

# PGUB | Management Consultants



Welcome Peter Gresch

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## WELCOME

Dear customers and business partners,

Who would have imagined what has happened to us in the year 2022? We all feel now more than in previous decades that things around us change or need to change. Democracies are under threat, the world climate is worsening and dramatic conflicts – in Russia, the Middle East or with China – affect global business as well as our privacy. Many business and political strategies around so-called megatrends and their influence need drastic modifications and re-orientation.

My perception is that in such a phase companies that are good at riding the wave(s) and drive drastic actions e.g. towards CO2 neutrality in their environment will sooner or later increasingly do better than their competitors. It was a good two years ago when, in view of the looming Covid pandemic, states and their companies canceled and stopped everything that could be stopped. After the first shocks had been digested, it quickly became clear: the change continues and – it is even accelerating! Electromobility, for example, continued to gain momentum.

With that, our PGUB expertise has come into greater demand than ever before. That's why we are looking forward to the new challenges, helping our new as well as long-term customers in their re-orientation of strategies, markets and products. With an experienced, highly engaged team that continues to grow. Being committed to be part of your change.

We wish all of you the best for the rest of 2022 and for a hopefully better 2023.

Yours,

*Peter Gresch*



# HIGH PERFORMANCE COPPER MATERIALS FOR E-MOBILITY

by JX Nippon Mining & Metals Corporation

JX Nippon Mining & Metals (JX) is an integrated producer of copper and related metals. We carry out global business operations that cover a robust supply chain from mining, smelting and refining to manufacturing and recycling of end-of-life equipment, thus creating a closed loop for a sustainable future.

JX Nippon Mining & Metals Functional Materials Division supplies advanced copper materials which are essential for our lives wherever things are connected. Our products can be used for various electronic components in applications such as electric vehicles, drones and industrial robots. They range from treated rolled copper foil used in flexible printed circuit boards to precision rolled products including beryllium-free Titanium Copper and Corson Alloy used in connectors and other interconnection components.



JX NMM Key products:

- Sn-Cu-PET Foil for electromagnetic shielding
- Titanium Copper Alloys for connectors, camera modules
- Corson Alloys for connectors
- Copper Alloy Foil for LiB anode current collector
- Treated Rolled Copper Foil for flexible printed circuits
- Electro-Deposited Copper Foil for flexible printed circuits



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"Hydrogen will have a central role in the energy systems of the future and will significantly influence strategies of industry sectors such as mobility, electricity and heat. Hence, we at PGUB are moving into this field."

## HYDROGEN: A KEY ELEMENT IN FUTURE ENERGY SYSTEMS

by Matthias Brendel

Hydrogen is increasingly becoming the central strategic energy carrier of the future. Its potential uses are very diverse and combine needs from areas such as mobility, heat generation and electricity. Many countries have announced hydrogen strategies and are at different stages of their definition and implementation.

Germany currently has allocated public fundings of €9 billion to support the development of hydrogen technologies. The initiative addresses elements of the entire value chain from production, transportation and infrastructure to its use in industry or mobility. In order to produce hydrogen in a climate-friendly way, a significant increase in renewable electrical energy is required. This would allow hydrogen production through electrolysis and is referred to as "green hydrogen". However, such production may not always be local and, therefore, will require a complex logistics chain. Much of this is yet to be defined and represents a huge investment.

In the area of mobility, the use of hydrogen opens up a multitude of solutions, ranging from automotive and commercial vehicles to train, marine and aviation. Fuel cells (FC) are using hydrogen and convert it into electric energy. Toyota Mirai, Hyundai Nexo or the recently announced BMW iX5 Hydrogen are FC vehicles with an impressive maturity level. In addition, the refueling times of these vehicles are very similar to those of conventional cars.

Hydrogen can also be the basis for synthetic fuel production in Power-to-X processes. While e-fuels would allow the use of combustion engines with an improved carbon footprint, it is also seen as a potential solution for applications which cannot easily be electrified, such as planes or ships. At the same time, e-fuels would provide a good basis for storage and transportation of energy.

PGUB regards the Hydrogen Economy as a new strategic competence field. Synergies in the areas of electrification and power electronics are strong and many of our partners are active in the development of related technology. We are already working in projects around hydrogen storage, power electronics for fuel cells and hydrogen generation. If you are interested to learn more on this, please, do contact us.



