note here is that companies are fully aware of the potential for counterfeits, but without proper intelligence and insight into the stock of trusted suppliers, they often find themselves backed into a corner and make a risky decision for the sake of preventing a total production shutdown.

EE Times Europe: What needs to be done to remedy the current shortfall for the automotive industry?

Barnett: Part of the reason the shortages are so severe is that automakers are purchasing from the same supply pool as everyone else. To an extent, manufacturers like Tesla were able to sidestep the shortages by designing their own chips and architecture, which provides two distinct benefits: a connection to the supply, and no need to share with competitors or other industries.

OEM and Tier 1 suppliers need to step back and rethink their product design and platform strategies. By investing more into proprietary architecture and closely working with their suppliers, they can secure exclusive access to chips.

We're already seeing this kind of movement with the recent announcement from both Ford and GM that they intend to enter the semiconductor business. Ford is set to partner with semiconductor manufacturer GlobalFoundries, while GM has begun engaging with chip manufacturers like Qualcomm Inc. and NXP Semiconductors NV, to become more closely involved with the process and supply.

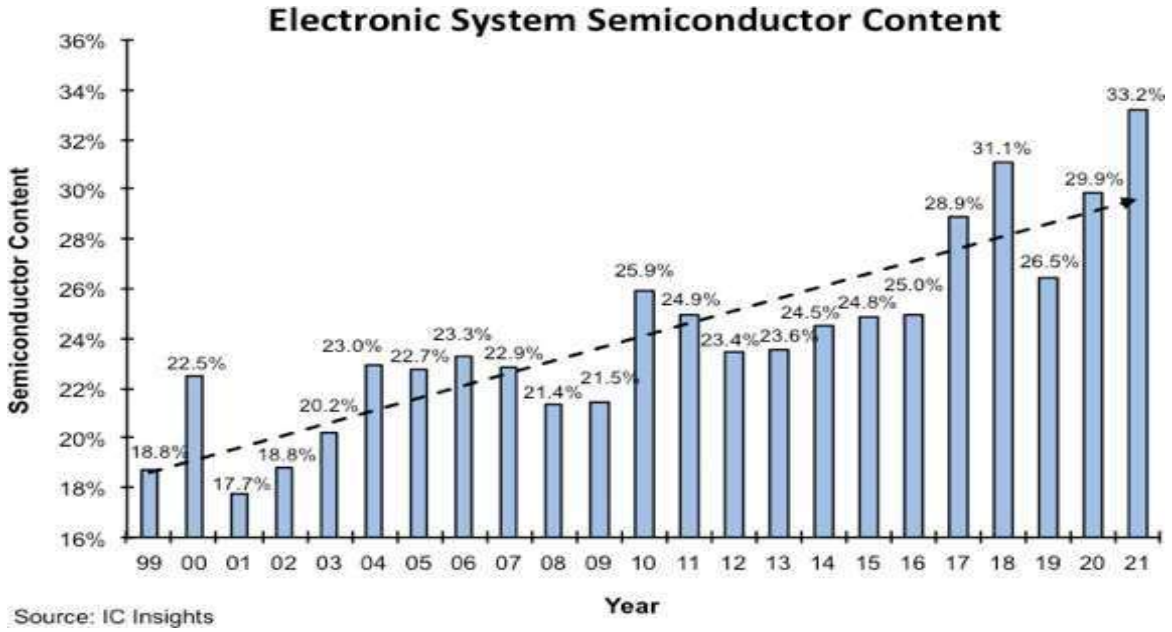
There's no magic fix for the shortages, but automakers are making the intelligent decision to secure new strategies and supply chains that ensure sourcing viability into the future.

Green Copper Meets Sustainability and Decarbonization Requirements

Copper and clean energy:

Decarbonization can be seen as part of the cost of fighting climate change, or at least slowing it down. The purpose of decarbonization is not just to halt climate change, but also to achieve a higher level of efficiency. Electric vehicles, of course, tie into that messaging, since they are an integral part of it. However, there are other relevant aspects, such as reducing our dependence on plastics, reducing chemicals in general and pollutants, reducing our usage of all types of materials and becoming more efficient and less wasteful. EVs can bring efficiency by centralizing the power source and power production. And then, if you can make that power production greener, you can get even greater efficiency gains.

Copper will play a critical role in the transition to clean energy. Clean energy technologies are becoming the fastest-growing segment of copper demand, including applications such as wind turbines, solar panels, EV batteries, and large-scale energy storage.

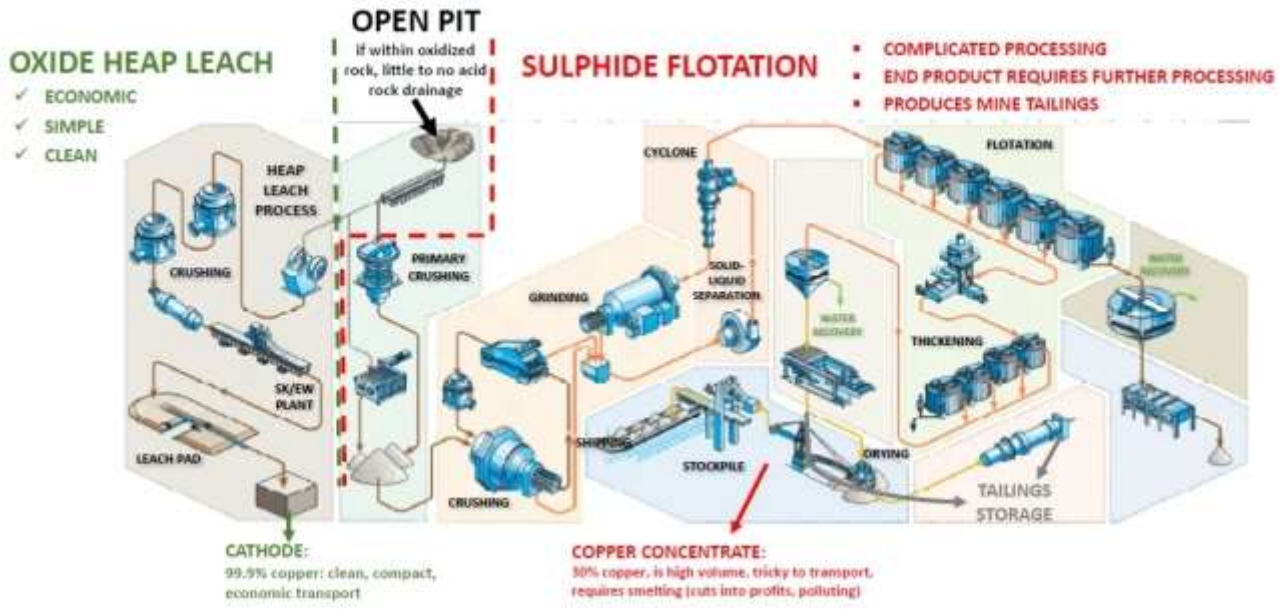


How World Copper meets copper demand:

World Copper Ltd, a mineral resource company focused on the development of copper assets, has market experience gained through the history of mining operations accumulated by its board of directors and management. “We don’t invest in the usage of copper, or in how we can use it more efficiently, we are investing in supplying the world’s demand for copper,” said Nolan Peterson, CEO of World Copper. Higher grade mines are becoming harder to find. The average grade mined by the top 15 producers has decreased from 1.20% to 0.72% Cu in this decade, and it’s becoming more expensive to produce copper now than it ever was in the past.

What differentiates World Copper from other mining companies is how the mineral is extracted. The deposits which produce the vast majority of the world’s copper are using a process called sulphide flotation, which is a complicated process and uses a lot of water and generates greenhouse gases. World Copper, however, is using another method for copper production, called heap leach copper oxide.

"We can produce copper cleaner and greener than any other source of copper in the world," said Peterson. "Not only are we an oxide project, but we also have the benefit of a project using gravity, since it's located at the top of a mountain, and Chile is a country leader in renewable power. As shown in Figure 2, sulphide process requires very large equipment and workforce, uses a lot of water, and the output product is a concentrate, not pure copper. According to World Copper, oxide heap leaching, the other way around, is currently one of the cleanest ways to make copper. Today, 70% of the world's copper comes from the first method, while the remaining comes from oxide heap leaching.



Peterson believes, as people begin to care more about electrification and decarbonization, they will look for that greener copper and promote its development. And if that means paying a little bit more to say that their supply chain is green, he thinks that many manufacturers will go down that road.

Copper production from oxide heap leaching costs one-third that of sulphide flotation, and no smelting process is required to produce copper cathodes as the energy consumption of the process is lower overall. Smelting is a process that takes copper concentrate ore, and uses what's called pyrometallurgical technology to basically roast the ore at a very high temperature. This process usually requires a fossil fuel of some sort to get that temperature high enough, and once it does that, it releases sulphur and other chemicals into the air. On the other hand, copper oxide uses electrowinning, which basically uses electricity, in place of the smelting operation.

"Right now, we are in the planning stage, developing our property, and picking the appropriate techniques and technologies," said Peterson. "We're years away from operations, but we will be contemplating the use of technologies like regenerative brakes, for example, on our mining vehicles and potentially hybrid type vehicles, as a couple of examples of technological solutions that will enhance our project."

What OEMs are looking for is 100% pure copper. They don't necessarily want finished products, because they finish them themselves. What customers are looking for is the green aspect of copper which entitles them to say that copper was produced in the greenest and cleanest manner possible. And that entails using what is called grade A cathode, the end-product of the oxide heap leach process (see Figure 2).

World Copper is currently developing the Escalones project near Santiago. Escalones is Chile's largest copper oxide deposit under exploration and development, with three and a half billion pounds of copper mineral in the ground. The company is currently working on a preliminary economic analysis that will help it present the development of that asset to the market and encourage investment as the project progresses. World Copper is also investing in Arizona in a project called Zonia. This is a copper oxide project, and it plans to shortly begin the permitting process and to bring it into operation. With 500 million pounds of copper, Zonia is smaller, but less expensive and faster to develop.

"We are pushing forward on these two projects. We are probably three or four years away from development, or from construction and operations at the earliest. However, we think it is a good time to invest because we are undervalued in the market for the assets we have and the quality of their development potential," said Peterson.

VidyaVikas Education Trust's
Universal College of Engineering
Kaman-Bhiwandi Road, Survey
No. 146 (Part), Village Kaman, Taluka Vasai,
District Palghar-401208
Ph- 8007090722, 8407979167, 8007478659
Website: www.ucoe.edu.in/www.universalcollegeofengineering.edu.in