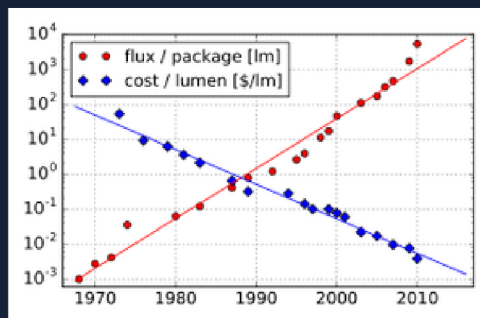


# THE END OF HAITZ'S LAW?

by Detlef Decker

We often notice with new technologies that their performance increases while at the same time the costs decrease. As early as 1965, Gordon Moore had described a law for semiconductor chips, according to which the performance doubled about every 18 months – with the costs and the surface area remaining constant. A similar law revolutionized lighting technology in less than three decades.

Born in Germany and later active in the USA, Roland Haitz was a major pioneer of LED technology. More than 20 years ago, he postulated a law named after him, according to which the amount of light generated per LED (flux per package) increases by a factor of 20 every ten years, while at the same time the costs for the luminous flux (\$ per lumen) decrease by a factor of 10. As you can see in the graph, the law describes the development over 40 years quite accurately.



Source: [https://en.wikipedia.org/wiki/Haitz%27s\\_law](https://en.wikipedia.org/wiki/Haitz%27s_law)

LEDs have replaced incandescent lamps almost everywhere, both technically and economically. However, the question now arises as to whether further increases in luminous flux and cost reductions are possible at the current rate.

The general conditions for the development of LED technology have largely changed in recent decades. The pure LED chip production has reached a very high level of technological maturity. The high internal quantum efficiencies and decoupling efficiencies can hardly be increased and the economies of scale, which have arisen in particular through use in general lighting, have led to very low production costs. A further exponential development is therefore not to be expected.

In addition, many new LED systems work with direct chip integration. Examples of this are  $\mu$ LED, ISELED® or LED pixel modules for matrix headlights. The reference parameters "flux/package" and "\$/lm" become meaningless here. But what is even more important is that the costs of the individual chips in today's LED lighting systems only represent a small proportion of the system costs. In short, the focus for new product generations is now on electronics, thermal management and system integration.

"This article summarizes a paper which I presented at the VDI conference "Optische Technologien in der Fahrzeugtechnik" in the summer of this year."





“Singapore is a great location for this kind of conference as the city is taking many measures to transform their mode of transportation to clean and greenhouse gas-free means at an impressive speed.”

## AUTUMNAL EVENTS TO HARVEST CONTACTS AND INSIGHTS

by Dirk Jürgens & Dr. Thomas Stange

After the end of the summer vacation period in Europe, which usually lasts until the final days of August, the number of conferences and trade shows tends to increase rapidly. PGUB involves itself actively in selected events that provide a good fit with our activities, that allow us to foster our network of customers, partners and friends and that create new business opportunities for presenters, exhibitors and participants.

### Engaging the Asian Market

The first in a row of such events was held in Singapore on 12th and 13th September. After successful establishing both a Charging and an Automotive Battery Conference in Germany, the organizers – Süddeutscher Verlag and the respective Program Committees, headed by chairman Peter Gresch – decided to bring a joint format to Asia. They opted for the city state on the equator for the premiere of the Automotive Charging & Battery ASEAN Conference.



With a total of more than 70 participants, top-class speakers, the support of two main sponsors, namely the Singapore Battery Consortium and TÜV Süd, as well as four exhibitors, the conference was a great success. The event brought together speakers and visitors from Europe and Asia to talk and discuss about electric vehicles and latest trends in both markets. As always, the conference was competently moderated by Peter Gresch, and he and the organizers concluded that after this promising start they would be back next year.





## What's New in the US?

Just a few weeks later, another premiere took place in the opposite direction, namely in Detroit, Michigan. The first US Automotive Wire Harness & Electrical Distribution Systems (EDS) Conference, an offshoot of the well-established Boardnet Congress in Ludwigsburg, was held in the heartland of the North American Automotive industry.

Topics presented and discussed concerned the future of EDS architectures (moving towards zonal controllers), the automation of harness manufacturing, the rise of data rates or the mitigation of risks of "aging" high voltage contacts. The organizers were very pleased to welcome around 140 participants to this event.

As a regular participant of and exhibitor at the German Boardnet Congress, PGUB sent a representative to Detroit who used the opportunity to visit our long-term customer Telamon ([www.telamon.com](http://www.telamon.com)) and to accompany them to the conference to create new leads.

## Rutronik Counts to Three

Back in Germany, PGUB's business partner Rutronik ([www.rutronik.com](http://www.rutronik.com)) was happy to host their own Automotive Congress for the third time. After a pause imposed by the Covid pandemic, everyone attending welcomed that this gathering could finally take place again.

The event started on the evening of 11th October with a Dinner Reception in an old gasometer in the Eastern part of Pforzheim. After its decommissioning, it was eventually turned into a location in which one can experience the wonders of the Great Barrier Reef via a full-circle panorama of the underwater world. It feels like fine dining some thirty feet under water, surrounded by corals, schools of small fish, roaming predators and human divers.

Following this prelude was a day fully packed with presentations from renowned Automotive companies, ranging from OEMs down to component suppliers. The venue was the Pforzheim Conference Center, which provided ample space for the conference with its approximately 150 participants, for an exhibition with more than a dozen booths as well as for networking and catering.

Keynotes came from Rutronik's Director of the Automotive Business Unit, Uwe Rahn, on megatrends, Prof. Dr. Schaller of Technical University Munich on the electrification of medium and heavy duty commercial vehicles, and Dr. Thomas Hueck of Bosch who gave his views on the near-term economic outlook for our industry. In between, moderator Peter Gresch held an interview with Reinhard Prechler, responsible for E/E system integration at Audi. A full 13 more presentations covered topics of "Light & Sight", "Boardnet, Power, MCU" and "Automotive Sensors / ADAS". The congress ended with a panel discussion on when to expect autonomous driving vehicles.

"The Rutronik Automotive Congress was well-balanced between talks on the greater challenges and those that focused on more detailed hard- and software aspects. It also provided for great networking."







## INTERVIEW WITH DR. WOLFGANG BOCHTLER

by Dr. Thomas Stange

Wolfgang, you have a long track record in flexible printed circuits (FPCs) and worked as a senior executive for a major Japanese supplier for almost two decades. Now, you are member of the the PGUB Advisory Board. How come?

There are two main reasons. Firstly, Peter Gresch asked me to join. We have known each other for many years and worked together mostly within the framework of the ZVEI's activities towards the Automotive industry.

And the other reason?

PGUB is simply a cool outfit! We have a team of people who all boast hands-on experience from many years in major Automotive companies. They know their stuff, they know the workings of the industry and they have an impressive network to rely on. Plus, the working atmosphere is very relaxed and we tackle many interesting topics.

Can you give us an example?

I'll give you two. GTS Flexible Materials is a Welsh company which provides substrate foils to FPC manufacturers. The overwhelming bulk of these are situated in Asia, and they usually use polyimide. However, GTS argues, there is a better suited material for applications in battery electric vehicles called PEN or polyethylen naphtalate. It is safer, less costly and eases assembly when used for FPCs to connect the cells in battery modules. We help them to assess the market opportunity and to promote their message. But there is also a strategic aspect to this.

How is that?

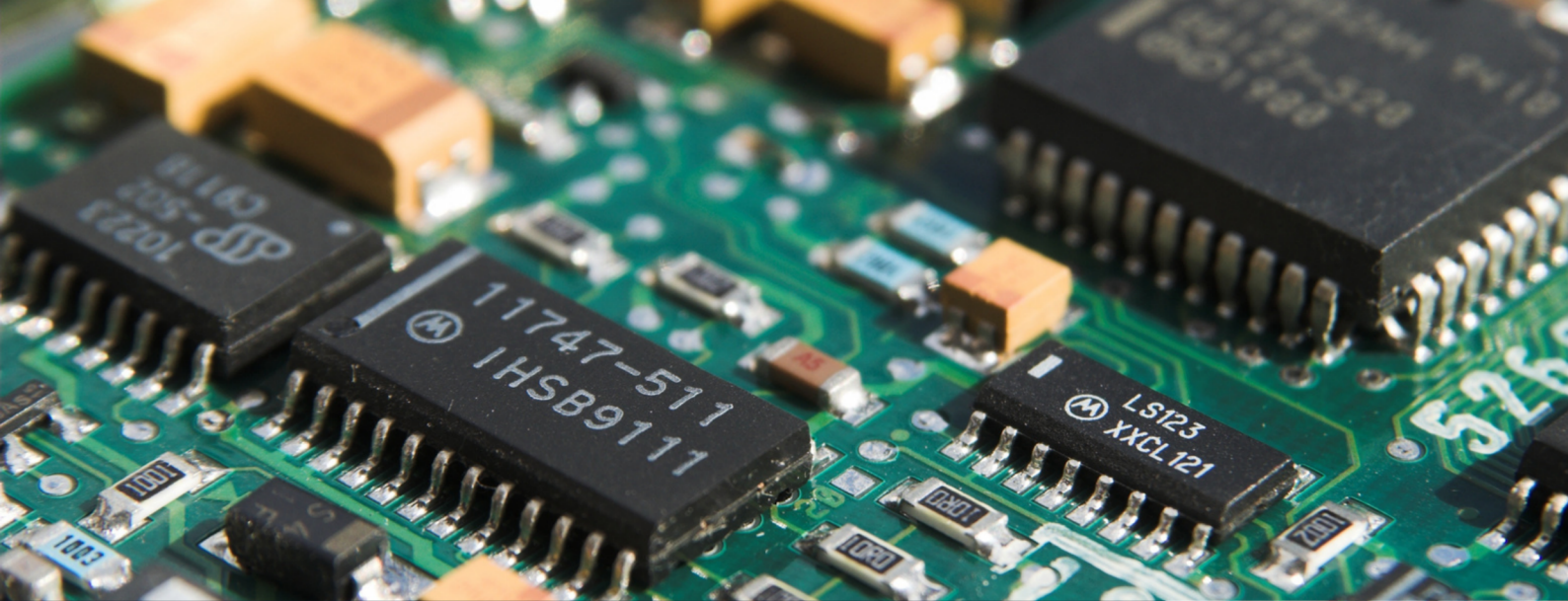
Most experts assume that by 2030 some 30 million cars will be partly or fully electrified. FPCs have clear advantages over cable harnesses or printed circuit boards. If PEN were to become the substrate material of choice, GTS is in for a fast growing market. We support them in devising a respective growth strategy and to take this to their investors.

What's example number two about?

We are working with the Japanese company JX Nippon Metals (cf. page 3). One of their products is rolled copper foil, which has material property advantages over the electrodeposited foils. Now, electrodeposited foils have a cost advantage – there is no denying that. So, we are helping them to identify applications in which their solution and its strengths outweigh the cost factor: demanding cases of EMC shielding, for instance, or high-performance current collectors for battery cells.







# QUO VADIS, HARDWARE DEVELOPMENT?

by Peter Störmer

What ever happened to classic hardware development? Is it still needed? Because today it sounds as if this "recipe" does the trick: take 1-2 pieces of SoC, add a micro capacitor, an FPGA and a little DC/DC conversion according to the application specifications; put these on a printed circuit board, add an aluminum housing with sufficient grease for heat dissipation on top... And the super hardware at price X is ready to do whatever Y you had in mind.

But wait! It is not quite like that. True, there have been changes, but the tasks of a hardware developer are far from boring or superfluous. Where, for example, body hardware was developed in the past and circuitry with a parts list was the leading medium, creativity is now expected when designing the layout constraints and EMC measures for a zonal ECU. Test and verification are more complex due to the high-speed design. Here, the "hardware-ker" is the architect who knows the construction plan and designs the basis and makes this available to the team.

Working with higher voltage levels, also makes one or the other realize that, for example, diodes simply do not block and that reverse currents can have significant magnitudes. The control of GaS and SiC components, the design of DC/DC converters requires a lot of know-how to achieve maximum efficiency. One or the other hardware-ker will also create the low-level software and thus build an effective bridge to the application.

This surely should not bore anyone. In fact, creativity is needed more than ever. While a few years ago knowledge of the details of the components was required, today it is also knowledge of the architecture of the increasingly complex components and interfaces.

Project work today is characterized by "agile". Originally created in software development with small teams, agile methods can now be found in many areas of the company. In day-to-day work, it definitely makes sense if everyone in a team has the same understanding and works with the same methods (goals). Ultimately, hardware development is also becoming increasingly "agile". Software is the central part of the team today, hardware development has become more fundamental.

VDI Seminar:

Compact knowledge of  
electrical engineering &  
electronics (E/E) in the  
automobile

Next Date:

08-09 November 2022  
Düsseldorf

Seminar Management:  
Peter Störmer, PGUB



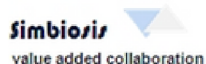


# TECHN BACKG

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## Cooperation Partner:



Peter Gresch



Dirk Jürgens



Viviane de Schrijver



Maximilian Ettinger

Strategies

Co-Operations

M&A

Sales and Marketing

Business Development

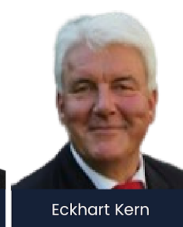
Purchasing



Josef Schriek



Hubert Fluch



Eckhart Kern

Mechatronics

Lighting, Interior, Switches

Auxiliaries, Sensors

Project Management

Manufacturing, Quality



Detlef Decker



Ruben Junker



Matthias Brendel



Dr. Thomas Stange



Florian Heinzelmann

E-Mobility

Electrified Powertrains

Battery Technologies

Charging

Thermal & HVAC

Vehicle Engineering



Andreas Zipser



Philip Rössig



# LOGY ROUND

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